FD-FM Series
Optical Power Meters

OPERATING
INSTRUCTIONS

Fiberdyne Labs, Inc.
FD-FM Series Optical Power Meters
Operating Instructions

(315) 895-8470
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General

Thank you for purchasing a Fiberdyne Labs Optical Power Meter. The lightweight, handheld Models FD-FM8515B/C & FD-FM8520 Optical Power Meters are precision meters in a pocket size case.

Models FM8515B/C and FM8520 are calibrated at the standard wavelengths of 850, 1310 and 1550 nm.

Models FM8515B and FM8520 can measure absolute power in **dBm**, and microwatts **(W)** along with attenuation (relative power) as **dBr**. Model FD-FM8515C can measure absolute power in **dBm**, and milliwatts **(mW)** along with attenuation (relative power) as **dBr**.

Features
- Calibrated at 850, 1310, and 1550 nm *(Models FD-FM8515B/C and FD-FM8520)*
- +5 to -70 dB dynamic range *(FD-FM8515B, FD-FM8520)*
- *+23 to -50 dB dynamic range (FD-FM8515C)*
- *250 Stored Readings per wavelengths (FD-FM8520)*
- 2 kHz Modulation detection *(FD-FM8520)*
- Reference store facility *(FD-FM8515B/C, FD-FM8520)*
- RS-232 Output for Printer / PC Upload *(FD-FM8520)*
- Measurements in dBm, dBr, and microwatts *(FD-FM8515B, FD-FM8520)*
- \> 100 hours of battery life
- Adapter caps for SC, FC, and ST connectors

Applications
- Cable and Link Loss Measurement
- Network Auditing and Maintenance
- Troubleshooting and Repair
- Connector and Coupling Losses
- Field Test and Repair
- Bare Fiber Loss Measurement
- Transceiver Output Level

Safety

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Precautions

Use care when working with any optical transmission equipment. It is good practice to avoid looking directly at any optical fibers or optical sources. Always refer to your company's safety procedures when working with optical systems.

It is important to keep all optical connections and surfaces free from dirt, oils or other contamination to ensure proper operation. This applies to all connectors that are connected to the optical port on any one of the Fiber Meters. Scratched or contaminated connectors can reduce system performance. Refer to your company practices for cleaning optical connectors. Always replace the protective dust cap after use.

LCD Display

The Optical Power Meter's **LCD** display has large characters to view measurements. Out-of-range inputs are shown via a "**OVERRANGE**" indicator.

The **LCD** display includes operating modes; **dBm, dBr, W, (mW FD-FM8515C), and REFSTORE (FD-FM8515B/C, FD-FM8520)**. Enunciators for low battery condition, signal over range, selected wave-length, measured results, 2 kHz modulation indicator **(FD-FM8520)**.

For an optical power measurement less than -70 dBm **(FD-FM8515B, FD-FM8520)** or less than -50 dBm **(FD-FM8515C)**, the **LCD** display will read "**.LO**". A "**LOWBATT**" warns the operator that battery power is low.

When the Optical Power Meter is first turned on, all segments of the **LCD** display are activated for approximately 1 second. This is a self test of the on-board microcontroller based measurement and display system. The self test is then followed by a 2 second display of the software version code. After this start-up sequence, the instrument is stabilized and ready to use.

Front Panel Operating Controls

FIBERDYNE LABS

1550nm 1300nm 850nm
STORE   MODULATION
LOW BATT OVER RANGE

-8.8.8.8

dBm   dBr   µW   REF

STORE

MODE   λ   REF STORE

2nd   LINK

ON   OFF

Fiber Meter FD-FM8520
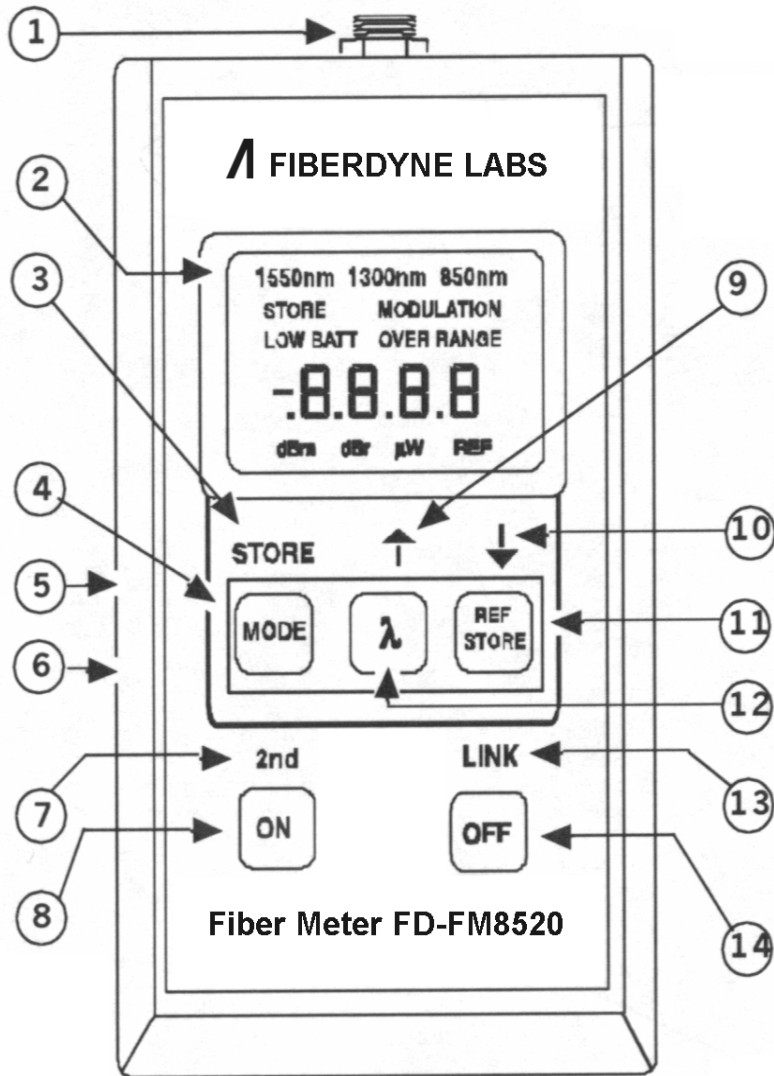
Front Panel Operating Controls

Note: Fiberdyne Labs Models FD-FM8515B/C and FD-FM8520 have some of the same features. The front panel drawing of the FD-FM8520 was selected because it has all the features of all the other Fiberdyne Power Meters plus storage, and a RS-232 interface. Figure 1 is for reference purposes only.

(1) FD-FM8515B/C, FD-FM8520

Universal Adapter Mount - the threaded mount allows the connection of various adapter caps for the acceptance of the required fiber optic connectors. Adapter caps, purchased separately, convert the threaded mount to the required connector style.

(2) FD-FM8515B

Liquid Crystal Display (LCD) - When the Power Meter is first powered **ON**, all segments of the display are illuminated as a self test. Measurements are displayed in absolute power (**dBm**), loss (**dBr**), and microwatts (**W**), with enunciators defining wavelength, **LOWBATT** (low battery), **OVERRANGE** (when > +5 dBm is measured), and **REF** (indicates referenced value for loss measurement).

(2) FD-FM8515C-High Power -Liquid Crystal Display (LCD)

When the Power Meter is first powered **ON**, all segments of the display are illuminated as a self test. Measurements are displayed in absolute power (**dBm**), loss (**dBr**), and milliwatts (**mW**), with annunciators defining wavelength, **LOWBATT** (low battery), **OVERRANGE** (when >+23 dBm is measured), and **REF** (indicates referenced value for loss measurement).

(2) FD-FM8520 - Liquid Crystal Display (LCD)

When the Power Meter is first powered ON, all segments of the display are illuminated as a self test. Measurements are displayed in absolute power (dBm), low (dBr), and microwatts (W), with annunciators defining wavelength, LOWBATT (low battery), MODULATION (detection of 2-kHz signal), OVERRANGE (when >+5 dBm is measured), REF (indicates referenced value for loss measurement), and STORE (storage of current measurement).

(3) FD-FM8520 -

The **STORE** function is a 2nd key function of the **MODE** key and is activated by depressing the **ON** key a second time. The **STORE** annunciator is displayed indicating that the FD-FM8520 is in the 2nd function mode. While in the **STORE**[1] mode, measurements can be stored by depressing the **STORE** key.

1. While in the STORE mode, the FD-FM8520 cannot be turned off.

(4) FD-FM8515B/C & FD-FM8520 -

Each press of the **MODE** key cycles between dBm, dBr, W or mW, and REF measurement mode.

(5) FD-FM8520 -**Serial Port** -

This connector is used for printing or transferring stored data measurements. Stored data can be printed to an optional printer or imported into a PC spreadsheet such as Microsoft Excel for data analysis.

(6) FD-FM8515B/C, FD-FM8520 -**Battery Charger Input** -

This optional feature is used when the power meter is ordered with NiCad rechargeable batteries.

(7) FD-FM8520 -

A second (2nd) function of each key is available on the front panel. The 2nd function is activated by depressing the **ON** key again after the FD-FM8520 has been powered **ON**, and the display has completed its self-test. The **STORE** annunciator indicates that the 2nd function is activated.

⑧   FD-FM8515B/C -

When depressing the **ON** key once, the unit powers on. During this power on cycle, the display does a self-check of all its segments. If no keys are pressed for 5 minutes, the power meter automatically powers off to conserve battery life.

⑧   FD-FM8520 -

When depressing the **ON** key once, the FD-FM8520 powers on. During this power on cycle, the display does a self-check of all its segments. When depressing the **ON** key a second time, the FD-FM8520 enters into its **2ⁿᵈ** key function state by displaying the **STORE** annunciator.   If no keys are pressed for 5 minutes, the FD-FM8520 automatically powers off to conserve battery life.

⑨   FD-FM8520 -

The   function is considered a **2ⁿᵈ** key function. Each time this key is depressed the storage location increments. When holding down the   key, the display will show the storage location number, and then upon release of the   key, the stored value will be displayed.

⑩   FD-FM8520 -

The   function is considered a **2ⁿᵈ** key function. Each time this key is depressed the storage location will decrement. When holding down the   key, the display will show the storage number, and upon the release of the   key, the stored value will be displayed.

⑪   FD-FM8515B/C, FD-FM8520 -

Depressing the **REF STORE** key will store the current **dBm** value displayed as a reference power level.

⑫   FD-FM8515B/C, FD-FM8520 -

The Greek letter lambda ( ) denotes wavelength. 1550, 1300 and 850nm wavelengths are available. Depressing this key will select the desired wavelength on the power meter.

(13) **FD-FM8520** -

The **LINK** function is considered a **2ⁿᵈ** key function. When this key is depressed, the **SERIAL** port is activated, and the r**232** annunciator is displayed.

(14) **FD-FM8515B/C, FD-FM8520** -

Depressing the OFF key will turn off the power meter.

Operating Procedures

Clearing Memory (Applies to Model FD-FM8520 only):

CLEAR All Locations: Stored data in all locations can be **CLEARED** by depressing and holding the **ON** key a second time (the **STORE** annunciator will be displayed indicating that the **2ⁿᵈ** key function is enabled), and the **STORE** key simultaneously for 5 seconds. The stored location counter will decrement to location 1, indicating that stored data in all locations has been cleared. The **CLEAR** function applies to whichever wavelength is selected at the time.

CLEAR Selected Location: Stored data in a selected location can be over written by accessing that location using the   or   keys. The **STORE** annunciator should be displayed indicating that the **2ⁿᵈ** key function is enabled. Depress and hold both the **STORE** key, and the   key simultaneously until the new value is displayed.
Printing Stored Data *(Applies to Model FD-FM8520 only)*:

The FD-FM8520 must be connected to the Printer using the interface cable supplied. The FD-FM8520 transmits at: **9600** baud, **8** data bits, **1** stop bit, **no** parity, **XON/XOFF**.

The STORE annunciator should be displayed indicating that the 2ⁿᵈ key function is enabled. Depress the LINK key and the r232 annunciator will display. Then depress the   key, and the STORE annuciator will blank out, indicating that the stored data has been sent to the printer. The following is an example of the printout:

<div align="center">

Fiberdyne Labs, Inc. FM8520 Fiber Meter
Fiber Optic Measurement Report

</div>

LOC.#	READINGS	LAMDA
1	-9.01 dBm	1550nm
2	-12.01 dBm	1550nm
3	-9.01 dBm	1550nm

Uploading Stored Data to a Spreadsheet *(Applies to Model FD-FM8520 only)*:

Connect the FD-FM8520 to an available **COM** port on a PC using the interface cable supplied. The PC must contain a third party communications program. An example would be : *Windows Hyper Terminal*. The FD-FM8520 transmits at: **9600** baud, **8** data bits, **1** stop bit, **no** parity, **XON/XOFF**. The **STORE** annunciator should be displayed indicating that the **2nd** key function is enabled. Depress the **LINK** key and the **r232** annunciator will be displayed. Then depress the   key, and the **STORE** annuciator will blank out, indicating that the stored data has been sent to the PC.

Operation

Optical Power Verification

Verification that the Fiberdyne Optical Power Meter is operating properly can be accomplished by following the procedure described below.
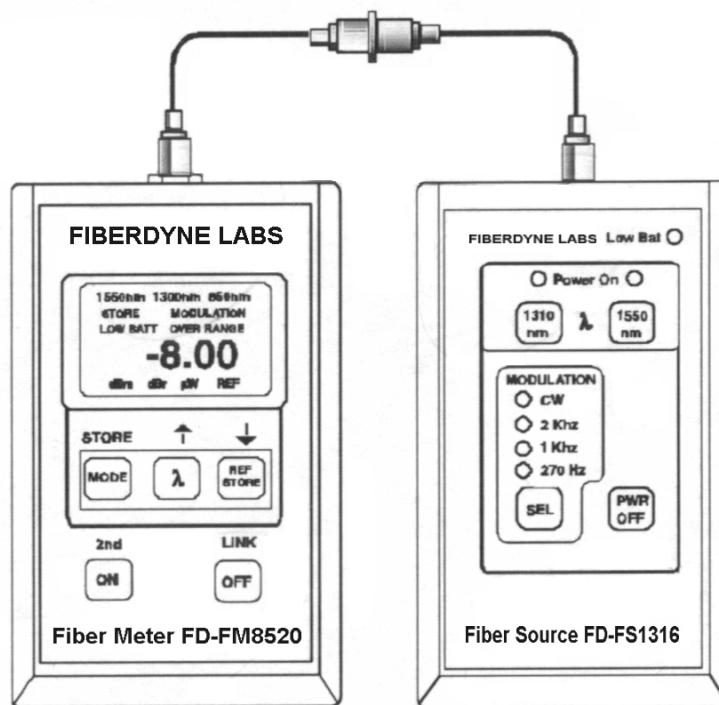

Figure 2 - Optical Power Verification Diagram

- Clean all optical ports and connectors according to your company procedures.
- Connect a patch cable to the Fiberdyne Optical Power Meter.
- Connect a patch cable to a light source such as Fiberdyne's Model FD-FS1316 Laser Light Source.
- Connect the ends of the patch cables together using a coupling device.
- Turn on the Fiberdyne Laser Light Source and set to 1310nm. The unit will stabilize very quickly.
- Turn on the Fiberdyne Optical Power Meter and set the wavelength to 1310nm.
- Adjust the output of the Fiberdyne Laser Source until the Fiberdyne Power Meter reads -**08.0 dBm**. (Note: The launch output power of the Fiberdyne Laser Source is -**08.0 dBm** with an output adjust control of **1.0 dB**.)
- Record the power meter reading. This measurement will be the reference level.

Note: An important consideration is the wavelength of the optical signal. Both the Laser Source and the Power Meter must be set at the same wavelength to ensure accurate measurements. The above example describes 1310nm testing. To test 1550nm or 850nm, simply set both the Fiberdyne Laser Source and the Fiberdyne Power Meter to either 1550nm or 850nm.

Optical Loss Measurements
- Verify the optical power and either record the reading, of if the power meter is a Fiberdyne Model FD-FM8515B/C, or FD-FM8520, simply depress the **REF STORE** Key while in the **dBm** MODE, and the power measurement will be stored automatically.

- Disconnect the patch cables at the coupling. Be sure not to disturb the connection at the end of the Fiberdyne Fiber Laser Source or the Fiberdyne Power Meter. This is to ensure accurate measurements.

- Reconnect the patch cables to the fiber under test. Refer to the example in Figure 3.

- If the Power Meter is a Fiberdyne Model FD-FM8515B/C or FD-FM8520, select **dBr** via the **MODE** Key, and the power reading for the Loss of the fiber under test (-**02.2 dB**) will automatically be calculated and displayed.
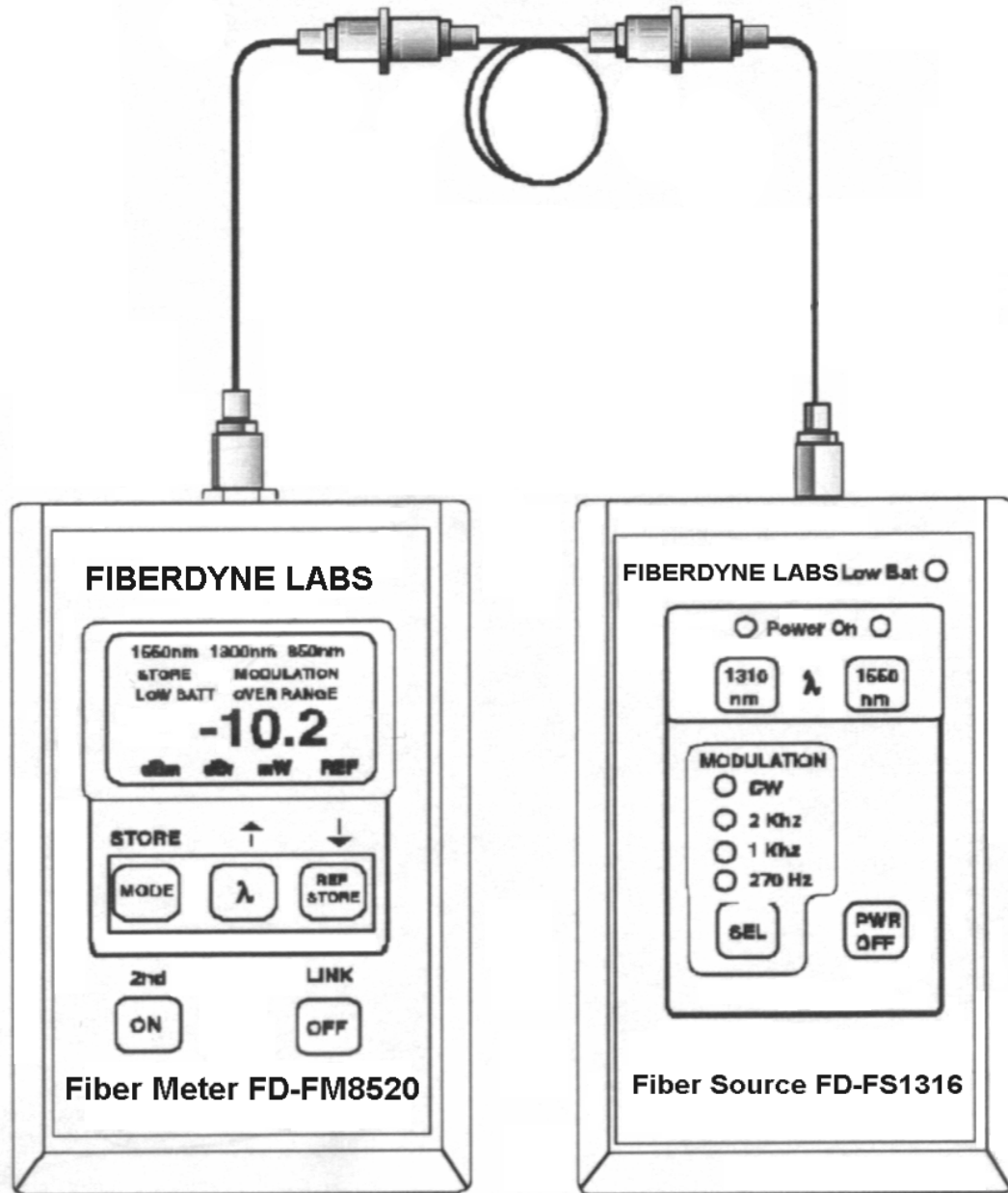
Figure 3 - Optical Loss Measurement Diagram

Store Loss Measurement: (Applies to Model FD-FM8520 only)

- The current **dBr** (relative) measurement can be stored by:

1. depressing the **ON** key which activates the **2ⁿᵈ** key function (the **STORE** annunciator will illuminate), and then
2. depressing the **STORE** key. When the ST**ORE** key is depressed, the FD-FM8520 automatically reverts back to its primary key function mode.

- To store another measurement:
1. depress the ON key, and then
2. depress the STORE key. The FD-FM8520 automatically increments to the next storage location.

Notes:

1. The FD-FM8520 will not display a <u>stored</u> **dBr** measurement in the **W MODE**. This is indicated by <u>dashes</u> in the display.

2. When displaying a stored **dBr** measurement in the **dBm MODE**, the **dBr** annunciator flashes indicating the measurement is in **dBr**.

3. When displaying a stored **dBm** measurement in the **dBr MODE**, the **dBr** annunciator flashes indicating the measurement is in **dBm**.

4. When displaying a stored **W** measurement in the **dBr MODE**, the dBm annunciator flashes indicating the measurement is in **dBm**.

Application Note

Hyper Terminal Setup: (Applies to Model FD-FM8520 only)

Most communication programs will communicate with the FD-FM8520 Optical Power Meter. This note will describe Hyper Terminal which is standard with Microsoft Windows 95/98.

Step 1 - From the Windows Toolbar, click on "**START**" select "**PROGRAMS**", select "**ACCESSORIES**", select "**COMMUNICATIONS**", then "click" on "**HYPER TERMINAL**". The Hyper Terminal folder will now be open.

Step 2 - Double "click" the "**Hypertrm.exe**" ICON. This will open the Hyper Terminal application program.

Step 3 - The <u>Connection Description</u> dialog box will now appear. Enter a name to be used (such as FD-FM8520), and select the desired ICON. After this is done enter **OK**.

Step 4 - The Connect To dialog box will now appear. Under the "Connect using"

drop down menu box, select the appropriate "**Direct to COM Port**". After this is done enter **OK**.

Step 5 - The COM Port Properties dialog box will now appear. Select the following under "Port Settings":

<div align="center">

Bits per second　　= 9600

Data Bits　　　　　= 8

Parity　　　　　　= None

Stop Bits　　　　　= 1

Flow Control　　　= Xon/Xoff

</div>

After the above have been selected, enter **OK**.

Step 6 - The Hyper Terminal window will now appear with the name that you selected in Step 3. In this example it is (**FD-FM8520** - **Hyper Terminal**).

Step 7 - All the COM port property settings that were previously entered, plus the ICON that was selected in Step 2 can be saved while in the FD-FM8520 - Hyper Terminal window by selecting **File**, then "clicking" on **Save**.

Step 8 - Connect the supplied RS-232 interface cable from the Fiberdyne FD-FM8520 to your computer. *Note: Typically, the Serial/COM ports on computers are MALE.*

<div align="center">

Maintenance

</div>

Battery Replacement
The Fiber Meters require no periodic maintenance other than replacing the batteries. Under normal use the two AA alkaline batteries should provide greater than 100 hours of continuous use. To replace battery, place the unit with its back side facing up. Use a small screwdriver to remove the two screws and release the battery cover. Install the battery and then secure the cover to the unit with screws.

Optional Battery Charger
When the Fiber Meters are purchased with the optional battery charger, they are shipped with two AA NiCad rechargeable batteries. The batteries have been kept in the uncharged state for shipment. Therefore, be sure to fully charge them before use.

To charge the batteries, simply plug the charger's transformer into an AC outlet and the other end into the charger jack on the fiber meter. Charge the unit overnight (about 14 hours). The batteries may be charged with any battery charger with the following specifications:

INPUT   AC 120V~, 60Hz in the USA and Canada

                     AC 110-240 V~, 50/60 Hz in other countries

        OUTPUT   8.7-15 V AC or DC @ > 150mA

                     2.1 mm coax jack (Tip – Positive)

Important – When charging batteries in the unit, please be sure to use only NiCad batteries. Charging any other type of battery will cause damage to the unit.

General Care
To avoid damage to the Optical Power Meters, do not use cable connectors that are dirty or faulty. A dust cap is provided for the optical output port, and should be in place when the unit is not in use to prevent foreign material from entering the port. It is best to clean the connectors first, using cotton swabs and isopropyl alcohol.

To clean the inside of the optical connector, use only a small diameter cotton swab lightly moistened with isopropyl alcohol.

Clean the Optical Power Meter's body with a damp cloth. Do not use solvents or abrasives.

Calibration
The recommended calibration interval on the Fiberdyne FD-FM Series of Optical Power Meters is every 2 years.   Fiberdyne Lab's calibration service is <u>N.I.S.T</u>. Traceable and properly equipped to calibrate these meters.

Customer Service
Repair
If repair of any of the Fiberdyne Optical Power Meters is necessary, return the unit in accordance with the warranty instructions in the back of this manual to the address listed below.

                     Fiberdyne Labs, Inc.
                     127 Business Park Drive
                     Frankfort, New York 13340
                     Tel: (800) 894-9694
                     Fax: (315) 895-8436

Technical Assistance
Should you need technical assistance with any of the Optical Power Meters, contact Applications Engineering at the following telephone numbers:
        Toll-free: 1-800-894-9694   --or--   Outside the USA 001-315-895-8470

Ordering Information

Orders for any of the Fiberdyne Optical Power Meters, and any of their accessories should be directed to the address shown above.

MODELS	*FD-FM8515B/C & FD-FM8520*
Detector Type	InGaAs (FD-FM8515B, FD-FM8520) Filtered InGaAs (FD-FM8515C)
Power Range	-5 to -70 dBm (FD-FM8515B, FD-FM8520) +23 to -50 dBm (FD-FM8515C)
Calibration Wavelength	850, 1310, & 1550nm
Accuracy	+/- .25dB (measured at 23°C, 1310nm @ -20dBm)
Resolution	0.01dB
Display Indicators	4 Digit LCD
Low Battery Indicator	Visual indicator
Signal Overange	Visual indicator
Modulation - 2kHz	Visual indicator (FM8520)
Battery Life (Alkaline)	>100 hrs. continuous use
Adapter Caps	ST, FC, SC, & Universal
Power	Two AA-Size Alkaline or NiCad (opt.)
NiCad Charger (opt.)	8.7-15 VAC/DC >150mA – Tip Positive
Operating Temp. Storage Temp.	0°C to +40°C -20°C to +60°C
Size	6.3"H x 3.3"W x 1.3"D (160 x 83 x 33mm)
Weight	0.49 lbs (220g)

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http://www.fiberdyne.com/techinfo/index1.html

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