



205 Westwood Ave  
Long Branch, NJ 07740  
1-877-742-TEST (8378)  
Fax: (732) 222-7088  
salesteam@Tequipment.NET

**FLUKE®**

# FTK100

Optical Fiber Test Kit

## Users Guide

April 2000, Rev. 1 4/03

© 2000, 2003 Fluke Corporation. All rights reserved. Printed in USA.  
All product names are trademarks of their respective companies.

### **LIMITED WARRANTY AND LIMITATION OF LIABILITY**

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is one year and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries, or to any product which, in Fluke's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available only if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

**THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.**

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Fluke Corporation  
P.O. Box 9090  
Everett, WA 98206-9090  
U.S.A.

Fluke Europe B.V.  
P.O. Box 1186  
5602 BD Eindhoven  
The Netherlands

# Table of Contents

Title	Page
⚠ Safety Information .....	iv
Cleaning Fiber Connections.....	iv
Introduction .....	1
Contacting Fluke Networks .....	2
Unpacking.....	2
Features.....	4
Measuring Optical Power.....	6
Setting a Reference for Loss Measurements.....	8
Measuring Optical Power Loss .....	10
Maintenance .....	12
Battery Replacement .....	12
Accessories and Replacement Parts .....	13
Calibration and Service .....	14
FM130 Fiber Meter Specifications .....	14
FOS-850/1300 Fiber Optic Source Specifications .....	15
Appendix A: Glossary .....	17



# List of Figures

Figure	Title	Page
1.	Standard Equipment .....	3
2.	FM130 Fiber Meter Features .....	4
3.	Display Features .....	5
4.	FOS-850/1300 Fiber Optic Source Features .....	6
5.	Measuring Optical Power .....	7
6.	Setting a Reference .....	9
7.	Measuring Loss.....	11
8.	Battery Replacement .....	12

## **△ Safety Information**

### **△ Warning**

**To avoid possible eye damage caused by hazardous radiation:**

- **Never look directly into optical output connectors. Some sources produce invisible radiation that can permanently damage your eyes.**
- **Do not open the case, except to change the battery; no user-serviceable parts are inside.**

### **Caution**

**To avoid false test results, replace the battery as soon as the low battery indicator (BAT) appears.**

## **Cleaning Fiber Connections**

Always clean the fiber ends before making connections. Use any of the following:

- Lint-free swabs or wipes moistened with isopropyl alcohol
- Pre-moistened swabs or wipes approved for use on fiber connectors

Canned air approved for use on fiber connectors is also useful for dislodging contamination. Protect all connectors with dust caps when not in use.

# ***Optical Fiber Test Kit***

## ***Introduction***

The FTK100 Optical Fiber Test Kit is used to measure optical power and optical power loss at 850 nm, 1300 nm, 1310 nm, and 1550 nm. The FM130 Fiber Meter (also referred to as “the meter”) includes the following features:

- Measures optical power loss of multimode or singlemode fibers.
- Measures output power from optical sources such as network interface cards and optical test equipment.
- Displays output power measurements in dBm or  $\mu$ W.

- Operates for up to 50 hours on a single 9 V battery. Automatic power-down feature helps conserve battery power.
- Displays remaining battery life.
- Designed to use the optional ToolPak™ Meter Hanging Kit from Fluke.

The FTK100 Kit includes a Fluke FOS-850/1300 Fiber Optic Source, which provides light for multimode testing at 850 nm and 1300 nm. For testing singlemode fiber, Fluke offers the optional LS-1310/1550 Laser Source.

The instructions in this guide assume you are using the FOS-850/1300 source included. For other optical sources, refer to the manufacturer’s instructions.

## **Contacting Fluke Networks**

Visit the Fluke Networks web site at  
**[www.flukenetworks.com](http://www.flukenetworks.com)**.

For operating assistance in the USA, call 1-800-283-5853.

To order accessories or get the location of the nearest  
Fluke distributor or Service Center, call:

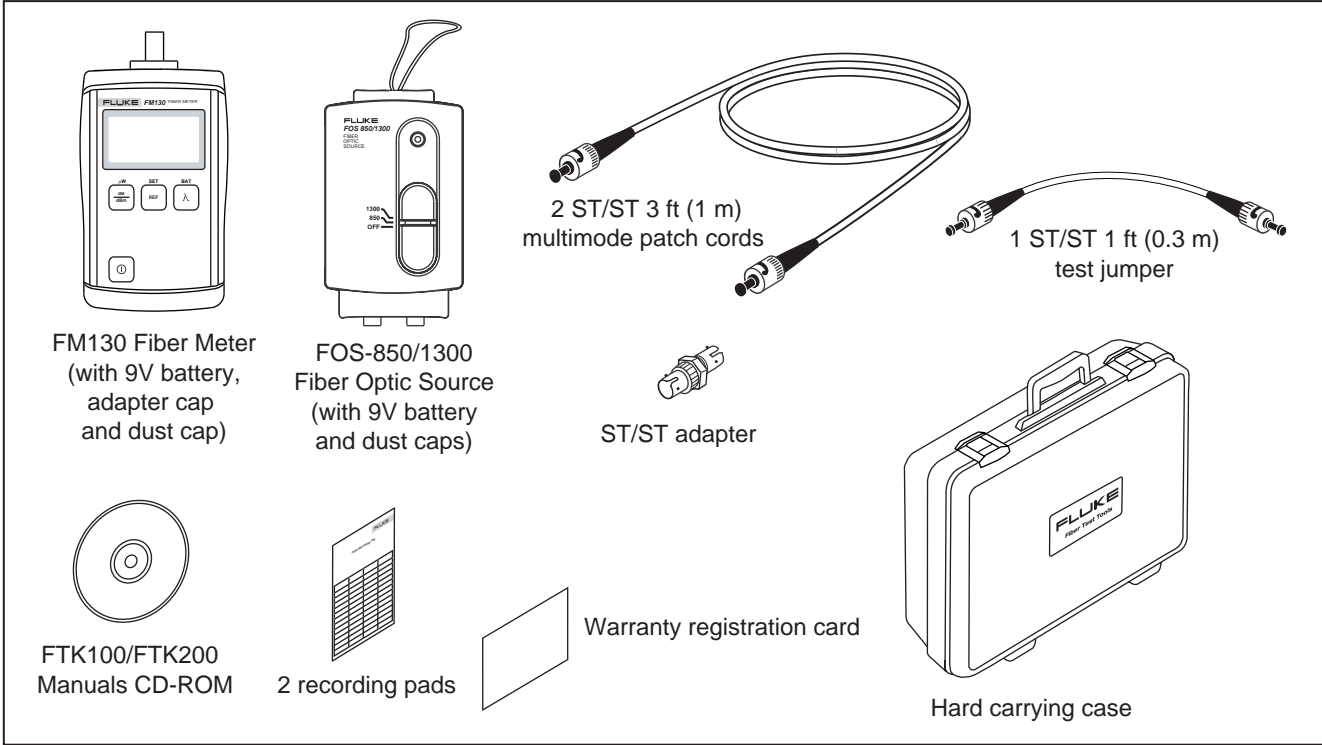
- USA: 1-800-283-5853
- Canada: 1-800-363-5853
- Europe: +44 1923 281 300
- Japan: +81-3-3434-0181
- Singapore: +65-6738-5655
- Anywhere in the world: +1-425-446-4519

## **Unpacking**

The equipment listed below and shown in Figure 1 is included with the FTK100 Kit. If anything is missing or damaged, contact the place of purchase immediately.

- FM130 Fiber Meter (with 9 V battery installed)
- ST adapter cap with dust cap
- FOS-850/1300 Fiber Optic Source (with 9 V battery and dust cap installed)
- 2 ST/ST 3 ft (1 m) 62.5  $\mu$ m multimode patch cords
- 1 ST/ST 1 ft (0.3 m) 62.5  $\mu$ m multimode test jumper
- 1 ST/ST adapter (singlemode quality)
- 2 recording pads
- Warranty registration card
- Hard carrying case
- FTK100/FTK200 Manuals CD-ROM





**Figure 1. Standard Equipment**

afr02f.eps

## Features

Figures 2 and 3 show the meter's features. Figure 4 shows the features of the FOS-850/1300 Fiber Optic Source.

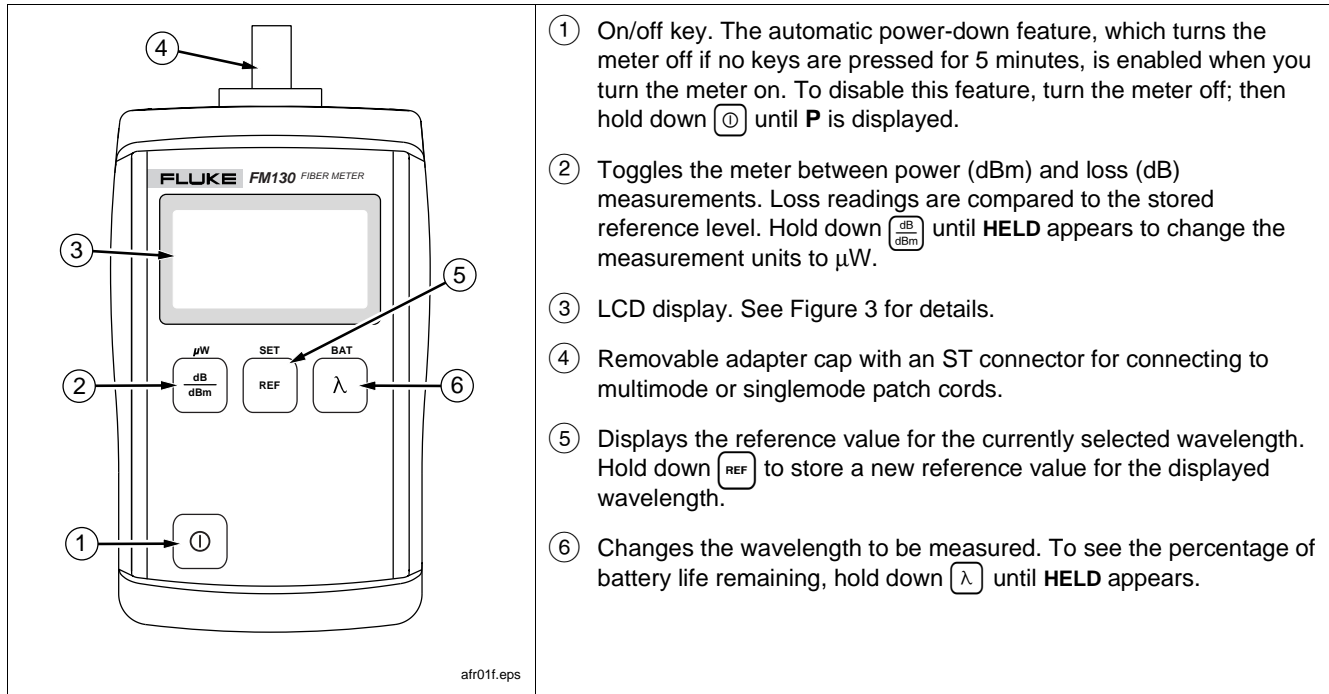
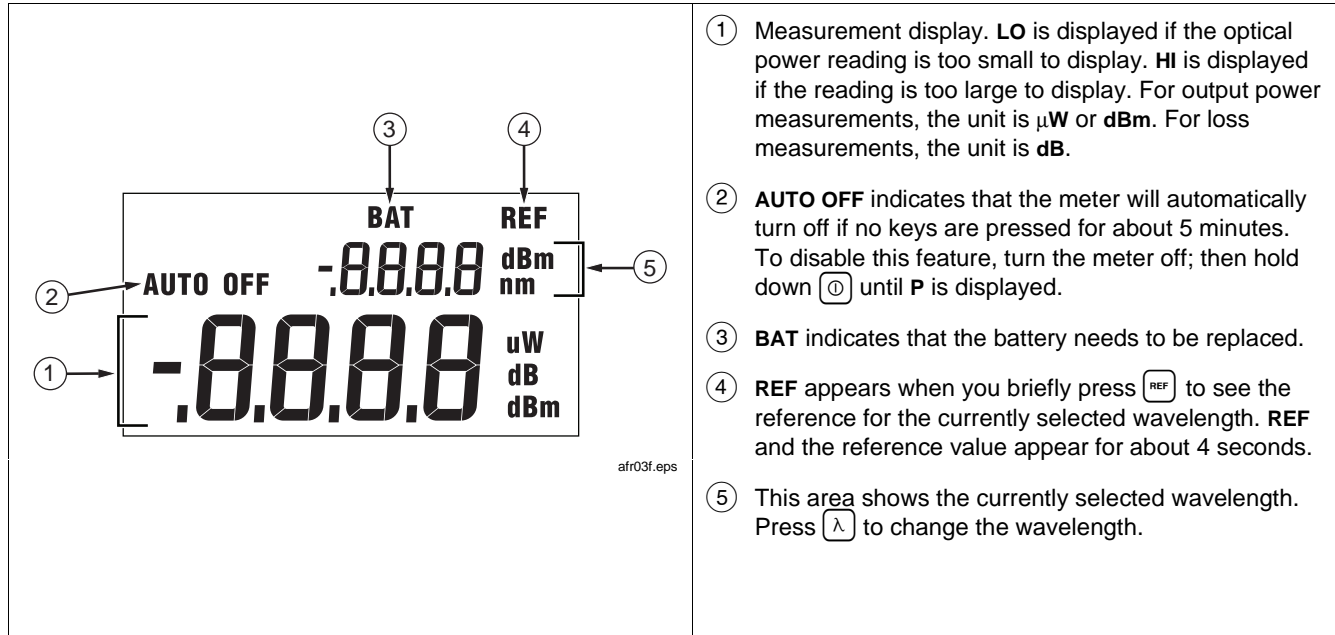
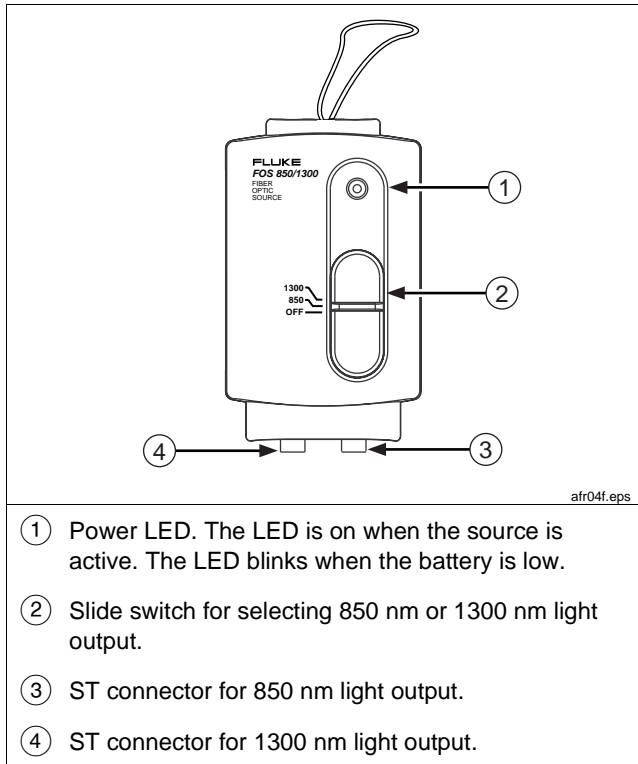


Figure 2. FM130 Fiber Meter Features



**Figure 3. Display Features**



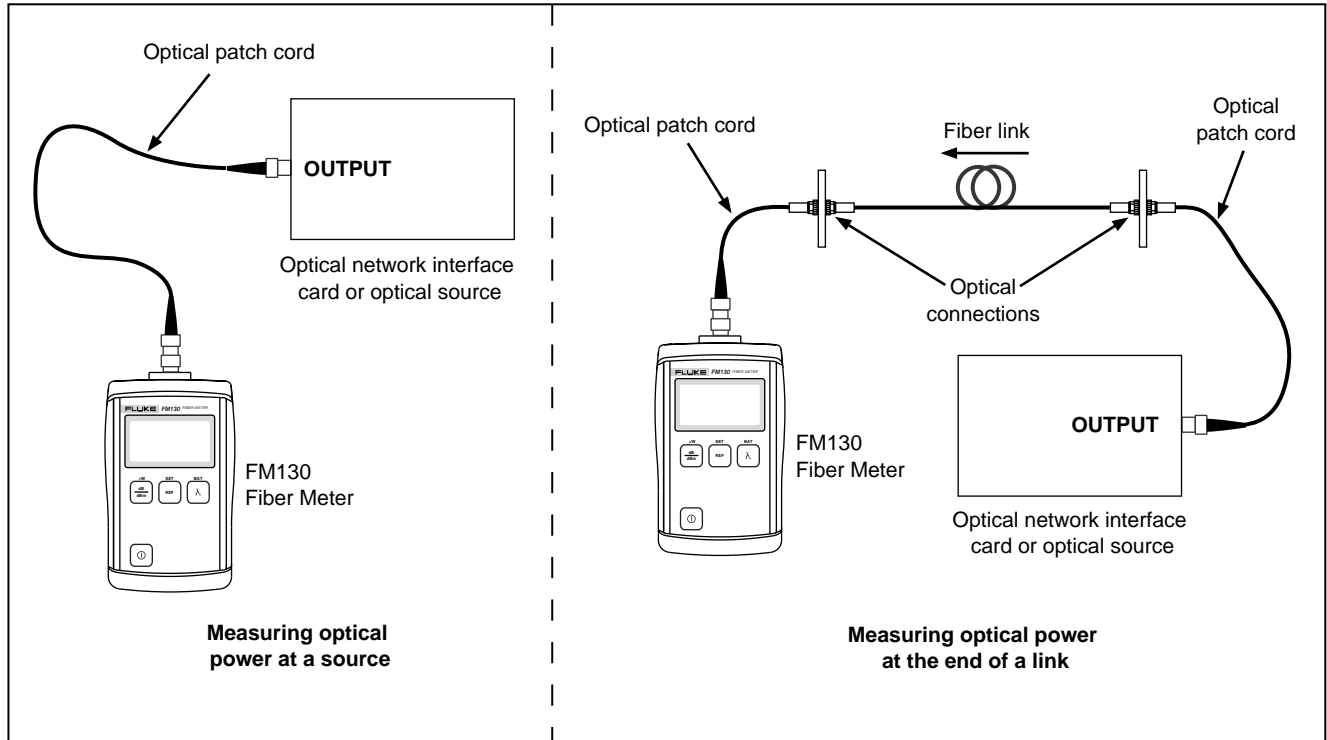
**Figure 4. FOS-850/1300 Fiber Optic Source Features**

## **Measuring Optical Power**

Optical power is the output power produced by a source such as an optical network interface card or optical test equipment. You can measure power at a source or at the end of a fiber link.

To measure optical power, proceed as follows:

1. Verify that the meter and source are set to the proper wavelength. Let the source warm up for two minutes, if necessary.
2. Clean all fiber ends.
3. Make the connections shown in Figure 5.
4. Verify that the meter is in the power measurement mode. The measurement unit should be **dBm**. If necessary, press  $\left[ \frac{\text{dB}}{\text{dBm}} \right]$  to change the measurement unit to **dBm**. To change the unit to  $\mu\text{W}$ , hold down  $\left[ \frac{\text{dB}}{\text{dBm}} \right]$  until **HELD** appears.
5. Read the power measurement.



**Figure 5. Measuring Optical Power**

afr05f.eps

## Setting a Reference for Loss Measurements

Setting a reference lets the meter automatically subtract from loss measurements the losses due to patch cords. The loss for a fiber under test is automatically calculated as the difference between the reference loss and the loss with the fiber inserted.


For the most accurate test results, you should set the reference at these times:

- Anytime you start using a different optical source for loss measurements.
- Anytime you change the patch cord used on the meter or source.



### Note

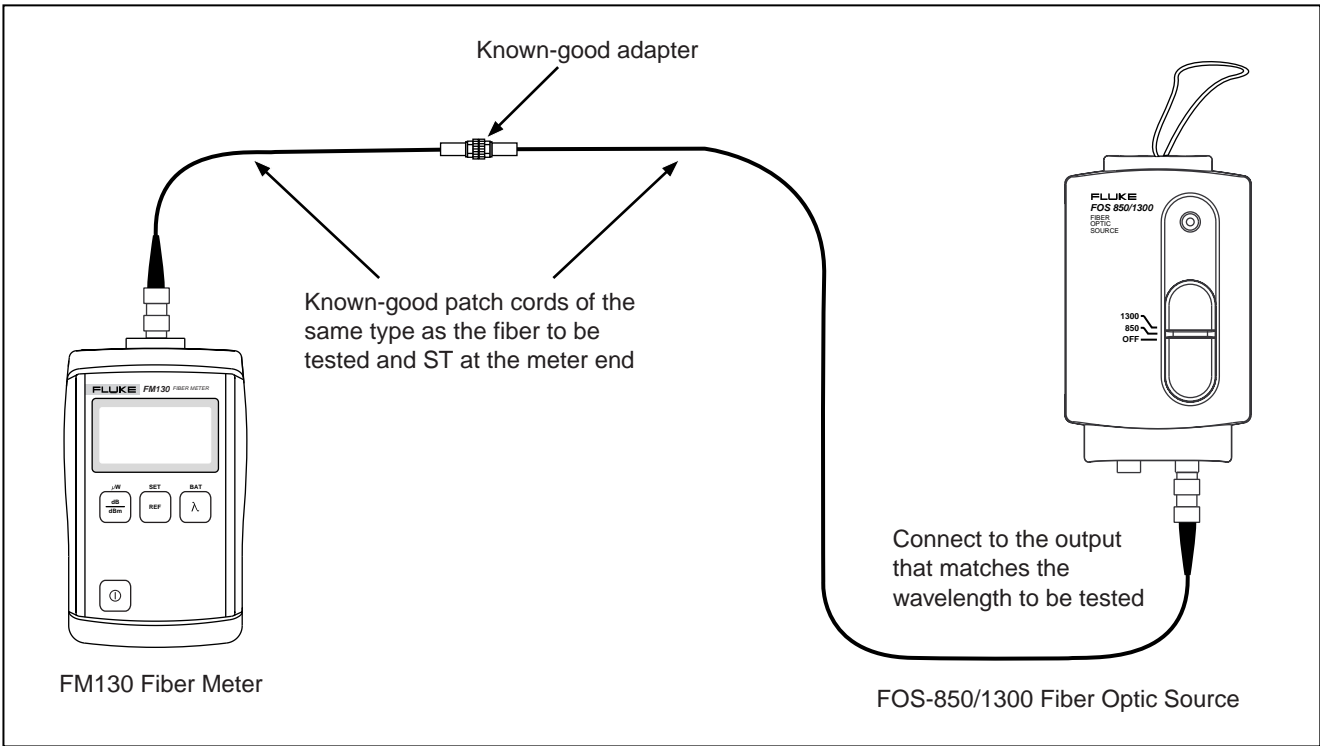
*For the most accurate test results, set the reference at the beginning of each day using the patch cords and wavelength settings you will use for testing.*

The meter stores a separate reference value for each wavelength. The reference values are not affected when you turn the meter off or change the battery.

To view the reference for the selected wavelength, press  briefly.

To set a reference, proceed as follows:

1. Set the source to the wavelength you will use for testing. Let the source warm up for two minutes.
2. Select two known-good patch cords of the same type as the fiber to be tested. Select one known-good adapter of the appropriate type. Clean all fiber ends.
3. Make the connections shown in Figure 6. Turn on the meter. Press  to select the proper wavelength. Normally, the reading will be about -20 dBm. If the reading is too low, check the source connections and wavelength, or clean the fiber ends again, or select different patch cords, or use a different adapter.
4. To set the reference, hold down  until **HELD** appears on the display. The loss reading should then change to 0 dB. The last digit may vary slightly because of fiber movement and minor variations in the output power of the source.
5. If you are testing with more than one wavelength, change the meter and source to the new wavelength, then repeat step 4.



**Figure 6. Setting a Reference**

afr06f.eps

## **Measuring Optical Power Loss**

Optical power loss is the light energy lost through the fiber, adapters, splices, and other components in a fiber link. The loss for a fiber under test is automatically calculated as the difference between the loss with the fiber inserted and the reference loss. (See Figures 6 and 7.)

To measure loss, proceed as follows:

1. Verify that the meter and source are set to the proper wavelength. Let the source warm up for two minutes, if necessary.

*Note*

*The patch cords used for loss measurements should be the same patch cords used to set the reference at the wavelength you are testing. If the patch cords have been disconnected from the meter or source since the reference was set, set the reference again before measuring loss.*

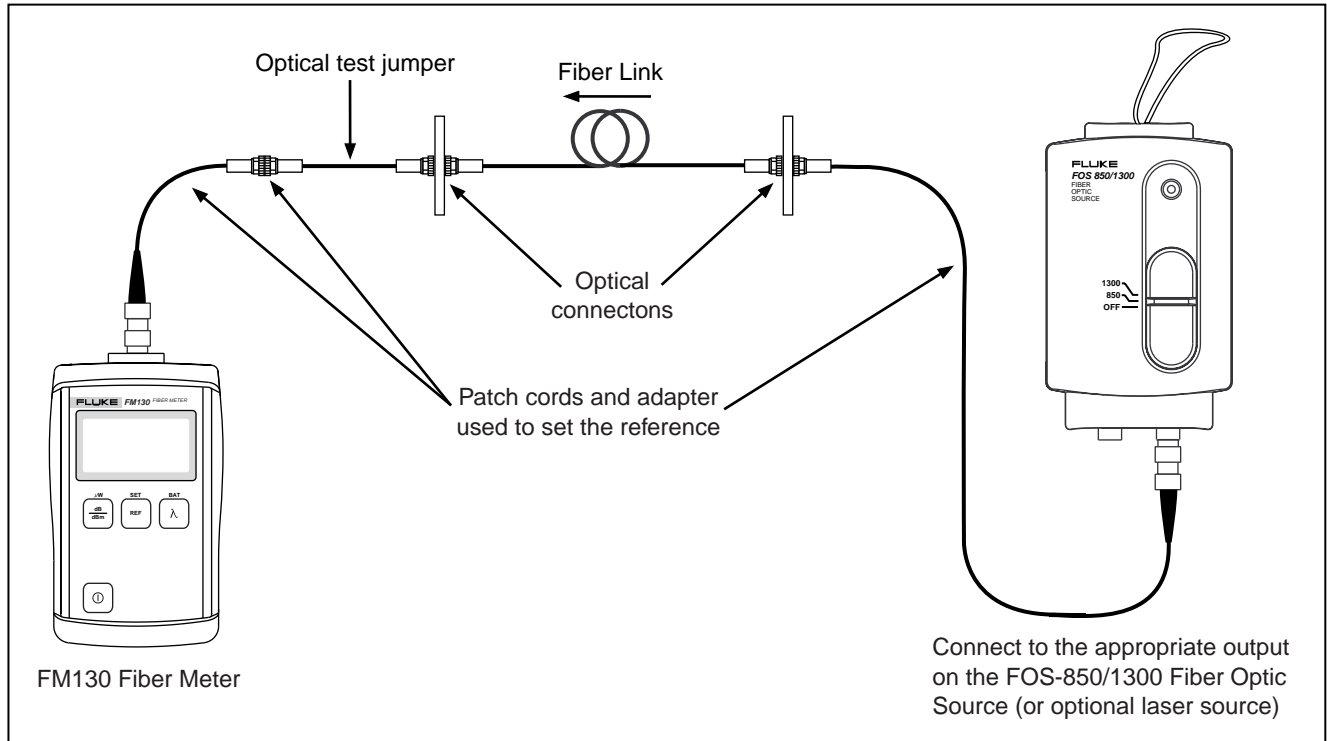
2. Clean all fiber ends.
3. Set a reference, if necessary. (See the previous section “Setting a Reference for Loss Measurements” for details.)
4. Make the connections shown in Figure 7.

*Note*

*The additional test jumper used during loss measurement ensures that the loss you measure includes the fiber to be tested and the connections at both ends of the fiber.*

5. Verify that the meter is in the loss measurement mode. If so, the unit of measurement will be **dB**. If it is not, press  $\left(\frac{\text{dB}}{\text{dBm}}\right)$ .
6. Read the loss measurement.





**Figure 7. Measuring Loss**

afr07f.eps

## **Maintenance**

Clean the case with a soft cloth dampened with water or a mild detergent. Do not use solvents or abrasive cleansers.

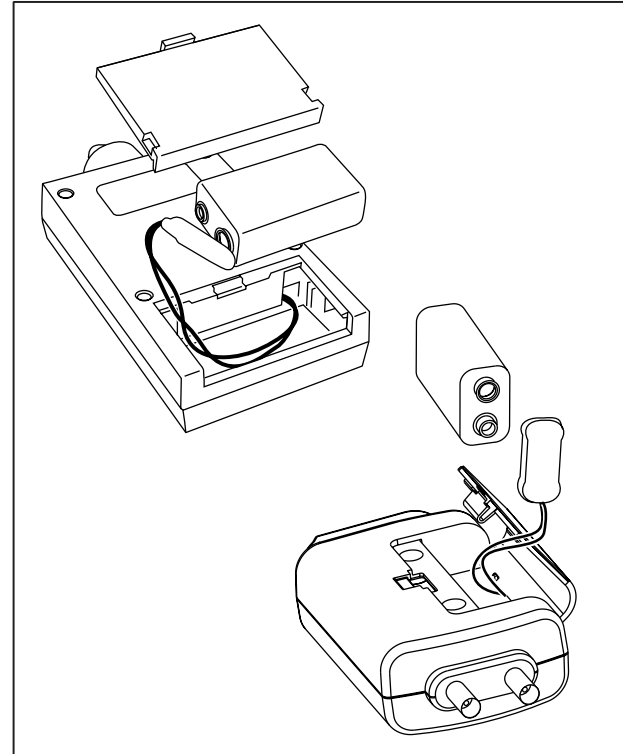
Always cover the connector with the dust cap when not using the meter.

Do not open the case (except to replace the battery). No user-serviceable parts are inside.

## **Battery Replacement**

Replace the battery in the FM130 Fiber Meter when **BAT** appears at the top of the display. Refer to Figure 8.

Replace the battery in the FOS-850/1300 Fiber Optic Source when LED blinks or does not turn on. Refer to Figure 8.



afr08f.eps

**Figure 8. Battery Replacement**

**Accessories and Replacement Parts**

Table 1 shows the accessories and replacement parts available from Fluke for the FTK100 Optical Fiber Test Kit.

**Table 1. Accessories and Replacement Parts**

<b>Description</b>	<b>Fluke Model or Part Number</b>
Recording pads, pack of 10	NF410
ToolPak™ meter hanging kit	TPAK
ST adapter cap for FM130 Fiber Meter	1568277
ST/ST 62.5 μm multimode patch cord	FOC-ST/ST
ST/SC 62.5 μm multimode patch cord	FOC-ST/SC
ST/ST 62.5 μm short test jumper	NF230
ST/ST adapter	NF300SM
SC/SC adapter	NF310SM

**Table 1. Accessories and Replacement Parts (cont.)**

<b>Description</b>	<b>Fluke Model or Part Number</b>
LS-1310/1550 Laser Source	LS-1310/1550
Battery door for FOS-850/1300 Fiber Optic Source	200474
Battery door for FM130 Fiber Meter	1568289
FTK100/FTK200 Manuals CD-ROM	2072094

### **Calibration and Service**

Have the meter calibrated at an authorized Fluke Service Center every 12 months.

For service, contact an authorized service center. To locate the nearest service center, contact Fluke as described at the beginning of this guide.

### **FM130 Fiber Meter Specifications**

<b>Detector type</b>	Germanium
<b>Calibrated wavelengths</b>	850 nm, 1300 nm, 1310, and 1550 nm
<b>Measurement range</b>	+6 dBm to -50 dBm
<b>Resolution</b>	0.01 dB
<b>Loss and power measurement accuracy</b>	$\pm 0.25$ dB at 25 °C and -10 dBm
<b>Temperature range</b>	Operating: 0 °C to +50 °C; Storage: -30 °C to +60 °C
<b>Humidity range</b>	Operating: 0 to 95 % RH, non-condensing
<b>Battery type and life</b>	9 V alkaline (NEDA 1604A or IEC 6LR61); 50 hours typical with alkaline battery
<b>Low battery indication</b>	<b>BAT</b> appears on the display
<b>Display</b>	4-digit LCD display


**FM130 Fiber Meter Specifications (cont.)**

<b>Certifications</b>	CE
<b>Dimensions</b>	3.2 in x 5.8 in x 1.5 in (8.1 cm x 14.7 cm x 3.8 cm)
<b>Weight</b>	8.6 oz (244 g)

***FOS-850/1300 Fiber Optic Source Specifications***

<b>Light source</b>	Infrared LED
<b>Wavelength</b>	850 nm $\pm$ 30 nm; 1300 nm -40 nm/+50 nm
<b>Output power</b>	-20 dBm nominal into 62.5 $\mu$ m multimode fiber
<b>Connector</b>	ST
<b>Beam divergence</b>	0.3 radians
<b>Maximum output</b>	200 $\mu$ W (radiated into free space)
<b>Stability</b>	$\pm$ 0.2 dB per 8 hours at 20 °C after 20 minute warm-up

**FOS-850/1300 Fiber Optic Source Specifications (cont.)**

<b>Temperature coefficient</b>	-0.08 dB per °C, <18 °C or >28 °C
<b>Battery type and life</b>	9 V alkaline (NEDA 1604A or IEC 6LR61); 24 hours typical with alkaline battery
<b>Low battery indication</b>	Blinking LED
<b>Temperature range</b>	Operating: 0 °C to 40 °C; Storage: -20 °C to +70 °C
<b>Humidity</b>	Up to 75 % RH, 0 °C to 40 °C
<b>Conformance</b>	 and IEC 1010-1
<b>Dimensions</b>	4.5 in x 2.5 in x 1.5 in (11.4 cm x 6.4 cm x 3.8 cm)
<b>Weight</b>	5.0 oz (142 g)

# Appendix A

## Glossary

### *Adapter*

A device used to mate fiber connectors of the same or different styles.

### *Attenuation*

A loss of optical power due to losses in the fiber itself or in connections between fibers.

### *Core*

The light-conducting central portion of an optical fiber.

### *dBm*

A unit of power (in decibels), assuming a reference of 1 mW (1/1000 of a watt).

### *Insertion loss*

Loss of optical power caused by adding a connector, adapter, splice, or other optical component to a fiber path.

### *Launch cable*

A fiber patch cord used to couple an optical source to a fiber.

### ***Macrobending losses***

Light losses due to large-radius bends in a fiber, such as bends made during installation.

### ***Microbending losses***

Light losses due to microscopic imperfections in a fiber.

### ***Multimode fiber***

Fiber with a relatively large core (50  $\mu\text{m}$  or more) that offers many paths, or modes, for propagation of light.

### ***Optical power***

Optical power measured at a source or the end of a fiber and expressed in microwatts ( $\mu\text{W}$ ) or in decibels with reference to one milliwatt (dBm).

### ***Receive cable***

A fiber patch cord used to couple a fiber to an optical receiver.

### ***SC connector***

Subscription Channel Connector. An optical connector that originated in Japan and provides push-pull connections, low loss, and low backreflection.

### ***Singlemode fiber***

Fiber with a small core (8  $\mu\text{m}$  to 10  $\mu\text{m}$ ) that offers just one path, or mode, for propagation of light.

### ***ST connector***

Straight-Tip Connector. A popular fiber connector originally developed by AT&T.

### ***Test Jumper***

A short patch cord used when testing a fiber link.

