FLUKE networks

FIBER OneShot™

Length Meter

Users Manual

PN 3374501
October 2009

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Fluke Networks mainframe products will be free from defects in material and workmanship for one year from the date of purchase. Parts, accessories, product repairs and services are warranted for 90 days, unless otherwise stated. Ni-Cad, Ni-MH and Li-Ion batteries, cables or other peripherals are all considered parts or accessories. This warranty does not cover damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke Networks' behalf.

To obtain service during the warranty period, contact your nearest Fluke Networks authorized service center to obtain return authorization information, then send your defective product to that Service Center with a description of the problem.

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE NETWORKS IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY.

Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

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Introduction

The FIBER OneShot™ Length Meter measures the length of singlemode fiber optic cables and can show the distance to a break or a bad connection on the fiber.

Registering Your Product

When you register your product with Fluke Networks you get access to valuable information on updates, troubleshooting procedures, and other support services.

To register online, go to **www.flukenetworks.com/registration**. Or, send the registration card that came with this product to Fluke Networks.

The Fluke Networks Knowledge Base

The Fluke Networks Knowledge Base gives answers to typical questions about Fluke Networks products and includes information on technology and procedures for network and cable tests. To see the Knowledge Base, go to **www.flukenetworks.com**, then click **Support** > **Knowledge Base** at the top of the page.

Safety Information

	Warning or Caution: Risk of damage to or destruction of equipment or software. See explanations in the manual.
	Warning: Risk of electrical shock.
	Warning: Class 1 laser. Risk of damage to your eyes caused by hazardous radiation.
	Do not put products that contain circuit boards into waste containers. Refer to local regulations for disposal procedures.

Warning: Class 1 Laser

To prevent possible damage to your eyes caused by hazardous radiation:

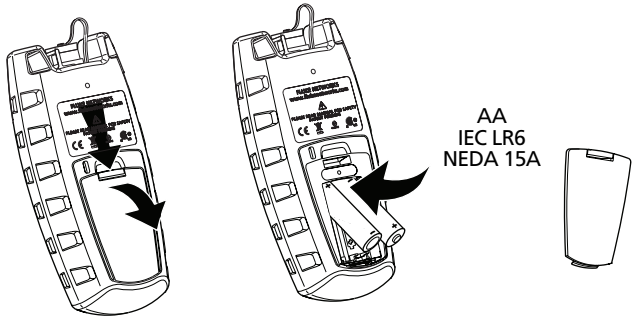
- **Do not look directly into optical connectors. Some optical equipment emits invisible radiation that can cause permanent damage to your eyes.**
- **Do not turn on the meter unless a fiber is attached to the port.**
- **Do not use a magnifying device to look at the optical outputs without the correct filter.**
- **Use of controls, adjustments, or procedures that are not in this manual can cause exposure to hazardous radiation.**

⚠ Caution

To prevent damage to fiber connectors, to prevent data loss, and to make sure that your test results are as accurate as possible:

- **Do not connect APC connectors to the meter. An APC connector will cause damage to the fiber endface in the connector on the meter. See Figure 3.**
- **Use only patch cords that comply with GR-326-CORE specifications. Other patch cords can cause unreliable measurements.**
- **Use the correct procedures to clean all fiber connectors before each test. If you do not do this or if you use incorrect procedures, you can get unreliable test results and can cause permanent damage to the connectors.**
- **Put protective caps on all connectors when you do not use them.**
- **Do not connect the meter to a network that is on. If you do, the meter can cause problems in the network.**
- **If ACTIVE LINE blinks, immediately disconnect the meter from the fiber. Optical power levels more than +7 dBm can cause damage to the detector in the meter.**

Battery Installation and Life



Note: Fluke Networks recommends alkaline batteries.

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Figure 1. How to Install the Batteries

The meter can do approximately 1500 tests before you must replace the batteries.

Physical Features

See Figure 2.

1. Output port with SC adapter and UPC endface
2. Starts a test
3. On/off key
4. Navigation keys
5. Press to see the setup menu, to select an item, and to save a setting
6. LCD display

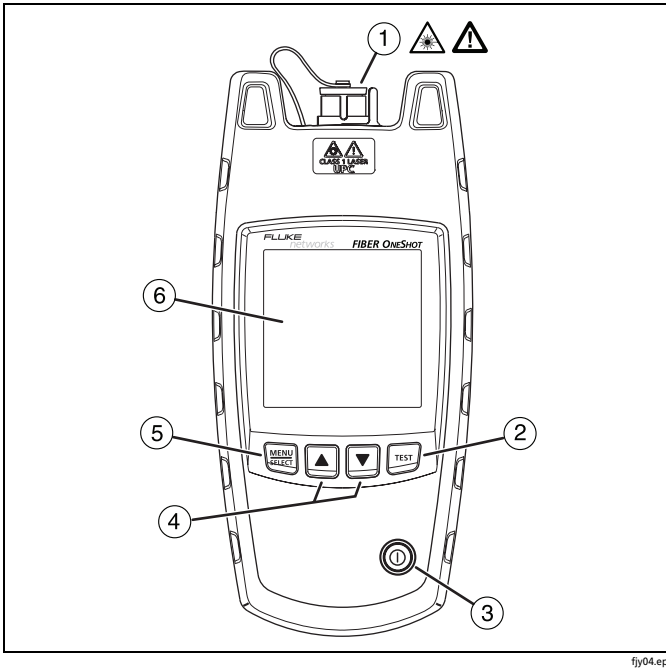

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Figure 2. Physical Features

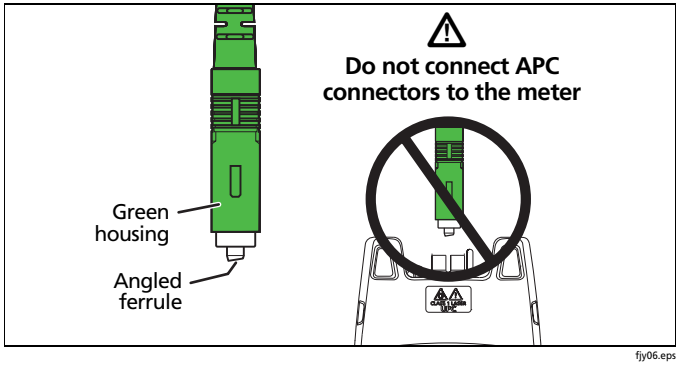

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Figure 3. How to Identify an APC Connector

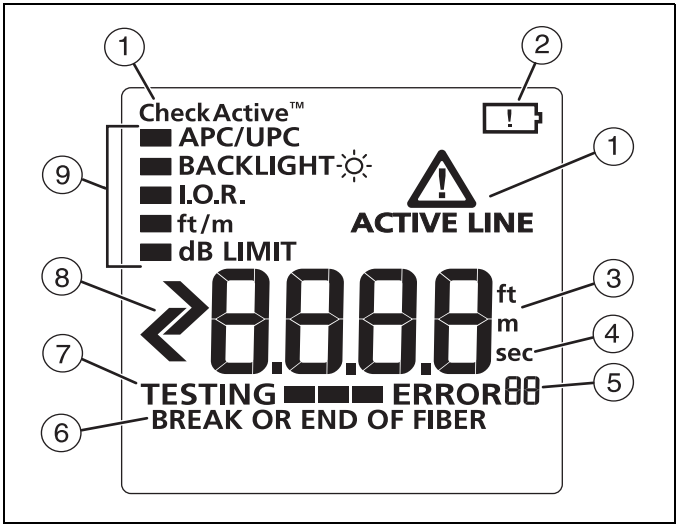

Figure 4. Display Features

(1) **CheckActive**™ shows when the meter looks for an optical signal on the fiber. **CheckActive**™ and **ACTIVE LINE** blink if there is an optical signal on the fiber. The meter will not do a test if there is an optical signal on the fiber.

⚠Caution

If ACTIVE LINE blinks, immediately disconnect the meter from the fiber. Optical power levels more than +7 dBm can cause damage to the detector in the meter.

② When the low battery symbol shows, replace the batteries soon. See page 4.

③ The digits show the fiber length in feet or meters.

④ Shows when you look at the setting for the backlight timer. The setting is in seconds.

⑤ Shows an error number for error conditions.

⑥ Shows when the meter completes a length measurement.

⑦ Shows as the meter measures length.

⑧ ❯: Shows when the length is more than the range of the meter. See page 14.

❮: Can show for short fibers when the meter cannot measure the length accurately. See page 14.

⑨ Settings for the meter.

Settings

To change the settings on the meter:

1 Press [MENU SELECT].

2 To select a setting to change, press [▼], then press [MENU SELECT].

3 Use [▲] [▼] to change the setting. See page 8 for information on the settings.

4 Press [MENU SELECT] or [TEST] to save the setting.

APC/UPC

Angled Physical Contact/Ultra Physical Contact. If most cables you will do tests on have UPC connectors, set this to UPC.

BACKLIGHT

The display backlight turns off if you do not press a key for the period of time shown. You can set the time to 5 to 60 seconds in increments of 5 seconds.

I.O.R. (index of refraction)

The index of refraction is the ratio of the speed of light in a vacuum to the speed of light in a fiber. The meter uses the index of refraction to calculate length. If you increase n, the calculated length decreases. The default is 1.468. This value is satisfactory for most fibers.

ft/m

Select feet or meters as the unit for length measurements.

dB LIMIT

Sets the minimum size of a reflection that the meter shows as a break or the end of the fiber when the reflection is before the end of the fiber. You can select -35 dB (larger reflection), -40 dB, or -45 dB (smaller reflection). The default is -40 dB.

The Connector Adapter

The meter has an SC connector adapter that you can remove to clean the fiber endface in the port (Figure 5).

How to Clean Connectors and Adapters

Always clean and do an inspection on fiber connectors before you make connections. Use fiber optic solvent and optical-grade wipers or swabs to clean connectors. You can purchase these supplies from Fluke Networks.

How to Clean the Connector on the Meter

1. Turn off the meter.
2. Remove the connector adapter to get access to the ferrule (see Figure 5).
3. Touch the tip of an optical-grade solvent pen or swab soaked in solvent to a dry, optical-grade wiper.
4. Touch a new, dry swab to the solvent on the wiper.
5. Twist the swab around against the fiber endface 3 to 5 times, then twist a dry swab around against the fiber endface 3 to 5 times.

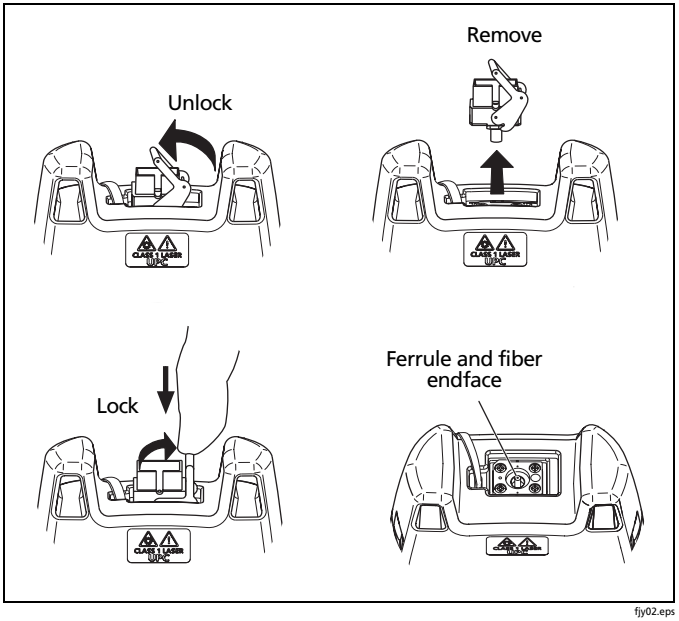

Figure 5. How to Remove and Install the Connector Adapter

How to Clean Bulkhead Connectors (sources and patch panels)

1. Do steps 2 and 3 above to put solvent on a swab.
2. Push the swab into the connector, twist it around 3 to 5 times against the endface, then discard the swab.
3. Twist a dry swab around in the connector 3 to 5 times.
4. Before you make a connection, use a fiber microscope (for example, the Fluke Networks FiberInspector™ Video Microscope) to do an inspection on the connector.

How to Clean Connector Ends

1. Touch the tip of an optical-grade solvent pen or swab soaked in solvent to a dry, optical-grade wiper.
2. Rub the connector endface across the solvent on the wiper, then rub it two times across the dry area of the wiper.

Note

A different procedure is necessary to clean some connector styles (for example, VF-45).

Always put protective caps on connectors you do not use. At intervals, clean the caps with a swab or wipers and fiber optic solvent.

How to Use the Meter

Notes

Always use patch cords that comply with GR-326-CORE specifications. Other patch cords can cause unreliable measurements.

Do not use the meter to measure fibers that have PC connectors. PC connectors cause large reflections that the meter shows as the end of the fiber.

1 Clean all fiber connectors.

2 Connect the fiber to the meter, as shown in Figure 6.

To connect to APC connectors, use a UPC/APC patch cord. To connect to UPC connectors, use a UPC/UPC patch cord.

3 Turn on the meter, then press TEST.

Note

After you turn on the meter, it shows PASS for a short time to show that it operates correctly.

⚠ Caution

If ACTIVE LINE blinks, immediately disconnect the meter from the fiber. Optical power levels more than +7 dBm can cause damage to the detector in the meter.

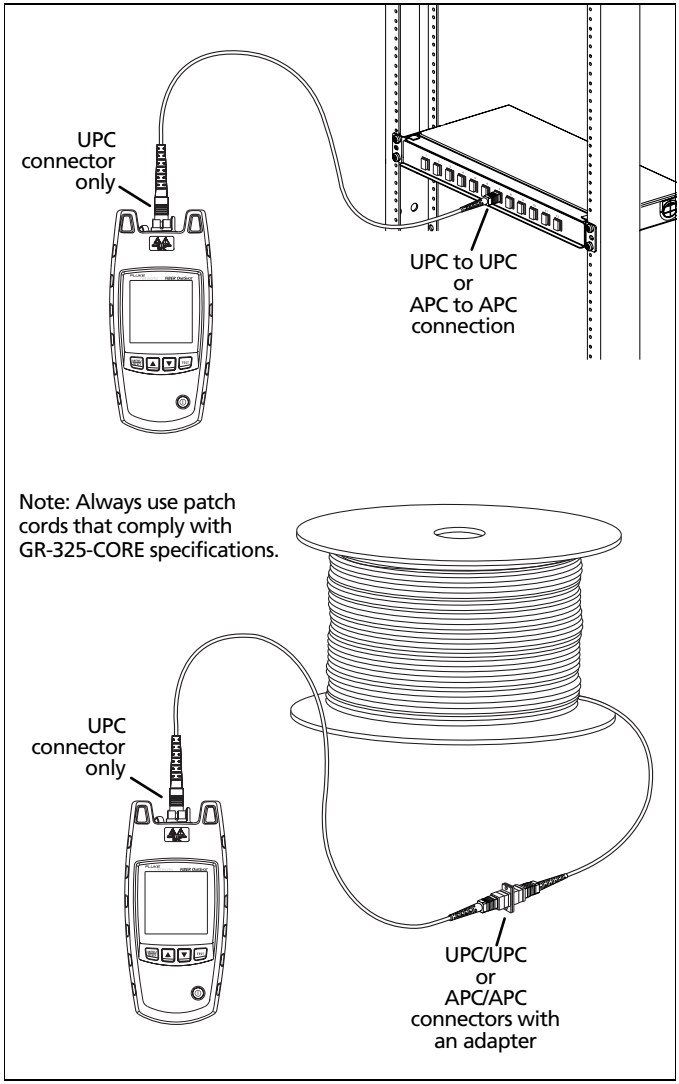

Figure 6. How to Make Connections

Measurement Results

The meter measures the length of the fiber. The length can be the distance to an APC or UPC connector at the end of the fiber or the distance to a break. If there is a large reflective event before the end of the fiber (larger than the **dB LIMIT** setting) the meter shows the distance to that event.

The meter can show these results in the given situations:

The meter shows 0 m, 0 ft, 1 m, or 1 ft.

- The connection to the meter is bad.
- The connector on the meter or the fiber is dirty. See page 11 for instructions on how to clean the connectors.
- The meter is connected to a PC connector. PC connectors cause large reflections that the meter shows as the end of the fiber.

The meter shows >6000 m or >9999 ft.

The fiber is longer than the meter can measure.

The meter shows < with the measurement.

APC connectors make very small reflections. On some short fibers, this small reflection is hidden in the reflection from the bulkhead connector on the meter. In these situations, the meter shows a range (for example, < 9 m), rather than an exact length.

The length measurement is incorrect.

- The **I.O.R.** (index of refraction) is incorrect. See page 8.
- The cable has PC connectors. PC connectors cause large reflections that the meter shows as the end of the fiber.

Maintenance

To clean the display, use lens cleaner and a soft, lint-free cloth. To clean the case, use a soft cloth that is moist with water or water and a weak soap.

⚠Caution

To prevent damage to the display or the case, do not use solvents or abrasive materials.

To clean the optical connector, use the procedure given on page 11.

⚠Warning⚠

To prevent possible fire, electrical shock, personal injury, or damage to the meter:

- **Do not open the case. You cannot repair or replace parts in the case.**
- **Use only replacement parts that are approved by Fluke Networks.**
- **If you replace parts that are not specified as replacement parts, the warranty will not apply to the product and you can make the product dangerous to use.**
- **Use only service centers that are approved by Fluke Networks.**

Note

If the meter shows **ERROR**, *servicing is necessary. Speak to a Fluke Networks representative. See page 16.*

Contacting Fluke Networks

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- Australia: 61 (2) 8850-3333 or 61 (3) 9329 0244
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- Canada: 1-800-363-5853
- Europe: +44-(0)1923 281 300
- Hong Kong: 852 2721-3228
- Japan: 03-3434-0510
- Korea: 82 2 539-6311
- Singapore: +65-6799-5566
- Taiwan: (886) 2-227-83199
- USA: 1-800-283-5853

For more phone numbers, go to our website.

Options and Accessories

For a complete list of options and accessories go to the Fluke Networks website at **www.flukenetworks.com**.

Option or Accessory	Fluke Networks Model Number
VisiFault™ Visual Fault Locator	VisiFault
FT500 FiberInspector™ Mini Video Microscope	FT500
FT500 FiberInspector™ Mini Video Microscope and Fiber Optic Cleaning Kit	FT525
FT120 FiberViewer™ Microscope, 200X	FT120
FT140 FiberViewer™ Microscope, 400X	FT140
Fiber Optic Cleaning Kit with carrying case	NFC-Kit-Case
Fiber Optic Cleaning Kit	NFC-Kit-Box
Singlemode patch cord, GR-326-CORE compliant, UPC to APC, 1 m	FIBR-AC-UAPC
Singlemode patch cord, GR-326-CORE compliant, UPC to UPC, 1 m	FIBR-AC-UUPC
ST/ST singlemode fiber optic adapter	NF300SM
SC/SC singlemode fiber optic adapter	NF310SM
Soft carrying case and holster	FIBR-AC-CH

Specifications

Specifications are typical.

Operating temperature with the battery	0°C to 50°C
Non-operating temperature	-20°C to 60°C
Operating relative humidity (without condensation)	95% (10°C to 35°C) 75% (35°C to 40°C) uncontrolled < 10°C
Vibration	Random, 5 Hz to 500 Hz, MIL-PRF-28800F CLASS 2
Shock	1 meter drop test
Safety	CSA C22.2 No. 61010.1:04 EN 61010-1 2nd Edition 2001 EN60825-1,2:2006
Altitude	3000 m
EMC	EN 61326-1: 2004
Battery type	2 AA alkaline batteries (no battery charger)
Battery life[1]	1500 tests
Laser safety	Class 1 CDRH Complies to EN 60825-2
Sampling spacing[2]	12.5 cm to 1 m (1.25 ns to 10 ns)
Instrument reporting information	Distance to the first reflective incident and/or end of fiber[2]

1. 3 km cable with 1 meter resolution, 500 ns pulse width, and < 1% duty cycle with 255 averages.
2. Changes with pulse width (1 m for 3 km). Helps to save battery power and memory space.

Incident type detected	**Display**
UPC or APC open Break Reflective incident Poor bulkhead connection	BREAK OR END OF FIBER BREAK OR END OF FIBER BREAK OR END OF FIBER 0 ft/m (Will not measure a splice loss, connector loss, bend loss, or fiber attenuation.)
LCD type	Backlit black and white (segments)
Index of refraction range	1.45 to 1.5 (factory default is 1.468)
Auto turn off	Automatically turns off after 5 minutes if no keys are pressed. Backlight turns off first.
Factory calibration interval	None
Output wavelengths	1310 nm ± 25 nm
Emitter type	Fabry-Perot laser diode connected to 9/125 µm fiber
Laser classification	Class 1 CDRH Complies to EN 60825-2
Pulse widths[3]	20 ns to 500 ns
Power into fiber under test	> 10 mW-pk
Dynamic range[4]	>11 dB

3. Pulse widths of 20 ns and 500 ns are typical.
4. With 500 ns pulse width, using IEC 98 and 255 averages with filtering.

Distance to first reflective open[5]	1 m
Photodiode	40 µm - 80 µm, PIN InGaAs
Maximum distance	6000 meters or 9999 feet
Distance accuracy (0 m to 3000 m or 0 ft to 9999 ft)	± 1 m for reflective incidents, ± 0.1% of length[6] ± 3 m for non-reflective incidents, ± 0.1% of length[7]
Testing speed	< 6 seconds typical[8]
Connector	Removable/cleanable SC adapter, UPC polish
Fiber types tested	9/125 µm singlemode
Reflectance threshold[9]	-40 dB typical
APC open detection[10]	-65 dB reflectance typical and backscatter > 3 dB above the noise floor

5. With a reflectance range from -40 dB to -14 dB.
6. ± user-configurable Index of Refraction (IOR) error ± the incident location error. Incident location error for reflective incidents: ±1 m from 1 m to 3 km.
7. ± user-configurable Index of Refraction (IOR) error ± the incident location error. Incident location error for non-reflective incidents: ±2 m for lengths ≤15 m, otherwise ±1 m.
8. Does not include the active fiber test.
9. Finds and gives the location of an event that has a reflectance larger than -40 dB, such as a dirty UPC connector.
10. Fiber length test with an open connector end that has a reflectance of -65 dB typical (APC). Usually appears as a "non-reflective" event that falls into the noise floor.

Input connector	SC with removable/cleanable adapter UPC polish
Detector type	InGaAs PIN photodiode used in incident detection
Safety	CSA C22.2 No. 61010.1.04 EN 61010-1:2001 {2nd Edition}, EN60825-1:2007 Class 1 Laser
EMC	EN 61326-1, EN61000-4-2,3 80 MHz to 2.7 GHz @ 3V/m. Telephony Requirements: Class B Emissions
CE	Conforms to relevant European Union directives
N10140	Conforms to relevant Australian standards
C SA US	Listed by the Canadian Standards Association CSA C22.2 No. 61010.1.04