FIBER*works*®

Fiber Optic Cable

Installation and Service Manual

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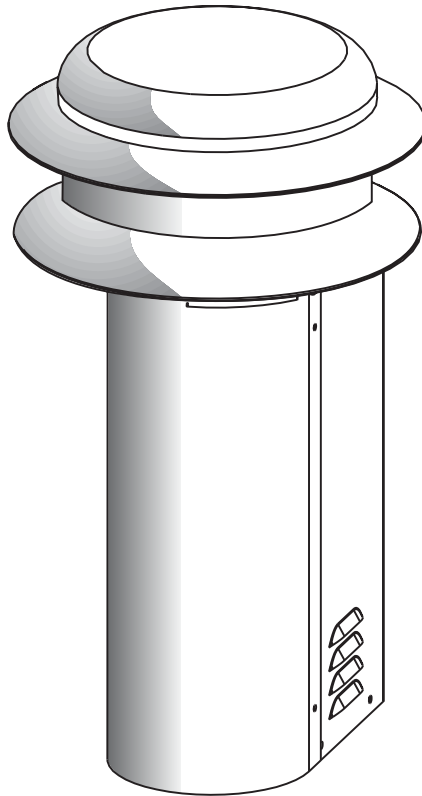
Underwriters
Laboratories, Inc.
Listed

Ul Model No.s
20100100
20100200
20100300
20100400
20100500
20100600

C E

CE Model No.s
20100208
20100408
20100608

Pentair Water
Pool and Spa®

IMPORTANT SAFETY INSTRUCTIONS

When installing and using this electrical equipment, basic safety precautions should be followed, including the following:

READ AND FOLLOW ALL INSTRUCTIONS

1. DANGER: To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.

2. Check your local building codes before installation to ensure the Photon Generator® light source is located at least the minimum distance from the pool that local codes require.

3. The electrical supply for this product must include a suitable rated switch or circuit breaker to open all ungrounded supply conductors to comply with Section 422-20 of the National Electrical Code, ANSI/NFPA 70-1987. The disconnection means must be readily accessible to pool and spa users, but installed at least 5 feet (1.5m) from the pool or spa water.

⚠WARNING

RISK OF ELECTRICAL SHOCK OR ELECTROCUTION

This Photon Generator must be installed by a licensed or certified electrician in accordance with the National Electrical Code and all applicable local codes and ordinances. Improper installation will create an electrical hazard which could result in death or serious injury to pool users, installers, or others, due to electrical shock, and may also cause property damage.

Disconnect all power before starting the installation process to all associated pool equipment. Failure to do so may lead to severe electrical shock, which can result in death or severe personal injury.

⚠WARNING

Before installing this **FIBER**works product, read and follow all warning notices and instructions accompanying this light product. Failure to follow safety warnings and instructions can result in severe injury, death, or property damage. You are going to be using a sophisticated device which requires knowledgeable handling in order to insure its optimum performance. **Please do not touch anything until you have read and understood these instructions.** If you have any questions, please call our service hotline, Monday through Friday, 7:30 a.m. to 4:30 p.m.: **(800) 831-7133.**

⚠WARNING

It is recommended that **FIBER**works be installed by trained and certified **FIBER**works dealers only. This installation manual assumes that your Photon Generator will be properly installed in full accordance with the instructions provided, the National Electric Code, and any local codes applicable for an electrical installation of this type.

SAVE THESE INSTRUCTIONS

Table of Contents

Photon Generator Specifications

Electrical

    Input Voltage .... 120 V @ 2 A; CE units 240V @ 1A

    Power Consumption .... Less than 250 Watts

Mechanical

    Dimensions .... 18 in. x 10 in. x 12 in.

    Weight .... 20 lbs.

    Materials .... Powder coated steel, aluminum, high strength plastic

This unit will accommodate up to 600 FIBERworks fibers.

Contents of the Shipping Carton

This package should contain all of the following items:

√ Photon Generator
√ Sub-terrain Mounting Base
√ Ferrule Kit
√ FIBERworks Installation and Service Manual - p/n 99293100 (this manual)
√ Owner's Manual
√ Warranty Registration Card
√ Spare Light Bulb
√ Light Bulb Order Form

To perform this installation, you will need the following items:

Electrical wire and conduit to connect main power, FIBERworks cable and fittings as required, OptiFusion termination kit, (p/n 21005500), and the tools/equipment listed in relevant sections of this manual.

SECTION I.   **Before You Begin Installation**

The Installer's Ten Laws of FIBERworks

1. DO NOT ATTEMPT INSTALLATION WITHOUT CERTIFIED TRAINING.

2. Take your time and be patient when terminating - Rushing a 90 second FiberKnife 400 fiber termination can cause 30% loss of light.

3. Use only prescribed OptiFusion tools - FIBERworks FiberKnife and shield.

   (DO NOT USE MECHANICAL CUTTERS OR KNIFE BLADE HEATED WITH TORCH)

4. Make conduit runs as direct as possible - plastic fiber loses 2% of light per foot; see Table 1, Light Transmission Versus Distance.

5. When handling the cable do not bend final 12 in. of cable before lens.

6. Push lens and final 1 in. of cable into lens body - DO NOT PULL IN!

7. Bottom of Photon Generator should be at or slightly above grade and protected from grass.

   Locate the Photon Generator above water level whenever possible. If raised water features are being lit, be sure the end of the conduit inside the Generator is filled with RTV, other suitable sealant or conduit seal kit #22002000 and locate the Generator so water will drain away from it and not accumulate inside of or around the Photon Generator. This will prevent water from flooding the electrical portion of the unit.

8. Make sure you have mounting accessory of choice, either the Sub-terrain Mounting Base, or Surface Mount Kit.

9. PROPER TERMINATION AT PHOTON GENERATOR; see Photon Generator Installation Steps.

   a. First mechanically cut all cables even to top of Photon Generator.

   b. Strip all cable jackets to 3 in. or 4 in. above bottom of Generator.

   c. SANITY SAVER- one wrap of electrical tape over fiber bundle end.

   d. Install ferrule and tighten with 2-3 in. of fiber extending out of fiber disk; see Figure 10.

   e. Hot knife cut. Hold blade angled at 15 degrees, as if you were cutting cream cheese. Don't stop and restart, but rather keep continuous light pressure. Don't saw or wiggle knife. Ease up pressure as you come to end of cut.

   f. Be sure ferrule is fully rotated and secured by ferrule screws.

   g. Wrap electrical tape or tie wrap around bundle at angled aluminum piece under transformer.

10. WHEN IN DOUBT CALL your FIBERworks Specialist or Technical Service at 800-831-7133.

The Pool Designer/Salesperson's Ten Laws of FIBERworks

1. The color of fiber optics is fantastic... but don't just sell fiber optics, sell FIBERworks! More Light... More Color... More Friendly than other similar fiber optic systems... from the World's Leading Manufacturer of Underwater Lights!

2. Delight your customers and get referrals. Don't undersize - never use fewer fibers or fewer lights than recommended.

3. The Longer the fiber optic cable, the more it will cost and the less light it will transmit to the pool, spa, water feature or landscape light. Distance costs 2% of light per foot; see Table 1, Light Transmission Versus Distance.

4. Choose your Photon Generator location(s) wisely. Give your biggest cables the shortest runs. If you design "never ending" decks, design a planter between 5 and 10 feet (depending on code) from the primary lens location.

5. Colored surfaces absorb light. The darker the surface, the more light it will absorb. Do not waste your customer's money on underwater fiber optics for dark surfaces. They will not fully appreciate the dramatics of fiber optic colors. Use Amerlites, AquaLights or Hi-Lites.

6. The darker your pool surface, the more dramatic will be perimeter FIBERworks. Dark pools make great reflecting pools and fantastic perimeter FIBERworks pools. For perimeter installations over 200' consult your FIBERworks Specialist.

7. FIBERworks powerfully illuminates the wall and floor surface toward which the lens is pointed... modest illumination is on the wall which holds the lens. AmerGlow™ 12, 30, 70 or 100 cables make great step lights and shadow fillers when directed toward or across the wall holding the AmerGlow™ 325, 225 or 170 cables.

8. The primary light of a lens spreads at a 70 degree angle (35 degrees from the lens center line). You can angle the Invisible Gunite Lens Body in the wall before shotcrete or gunite by tying the 1 in. PVC pipe to the rebar and staking the back end at the angle desired.

9. Always use Certified FIBERworks Installers. A rushed or poor installation can kill performance by 30%. Schedule training as soon as possible.

10. WHEN IN DOUBT CALL Technical Service at 800-831-7133 OR- fax a scale drawing to 919-566-8924.

A. FIBERCAD Design Assistance for Pools & Spas

For assistance in designing your fiber optic pool or spa lighting, fax a FIBERCAD information form and scale drawing to 919-566-8924.

If designing your own lighting layout, it is critical to keep the Photon Generator as close to the pool as possible (less than 15' is desirable) and cable runs as short as possible to maximize light output; see Table 1, Light Transmission vs Distance.

Do not attempt to light a pool larger than 24 ft. x 42 ft. (or 1,000 sq. ft.) with a single Photon Generator.

B. OptiFusion Lens positioning with the Photon Generator centered at end of pool.

1. AmerGlow 170, 225 and 325 only, with the lens positioned at the end of the pool.

   a. For white or nearly white concrete, fiberglass or vinyl pools, OptiFusion lenses intended to illuminate the entire length of the pool are best placed in the shallow end wall or step as near the water surface as possible.

   b. For light colored vinyl pools, place the lenses in the deep end 18 in. below water to adequately illuminate the hopper and slope.

   c. If using shadow fillers, end light should be as close to water level as possible. Whenever possible the lenses should not face directly towards the home or entertainment area.

   d. Single AmerGlow 170, 225, 325: Center of end wall.
      Dual AmerGlow 170's or 225's: Each 2 to 3.5 feet from center line (4 to 7 feet apart).

C. OptiFusion Lens positioning on the side of the pool with the Photon Generator centered on side of pool.

1. AmerGlow 100, 70 and 30 only, with the lens positioned at the side of the pool.

   a. Avoid facing lenses directly towards home or entertainment area. Lenses should be located and directed to offer uniform illumination of the entire pool allocating more light for areas with greater floor and wall surface area such as the deep end. Also see Light Transmission vs Distance table for more help.

   b. The best lighting is achieved on the surfaces the lens is facing.

   c. Depth of OptiFusion lenses intended to cast light less than 25 feet in white or nearly white concrete or fiberglass pools should be located approximately 1/3 of the distance between the water surface and the beginning of the transition from wall to floor.

   • Place slightly higher in the 3 ft. shallow ends, to avoid hot spots on the floor.

   d. In vinyl pools, the shallow end lenses should be located 9 in. below water.

   • Lenses next to the slope should be located 12 in. below water.

   • Deep end lenses should be located 18 in. below water.

Note

In many pools, optimum lighting can be achieved with AmerGlow 170, 225 or 325 cable(s) in the end, and an AmerGlow 30, 70 or 100 in the adjoining side wall illuminating the end wall where the AmerGlow 170, 225 or 325 is located.

Cable Length	FIBER EQUIVALENT LIGHT TRANSMISSION at 10 ft.							
	AMERGLOW CABLE SIZES							
	325 fiber equiv.	225 fiber equiv.	170 fiber equiv.	100 fiber equiv.	70 fiber equiv.	30 fiber equiv.	12 fiber equiv.	% of Light Lost
10	325	225	170	100	70	30	12	
12	312	216	163	96	67	29	12	4.0%
14	300	208	157	92	65	28	11	7.8%
16	288	199	151	89	62	27	11	11.4%
18	276	191	145	85	60	26	10	14.9%
20	266	184	139	82	57	25	10	18.3%
25	240	166	126	74	52	22	9	26.1%
30	217	150	113	67	47	20	8	33.2%
35	196	136	103	60	42	18	7	39.6%
40	177	123	93	55	38	16	7	45.4%
45	160	111	84	49	35	15	6	50.7%
50	145	100	76	45	31	13	5	55.4%
55	131	91	68	40	28	12	5	59.7%
60	118	82	62	36	25	11	4	63.6%
70	97	67	51	30	21	9	4	70.2%
80	79	55	41	24	17	7	3	75.7%
90	65	45	34	20	14	6	2	80.1%
100	53	37	28	16	11	5	2	83.8%

Table 1

This table shows the effect of longer cable runs on light transmission. Longer cable runs have the same effect as cutting down on the number of fibers.

**The first 10' is considered unavoidable and is used here as a standard for comparison.

⚠WARNING

Provide adequate lighting to your pool for nighttime use. The amount of light needed will vary with the size and shape of the pool. This may require additional lighting sources. Failure to provide adequate lighting can result in swimming and diving hazards that can cause severe injury or death. Consult your local building department or a lighting professional to determine lighting requirements.

SECTION II.   Running Conduit

A. General conduit tips.

- Use electrical sweep elbows and 45's or heat bend PVC pipe. DO NOT use plumbing 90° or 45° elbows. Using the right conduit and fittings will allow the cable to be fed much easier, and will prevent damage to the fiber optics.
- Use rigid PVC pipe or SMOOTH ID flexible PVC for all cable runs. Flexible pipe can be used but is not recommended for this type of installation because of its high friction walls.
- Make your job easier - use electrician's lube when feeding cable.

B. Choosing the best size conduit for the job.

a. For AmerGlow 325, 225 or 170 use 1 in. or larger rigid PVC conduit; 1½ in. is preferred.

b. Use ¾ in. or larger conduit for AmerGlow 100 or 70.

c. Use ½ in. or larger conduit for AmerGlow 30 or 12.

C. Electrical conduit requirements.

a. For manual operation at Photon Generator, remote control or single remote toggle switch operation, use ½ in. electrical conduit to run 3 - 18 AWG (black, white and green) or larger wires to each Photon Generator location.

b. For dual remote toggle switch or automated operation (Compool®, etc.), use ½ in. electrical conduit to run 4 - 18 AWG (red, black, white and green) or larger wires to each Photon Generator location; see Figure 8.

c. It is very important that the unit be properly grounded - there is serious risk of electrical shock or electrocution otherwise.


⚠WARNING

The Photon Generator must be properly grounded. Consult the National Electrical Code and all other applicable local codes and ordinances for proper grounding techniques. Improper installation will create an electrical hazard which could result in death or serious injury to pool users, installers, or others, due to electrical shock, and may also cause property damage.

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d. Make sure the conduit comes up in the correct area in the front of the Photon Generator; see Section IV for this information.

e. Extend conduit up through the bottom of the Photon Generator at least six inches. Once the Photon Generator is installed, the conduit should extend one inch past the angled aluminum piece beneath the transformer.

D. Running the conduit for AmerGlow fiber optic cable.

a. Using the sizes determined above, run the conduit from the pool wall to the Photon Generator location.

b. Conduit near the Photon Generator should be at least 4 in. deep if using the sub-terrain mounting base to mount the Photon Generator.

c. Use only electrical sweep elbows and 45's - DO NOT use plumbing 90's or 45's, as they can damage the fiber optics or prevent pulling the cable.

d. The lens body should be located according to recommendations in the "Before You Begin Installation..." section. Conduit should slope to that depth.

e. If using smaller than 1 in. conduit, do not bush down within 2 in. from rear of lens body.

f. Use a 12 in. minimum straight section of conduit behind the lens housing.

g. For gunite pools, the recessed cut back for lens housing should be at minimum 1¼ in., as shown in Figure 1. Dimension "A" should be 1 in. for a FIBERworks Standard Gunite fitting, and 1½ in. for a FIBERworks Invisible Gunite fitting; see Figure 1.

Figure 1.
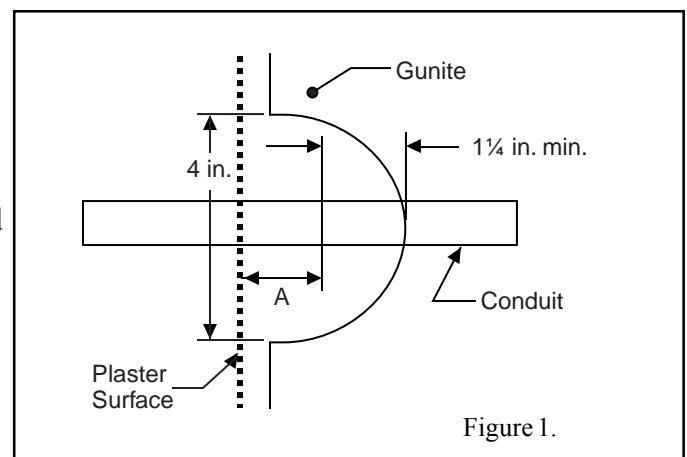
h. At the Photon Generator location, leave at least 6 in. of conduit above the anticipated sub-terrain mounting base or deck surface and place tape over both ends of conduit. The tape and extra length will help prevent debris from getting into the conduit until the cable is run. The conduit should be cut back to 1 in. above the bottom of the Photon Generator mounting location just before the fiber optic cable is run (does not apply to power supply conduit).

Figure 2.

i. Use the **template on the back page of this manual** to determine conduit location inside the Photon Generator if you are installing on a poured concrete deck, on a wood deck or in the ground.

j. For either type of installation, use duct tape or tie wrap to bundle the conduit together in the Photon Generator area. Keeping the conduit together will help when preparing the cable later.
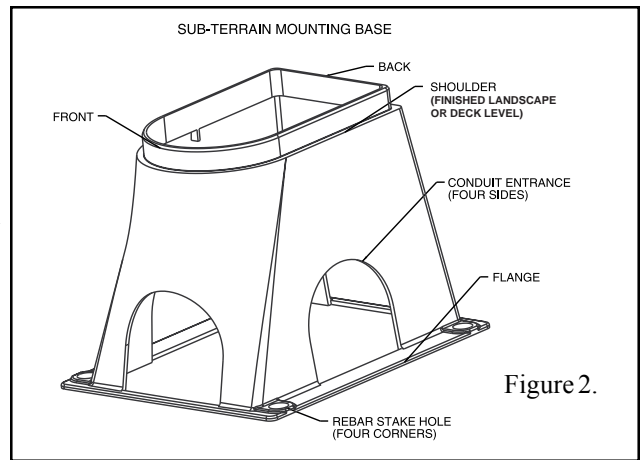
SECTION III. Installing Lens Housings

- FIBERworks lens housings are installed the same way regular water return fittings are installed.

⚠CAUTION

Use only FIBERworks lens housings. Other fittings will not seal conduit. Each FIBERworks lens housing has a label identifying it as such. Do not use excessive glue, as the overflow may run onto the O-ring sealing surface.

SECTION IV. Preparing to Mount the Photon Generator

A. Choose the right installation type from the two methods for installation of the Photon Generator.

1. For a simple, quick installation, you can mount the Photon Generator to the sub-terrain mounting base (included). This allows the unit to be located away from the deck, for example, in a garden near the pool, among some shrubbery, etc. Be sure the unit is situated such that the air vents are not going to be blocked by overgrowth. The sub-terrain mounting base can also be poured into the concrete deck or pad.

2. The Photon Generator can also be mounted to the concrete pad or a wood deck (requires surface mounting kit, P/N 24000800).

B. Installing the Sub-Terrain mounting base; see Figure 2.

1. If conduit has already been run, set mounting base over top of conduit to determine if the bottom flange or side arches need to be cut. The top shoulder of the base should be at or slightly above finished landscape or deck level.

2. Leveled base can be secured in place with 3/8 in. rebar angled through holes provided in corners of bottom flange.

Note
Flat side of base is back of the Photon Generator where switches are located. Locate this side away from line of site to the Photon Generator.


C. Mounting to a poured concrete pad.

1. What you'll need:

   √ Surface mounting kit (P/N 24000800)
   √ ¼ in. concrete anchors and screws or 3/16 in. x 1¾ in. flat head Tapcons.
   √ Masonry drill - ¼ in. or 5/32 in.
   √ Hammer
   √ Screw Driver or Nut Driver

Photon Generator Installation Steps, as detailed in Sec. IV-B and C.

Tools and Material Required:

√ Hammer

√ Side Cutters

√ Phillips Screwdriver

√ Hacksaw or PVC Cutters

√ Four 12 in. lengths of 3/8 in. Rebar or Rod

TAPE OPEN ENDS
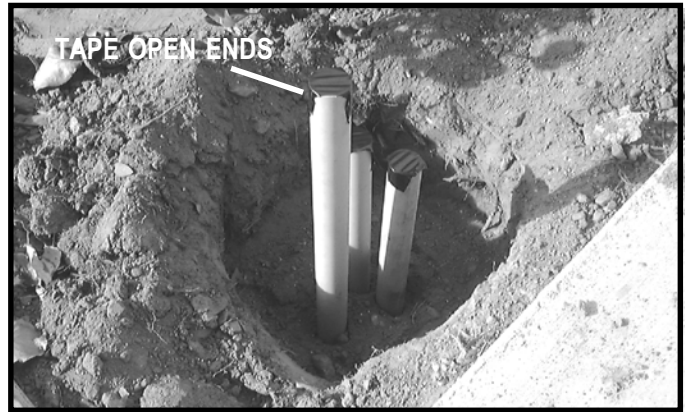
1. Conduits set per generator template.
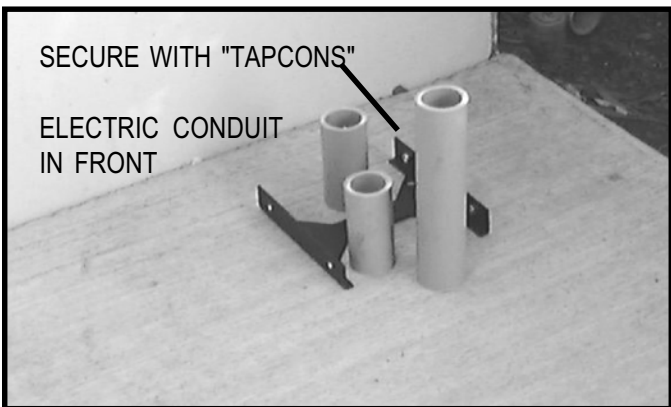

2. Cut subbase flanges as needed.

3. Drive 3/8 in. rebar at an angle in the corners.

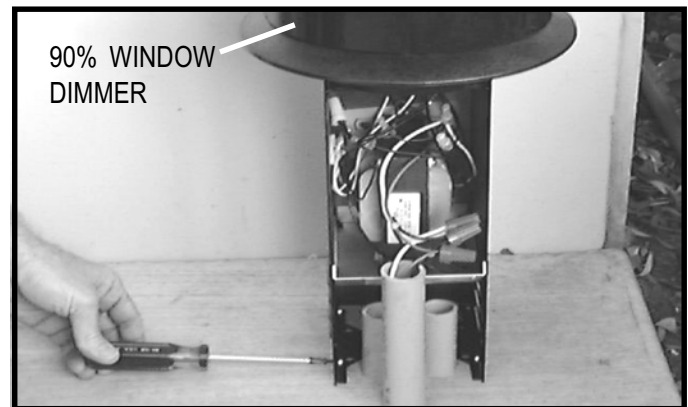ELECTRIC CONDUIT IN FRONT AND EXTENDING 6 IN. ABOVE SUBBASE

4. Backfill 1 to 4 in. below lip for mulch or concrete.

5. Secure the generator with the screws provided.

SECURE WITH "TAPCONS"

ELECTRIC CONDUIT IN FRONT

6. "H" bracket for wood decks or concrete.

90% WINDOW DIMMER

7. Secure the generator with the screws provided.

2. Installing the surface mounting kit.

    a. Set the "H" bracket in place on the backside of the conduit bundle.

    b. Make sure the template is located correctly with respect to the conduit, and oriented so that the Photon Generator will be facing in the desired direction. See the template at the back of this manual for correct conduit location.

    c. Mark and drill the holes for the anchors or Tapcons.

    d. Secure the "H" bracket to the concrete pad with screws or Tapcons; see Figure 3.

SECTION V.   Feeding or Pulling the AmerGlow Cable

A. What you'll need

√ Electrical Tape

√ Fishtape (optional)

√ Electrician's lube (optional)

B. Tips, tricks and traps

- Use electrician's lube on the cable, to help it through the conduit. Though not necessary, it can make the task easier and quicker.

- Cut conduit at Photon Generator to correct length (1 in. above base) before pulling cable.

- Cover the end of the cable with electrical tape, or similar, to make a pilot tip. This will make guiding the cable through the conduit easier. This applies whether pushing the cable through from the pool side, or pulling it with fishtape.

- At the Photon Generator location, after the cable is pulled and lenses are set, seal the conduit around the cables with RTV silicone caulking or conduit seal kit #22002000. This will help keep debris out of the conduit during the rest of the installation, and provide an added precaution to prevent water from entering the Photon Generator should the conduit develop a leak during its lifetime.

- Leave about 1 foot of cable extending past the end of the lens housing at the pool (only necessary if cutting and OptiFusing cable and lens on job location).

  Once the cable is finished and the lens is installed at the pool end, you should have 20 in. to 24 in. extending up above the Photon Generator mounting location. This will allow easier installation into the Photon Generator. Also, a few extra inches in the fiber bundle will accommodate fiber re-termination if the fiber ends were to become damaged over years of service. Additionally, it allows for later addition of fibers for landscape or pool lighting.

- If the lens assembly and/or Photon Generator are not to be installed immediately, tape the ends of the cable to protect the fiber.

⚠ CAUTION
On pre-OptiFused cable, avoid manually bending the first 12 in. of cable on the lens side. This can disturb the factory termination and prevent maximum performance of the system.

- Know your cable length - do not underestimate the cable length required. Allow 20 in. extra for pre-OptiFused cable and 24 in. for bulk cable from pool wall to bottom of Photon Generator.
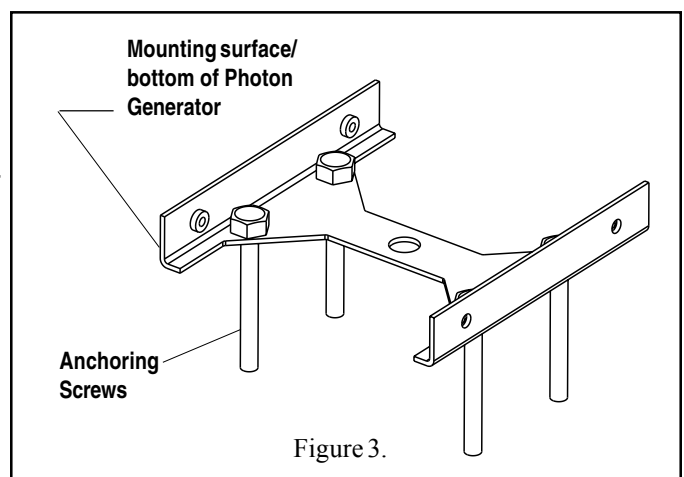

Mounting surface/ bottom of Photon Generator

Anchoring Screws

Figure 3.

C. Pulling or feeding pre-OptiFused cable

1. For Standard Gunite lens housing and Fiberglass lens housing remove the spacer and spacer O-ring using diagonal-cutters.

2. Remove the reminder tag from the cable.

3. Push the fish tape through the conduit from the Photon Generator side.

NOTE

In many cases, AmerGlow cable may be fed through conduit without the use of a fishtape.

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4. Attach the cable at the poolside with duct or electrical tape, making sure to cover the open end of the cable.

5. Reel up fishtape while second person pushes the cable from the pool side, applying electrician's lube on the cable as it is fed through.

    a. Keep the last foot of cable on the lens side as straight as possible.

    b. Be careful not to damage the lens assembly.

6. Stop feeding the cable when one foot is left on the pool side.

    a. Make sure the lens O-ring and spacer O-ring (if applicable) are in position and clean.

    b. Clean the O-ring sealing surface on the inner flange of the lens housing.

7. Continue to pull the cable until the lens assembly is 1 in. away from the seated position.

⚠**CAUTION**

DO NOT snug the lens into place by pulling on the cable! This may cause the cable to pull away from the lens, and will impair performance of the OptiFusion system.

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8. Place the lens retaining nut onto the lens and PUSH the lens into place.

9. Hand tighten the lens using the lens tightening tool, until the O-ring is seated.

    a. For standard gunite and fiberglass lens housings (which do not use the spacer and spacer O-ring), **hand tighten** ¼ turn past the seated O-ring position.

    b. For Invisible Gunite and Vinyl Liner housings (which use the spacer and spacer O-ring), **hand tighten** the lens retaining nut ½ turn past the O-ring's seated position.

D. Pulling or feeding bulk cable.

1. Push the fishtape through the conduit. In many cases, AmerGlow cable may be fed through conduit without the use of fishtape.

2. Attach the cable to the end of the fishtape using duct or electrical tape. Cover the fibers completely with tape. Pull cable through conduit using electrician's lube as needed.

3. Leave one (1) ft. of cable extending past the lens housing, and about one foot (1') above the Photon Generator mounting surface.

SECTION VI.   AmerGlow Lens Assembly

A. What you'll need:

√   OptiFusion termination kit, P/N 21005500. Contains: cable stripper, hot knife, spare blades, cutting shield, lens tightening tool, OptiFusion gel.

√   Cable Cutters

√   Wire snips

√   Channel locks

√   Crescent wrench

√   Electrical Tape

B. Preparing the cable

NOTE

There should be about 1 foot of cable sticking out of the lens housing at this point.

⚠WARNING

FiberKnife reaches extreme temperatures. Grasp only by the handle. Failure to follow these directions can lead to severe burns.

1. Plug in the FiberKnife and set it on the stand provided.

   a. Let the knife warm up for 15 minutes. This is especially important for larger cable sizes.

   b. Keep the knife out of the wind while warming, as the breeze can cool it off. The Photon Generator front cover can be used as a shield.

   c. Allow at least 5 minutes between large cable cuts for the knife to reheat.

2. Use the cable stripping tool to strip back 1 in. of the cable jacket.

⚠CAUTION

DO NOT damage any of the fibers. If the fibers are nicked they can break, reducing light output.

- Practice on some spare cable a few times. With a little practice, you will be able to make good cuts with this stripper.
- There is an extra blade inside the stripper handle.

   a. Adjust the stripper and practice a few times on an extra piece of cable if you haven't used it before.

   b. Adjust the cutting depth by turning the black knob on the end of the cable stripper.

   c. Push the spring tension guide open with thumb, and place stripper on cable as shown in Figure 4.

   d. Rotate the stripper around the cable with the black knob toward opening; as shown in Figure 5.

   e. The cable stripper is directional - if it does not cut properly, try moving it over and rotating in the opposite direction.

   f. Once jacket is separated, pull stripper towards end of cable, to remove jacket.

   g. Fan the fiber ends to remove the excess powder from them.

3. If you are installing an invisible gunite or vinyl liner lens housing, place the spacer and spacer O-ring onto the cable - the direction is indicated on the spacer.

4. Assemble the seal nut; see Figure 6.

   a. Wrap electrical tape around the end of the fibers.

   b. Slide the compression nut onto the cable with the threads toward the end.

   c. Choose the correct grommet size and slide it onto the cable until 1/16 in. past the edge of the jacket. The cable size is molded onto the back of the grommet.

   d. Straighten the cable coming out of the lens housing, and try to keep it straight from this point on.

   e. Place the seal nut over the grommet and tighten compression nut.
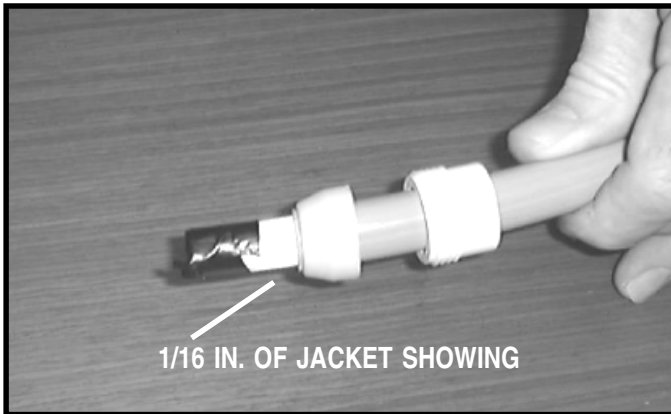

Figure 4.
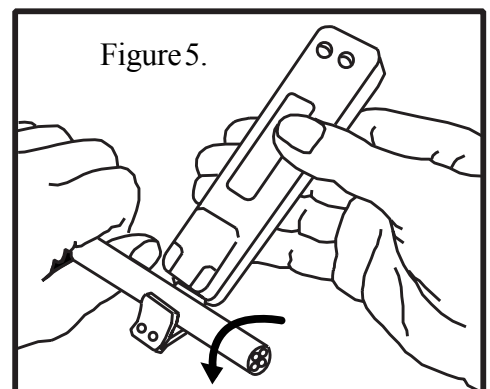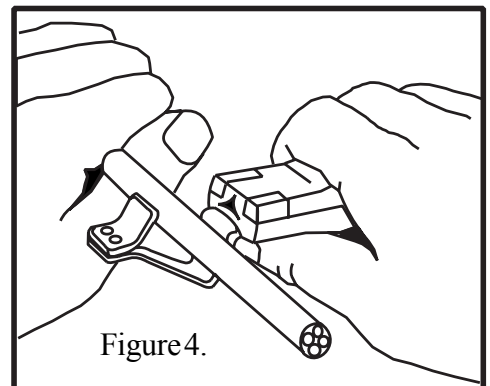
Figure 5.

AmerGlow Lens Assembly Installation Steps, as detailed in Sec. IV-B.
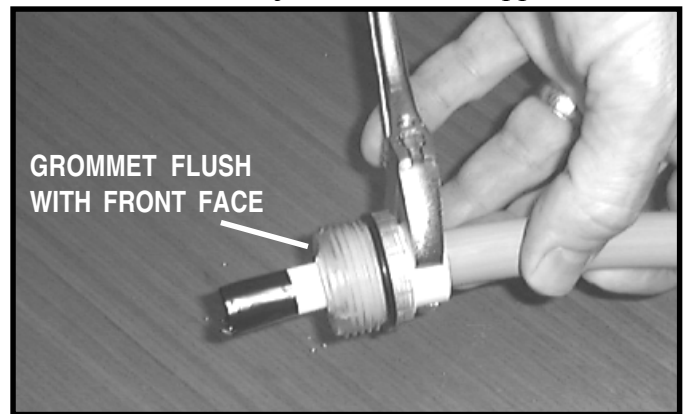
Tools and Material Required:

√ Cable Stripper
√ Crescent Wrench
√ Hot Knife
√ Cutting Shield
√ Lens Tightening Tool
√ Electrical Tape
√ OptiFusion Gel

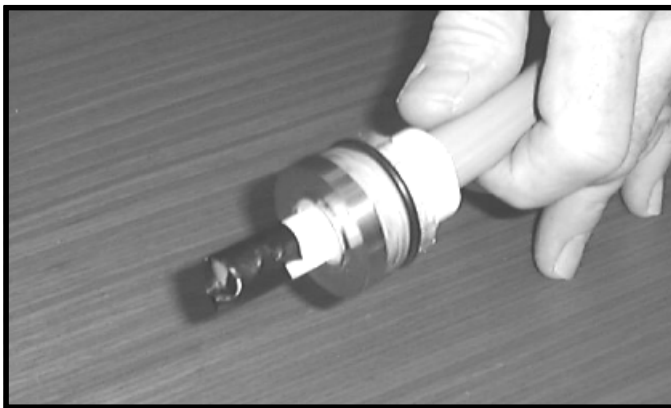1. Remove 1 in. of the jacket with the stripper.

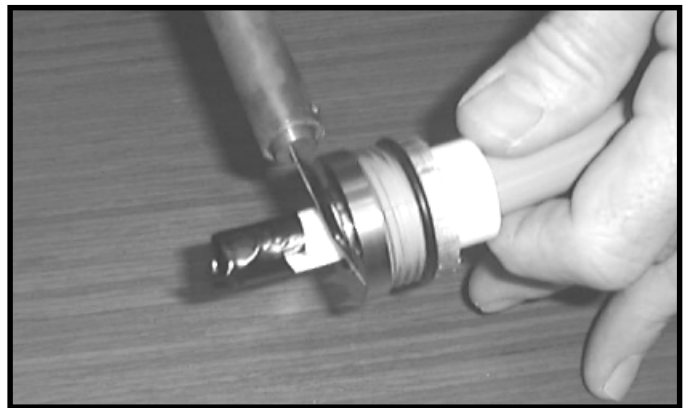**1/16 IN. OF JACKET SHOWING**

2. Add tape, spacer, compression nut and grommet.

GROMMET FLUSH WITH FRONT FACE

3. Add seal nut and tighten.

4. Screw on cutting shield.

5. Angle hotknife 15 degrees.

6. Fill reservoir with gel.

CHECK FOR AIR BUBBLES
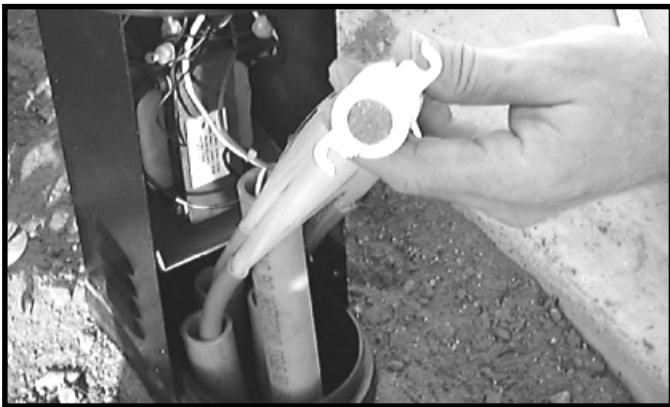
7. Slowly screw on lens cap.

AmerGlow Lens Assembly Installation Steps, continued.

INVISIBLE GUNITE
LENS HOUSING

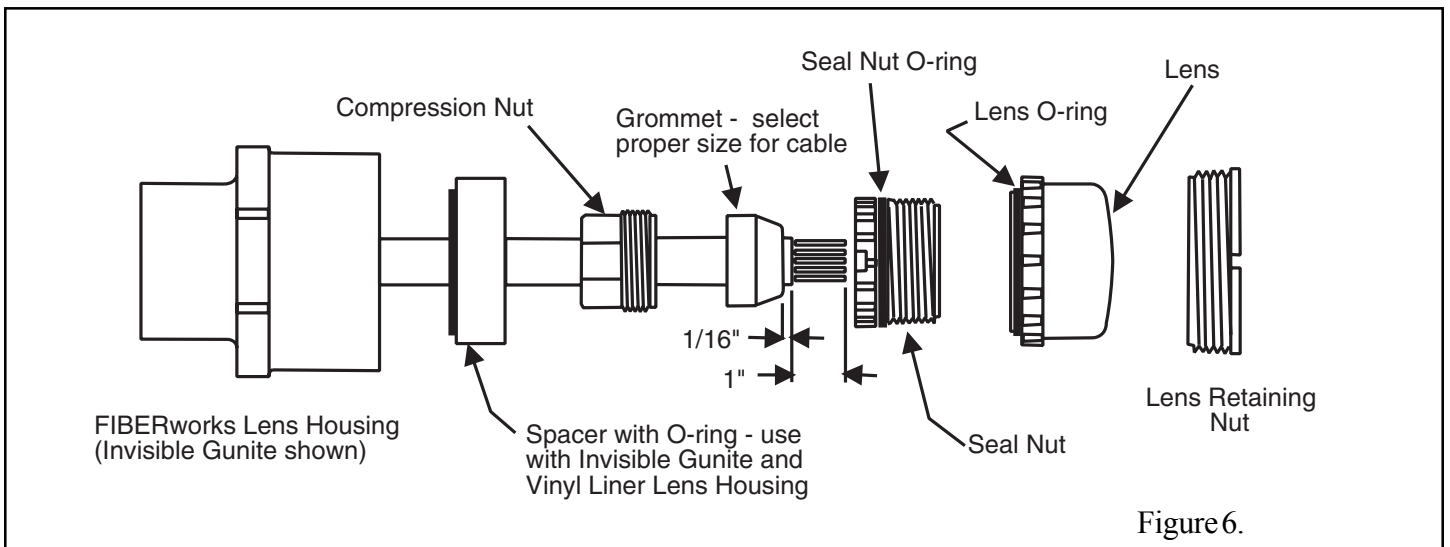VINYL LINER
LENS HOUSING

BEFORE OR AFTER
FACE PLATE
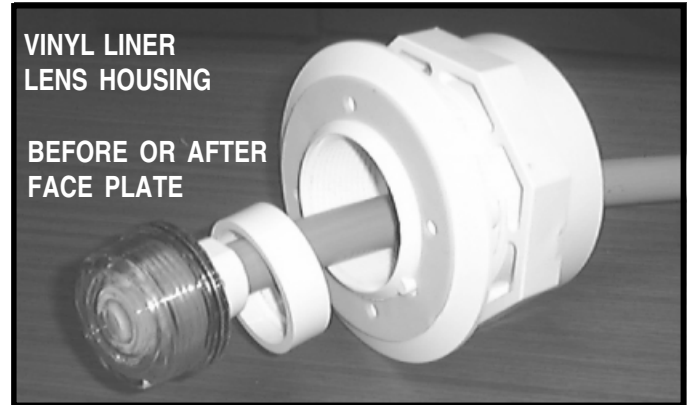
8. Cable in fitting, use a spacer if needed.

9. Hand-tighten the retainer nut.

(4. e.) • Hold the seal nut stationary with your hand and rotate the compression nut using a crescent wrench.

• If you use channel locks to hold the seal nut, be careful not to damage the O-ring.

• Tighten the compression nut until the grommet is flush with the front surface of the seal nut (for smaller cables) or there is only one thread left showing on the compression nut (for larger cables).

• Pull on the completed assembly to be sure cable does not move.

Compression Nut

Grommet - select proper size for cable

Seal Nut O-ring

Lens O-ring

Lens

1/16"

1"

FIBERworks Lens Housing
(Invisible Gunite shown)

Spacer with O-ring - use with Invisible Gunite and Vinyl Liner Lens Housing

Seal Nut

Lens Retaining Nut

Figure 6.

5. Cut the fiber.

Note

This is the most critical step for a successful installation.

a. Screw the Cutting Shield onto the seal nut until it bottoms out. At this point, only fiber should be sticking out past the edge of the cutting shield. If jacket or grommet is sticking out, disassemble seal nut assembly and adjust the grommet position.

b. Hold the cable at the seal nut, keeping the cable straight.

⚠CAUTION

DO NOT use too much force - you will only damage the FiberKnife and/or your cut. Let the heat of the knife do the cutting.

DO NOT saw, wiggle or rotate the blade back and forth.

On the larger cables, it may help to rotate the handle side of the blade downward slightly.

• Place the blade against the cutting shield at a 10-15 degree angle; see Figure 7.

• Press with a light to moderate constant pressure using the cutting shield ring as a guide.

• Ease up towards the end of the cut to keep the last few fibers from folding over.

6. Remove the Cutting Shield.

⚠WARNING

Shield may be hot. Exercise caution when removing it. Failure to do so could cause burns.

---

7. Inspect the cut.

a. The cut should be smooth and flat, with no visible lines or surface bubbles. When training and performing your first cuts, using a small magnifying glass can help see imperfections that may be difficult to see with the naked eye.

b. A good professional cut is critical to the performance of the fiber optic system.

c. There are several things which can cause a bad cut:

• The cable jacket was not completely stripped back.

• Sawing or wiggling the blade during cutting, or incorrect blade angle.

• Burrs on the edge of the cutting shield.

• The FiberKnife is not warmed up enough. Allow enough time between cuts for the knife to reheat, and keep it out of the wind while heating it.

• The blade needs replacing about every 15 - 20 cuts; replacement pack of 3 blades, P/N 21005600.

C. Installing lenses

1. Wipe the fiber face with an Optic Prep Pad or a clean cloth to remove any residual powder.

2. Fill the entire gel cup located on the inside of the lens with OptiFusion gel until it crests above the gel cup edge.

3. Assemble the lens to the seal nut.

a. Make sure the lens and seal nut O-rings are clean and in place.

b. Hold the compression nut with a wrench and hand tighten the lens onto the seal nut until lens bottoms out. Keep the end of the cable straight during this step.
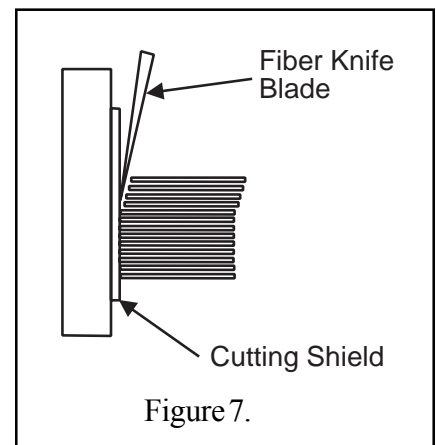
Fiber Knife Blade

Cutting Shield

Figure 7.

4. Install the lens into the lens housing.

   a. If applicable, make sure the spacer and spacer O-ring are in position and clean. The spacer is marked "This Side Toward Pool".

   b. Clean the O-ring sealing surface on inner flange of lens housing.

   c. Feed or pull the cable until the lens assembly is about 1 in. away from the seated position.

⚠CAUTION

DO NOT seat lens housing by pulling on cable. This may cause the cable to pull away from the lens, and impair light performance.

---

   d. Place the lens retaining nut onto the lens and **PUSH** the lens into place.

   e. Hand tighten the lens using the lens tightening tool, until the O-ring is seated.

   - For Standard Gunite and Fiberglass lens housings (which do not use the spacer and spacer O-ring), **hand tighten** ¼ turn past the seated O-ring position.

   - For Invisible Gunite and Vinyl Liner housings (which use the spacer and spacer O-ring), **hand tighten** the lens retaining nut ½ turn past the O-ring's seated position.

FIBER*works* makes your job easier:

For vinyl liner pools, the lens is sealed in the lens body before the liner is installed. You do not need to install the seal plate and cut your liner until the pool is completely filled.

SECTION VII.   Installing the Photon Generator

A. Mounting the unit

1. Seal the conduit around the cable with RTV silicone or conduit seal kit #22002000.

2. Remove the four black #6 screws securing the curved front cover of the unit, and set aside in a secure location.

3. Remove the front cover.

4. Secure Photon Generator with appropriate hardware provided with surface mounting kit or sub-terrain base. Do not over tighten screws.

B. Wiring the Photon Generator

⚠WARNING

### RISK OF ELECTRICAL SHOCK OR ELECTROCUTION

This Photon Generator must be installed by a licensed or certified electrician in accordance with the National Electrical Code and all applicable local codes and ordinances. Improper installation will create an electrical hazard which could result in death or serious injury to pool users, installers, or others, due to electrical shock, and may also cause property damage.

---

1. Determining when to use the bulb saver feature.

   a. The bulb saver feature is for installations located in areas with line voltage consistently higher than 120 Vac. Check the line voltage at the electrical panel, preferably at night, with a voltmeter to determine if this feature should be used. All units come with the transformer connected for normal operation.

   b. The bulb saver feature may also be used on installations with 120 Vac or lower line voltages to increase the average bulb life. Please note that using the bulb saver feature on pools with standard 120 Vac input voltage will decrease the nominal light output by about 15%.

⚠️WARNING

Connecting the bulb saver feature on installations with 120 Vac or lower input voltage can significantly reduce the nominal light output from the Photon Generator. Be sure the fiber optic system has been designed to adequately light the pool with the reduced output from the Photon Generator. Failure to provide adequate lighting can result in swimming and diving hazards that can cause severe injury or death.

2. Connecting the bulbsaver feature.

   a. Facing the front of the unit with the front cover removed, locate the transformer connection on the right inner wall of the Photon Generator tower. There are two wire leads coming from the transformer with female connectors held by a tie wrap. The white lead is for standard operation and the brown lead is for the bulb saver application. See Figure 8.

   b. Disconnect the dummy male connector from the brown lead and then disconnect the two white wires.

   c. Connect the brown lead from the transformer into the white wire from inside the unit.

   d. Plug the dummy male connector into the white lead of the transformer.

   e. Make sure connections are secure and tuck wires back into place.

Figure 8.
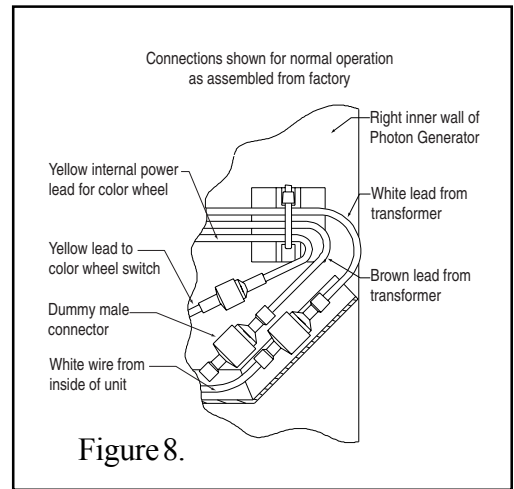
3. For all models, when not using dual remote switches or Compool® type system.

   a. For this application, there are only three electrical wires to connect. Connect a minimum #18-3 wire with black to black, white to white and green to green, using wire nuts or crimps to make the connections.

4. Converting the Manual Switch unit (20100200) to a Compool®/Jandy® unit (20100400).

   a. Locate the extra fused lead included in the ferrule assy. bag. Disconnect the extra male connector from fused lead. **DO NOT discard extra male connector.**

   b. Facing the front of the unit with the front cover removed, locate the color wheel switch connection (yellow wires) on the right inner wall of the Photon Generator tower. See Figure 8.

   c. Disconnect the yellow wires and plug the extra male connector into the yellow internal power lead for the color wheel.

   d. Connect the fused lead to the internal yellow lead for the color wheel switch. Tuck the fuse into unit next to the other power fuse.

   e. The two black power leads are labeled: 1 for power, 2 for color wheel.

   f. **Both switches must be in the "on" position** in order for the unit to operate from the remote switches.

5. For Compool® type automated systems or dual remote switches.

   a. The Photon Generator has four loose wires to connect: one white, black #1 and black #2, and one green. Please refer to your pool controller's manual for more information on the proper wiring and use of that equipment. The main power and color wheel motor of the Photon Generator are controlled by two auxiliary relay circuits in the power center. Figure 9 shows how to wire up the unit on both ends.

   b. Refer to the pool controller manual to determine which buttons on the controller operate the two relays.

Figure 9.
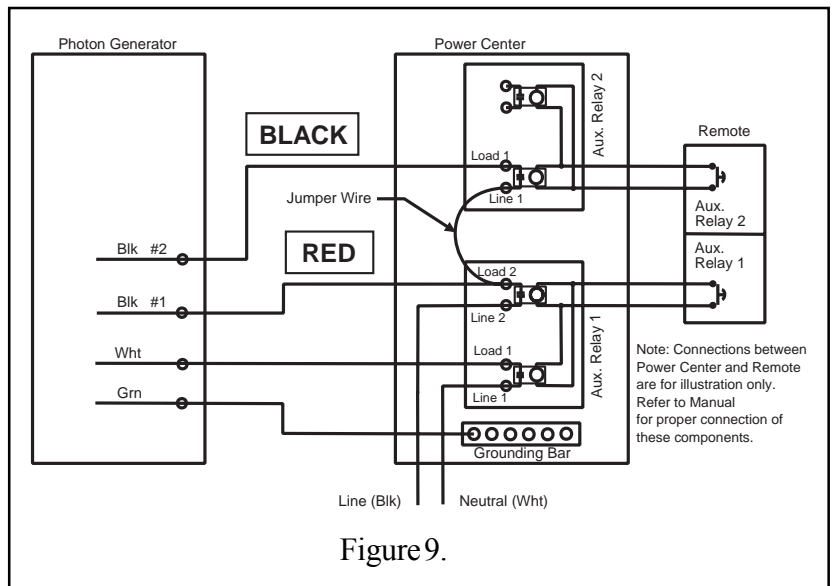
(Continued on page 21)

Ferrule Assembly Installation Steps,
as detailed in Sec. VIII A - D.

Tools and Material Required:
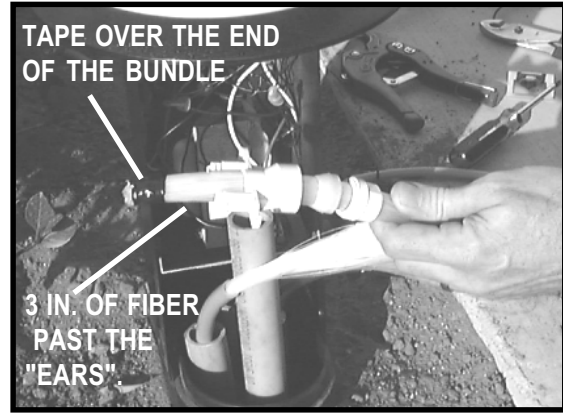
√ Cable Cutters   √ Cable Stripper
√ Crescent Wrench   √ Hot Knife
√ Phillips Screwdriver √ Cutting Shield
√ Electrical Tape

1. Cut all cables even with the generator top.

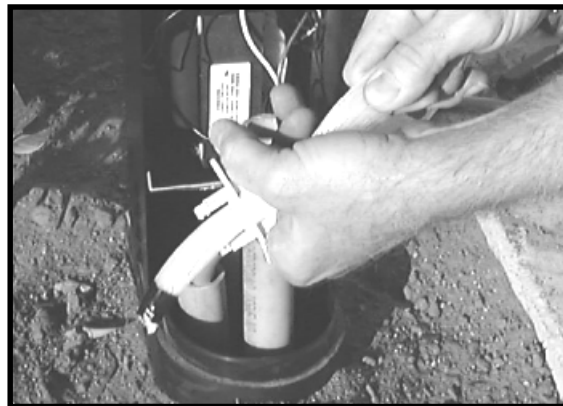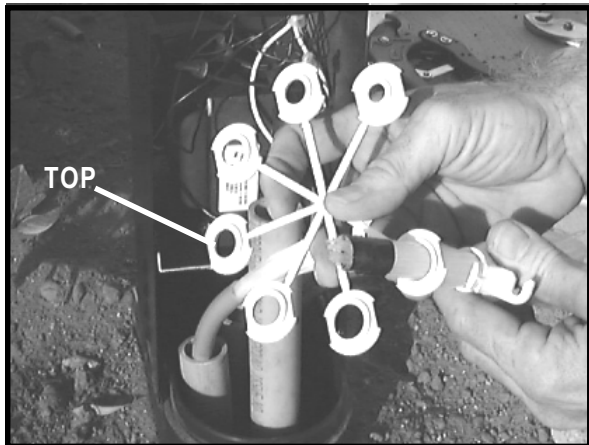2. Strip jackets from 3 to 4 in. above the base.

TAPE OVER THE END
OF THE BUNDLE

3 IN. OF FIBER
PAST THE
"EARS".

3. Assemble comp. nut, grommet, insert and ferrule.
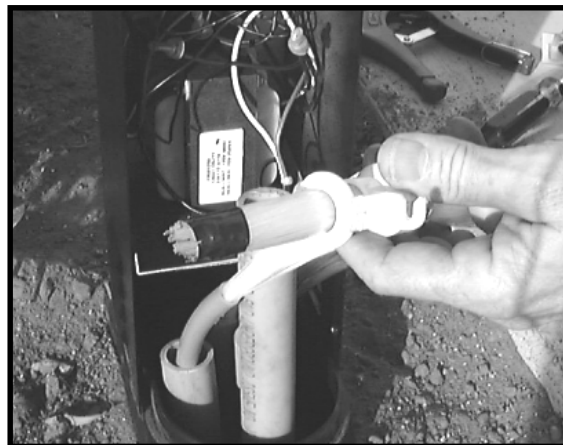
KEEP FINGERS
OFF "EARS"

4. Securely tighten the ferrule assembly.

5. Pull on ferrule to check tightness.

TOP
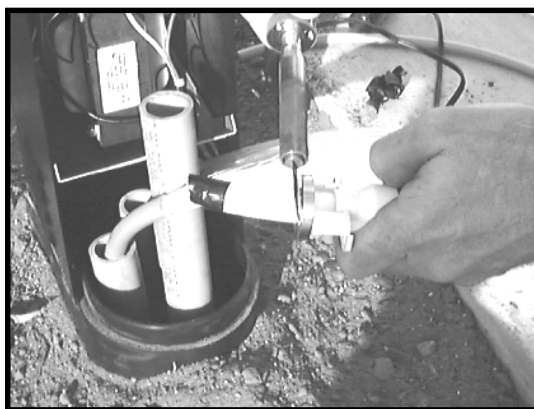
6. Select the correct "numbered" fiber disk.

7. Snap disk into "ears".

Ferrule Assembly Installation Steps, continued.

8. Screw on the cutting shield.

9. Hot knife cut, at a 15 deg. blade angle.

10. Inspect the cut, no lines or "puddles".

11. One wrap of the tape in the middle.

TOTALLY COVER THE EAR

12. Secure "ears" under the screws.

NOTE EXTRA FIBER

13. Ready for the front cover.

14. Install front cover.

KEEP VENTS CLEAR

15. Finished profile with 90% dimmer.

SECTION VIII. Installing the Cable at the Photon Generator

A. Preparing and installing the cable

⚠WARNING

FiberKnife reaches extreme temperatures. Grasp only by the handle. Failure to follow these directions can lead to severe burns.
---

1. Plug in FiberKnife, and allow to heat for 15 minutes, out of the wind. The Photon Generator front cover can be used as a shield.

2. Cut all the cables with cutters to top of Photon Generator.

3. Use the cable stripping tool to strip back cable jacket 3 to 4 in. above the Photon Generator base.

   a. Adjust the cutting depth by turning the black knob on the end of the cable stripper.

   b. Push the spring tension guide open with thumb, and place stripper on cable as shown in Figure 4.

   c. Rotate the stripper around the cable (black knob toward opening) as shown in Figure 5.

   d. The cable stripper is directional - if it does not cut properly, try moving it over and rotating in the opposite direction.

   e. Make sure the cut doesn't spiral.

   f. Once rotational jacket cut is made, grasp the cable and pull stripper towards end of cable to split jacket along its length, then remove jacket.

   g. DO NOT damage any of the fibers. If the fibers are nicked they can break, reducing light output.

   h. Practice on some spare cable a few times. With a little practice, you will be able to make good cuts with this stripper.

B. Loading the fiber into the ferrule

1. Gather all of the stripped cable ends together evenly and wrap tape around the fibers at the end.

   a. Fan the fiber ends to remove any excess powder from between the fibers.

   b. Arrange the bundle so that the fibers from the primary pool/spa underwater lenses or perimeter cable are mixed together and lie in the center of the fiber bundle. Locate less important fibers on the outside of the fiber bundle. Shine a flashlight from the lens back to the photon generator to help identify the fibers.

   c. For color contrast, separate out the fibers for the smaller division. A maximum of 60 fibers can be inserted here. It is easier if you let the fibers from the smaller division extend a few inches past the others.

   d. If the total number of fibers is less than 200 then add additional fibers to the fiber bundle until the total number of fibers is either 100 or 200. These additional fibers should be at least 6 inches long and arranged on the outside of the fiber bundle.

⚠WARNING

Fibers outside the 400 fiber bundle diameter do not provide adequate light output for primary pool/spa underwater lenses or perimeter cable. Outer 200 fibers are intended only for accessory lighting. For primary pool/spa lighting and perimeter cable use only the center 400 fibers. Failure to provide adequate lighting can result in swimming and diving hazards that can cause severe injury or death.
---

2. Select the proper compression nut and grommet for the number of fibers; see Table 2.

3. Determine if the ferrule insert is needed in the assembly. See Table 2. If so remove the ferrule insert from the disk tree. It is located between the 100 and 600 disks on the disk tree.

4. Slide the compression nut, grommet, ferrule insert (if applicable), and then ferrule body onto the fiber bundle. See Figure 10. Leave about 2 to 3 inches of fiber sticking out past the two posts on the top of the ferrule. For ColorContrast, the smaller bundle should extend an inch further, about 3 to 4 inches.

Table 2

Number of fibers	Compression Nut (check inner dia.)	Grommet (size indicated on back except 400 and 600 grommet)	Ferrule Insert (located on disk tree)
100	Small I.D.	70	yes
200	Small I.D.	225	yes
200-300	Small I.D.	225	yes
300-425	Small I.D.	325	yes
425-500	Small I.D.	400 (small I.D. cylinder)	no
500-600	Large I.D.	600 (large I.D. cylinder)	no

5. Tighten the compression nut until the fibers are securely held by the ferrule assembly.

    a. DO NOT use ferrule mounting flanges for leverage when tightening assembly as they may break off. Make sure fibers are not twisted or tangled.

    b. Pull on the fiber bundle to verify fibers are held securely by ferrule assembly. On some applications, it may be necessary to put a few wraps of electrical tape underneath the grommet to ensure a good grip.

    c. If you are using ColorContrast, do not tighten the compression nut until the fibers are installed in the disk and it is snapped in place. This allows the fibers to align without twisting.

6. Install the fiber disk onto the ferrule assembly.

    a. Choose the correct fiber disk off the fiber disk tree according to the number of fibers. The fiber range is on each disk. For color contrast this is the total number of fibers on both sides of the division.

    b. Slide the fiber disk, tapered end down, over the fiber bundle. Snap the fiber disk into the fiber disk support posts on the ferrule. For ColorContrast, slide the small bundle of fibers in first, then the larger bundle.

    c. Check the position of the ferrule assembly. The fiber disk should be at least as high as the lower tier on the Photon Generator.

⚠ CAUTION

Make sure there is enough slack in the cable(s) to be put in place. There should be about 3-4 in. of slack in the fiber bundle. If not, readjust the ferrule accordingly.

NOTE

This will provide ample fiber for future trimming of bundle required about every 5 years.

C. Cut the fiber.

1. Place the Cutting Shield onto the ferrule assembly and thread on until it bottoms out.

2. Hold the cable and ferrule assembly so the support posts are at the top and bottom (not on the sides), keeping the cable and fiber bundle as straight as possible.

3. Place the FiberKnife blade against the Cutting Shield guide ring at a 10-15 degree angle starting at the top Support Post.
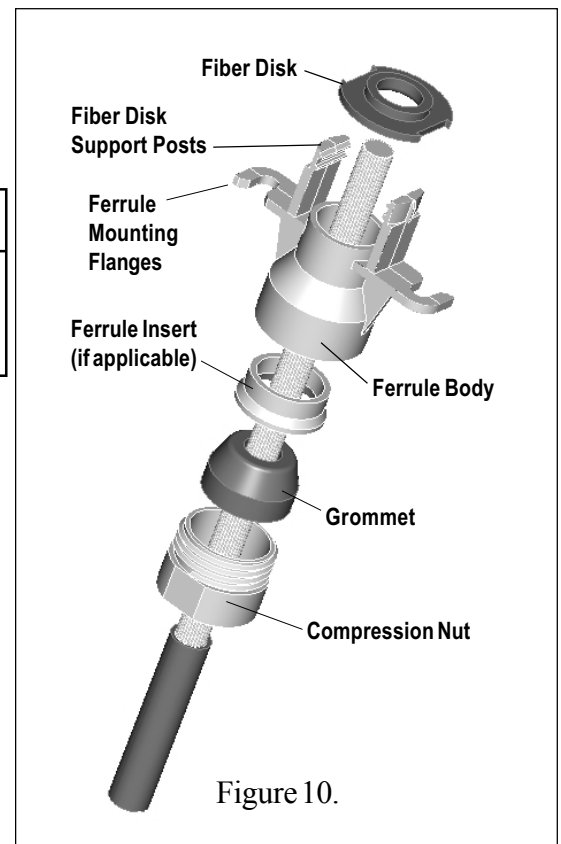

Fiber Disk
Fiber Disk Support Posts
Ferrule Mounting Flanges
Ferrule Insert (if applicable)
Ferrule Body
Grommet
Compression Nut

Figure 10.

<table>
<tr><td>

⚠IMPORTANT

Press with a light to moderate constant pressure using the cutting shield ring as a guide. IMPORTANT: Do not rush - allow 2 – 3 minutes to cut 600 fibers.

  DO NOT use too much force - Let the heat of the knife do the cutting.

  DO NOT saw, wiggle or rotate the blade back and forth.

  On the larger fiber bundles, it may help to rotate the handle side of the blade downward slightly.

</td></tr>
</table>

    a.   Ease up towards the end of the cut to keep the last few fibers from folding over.

4.   Remove Cutting Shield and wipe the fiber face with an optic prep pad or clean cloth. This removes any residual powder.

<table>
<tr><td>

⚠WARNING

Shield may be hot. Exercise caution when removing it. Failure to do so could cause burns.

</td></tr>
</table>

5.   Inspect the cut.

    a.   The cut should be smooth and flat, with no visible lines or surface bubbles. When training and performing your first cuts, use of a small magnifying glass can help see imperfections that may be difficult to see with the naked eye.

    b.   A good professional cut is critical to the performance of the fiber optic system. There are several things which can cause a bad cut:

- Sawing or wiggling the blade during cutting.

- Holding the blade at an incorrect angle.

- Burrs on the edge of the cutting shield.

- The FiberKnife is not warmed up enough. Allow enough time between cuts for the knife to reheat, and keep it out of the wind while heating it.

- The blade needs replacing (about every 15 - 20 cuts. Pack of 3 blades, P/N 21005600).

D. Install the ferrule assembly into the Photon Generator.

1.   Twist lock the ferrule assembly into the hole and the retaining screws under the Photon Generator light bulb.

2.   Be sure the ferrule is securely against both screws and tighten the retaining screws.

- The ferrule body should be centered in the mounting hole. The alignment of the ferrule assembly is **CRITICAL** to the performance of the fiber optic system.

3.   Make sure the ferrule is not being pulled sideways by the cable.

4.   Fill the cable conduit ends with silicone or use conduit seal kit #22002000 to prevent water from entering or leaking from the conduit.

E. Place curved metal front onto Photon Generator and secure with the four black #6 screws.

F. Test functionality of unit.

Photon Generator Conduit Template

A

B

C

D

E
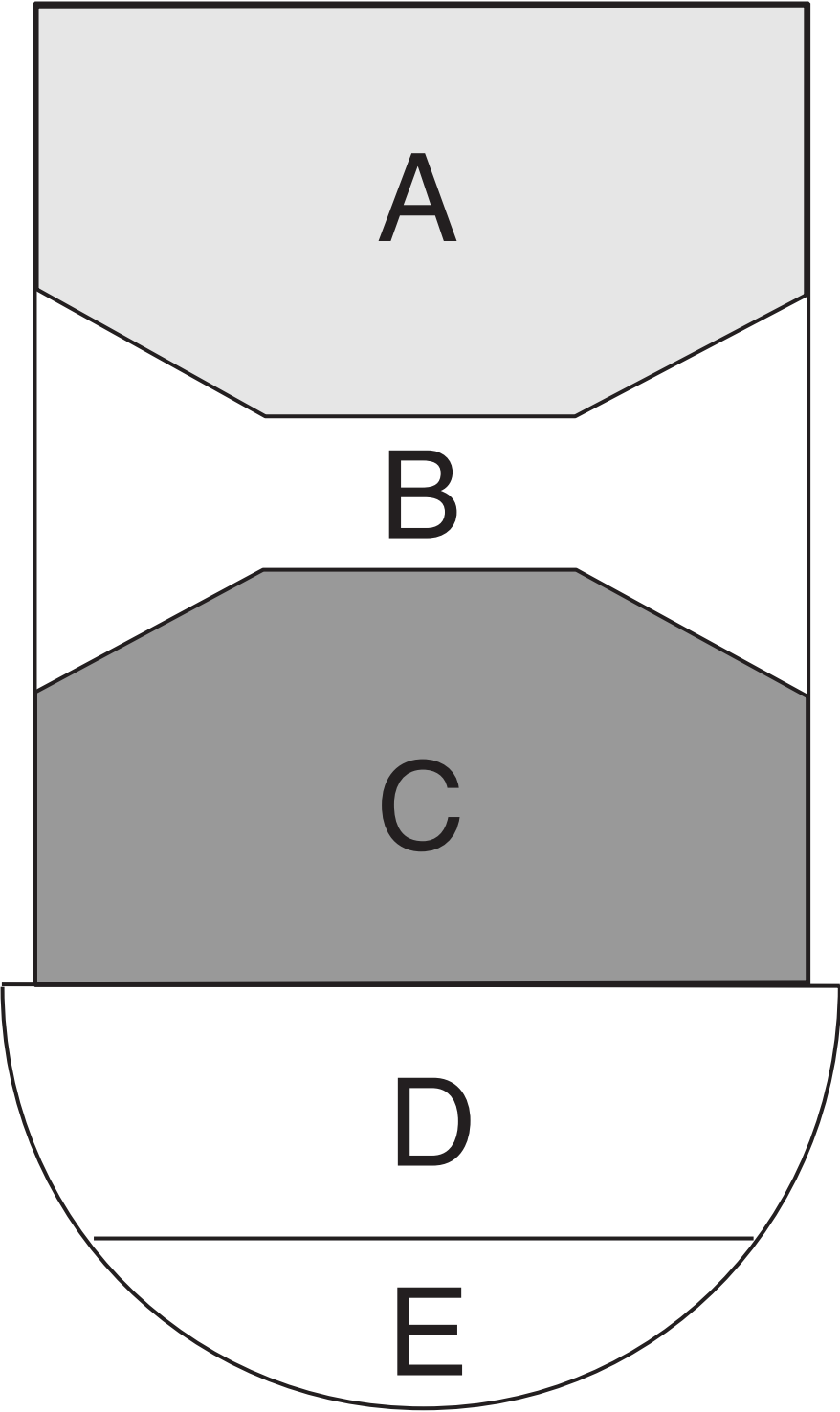
Sub-terrain Mounting Base

Electrical .... D or E

AmerGlow 170, 225 .... C, D, E

AmerGlow 12, 30, 70 .... A, B, C, D, E

Surface Mounting Kit

Electrical .... D or E

AmerGlow 170, 225 .... C, D, E

AmerGlow 12, 30, 70 .... A, C, D, E

SAVE THESE INSTRUCTIONS!

Pentair Water
Pool and Spa®