FLUKE®

FTK100

Optical Fiber Test Kit

Users Guide

1568009
April 2000

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⚠ 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 µW.
- 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

Visit Fluke's Web site at **www.fluke.com**.

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

- USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-363-5853
- Europe: +31-402-678-200
- Japan: +81-3-3434-0181
- Singapore: +65-738-5655
- Anywhere in the world: +1-425-356-5500

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 µm multimode patch cords
- 1 ST/ST 1 ft (0.3 m) 62.5 µm multimode test jumper
- 1 ST/ST adapter (singlemode quality)
- 2 recording pads
- *FTK100 Optical Fiber Test Kit Users Guide*
- Warranty registration card
- Hard carrying case

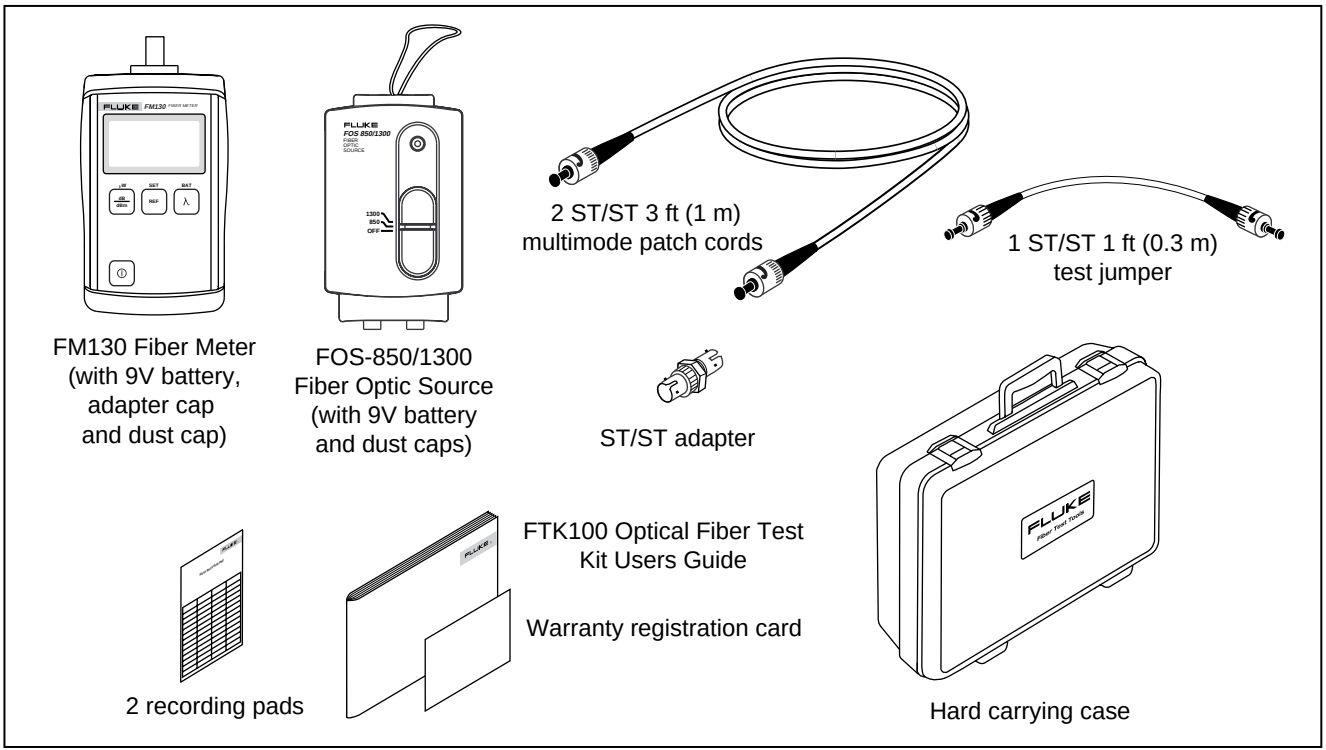

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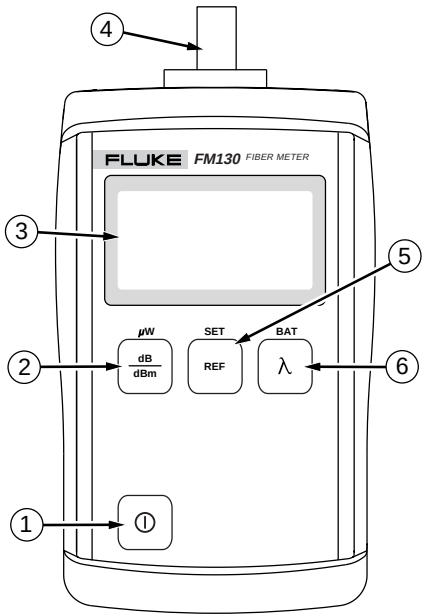
Figure 1. Standard Equipment

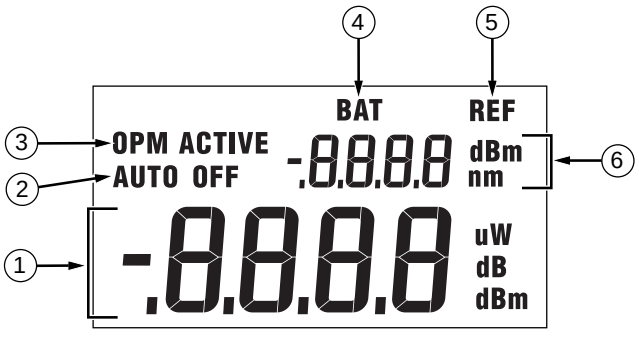
Features

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



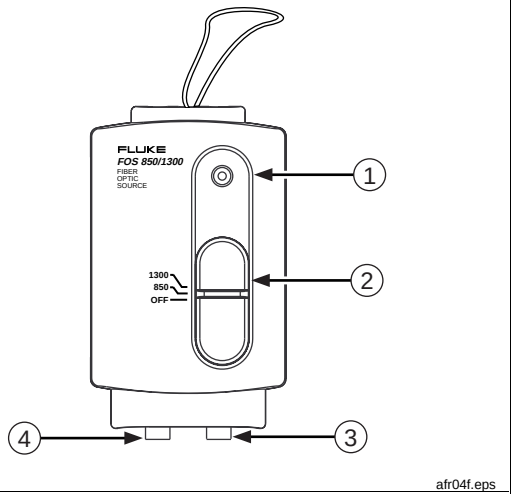
1. On/off key. The automatic power-down feature, which turns the meter off if no keys are pressed for 5 minutes, is enabled when you turn the meter on. To disable this feature, turn the meter off; then hold down ⏻ until **P** is displayed.
2. Toggles the meter between power (dBm) and loss (dB) measurements. Loss readings are compared to the stored reference level. Hold down dB/dBm until **HELD** appears to change the measurement units to µW.
3. LCD display. See Figure 3 for details.
4. Removable adapter cap with an ST connector for connecting to multimode or singlemode patch cords.
5. Displays the reference value for the currently selected wavelength. Hold down REF to store a new reference value for the displayed wavelength.
6. Changes the wavelength to be measured. To see the percentage of battery life remaining, hold down λ until **HELD** appears.

Figure 2. FM130 Fiber Meter Features



1. Measurement display. **LO** is displayed if the optical power reading is too small to display. **HI** is displayed if the reading is too large to display. For output power measurements, the unit is μ**W** or **dBm**. For loss measurements, the unit is **dB**.
2. **AUTO OFF** indicates that the meter will automatically turn off if no keys are pressed for about 5 minutes. To disable this feature, turn the meter off; then hold down ⏻ until **P** is displayed.
3. **OPM ACTIVE** indicates that the meter is on.
4. **BAT** indicates that the battery needs to be replaced.
5. **REF** appears when you briefly press REF to see the reference for the currently selected wavelength. **REF** and the reference value appear for about 4 seconds.
6. This area shows the currently selected wavelength. Press λ to change the wavelength.

Figure 3. Display Features



① Power LED. The LED is on when the source is active. The LED blinks when the battery is low.

② Slide switch for selecting 850 nm or 1300 nm light output.

③ ST connector for 850 nm light output.

④ ST connector for 1300 nm light output.

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 dB dBm to change the measurement unit to **dBm**. To change the unit to μ**W**, hold down dB dBm until **HELD** appears.
5. Read the power measurement.

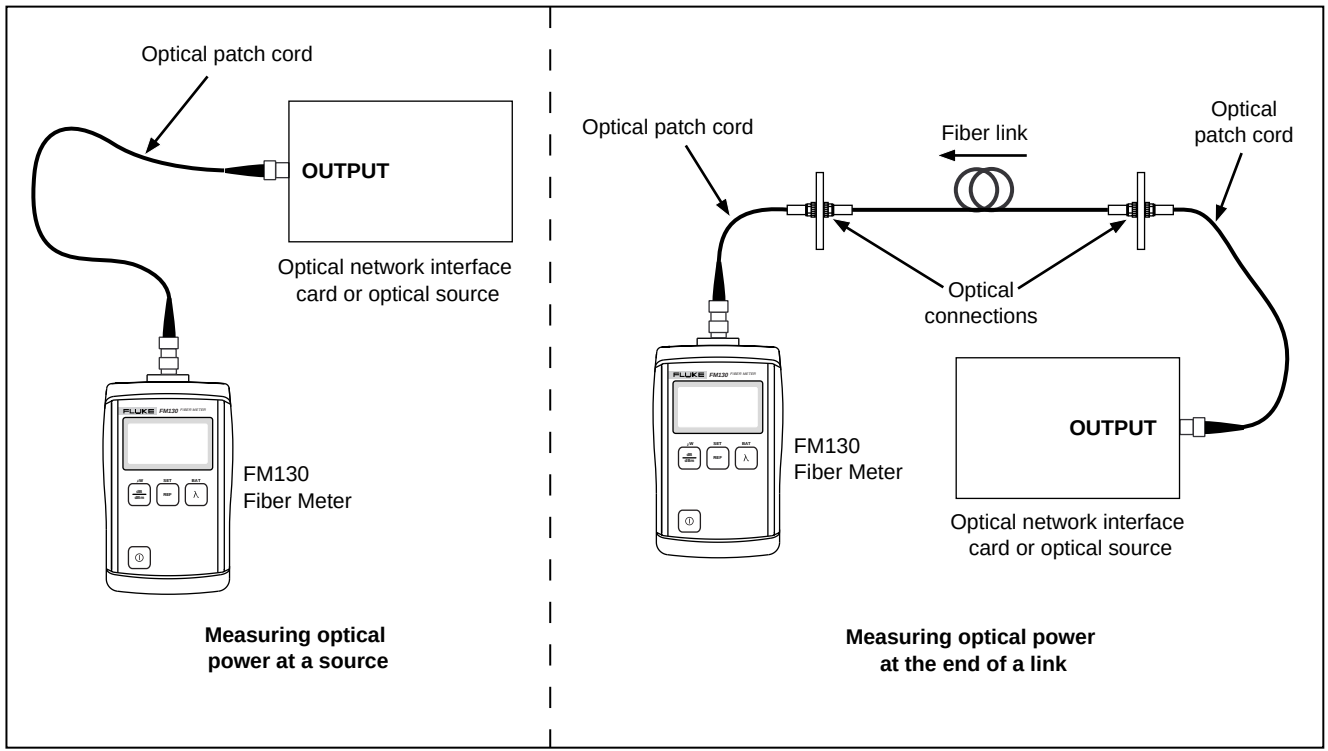


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Figure 5. Measuring Optical Power

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 REF 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 λ 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 REF 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.

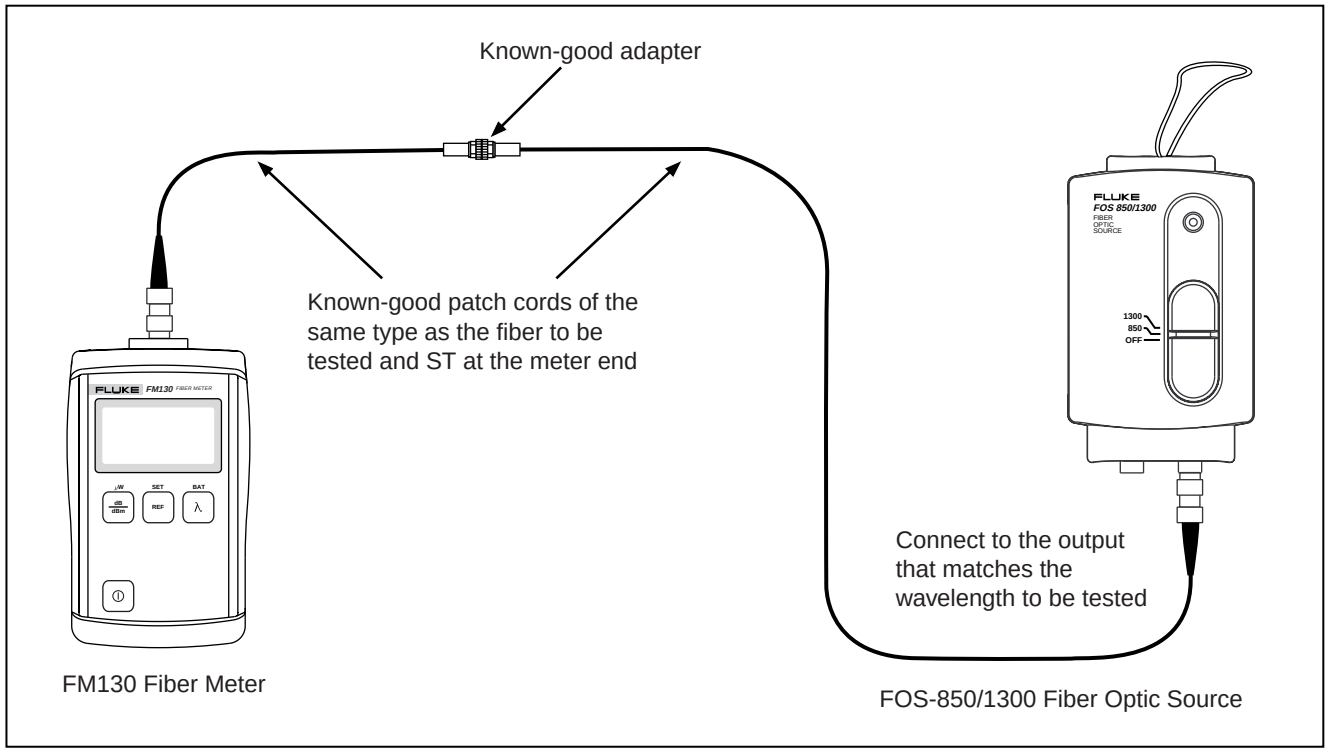

Figure 6. Setting a Reference

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 dB/dBm.
6. Read the loss measurement.

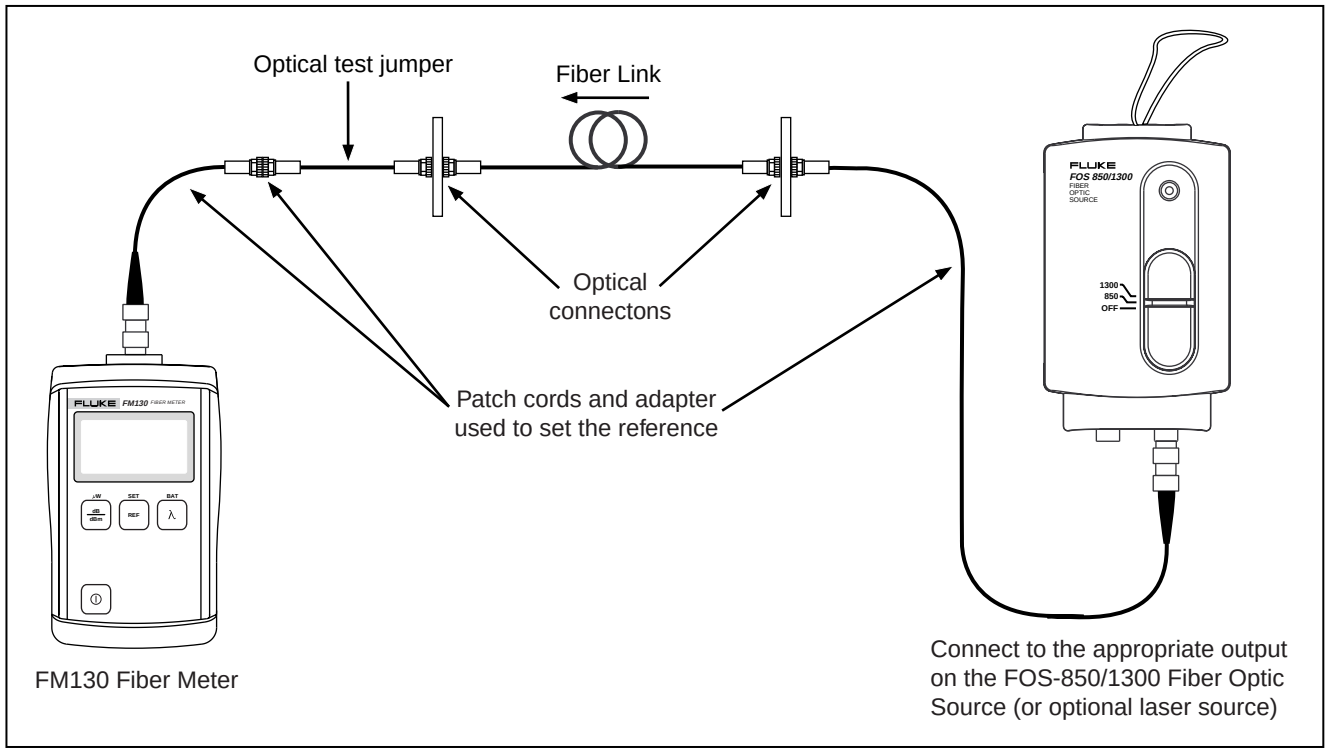

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Figure 7. Measuring Loss

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.

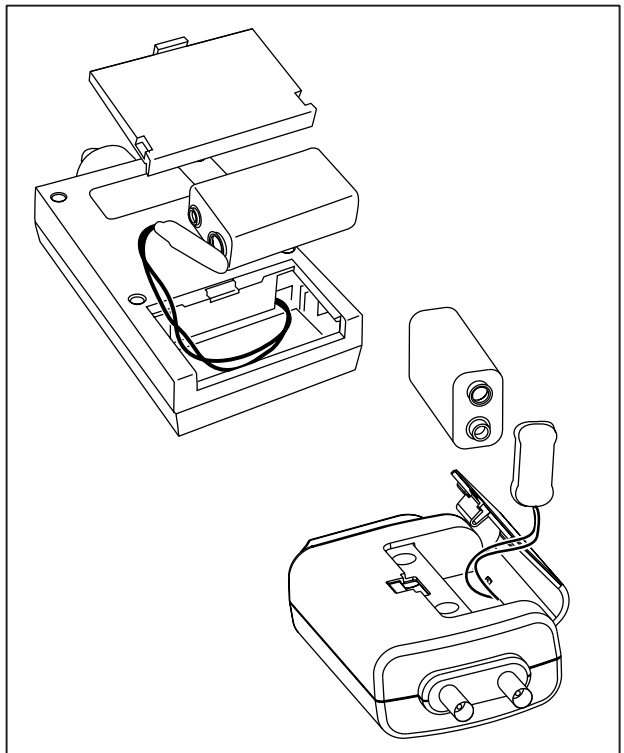

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Figure 8. Battery Replacement

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

Description	Fluke Model or Part Number
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.)

Description	Fluke Model or Part Number
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
Users guide, English	1568009
Mode d'Emploi, français	1568011
Manuale d'Uso, italiano	1568075
Bedienungs-Handbuch, Deutsch	1568027
Manual de Uso, español	1568053
Manual do Usuário, português	1568066
Users guide, Simplified Chinese	1568048
Users guide, Japanese	1568030

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

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

FM130 Fiber Meter Specifications (cont.)

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

FOS-850/1300 Fiber Optic Source Specifications

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

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

Temperature coefficient	-0.08 dB per °C, <18 °C or >28 °C
Battery type and life	9 V alkaline (NEDA 1604A or IEC 6LR61); 24 hours typical with alkaline battery
Low battery indication	Blinking LED
Temperature range	Operating: 0 °C to 40 °C; Storage: -20 °C to +70 °C
Humidity	Up to 75 % RH, 0 °C to 40 °C
Conformance	CE and IEC 1010-1
Dimensions	4.5 in x 2.5 in x 1.5 in (11.4 cm x 6.4 cm x 3.8 cm)
Weight	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 µm 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 (µW) 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 µm to 10 µm) 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.