1. PRODUCT DESCRIPTION

EQUIPMENT OVERVIEW

The Model 7500 Mini-OTDR offers >32dB of dynamic range, 20 meter attenuation dead zone and 5 meter event dead zone. There is an Auto Test function and information is displayed on a 9.4-inch, VGA, LCD screen.

Optical test options include a power meter, light source, and visual fault locator.

The Model 7500 is ideal for use in telecom, CATV, LAN, and manufacturing applications.

TELECOM

The Model 7500's dynamic range can be used for testing long trunk or interoffice fiber spans. The unit's short dead zone allows closely spaced features to be measured. Configured with the visual fault locator option, the Model 7500 will troubleshoot fiber in splice cabinets/enclosures, giving it a virtual "zero" dead zone performance.

CATV

The Loss Table automatically calculates the reflectance of mechanical splices as well as the Optical Return Loss (ORL) for the fiber span. The optional OTDR emulation software for your PC allows you to analyze data and generate hard copy documentation in your office.

LAN

The Model 7500 offers single-mode and multimode plug-ins that can be used in LAN applications where there is a need to test different types of fiber cable or composite cable. The Auto Test function allows fast, easy measurements without a skilled operator. Size, weight, and battery operation give the Model 7500 optimum portability.

MANUFACTURING

The Model 7500's dynamic range and accuracy makes it convenient for quick distance measurements on the production floor. Attenuation and length of fiber may be obtained quickly by generating a Loss Table.

MEASUREMENT ABBREVIATIONS

The following abbreviations and symbols are used throughout this manual:

atten = attenuation (dB/km)
act = active fiber signature or marker
avg = averaging
dB = decibel (optical one-way fiber loss)
dBm = decibel relative to one milliwatt
div = division
ft = feet
horz = horizontal
kft = kilofeet (1000 feet)
km = kilometer (1000 meters)
✷= laser on
m = meter
max = maximum
uW = microwatt
min = minutes
nm = nanometer
= external power adaptor is connected

ns = nanosecond
nW= nanowatt
pt = point
ref = reference fiber signature or marker
ref index = refractive index
refl = reflectance or reflective
ri = refractive index
sec = seconds
vert = vertical
λ = wavelength
 = pulse width (ns or meters)

THEORY OF OPERATION

OPTICAL TIME DOMAIN REFLECTOMETER (OTDR)

The Model 7500 operates by transmitting pulses of light from a laser into a fiber and measuring the reflected light with a detector. Reflections are measured at specific points along the fiber. The OTDR correlates these measurements in the correct sequence and constructs a "fiber signature." Distance and loss measurements are taken from the fiber signature.

The fiber signature is constructed from two types of basic reflections: pulse (or Fresnel) reflections and backscatter reflections. Pulse reflections occur where there is not a continuous glass core within the fiber cable, due to mechanical splices, breaks in the fiber, and so on. Backscatter reflections are generated uniformly along the fiber.

A sample fiber signature is shown in Figure 1-1. This figure illustrates many signature features encountered during measurements

Note: **See Appendix A:OTDR PRINCIPLES for a more detailed description of optical time domain reflectometry.**

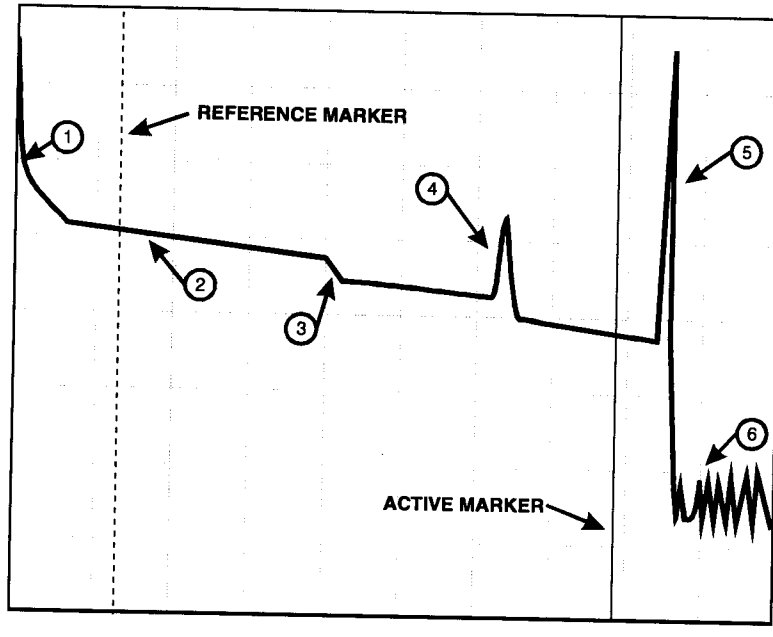

Figure 1-1. Fiber signature features.

The downward slope of the fiber signature is a result of the gradual attenuation (weakening) of the light signal. A splice causes an abrupt loss of power in the fiber, which results in characteristic steps in the fiber signature. The attenuation of the fiber can be calculated by measuring the slope of the backscatter signal from any section of fiber in the fiber signature. Splice loss measurements can be calculated by measuring the amount of power drop across a splice.

Note: **A range settting less than the actual length of the fiber can distort the fiber signature. Be sure the range is greater than the total fiber length.**

In Figure 1-1, the following components of the fiber signature are shown:

(1) Initial Pulse	This is the initial reflection due to the connection of the OTDR to the fiber being tested. Useful measurement information begins after this pulse.
(2) Backscatter Signal	This section of the signature shows the continuous backscatter from the fiber. The downward slope indicates attenuation in the fiber.
(3) Nonreflective Splice	The abrupt drop in the backscatter signal is caused by the loss in a nonreflective splice. A similar drop in the backscatter signal can occur at the location of a cable fault. Fusion splices are the most common nonreflective splices.
(4) Pulse Reflection	Any vertical pulse that appears in the fiber signature and past the initial pulse is called a pulse reflection. In addition to the initial pulse, there are three kinds of pulse reflections: reflective splices, end reflections, and ghost reflections. A reflective splice shows up in the fiber signature as the combination of a pulse reflection and a step change in the backscatter signal. Reflective splices are generally easier to locate in the fiber signature than nonreflective splices. Mechanical splices are often reflective. See (5), below, for a description of an end reflection.

A ghost reflection has no step change in the backscatter. A ghost reflection is not due to a feature at the display location but to a strong reflection that has occurred elsewhere in the fiber, such as an end reflection. (For more information about ghost reflections, see *GHOSTS* in *CHAPTER 4: MEASURING*.)

(5) End Reflection — A pulse reflection that appears at the end of a fiber is called an end reflection. An end reflection is identified by the fact that there is no further backscatter signal after this pulse. Note that a fiber without a clean, flat end (e.g., when a break has occurred) may not show an end reflection.

(6) Noise Floor — The noise floor is the sensitivity limit of the OTDR. The noise floor is lowered by the averaging process.

POWER METER

A power meter measures the optical power injected into the cable by the Light Source and transmitted through the cable to determine the cable loss. Power is measured in units of dB, dBm and watts.

VISUAL FAULT LOCATOR

The Model 7500's visual fault locator uses a Class II laser to physically show a break in a fiber cable. The cable break appears as a red flashing spot when the unit is operated in 1Hz mode. The visual fault locator may also be run in continuous wave (CW) mode.

LIGHT SOURCE

The Model 7500 can be equipped with a Class I stabilizer light source. The lasers used for the OTDR can be operated in CW or 2kHz mode. The wavelength selection is the same as for the OTDR function.

2. PHYSICAL FEATURES

The illustrations below show the Model 7500's external features. The illustrations are divided into front, side, and back features as shown in Figures 2-1, 2-2 and 2-3. The feature numbers in the figures correspond to numbered paragraphs in the chapter.

> ***Note:*** **Before using the Model 7500 for the first time, charge the battery pack for about four hours by plugging the unit into a 110/220VAC or 12VDC outlet using the power cord. The external power port on the Model 7500 is on the back left side.**

MODEL 7500 FRONT FEATURES

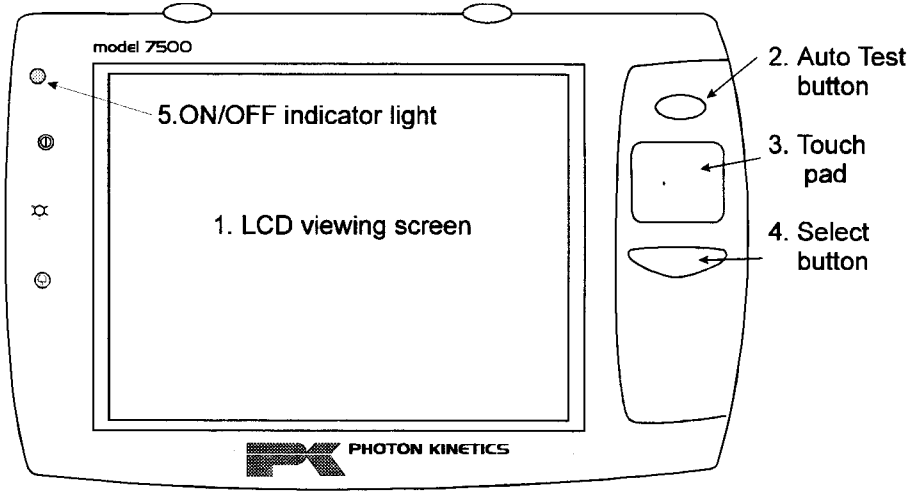

Figure 2-1. Model 7500 front features.

1. LCD VIEWING SCREEN

The 9.4-inch diagonal, VGA LCD viewing screen is where all information, menus, and fiber signatures are displayed. Avoid scratching this surface. Cleaning instructions for the screen are provided in *CHAPTER 7: MAINTENANCE AND TROUBLESHOOTING*.

2. AUTO TEST BUTTON

This button is located on the upper right-hand side of the Model 7500. Pressing it starts an automated OTDR test including instrument setup. Auto Test will:

1. Check the optical connection
2. Locate the end of the fiber
3. Determine the OTDR's pulse width and range
4. Average the fiber signature
5. Generate a Loss Table

3. TOUCH PAD

The Touch Pad controls the cursor similarly to a mouse or track ball. The Touch Pad is used for cursor control, marker movement, and drawing or moving zoom boxes.

To use the Touch Pad, place your finger or thumb on the touch pad. Slide it around the pad area and watch the screen. You'll see the cursor arrow (shown at right) move around the screen. The cursor moves in the same direction as your finger on the pad (i.e. if your finger slides from the lower left side of the pad to the upper right side of the pad, the cursor will move across the screen from lower left to upper right). Practice moving the cursor around until you feel comfortable using the Touch Pad.

Position the cursor on an item you wish to select and then press the Select button. Use the Select button to open menus or make other screen choices.

4. SELECT BUTTON

The Select button is used to make screen selections once you've moved to a location on the screen using the Touch Pad. It is similar to using the buttons on a mouse. Pressing once is the same as "clicking" with a mouse.

> ***Note:*** **Tapping a finger once on the touch pad has the same effect as pressing the Select button.**

5. ON/OFF INDICATOR LIGHT

When the slowly blinking green light is visible, the Model 7500 is undergoing a start up sequence. When the green light is solid, the Model 7500 is ready to use. A fast blinking green light indicates a low battery power level.

MODEL 7500 LEFT SIDE FEATURES

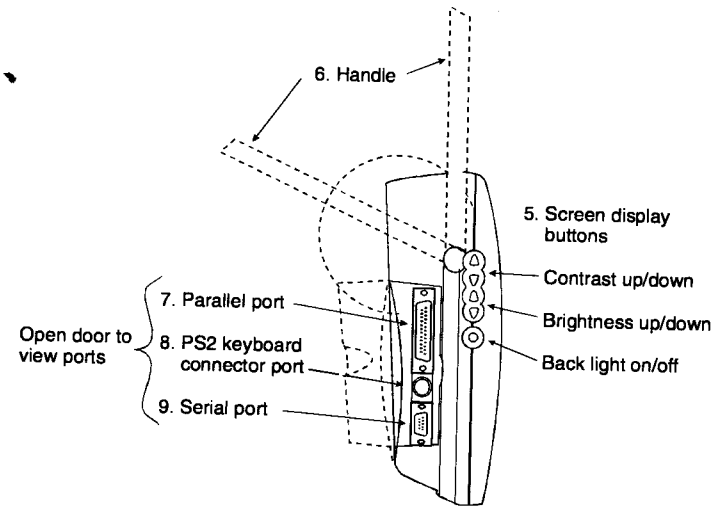

Figure 2-2. Model 7500 left side features.

5. SCREEN DISPLAY BUTTONS

The five small buttons on the Model 7500's left side are screen display buttons. The top two adjust screen contrast up or down. The next two adjust screen brightness up or down. The bottom one turns back light on or off.

The screen's contrast can be adjusted by pressing or holding down one of the top two buttons. Press the topmost button to increase contrast. Press the second button to decrease contrast.

When the back light is on, the screen's brightness can be adjusted continuously by pressing or holding the third and fourth buttons. Press the third button to increase brightness. Press the fourth button to decrease brightness.

The back light button activates a light on the display screen. The light makes the screen visible in the dark. Press it ON to light the screen.

> *Note:* **The back light will substantially decrease battery life. Turn back light off unless absolutely necessary. In direct sunlight, the back light should be turned OFF. In a dark environment, the back light should be turned ON>**

6. HANDLE

The handle on the Model 7500 swings into any position from zero to 180 degrees and can serve as a handle or a stand. A finger indent makes the handle easy to open.

7. PARALLEL PORT

Use the Model 7500's parallel port to connect to external printers.

8. PS2 KEYBOARD CONNECTOR PORT

You may connect a PS2-type keyboard to the Model 7500 by plugging it into this port on the side of the unit. This port allows connection to most newer keyboards.

9. SERIAL PORT

This feature is not currently available. It will be supported by future enhancements.

MODEL 7500 BACK FEATURES

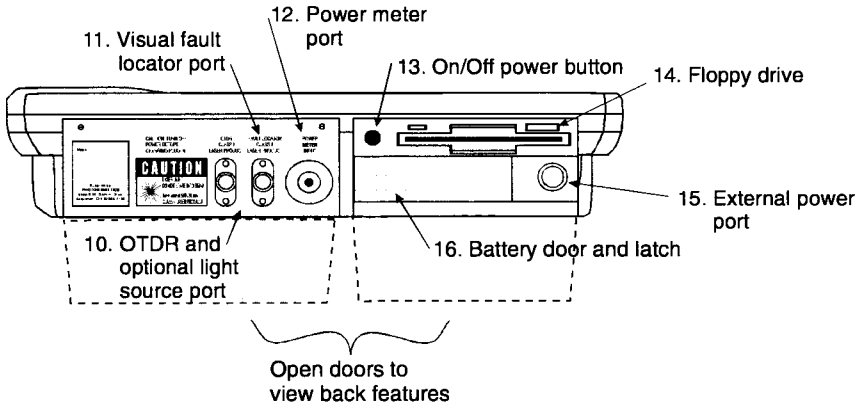

Figure 2-3. Model 7500 back features.

10. OTDR AND OPTIONAL LIGHT SOURCE PORT

Connect the fiber to be tested to this port. Make sure the mating connector on the fiber matches the connector on the Model 7500. This port is also used for the light source if the option is installed. The light source settings are accessed in the Options menu.

11. VISUAL FAULT LOCATOR PORT (optional)

When equipped with the optional visual fault locator, this port contains a 635nm visible laser diode. To use the Model 7500's optional visual fault locator, connect a fiber cable to this port. The functions for the visual fault locator can be accessed in the Options menu.

> ***Warning:*** **The visual fault locator uses a Class II laser to physically show a break or stress in a fiber cable. Follow laser safety precautions detailed in the Safety Summary as the front of this manual.**

12. POWER METER PORT (optional)

When equipped with the power meter option, the user can connect fiber to this port using one of the optional adapter caps. Power meter measurements from 850nm to 1550nm can be made. The power meter displays light loss through a cable as a number on the digital readout.

13. ON/OFF POWER BUTTON

This button is used to power the Model 7500 ON or OFF. The button is located behind the battery compartment door.

14. FLOPPY DRIVE

The Model 7500 comes with a 3 1/2" floppy drive that can read or save data. A high density 3 1/2" floppy disk can hold up to 1.44 MB of data.

15. EXTERNAL POWER PORT

A standard Photon Kinetics AC/DC power adapter can be used to power the Model 7500. The AC/DC power adapter also slow-charges the Model 7500's internal battery pack. Use only the power adapter provided with the unit.

16. BATTERY DOOR AND LATCH

This device uses a Nickel Metal Hydride (NiMH) battery pack. It can power the Model 7500 for up to four hours. Running the Model 7500 with the backlight on or under extreme temperature conditions may shorten battery life. Battery life will be shown on the lower right side of the LCD display screen when the unit is running. Note the power level periodically so you don't lose data if the battery pack runs out of power.

To remove the battery pack:

1. slide the latch back,
2. open the door,
3. disconnect the battery connector,
4. pull the tab on the battery.

To recharge the battery pack, plug the AC/DC power adapter into the Model 7500 and connect the adapter to a 110/220VAC or 12VDC power supply for six hours. The battery pack is 13.2V at 2.3 amps per hour. When plugged in, the Model 7500 may be used while the battery is being charged.

> ***Warning:*** **Do not attempt to alter or modify the battery pack. Return old battery packs to a battery disposal facility. If you are uncertain of where such a facility might be, contact Photon Kinetics. Do not short the external connectors.**