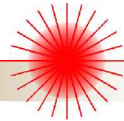




**O.W.L.**

MANUFACTURER OF QUALITY OPTICAL FIBER TEST EQUIPMENT

**OPTICAL WAVELENGTH LABORATORIES**



# Beaming Optical Length Tester (BOLT)



Operations Manual  
Version 1.0  
November 28, 2001  
OWL Part BOLT-1

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## SYMBOLS



This symbol signifies a potentially dangerous operation. **Extreme caution must be exercised when performing this operation.**



This symbol signifies a tip or suggestion for ease of use.

# GENERAL

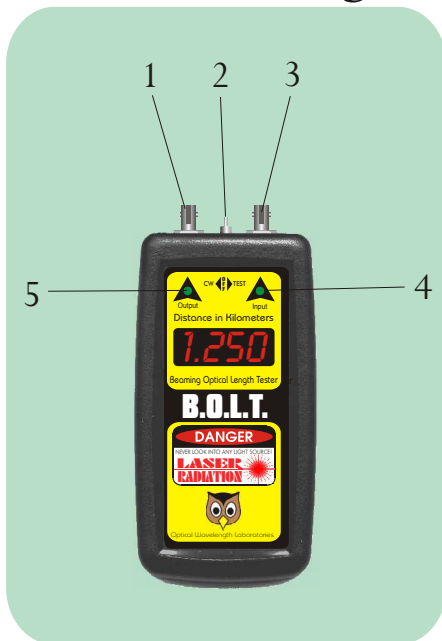
This manual describes the operation of the BOLT (Beaming Optical Length Tester). The BOLT is designed to measure the length of single mode and multi-mode fibers. It uses a “round robin” technique for fiber measurement; i.e. it loops back two fibers in the same fiber cable with a patch cord. The round trip time of the optical pulse is converted to kilometers, then divided by two to give the length of the fiber cable. There is no need to measure the length of every fiber; the length will be the same for all fibers in the cable, so this test only needs to be run once for each cable. This technique allows the BOLT to be very accurate (up to  $\pm 2.5$  meters).

Many network cabling standards require the fiber cable length to be recorded along with attenuation measurements. Optical measurement of fibers provides a quick and easy alternative to check the fiber jacket for markings or estimating the length by using a measuring wheel, and often provides a greater degree of accuracy.

The BOLT also includes a pulse mode feature for fiber location (when used with a fiber identifier), as well as a continuous wave mode to be used as a stable -10 dBm single mode laser light source.

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## Functional Diagram



### (1) 1310nm FP Laser Transmitter

This port houses a laser diode that emits invisible light into an optical fiber.

### (2) Continuous Wave/Test Selector Switch

This 3-way switch selects between OFF (center), length testing/ fiber identification mode (left), and continuous wave/ light source mode (right).

### (3) Detector Port

This port houses a germanium detector used to receive light from an optical fiber.

### (4) Test Mode LED

This LED indicates that the tester is in length testing / fiber identification mode.

### (5) Continuous Wave Mode LED

This LED indicates that the tester is emitting a continuous beam of light to be used as a stable -10 dBm light source.

NOTE: During normal operation, if either LED (4 or 5) is not lit, this indicates that the battery has insufficient power for accurate testing, and must be replaced.

# PRECAUTIONS

**Safety.** Extreme caution must be exercised when operating the BOLT. It produces an intense beam of invisible light that can cause permanent damage to the eye with prolonged exposure.



**NEVER LOOK INTO A LIGHT SOURCE OR THE END OF A FIBER THAT MAY BE ENERGIZED BY A SOURCE!**

Whenever possible, follow these safety tips when operating the BOLT:



Do NOT look directly at the connector. 1310 nm light is invisible, so you won't be able to tell if the laser diode is emitting a signal.

**Operational.** In order to insure accurate and reliable readings, it is vitally important to clean the ports on the tester, as well as the ferrules on the patch cords, before each use. If dirt, dust, or oil are allowed to build up inside the connector, the surface of the laser diode may become scratched, producing erroneous results. Replace the dust caps on the tester ports and patch cords when not in use.

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## REQUIRED ACCESSORIES

**Cleaning Supplies.** Fiber ferrules, connector ports and bulkheads should be cleaned with 99% or better isopropyl alcohol and a lint-free cloth. A can of compressed air should be available to dry off the ferrules, and to blow dust from the connector ports and bulkheads.

**Patch Cords.** Two identical patch cords are required to connect the BOLT to the system under test, and an additional patch cord is required to loop back the two fibers being used for the test. The connector styles on the patch cords must match the type on the BOLT and the type of the bulkheads in the system under test.

# APPLICATIONS

**Fiber Length Measurement.** The BOLT uses a “round robin” method of length measurement. This method requires two fibers from the same fiber cable to be looped back at one end with a patch cord. Light is injected into one of the fibers by the transmitter and is received by the detector connected to the other fiber. The round trip travel time is converted into length in kilometers and divided by two to arrive at the length of the fiber cable. It is not necessary to test each fiber for length; the length measurement applies to all fibers in the cable.

**Fiber Identification.** The BOLT provides a pulsed mode for easy fiber identification. Fibers are identified by clamping a fiber identifier onto a jacketed fiber, which produces a tone to indicate presence of a signal. This is useful for locating fibers that are marked incorrectly or not marked at all.



**NEVER LOOK INTO A LIGHT SOURCE OR THE END OF A FIBER THAT MAY BE ENERGIZED BY A SOURCE!**

**Stable Single Mode Light Source.** In Continuous Wave Mode, a steady beam of 1310 nm infrared laser light is injected into the fiber. This light is stabilized at -10 dBm, and when used with a power meter, functions as a NIST-traceable single mode laser light source for fiber attenuation testing.

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## OPERATION

### **Fiber Length Measurement (*Figure 1 - Length Testing Configuration - Page 4*)**

- (1) On one end of the fiber cable, loop back two of the fibers with one of the patch cords.
- (2) On the other end of the fiber cable, connect one patch cord to each of the fibers being used for the test. Connect the other end of the patch cords to the receiver and transmitter ports on the BOLT.
- (3) Power ON the BOLT into length test mode by flipping the switch to the left. In a few seconds, the display will show the length of the fiber in kilometers.

*NOTE: If the green indicator LED does not light up, this means that the battery power is insufficient for a valid test. The battery must be replaced before continuing.*

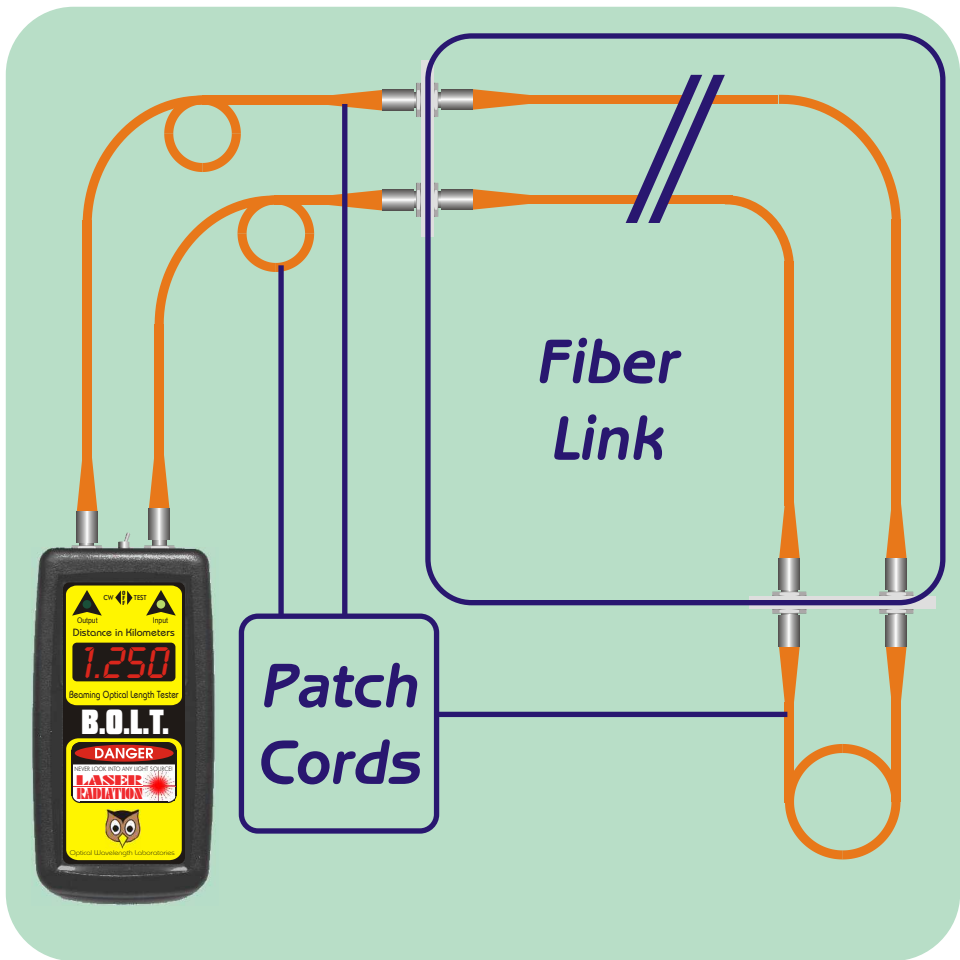


Figure 1 - Length Testing Configuration

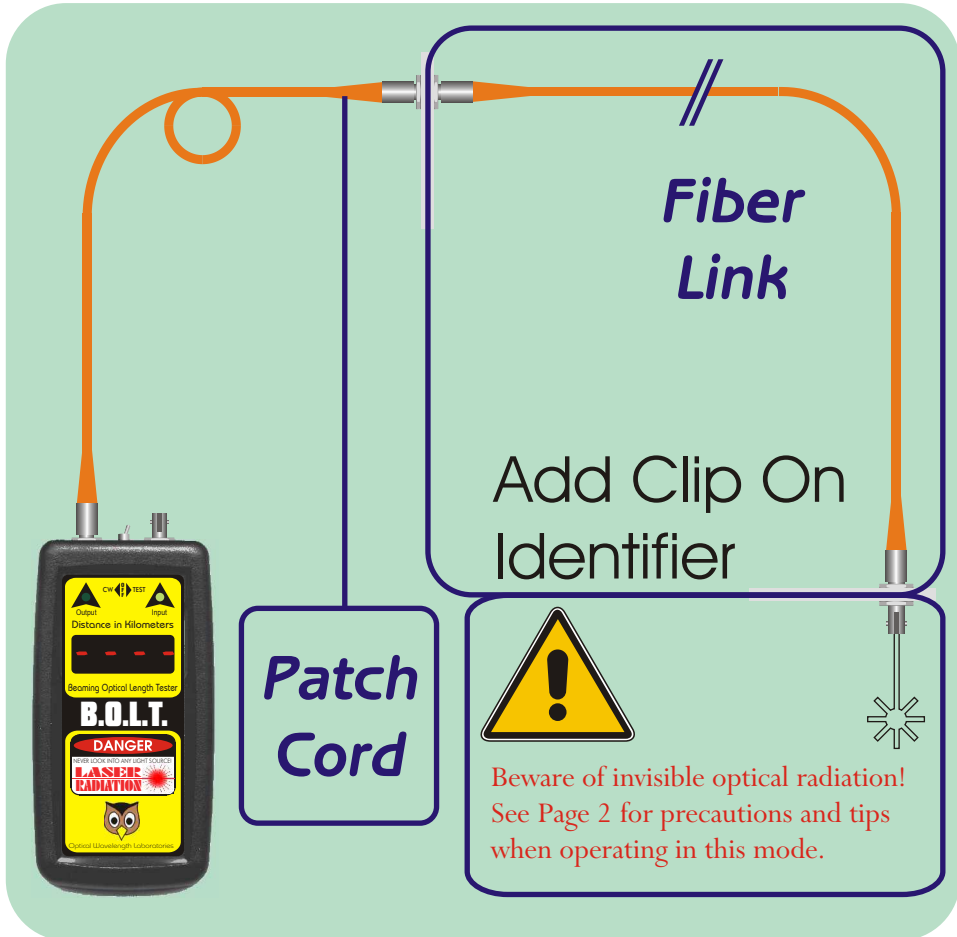
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### Fiber Identification (Figure 2 - Fiber Identification Configuration - Page 5)

- (1) Connect the BOLT to the fiber you are testing via a patch cord as shown in Figure 2.
- (2) Power ON the BOLT into fiber identification mode by flipping the switch to the left. This mode emits a flashing beam of invisible light into the fiber.
- (3) Identify the fiber by clamping a fiber identifier to the fibers until you locate the fiber being tested. Most identifiers produce an audible tone.



**NEVER LOOK INTO A LIGHT SOURCE OR THE END OF A FIBER THAT MAY BE ENERGIZED BY A SOURCE!**



*Figure 2 - Fiber Identification Configuration*

**Single Mode Light Source (Figure 3 - Attenuation Test Configuration - Page 6)**

- (1) Connect the BOLT to the fiber you are testing via a patch cord as shown in Figure 3.
- (2) Connect a power meter (such as the Fiber OWL) to the other end of the fiber you are testing via a patch cord as shown in Figure 3.

- (3) Power ON the BOLT to continuous wave/light source mode by flipping the switch to the right. The display will show a series of hyphens to indicate continuous wave / light source mode. Depending upon the type of units the meter is displaying, it will display either the attenuation of the fiber, or the actual power level being received.

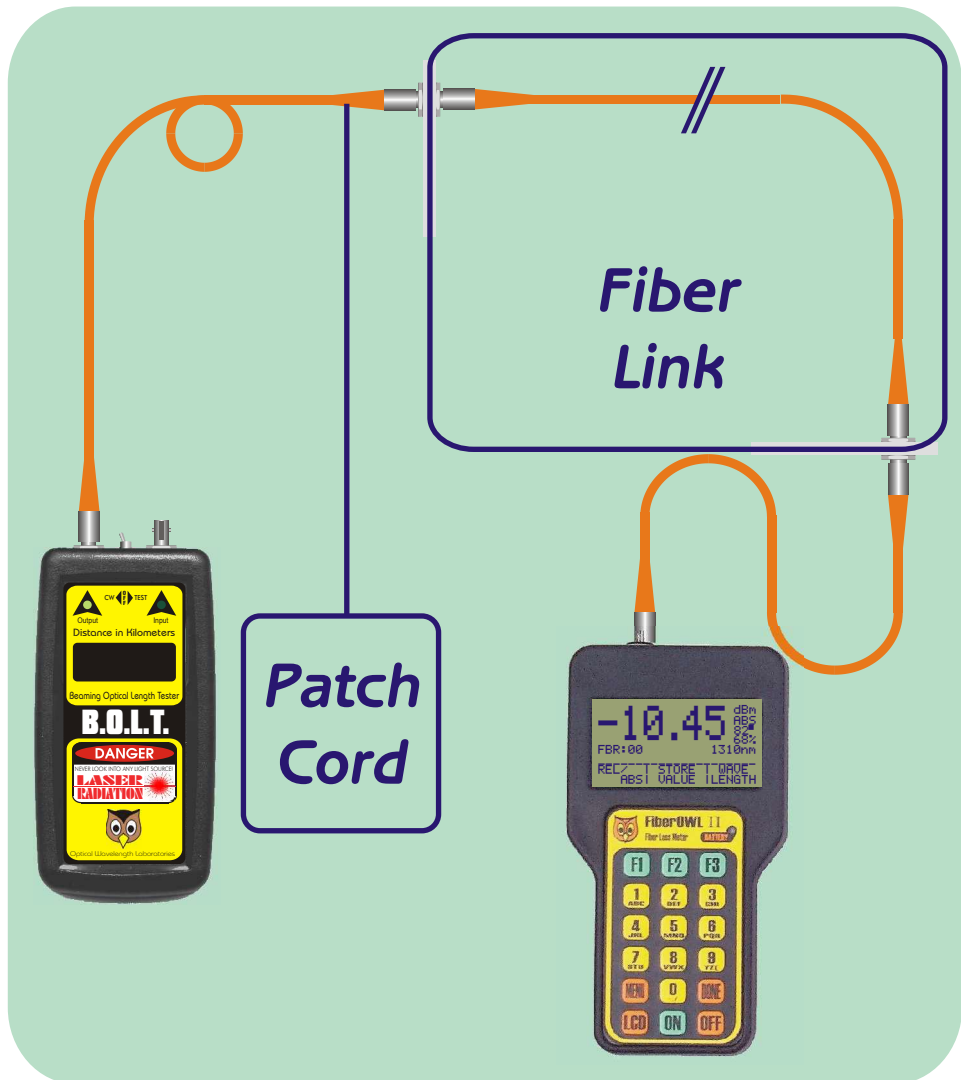


Figure 3 - Attenuation Test Configuration



# MAINTENANCE/CALIBRATION PROCEDURES

**Repair.** Repair of this unit by unauthorized personnel is prohibited, and will void any warranty associated with the unit.

**Battery Replacement.** The battery compartment is covered by a sliding plate on the back of the unit. One 9v battery is required for operation.

**Cleaning.** For accurate readings, the optical connectors on the BOLT and the connectors on the patch cords should be cleaned prior to attaching them to one another. Minimize dust and dirt buildup by replacing the dust caps after each use.

**Re-calibration.** It is recommended to re-calibrate the BOLT every 12 months to maintain the light source stability at -10 dBm, and for NIST traceability..


**Warranty.** The BOLT comes standard with a one-year factory warranty, which covers manufacturer defects and workmanship only.


## WARNING AND SERIAL NUMBER INFORMATION

The serial number and model number can be found on the back of the unit, as well as the laser source information.

DANGER


Visible Optical Radiation When Power Switch Is Set To The ON Position – Avoid Eye Exposure To Direct Or Scattered Radiation  
Fiber Laser: 1310 nm 0.1 mW



**Optical Wavelength Laboratories** 

Whitewater, WI 53190 (262) 473-0643

**MODEL# BOLT-1**  
**SERIAL# BTxxxxx**  
**DATE: 11/27/01**  
**POWER: 9V DC**

  
MADE IN USA

# SPECIFICATIONS

Launch Method: \_\_\_\_\_ FP Laser  
Output Power: \_\_\_\_\_ 0.1 milliwatts  
Resolution: \_\_\_\_\_ up to 0.001 kilometers  
Accuracy: \_\_\_\_\_  $\pm$  2.5 meters  
Measurement Range: \_\_\_\_\_ 25 kilometers  
Battery Life: \_\_\_\_\_ 15 hours  
Operating Temperature: \_\_\_\_\_ 0 to 55° C  
Storage Temperature: \_\_\_\_\_ 0 to 75° C  
Low Battery Indicator: \_\_\_\_\_ Yes  
Connector Style: \_\_\_\_\_ ST  
Width: \_\_\_\_\_ 2.75 inches  
Height: \_\_\_\_\_ 4.94 inches  
Depth: \_\_\_\_\_ 1.28 inches  
Weight (with battery): \_\_\_\_\_ 154 grams

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# CONTACT INFORMATION

**Address:**

Optical Wavelength Laboratories  
N9623 Hwy 12  
Whitewater, WI 53190

**Phone:**

(262) 473-0643

**Web:**

OWL-INC.COM

# CONVERSION FACTORS

The BOLT displays fiber length in kilometers. At times it may be necessary to convert the fiber length to a different unit of measurement. The table below provides conversion factors for various units of measurement.

To calculate the units you need, multiply the number on the BOLT display by the conversion factor listed in the table below:

1 kilometer	1000 meters
1 kilometer	0.6214 miles
1 kilometer	3281 feet

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## Examples:

Here are some examples of converting the BOLT display into different units of measurement. For these examples, let us assume a fiber length of 1.25 kilometers as shown by the display at right.

Distance in Kilometers



- kilometers to meters

$$1.250 \times 1000 = 1250 \text{ meters}$$

- kilometers to miles

$$1.250 \times 0.6214 = 0.777 \text{ miles}$$

- kilometers to feet

$$1.250 \times 3281 = 4101.25 \text{ feet}$$