



Fiber Optic Cable Installation

Introduction

Fiber optic cables can be easily damaged if they are improperly handled or installed. It is imperative that certain procedures be followed in the handling of these cables to avoid damage and/or limiting their usefulness. The information contained in this manual should serve as a guide to proper handling, installing, testing, and for troubleshooting problems with fiber optic cables.

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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://www.ab.com/manuals/gi>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: <ul style="list-style-type: none">• identify a hazard• avoid a hazard• recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the drive to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the drive to alert people that surfaces may be dangerous temperatures.

Overview

Optical fibers require special care during installation to ensure reliable operation. Installation guidelines regarding minimum bend radius, tensile loads, twisting, squeezing, or pinching of cable must be followed. Cable connectors should be protected from contamination and scratching at all times. Violation of any of these parameters causes increased attenuation or permanent damage to the cable. The following are a few general comments to consider when installing fiber optic cables.

Do not exceed Maximum cable lengths.

Make sure you check the installation instructions of the module for the appropriate cable lengths to ensure proper operation.

You may experience additional attenuation loss when using bulkhead connectors to join cables even when the total length is less than maximum. Care should be used in maintaining total attenuation budget when joining cables with bulkhead connectors.

Do not exceed minimum bend radius for a given cable type

Exceeding the bend radius of the cable can cause unseen damage to the fibers of the cables that may not manifest itself for a period of time. This can lead to an expensive restringing of cables at a later date. See the following cable specification tables for appropriate bend radii for each catalog number.

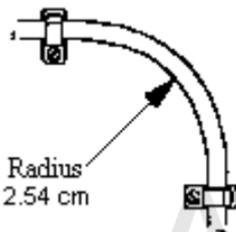


Figure 1 Correct Bend Radius

Fiber Optic Cable Mechanical Limits

Catalog Number	Length meters, (in)	Long Term Bend Radius No Load	Long Term Tensile Load
2090-SCVGx-0 (Glass)	1, (39) to 100, (3937)	2.54 cm	< 98 N
2090-SCVPx-x (Plastic)	0.1, (4) to 32 (1260)	2.54 cm	< 245N
2090-SCEPx-x (Plastic)	0.1, (4) to 32, (1260)	2.54 cm	< 70N
2090-SCNPx-x (Plastic)	0.1, (4) to 32, (1260)	2.54 cm	< 70N

Avoid twisting cable.

Use proper pulling techniques in laying out your cable. Putting twists in the cable greatly increases your chances of breaking the fibers.

Recommended Fiber Optic Cable Pulling Techniques

Installation methods for both wire cables and optical fiber cables are similar. Just remember these rules:

- **Use a pulling grip** designed for pre-connected fiber optic cables. Grips with a fixed pull ring should use a swivel to attach the pull rope.
- **Monitor Tension.** Do not exceed the maximum pulling load rating. On long runs (40m to 99m) use proper lubricants and make sure they are compatible with the cable jacket. On really long runs (over 100m) pull from the middle out to both ends. If possible, use an automated puller with tension control or at least a breakaway-pulling eye.

- **Always use a straight pull.** Use cable guides to maintain the recommended bend radius. Do not exceed the cable bend radius. Exceeding the bend radius harms the fibers. It may not be immediate, it may even take a few years but eventually by exceeding the recommended bend radius of the cable you reduce the useful life of the cable.

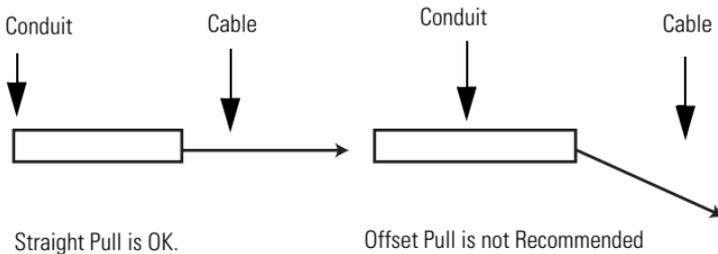


Figure 2 Proper Pulling Technique Through Conduit

- **Do not twist the cable.** Putting a twist in the cable can stress the fibers.
- **Roll the cable off the spool.** Use a device to aid in uncoiling long cables. Do not spin it off the spool end. This puts a twist in the cable for every turn on the spool.



Figure 3 Use a Device to Uncoil Fiber Optic Cable

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- **Figure 8 for a long pull.** If you are laying cable out for a long pull, use a “figure 8” on the ground to prevent twisting (the figure 8 puts a half twist in on one side of the 8 and takes it out on the other, preventing twists.).

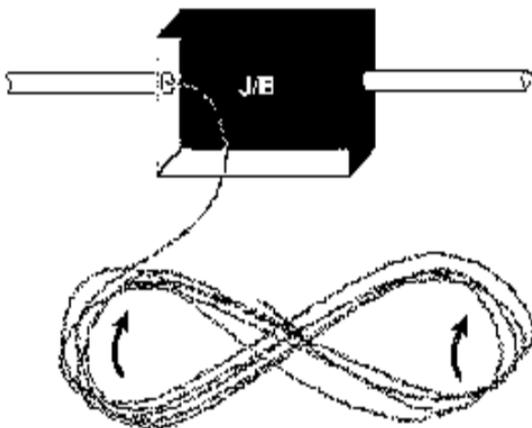


Figure 4 Prevent Twisting the Cable By Laying Cable in a Figure 8 Pattern

1. Lay cable on floor in a figure 8 pattern.
 2. Turn Figure 8 cable 360 degrees (upside down) before continuing.
 3. Pull in opposite direction (may require two people).
- **Use a swivel-pulling eye.** Pulling tension causes twisting forces on the cable

Routing Fiber Optic Cables

Take care when routing through cabinets and right angle raceways. Install cables in raceways without loops. Avoid placing fiber optic

cables in raceways and conduits with copper cables to avoid excessive loading or twisting.

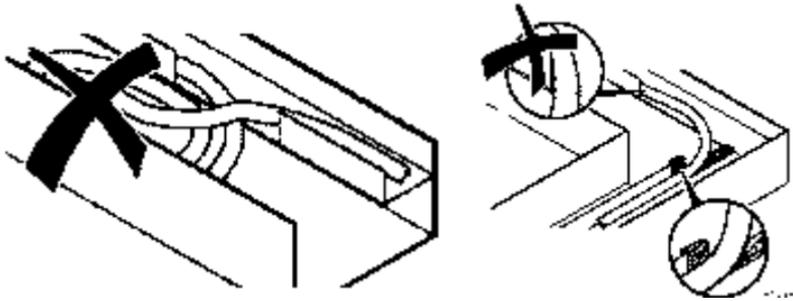


Figure 5 Using Raceways and Conduits

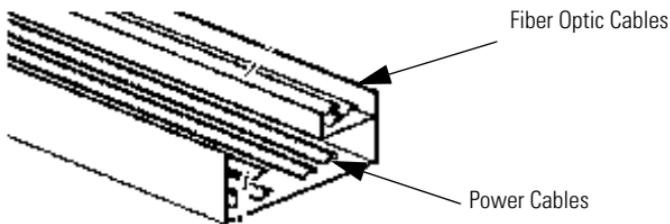


Figure 6 Using Raceways and Conduits

Protect cables from excessive or frequent bending.
Routing on a cabinet door should be used as a last resort and special

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care must be taken to protect the cable and avoid exceeding the bend radius of the cable.

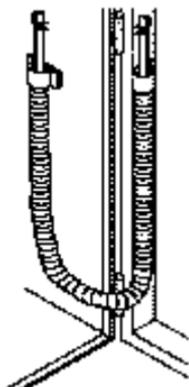


Figure 7 Routing Technique for Cabinet Door

When routing the cable proper pulling techniques should be used. See the section entitled *Recommended Fiber Optic Cable Pulling Techniques* earlier in this manual.

When attaching cables with clamps use plastic clamps with large surface areas and avoid pinching or squeezing cable. Cable clamps should be installed manually with gentle pressure.

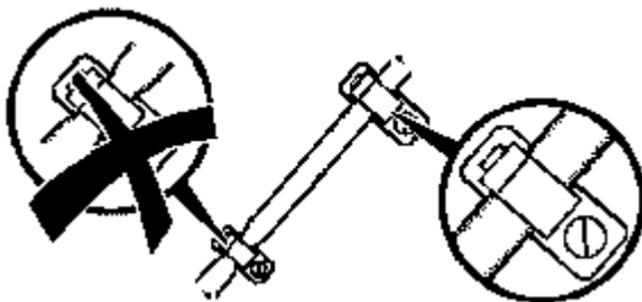


Figure 8 Proper Use of Plastic Clamps

Installation Checklist

Use the following installation checklist to ensure proper handling.

Installation procedure	Complete	Comments
Used uncoiling device to avoid twisting		
Maximum cable length not exceeded		
Bending radius maintained		
Tensile load not exceeded; proper pulling techniques used		
Lateral loading not exceeded		
Cable not squeezed or bent		
Cable installed without loops in raceways		
Cable protected from sharp edges		
Fiber cable installed in separate raceways from copper		
Cable connector cleanliness maintained		
Cable connector finger tight to transceivers		

ATTENTION



Hand tighten connectors. Do not use tools to tighten connectors as they may cause damage to cables and inhibit signal transmission.

Cleaning Techniques

Proper cleaning of the fiber optic cable ends and transceivers is essential to minimize system attenuation. Dirty fiber optic cables cross

contaminate their mating transceivers. Conversely a dirty transceiver contaminates its mating fiber optic cable.

There are a variety of ways to clean fiber optic components.

Cleaning Fiber Optic Cable Ends

Use a wet wipe to loosen particles on the end of the cable connector using a circular or straight wiping motion while using care to avoid wiping over area of pad that has already been used. Do not use a back and forth scrubbing action. Always use a clean area of the swab for each connector. When in doubt use a fresh wipe. Follow up the wet wipe cleaning with a dry wipe to remove any residue. Finally, the connector should be air cleaned to insure removal of any lint.

Cleaning Fiber Optic Transceivers

Choose an optical grade lint free swab that fits easily into the transceiver barrel. The swab should be gently placed into the barrel of the connector and rotate no more than one turn. DO NOT rotate back and forth or round and round because debris gets ground into the transceiver. The swabs should only be used ONCE. Use a dry clean swab and insert into barrel and rotate once. Discard swab. Use canned air to blow out the barrel.

Fiber Optic Cable Installation and Handling Instructions

For more detailed information on the proper care, handling, and installation of these cables see the *Fiber Optic Cable Installation and Handling Instructions* manual, publication number 2090-IN010A-EN-P. This manual can be downloaded free of charge in pdf format from the following websites:

www.theautomationbookstore.com

www.ab.com/manuals/gmc

Notes:

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Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

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