



HPT-5100 HyPerTest
Advanced Loss Test Set
OPERATING INSTRUCTIONS

Avoid exposure
Laser Radiation Emitted
from the aperture.

*This product conforms to CDRH standards for laser product
Per 21 CFR 1040.10 & 1040.11*

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1.0 Introduction

The HPT-5100 is the first Real Time low cost portable Advanced Loss Test Set (LTS) with the core functions required to automatically measure optical fiber loss, Power Meter (PM) measurements and Optical Return Loss (ORL). In the HyPerTest mode two units connected via one fiber under test immediately provide Bi-Directional, Dual Wavelength measurements for the entire suite of tests. The HPT-5100 is equipped with a 4" QVGA tabular presentation of fiber loss parameters, dual laser sources, and a quick reference instruction card in the ruggedized lid. The instrument is designed for stand-alone operation or connection to an optional printer or PC through the RS232 (or optional USB) Export feature. The HPT-5100 is contained in a compact, rugged plastic housing, with watertight, extremely heavy-duty protection when sealed. All controls are accessible via a 12 key weatherproof membrane keypad, offering simple, straightforward functionality. Measurement data and mode indication is supplied via the QVGA LCD display. The display includes tabular fiber data, large easy to read power measurements, pass fail analysis, mode and parameter enunciation, and soft key control. It provides easy viewing in direct sunlight or darkened conditions with the bright backlight.

The HPT-5100's APC or UPC singlemode output port uses eye safe 1310 or 1550 nm modulated laser sources. The power meters and receivers use InGaAs detectors for reliable, stable performance in any length fiber links. A high-speed microprocessor, provides real time single fiber Bi-Directional measurements of loss and ORL with <1/4 second Real Time screen update rates and pass/fail analysis.

The QVGA monochrome display provides a powerful yet simple set of fiber parameters and control indications to view an entire table of loss/ORL information or extra large display of optical power. There are 5 main display modes available. The LTS screen simultaneously displays relative or absolute fiber link loss at all wavelengths and provides source output and zero reference data. The ORL screen displays this same set of data with return loss measurements to examine total fiber reflected power or connector return loss measurements. The large PM screen displays system source power measurements at all popular fiber optic wavelengths. The HPT screen examines loss and ORL measurements with dual wavelengths and Bi-directionally, on an easy to read table of data. Pass/fail limits can be set up and errors displayed on the data table to facilitate automatic detection of failure conditions. All screens include important instrument parameters such as source wavelength selection, meter wavelength selection, modulation mode for fiber identification, a battery gauge, and an autohelp assistance feature to guide you through instrument operation. Programmable soft-key menus are updated for instrument modes of setup, measurement, and auxiliary parameters. Auxiliary and file header screens are available to adjust instrumentation parameters.

The 12 key membrane keypad provides simple straightforward commands to make measurements or navigate the soft-key menus. A new measurement is accomplished as easily as pressing the Test button, immediately fiber loss data is displayed. The soft-key menus are navigated by 5 buttons to provide manipulation of file storage, opening a communications channel, printing data, or controlling optical functions such as reference zero settings or selecting absolute or relative loss.

The Store / Recall / RS232 / Allmem Dump export features are useful for analyzing previously taken measurement data either on the LCD panel or viewed on a PC or printer. The storage of tabular data is made to a 1000 step table. Data can be retrieved via the auxiliary screen and a header can be customized for each storage location. The data is transmitted to a personal computer or directly to a Sipix A6 thermal printer via the RS232 port.

For a quick start guide refer to section 2.5 page 6, and the Quick Reference card inside the cover.

2.0 Preparation for Use

2.1 Inspection

Before shipment, this instrument has been inspected and found to be in perfect working order and free of defects.

The shipping carton should contain the following:

1. HPT-5100, configured as ordered with 8 - AA NiMH Batteries installed
2. AC/DC Charger
3. RS232 mini stereo jack to RJ11 modular cord, Printer adaptor, PC adaptor
4. Users Manual

2.2 Instrument Identification/ Configuration

The instrument's Model, Part Number, Serial Number, Date of Manufacture and Configuration are indicated on a label located inside the ruggedized cover of the unit. The instrument's history is filed at the factory by part number and serial number.

2.3 Power Requirements

The instrument is equipped with an AC/DC charger, which recharges the unit's internal NiMH batteries (8 - AA, 2500mA hours) as well as supplying mains power. When recharging, the charge indicator will increase one bar. Depending on usage, this will typically enable 16 to 24 hours use with a fresh, fully charged battery pack. Typical recharge time is 6 - 8 hours. Overnight is sufficient for a full charge. Fully discharging and charging the batteries once a month will maximize battery cycle life. Do not leave the charger plugged in long term, and remove the batteries if stored over a few months. The AC/DC adapter supplied with the unit is either a 110VAC (US plug) or 220VAC (Euro plug) input with a 12VDC @ 800mA center positive output.

Installation of battery types other than NiMH may cause instrumentation damage and will void the warranty. If you install NiMH batteries that are dead or less than 1 volt each, charge these batteries for one (1) hour before using the Mini-OTDR.

WARNING: To Prevent Fire or Shock Hazard: Do not install other battery types; Do not use the AC adapter without the batteries installed; Do not expose the AC adapter to rain or excessive moisture; Do not use the AC adapter when there are signs of damage to the enclosure or cord; Ensure that you are using the correct adapter for the local line voltage; Do not use any other adapter than the one provided with this instrument. Any other condition will void the warranty.

2.4 Unit Configuration

See the label inside the ruggedized cover for the unit configuration.

Figure 2.1 contains a front view of the HPT-5100 unit.

Front View of HPT-5100



figure 2.1

2.5 Quick Start Guide (Be certain fiber ends are cleaned before inserting !)

2.51 LTS Mode: To measure the loss of a fiber loop or spool when both ends are accessible:

1. Connect the APC (HPT-5100) or UPC (HPT-5110) end of the test jumper to the test port.
2. Press the Test button to engage the sources.
3. Use the left or right arrows to select the 1310nm or 1550nm source and the up or down arrows to adjust each power level if necessary, then select either or both to test.
4. Insert the second end 2.5mm ferrule of the test jumper into the Power Meter port and press F3:Zero twice.
5. Now connect the second end of the test jumper to the input of the fiber under test.
6. Insert the output 2.5mm ferrule of the fiber under test into the Power Meter port.
7. Take dB measurements and F1:Store or F3:Xport as required.

(Tip: If using another HPT-5100 as a source, select ONLY ONE source wavelength in its LTS or ORL mode. Be certain to match the wavelength between the two units)

2.52 ORL Mode: To measure the optical return loss of a connector or total ORL of a link:

1. Connect the APC (HPT-5100) or UPC (HPT-5110) end of the test jumper to the test port.
2. Press the Test button to engage the sources.
3. Use the left or right arrows to select the 1310nm or 1550nm source and the up or down arrows to adjust each power level if necessary, then select either or both to test.
4. Insert the second end 2.5mm ferrule of the test jumper into the Power Meter port and press F3:Zero twice.
5. Now connect the second end to the input of the fiber or connector being tested. (If testing a connector be sure to extinguish wrap after the connector. Properly terminate the end of the link to maximize accuracy.)
6. Take dB measurements and F1:Store or F3:Xport as required.

(Tip: Be certain that no other source is energized at the other end of the fiber or instrument damage could occur)

2.53 PM Mode: To measure the optical power of a system source:

1. Use the left or right arrows to select the appropriate source wavelength.
2. Insert the 2.5mm ferrule of the system source fiber into the Power Meter port.
3. Select F2: dB(m) measurements and F1:Store or F3:Xport as required.
4. If monitoring changes in power level select a new zero reference by pressing F3:Zero twice.

(Tip: If using an HPT-5100 as a source, select ONLY ONE source wavelength in its LTS or ORL mode.)

2.54 HPT Mode (HPT-5100 only): To measure the loss and ORL of a fiber link when both ends are not accessible together:

1. Connect the APC end of the test jumper to the test port.
2. Insert the second end 2.5mm ferrule of the test jumper into the Power Meter port and press F3:Zero twice.
3. Connect the second end to the fiber under test.
4. Repeat at the other end of the link with another HPT-5100 unit.
5. Press the Test button of the Master to begin testing.
6. Take dB measurements and F1:Store or F3:Xport if necessary.

(Tip: For measuring high loss fibers, if on low loss fiber (<10dB) adjust the source power levels lower in the LTS or ORL mode before step 1.)(To improve performance use the ORL or LTS modes)

2.55 To use the modulation mode for fiber identification:

1. Connect the APC end of the test jumper to the test port of the master unit.
2. Connect the second end to the fiber under test.
3. Select a modulation mode in the auxiliary menu, then press the test button in the LTS mode.
4. Connect the APC end of the test jumper to the test port of the slave unit.
5. Connect the second end to the fiber under test.
6. If the correct fiber is connected to the slave, the modulation indicator will blink in the slave LTS or ORL mode.

3.0 Cautions

3.1 Batteries

This unit is equipped with and has been designed to use Nickel-Metal-Hydrate (NiMH) rechargeable batteries. Replace batteries only with NiMH Rechargeable batteries **Do not** use the charger if the supplied NiMH batteries are replaced with Alkaline or any other battery type. Installation of alkaline batteries may cause instrumentation damage and will void the warranty.

WARNING: Do not use the AC adapter without the batteries installed.

If you install batteries that are dead or less than 1 volt each, charge these batteries for one (1) hour before energizing the Mini-OTDR.

3.2 Laser Safety

The HPT-5100 has been configured with laser diodes having central wavelengths of 1310 or 1550nm. The unit has been designed to comply with 21 CFR (Code of Federal Regulations) 1040.10 and 1040.11, for Class I emission limits. Although the CDRH does not consider Class 1 levels to be hazardous, we suggest limiting exposure by not looking directly into the laser aperture. Also, **do not under any circumstance** view or inspect the laser output fibers, connectors or the fiber under test through collimating or focusing optics unless the unit is turned off, batteries are removed and power adapter is disconnected.

WARNING: Before connecting to a patchcord or fiber under test, be certain the fiber has no active optical sources or instruments connected to the other end other than the HPT-5100 mate. Skin or eye damage could result from other high power sources e.g. EDFAs, or instrument damage could occur voiding the warranty.

Inside cover of the HPT-5100 to describe location of labels

Laser Safety Label



Serial Number / Date of Manufacture Label

4.0 Features

4.1 Mechanical

Instrument Enclosure

The HPT-5100 is manufactured in one of the most rugged plastic enclosures available. With the lid closed and locked, and the purge port tightened, the ruggedized enclosure is air and watertight. A manual or automatic purge port is supplied to temporarily balance the inside and outside air pressure to facilitate opening the unit after using it in higher altitude environments. Remember to retighten a manual purge port after every use. Although the front panel membrane keypad is weather resistant, care must be taken to avoid liquids and contaminants around the fragile optical and electrical connectors, and the glass display. Use a mild cleaning agent and damp soft cloth to clean up the panels and the outside case. See the maintenance section to clean the optical connector. NEVER open the instrument behind the membrane keypad panel for cleaning. Return the unit to the factory for servicing if necessary.

HPT-5100 Packaging

The instrument is shipped in a protective cardboard container along with the charger, RS232 connectors, and this manual. Save the protective packaging for storage and shipment. Surround the cardboard container with 2 inches of packing foam in a shipping box.

4.2 Functional

Power Save

The HPT-5100 incorporates a battery save feature that allows for maximum utilization of the battery life. Upon turning the unit on, it keeps track of the keypad activity. If no key presses are detected for a period of approximately 15 minutes, the unit will automatically turn itself off, storing the current mode settings. To disable this feature, enter the auxiliary menu auto-off feature and select AutoOff=Off. To enable this feature select AutoOff=On. When enabled, an "a" appears next to the battery gauge.

Low Battery and Power Shut Down

The HPT-5100 incorporates battery monitoring circuitry to manage the discharge and inform the user when the battery charge is approaching an unsatisfactory level. A battery gauge is displayed on the graphics panel that shows relative battery charge depth. When approximately ninety percent of the battery capacity has been expended, the gauge shows empty, indicating to the user that the batteries need recharging, and allowing a short period of time to finish using the instrument. The unit automatically powers down when the batteries become fully discharged.

Printing

The HPT-5100 incorporates a printing feature available via softkey. A Sipix A6 serial thermal printer driver is built into the instrument firmware. Using the modular serial cable and the 9 pin DB9 male adaptor supplied with the HPT-5100, connect to the serial cable supplied with the printer. When energizing the printer, allow 5 seconds for the form feed before pressing the print key.

5.0 Operation

5.1 Functional Description of Membrane Keys



Turns the unit On and Off.



Depressing this key will cause the unit to start or stop measurement in the Hypertest mode, or enable or disable the output sources in other modes.



Arrow Keys: left and right are used to select the source or PM wavelength, or to navigate the auxiliary and header modes. Up and down are used to navigate in the auxiliary menu, increment or decrement the storage location in the header and F1:Store modes, or to adjust the source output power in LTS or ORL mode.



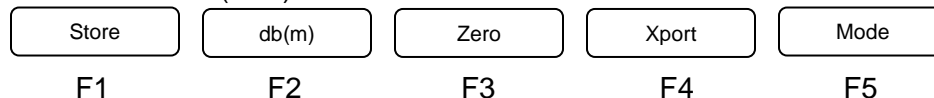
The enter key is used to select and change the parameter in the auxiliary mode or the alpha character in the header mode.



Function Soft keys F1, F2, F3, F4 or F5

These keys are graphics display definable keys and will execute the command immediately above the key dependent on operational mode as explained below. The first time a new function key is depressed it is highlighted and activates the AutoAssist display informing the user what that keys current function is. Press again to activate the function.

When in the Loss Test Set (LTS) mode:



Store: depressing this key saves the current trace and data information into the displayed storage location. After selecting the function with the first Store key depression, depress the up or down arrow keys to increment or decrement the storage location (1,2,3..999,1..). Hold the key for 1 second to increment or decrement 10s place, 2 seconds for 100s place. Each subsequent depression of the Store key will save the current trace data into that storage location, then auto-increment the counter to the next location. Depress F5 to suspend this function.

db(m): depressing this key allows toggling between measuring absolute power in dbm or relative power in db (against the zero reference value displayed for the selected wavelength(s)).

Zero: depressing this key takes a new zero reference measurement for each selected wavelength, displays it at the top of the screen, and stores it.

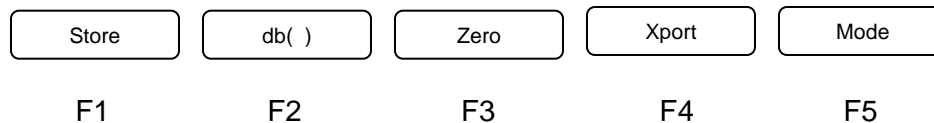
Xport: depressing this key sends the measurement data to a PC or the current screen information to a Sipix A6 thermal printer through the RS232 port (see auxiliary menu Xport(xxxx) function).

Mode: depressing this key advances the instrument to the ORL mode (cycles through the mode selections of LTS, ORL, PM, HPT, and Aux).



Arrow Keys: left and right are used to select the operational wavelength e.g. 1310nm, 1550nm, or both. Up and down are used to increment or decrement the source output power of the single wavelength specified. If both wavelengths are selected the AutoAssist will prompt 'Pick Wavelength' to select a wavelength with the left or right arrows before output power can be adjusted.

When in the Optical Return Loss (ORL) mode:



Store: see above.

db() : not active in this mode, always measures db in ORL mode.

Zero: depressing this key takes a new zero reference measurement for each selected wavelength, displays it, and stores it. To take an ORL zero reference, first connect an FC/APC connectorized jumper to the Test Port (TP) then insert the 2.5mm connector ferrule end into the Power Meter (PM) port. Depress the F3 key to start the zeroing process. The AutoAssist will display 'Zeroing Please Wait' momentarily. If the jumper is not connected properly the AutoAssist will display '*ORL Zero Error*' momentarily then display 'Jumper TP to PM' to remind you to connect the jumper for zeroing.

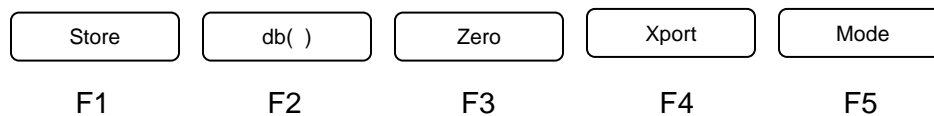
Xport: depressing this key sends the measurement data to a PC or the current screen information to a Sipix A6 thermal printer through the RS232 port (see auxiliary menu Xport(xxxx) function).

Mode: depressing this key advances the instrument to the PM mode (cycles through the mode selections of LTS, ORL, PM, HPT, and Aux).



Arrow Keys: left and right are used to select the operational wavelength e.g. 1310nm, 1550nm, or both Up and down are used to increment or decrement the source output power of the single wavelength specified. If both wavelengths are selected the AutoAssist will prompt 'Pick Wavelength' to select a wavelength with the left or right arrows before output power can be adjusted.

When in the Power Meter (PM) mode:



Store: see above.

db(m): depressing this key allows toggling between measuring absolute power in dbm or relative power in db (against the zero reference value displayed for the selected wavelength).

Zero: depressing this key takes a new zero reference measurement for the selected wavelength, displays it at the top of the screen, and stores it. An independent zero reference can be stored for each wavelength selected by the arrow keys.

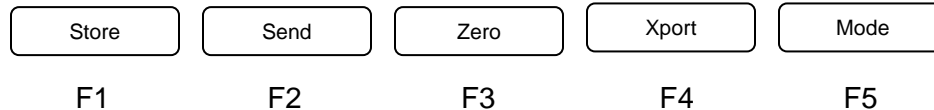
Xport: depressing this key sends the measurement data to a PC or the current screen information to a Sipix A6 thermal printer through the RS232 port (see auxiliary menu Xport(xxxx) function).

Mode: depressing this key advances the instrument to the HPT mode (cycles through the mode selections of LTS, ORL, PM, HPT, and Aux).



Arrow Keys: left and right are used to select the operational wavelength e.g. 850, 1300, 1310, 1490, 1550, or 1625. Up and down are not used.

When in the Hypertest (HPT) mode:



Store: see above.

Send: depressing this key will send a communication string across the fiber under test between two HPT-5100 units in both in HPT mode. Use the up or down arrow to select one of 8 messages. A display prompt will notify the sender if the message transmitted successfully, and both instrument will provide a ringtone. Both instruments must be idling in the HPT mode to function.

Zero: depressing this key takes a new zero and ORL reference measurement and stores it for each wavelength at both the master and slave locations. To take an HPT zero reference first connect an FC/APC connectorized jumper to the Test Port (TP) then insert the other end 2.5mm connector ferrule into the Power Meter (PM) port. Depress the F3 key to start the zeroing process. The AutoAssist will display 'Zeroing Please Wait' momentarily. If the jumper is not connected properly the AutoAssist will display '*HPT Zero Error*' momentarily then display 'Jumper TP to PM' to remind you to connect the jumper for zeroing.

Xport: depressing this key sends the measurement data to a PC or the current screen information to a Sipix A6 thermal printer through the RS232 port (see auxiliary menu Xport(xxxx) function).

Mode: depressing this key advances the instrument to the Aux. mode (cycles through the mode selections of LTS, ORL, PM, HPT, and Aux).



Arrow Keys: left, right, up and down are not used.

When in the Auxiliary (Aux.) mode:



The function keys F1 through F4 are not implemented in Aux. mode.

Mode: depressing this key advances the instrument to the LTS mode (cycles through the mode selections of LTS, ORL, PM, HPT, and Aux).



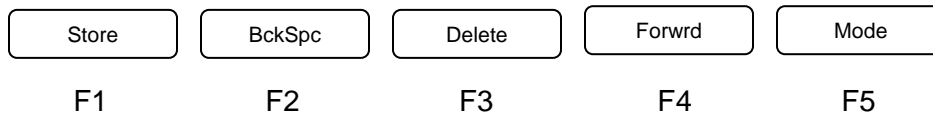
Arrow Keys: left, right, up and down keys move the highlighted selection on the Auxiliary menu. The up and down keys also act as limit value selection keys after selecting the 1310, 1550, or ORL Limit boxes with the Enter key.



The enter key is used to select and change the highlighted parameters 1 - 20 as described below.

1. Header (xxx): depressing the enter key places you into the Header screen described below.
2. Xport (xxxx): depressing the enter key toggles the RS232 port between exporting data for PC collection or printing with a Sipix A6 thermal printer.
3. Tone=(xxxx): depressing the enter key selects the source output modulation mode used for fiber identification. Choices are None, 270Hz, 1KHz, or 2KHz. Note: the output power drops 3db as read by a power meter when a modulation frequency is selected.
4. LCD Cont: depressing the enter key increases the LCD contrast level (1,2,3...9,1...). A higher number gives a darker display.
5. 1310 Limit: depressing the enter key allows changing the 1310nm HPT limit mode with the up and down arrows keys. Adjust the limit for the maximum (most negative) loss value acceptable. A highlighted reading will be displayed on the HPT screen if this limit is exceeded.
6. Recall (xxx): depressing the enter key recalls any previous readings and operational modes (if previously stored) from the specified storage location, then automatically increments to the next location. After the old readings are displayed press any key to return to the auxiliary menu. To change the storage location, go to the Header screen.
7. RS232 (xxx): depressing the enter key will transmit the data from that storage location to a PC through the RS232 connection. To change the storage location, go to the Header screen.
8. 1310nm Attn=(x): depressing the enter key will increment the output power of the 1310nm source by 1db (-10,-9,-8...0,-10...).
9. BkLite=(xxx): depressing the enter key will toggle the LCD BackLight on or off.
10. 1550 Limit: depressing the enter key allows changing the 1550nm HPT limit mode with the up and down arrow keys. Adjust the limit for the maximum (most negative) loss value acceptable. A highlighted reading will be displayed on the HPT screen if this limit is exceeded.
11. Clear (xxx): depressing the enter key clears previously stored readings and operational modes in the specified storage location, then automatically increments to the next location. To change the storage location or the header text, go to the Header screen.
12. AllMem Dump: depressing the enter key will transmit the data from all storage locations to a PC through the RS232 connection.
13. 1550nm Attn=(x): depressing the enter key will increment the output power of the 1550nm source by 1db (-10,-9,-8...0,-10...).
14. KeyBuz=(xxx): depressing the enter key will toggle the keypress buzzer on or off.
15. ORL Limit: depressing the enter key allows changing the ORL HPT limit mode with the up and down arrow keys. Adjust the limit for the maximum (most positive) ORL value acceptable. A highlighted reading will be displayed on the HPT screen if this limit is exceeded.
16. Clear All: depressing the enter key clears previously stored readings and operational modes in all storage locations. When initially depressed the key changes to display 'Hold Down', hold the key for 2 seconds, then the key will display 'All Clear'. If not held long enough the key will display 'Try Again'. For easy header setup, the last header line viewed is saved to all locations (e.g. _CABLE_x_FIBER_xxx_). Clear the header line first to clear all locations.
17. Baud=(xxx)Kb: depressing the enter key will toggle the RS232 baud rate between 115200,8,n,1 (115K baud rate, 8 data bits, no parity, 1 stop bit, no flow control) or 57600,8,n,1 for hookup to an external PC.
18. AutoOff=(xxx): depressing the enter key will toggle the Auto-Off function On=enabled or Off=disabled. When enabled the unit will automatically turn itself off after 15 minutes of keyboard inactivity, and an "a" for auto appears next to the battery gauge.
19. Speakr=(xxx): depressing the enter key will toggle the warning buzzer for communications on or off.
20. Enter CAL: This is for use by a qualified service technician only.

When in the Header mode:



Store: depressing this key saves the changes just made to the header into the displayed storage location.

BckSpc: depressing this key moves the header line character inverse cursor one space back.

Delete: depressing this key deletes the current character at the header line inverse cursor and increments the cursor one place forward.

Forwrd: depressing this key moves the header line character inverse cursor one space forward.

Mode: depressing this key abandons any unsaved changes to the current header, quits the header mode, and returns to the auxiliary mode



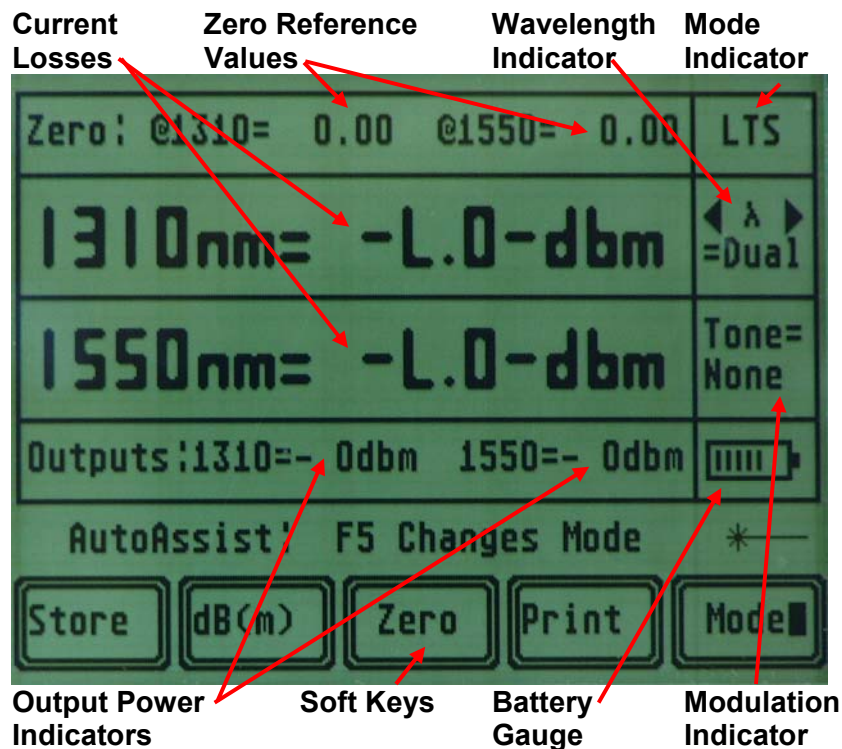
Arrow Keys: the left and right keys move the highlighted selection on the alphanumeric menu. The up and down keys select the next or previous storage location header to be displayed. Hold the keys for 1 second to increment or decrement the 10s place, 2 seconds for the 100s place.



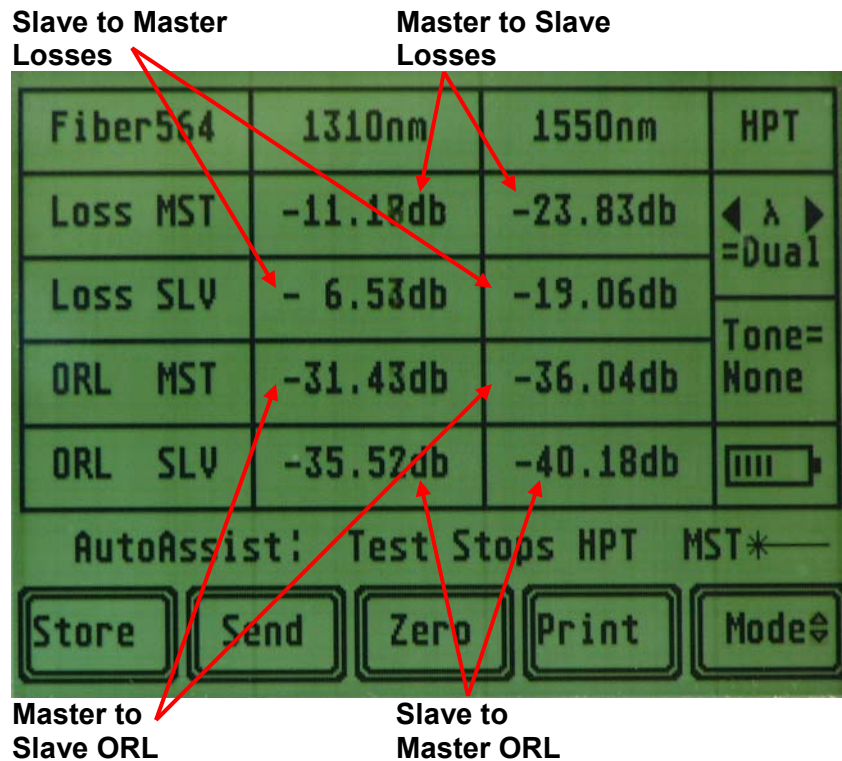
When the enter key is depressed, the character selected by the inverse cursor on the header line is changed to the alphanumeric character selected in the menu.

(Tip: For easy header setup before testing a group of fibers, the last header line viewed (e.g. _CABLE_x_FIBER_xxx_) can be preloaded to all storage locations by using the Clear All process in the auxiliary menu.)

5.2 Functional Description of LTS, ORL and PM Displays



5.3 Functional Description of HPT HyPerTest Display



6.0 Maintenance

6.1 Battery Replacement

In the event the batteries fail to retain a sufficient charge and need to be reconditioned or replaced, contact the factory for service. If you wish to recondition or replace the batteries in the field, extreme care must be taken not to damage the internal fibers or the instrument electronics. This damage will void the warranty. At all times protect the fiber connector and internal instrument from adverse environmental conditions.

The batteries can be reconditioned with a LaCrosse Technology BC-900 battery reconditioner or equivalent. Replace the batteries with 8 NiMH AA cell 2500 mA hour batteries, Energizer or equivalent. The batteries are accessible via 2 sliding latched covers inside the unit. This requires removal of the front panel and circuit board pack from the ruggedized case. To remove the front panel, turn power off and disconnect all electrical and fiber cords. Remove the 4 knurled knobs and their fiber washers from the front panel, pull the front panel out gently, taking care not to damage the internal fiber or electrical cords. Remove the screws from the 2 black plastic battery covers on the back of the circuit board pack, then slide the covers off. Replace the batteries taking care to install them properly as depicted in the battery holder diagrams. Replace the battery covers and screws. Very carefully install the circuit board pack and front panel into the rugged case being certain that the fiber and electrical cords are free from kinks. Tighten down the knurled knobs with their fiber washers while gently pressing on the front panel corners. If the instrument fails to function properly contact the factory for service.

6.2 Test Port

In order to maintain a low loss fiber connection, care should be taken to adequately clean the ferrule of any connector to be inserted in the Test Port. In the event that the port needs to be cleaned, we suggest the use of isopropyl alcohol and foam swabs specifically designed for cleaning connectors accepting 2.5mm ferrules. **CAUTION:** Insertion of a UPC connector into an APC port will damage the ceramic sleeve and connector ferrules. **WITH THE UNIT OFF** periodically inspect the test port sleeve for dirt, wear or damage.

Do not under any circumstance view or inspect the Test Port output fibers, connectors, or the fiber under test through collimating or focusing optics. A video inspection microscope should be used to examine all fiber ends. Contact our sales force for video microscope information.

6.3 Power Meter Port

The Power Meter detector is a non contacting surface behind the 2.5 mm ferrule sleeve. **Do Not Clean the Power Meter Port.** If debris enters the Power Meter port, attempt to displace it with a light dusting of dry canned air, or return the unit for servicing.

6.4 Recalibration and Verification

Periodic verification of the HPT-5100 is recommended to ensure that your instrument remains within specification. Although not imperative, we recommend a recalibration and verification once a year to inspect the test ports, and make certain the instrument is functioning properly and performing to its rated specifications. Consult the factory for service.

7.0 Application Information

7.1 Loss Measurements:

The LTS mode is useful for single instrument dB loss measurements of fiber optic components, patchcords, spools, and longer links with a loopback connector at the other end. Simultaneous dual wavelength loss measurements can automatically be accomplished with one HPT-5100 using this technique. When both ends of the fiber are together use this procedure for making measurements:

1. Connect the APC (HPT-5100) or UPC (HPT-5110) end of the test jumper to the test port.
2. Press the Test button to engage the sources.
3. Use the left or right arrows to select the source wavelength and the up or down arrows to adjust each power level if necessary, then select any or all wavelengths to test.
4. Insert the other 2.5mm ferrule of the test jumper into the Power Meter port and press F3:Zero twice.
5. Now connect a mating sleeve between the second end of the test jumper and the fiber under test.
6. Take the output 2.5mm ferrule of the fiber under test and insert into the Power Meter port.
7. Optimize the mating sleeve connection and read, in dB, the loss measurement.
8. Take dB measurements and F1:Store or F3:Xport as required.

(Tip: If using another HPT-5100 as a source, select ONLY ONE source wavelength in its LTS or ORL mode. Be certain to match the wavelength between the two units)

7.2 ORL Measurements:

The ORL mode is useful for making dB optical return loss measurements from fiber optic components or entire fiber links. When measuring component ORL it is important to eliminate any subsequent return loss from components or fiber further down the link. To accomplish eliminating unwanted return power, a fiber extinguishing wrap is useful. After the component being tested, wrap a 3mm jacketed fiber 10 – 20 times around a small (5-10mm) mandrel watching the ORL measurements decrease until the wrap no longer effects the reading. To verify instrument performance a cleaned unterminated UPC connector end produces approximately -14.5dB.

1. Connect the APC (HPT-5100) or UPC (HPT-5110) end of the test jumper to the test port.
2. Press the Test button to engage the sources.
3. Use the left or right arrows to select the source wavelength and the up or down arrows to adjust each power level if necessary, then select either or all wavelengths to test.
4. Insert the other 2.5mm ferrule of the test jumper into the Power Meter port and press F3:Zero twice.
5. Now connect the second end to the input of the fiber or connector being tested. (If testing a connector be sure to extinguish wrap after the connector. sure to extinguish wrap after the connector. Properly terminate the end of the link to maximize accuracy.)
6. Take dB measurements and F1:Store or F3:Xport as required.
7. Be certain there is no other source power on the fiber under test or instrument damage may occur.

7.3 Power Measurements:

The PM mode is useful for making dBm power measurements of fiber optic sources, or energized links, as well as measuring component insertion losses or power stability measurements. Be certain to select the appropriate wavelength for the most accurate power measurements. If the actual wavelength is not a selectable wavelength, choose the closest wavelength on the HPT-5100.

1. Insert the 2.5mm ferrule of the system source fiber into the Power Meter port.
2. Use the left or right arrows to select the source wavelength then select F2:dB(m) measurements.
3. Turn the remote source on, let it stabilize for a moment, and take the reading in dBm.
4. If insertion loss measurements or stability testing will follow, select a new zero reference by pressing F3:Zero twice, then measure relative power in dB. The newly selected zero reference power level is maintained at the top of the screen.
5. If using a HPT-5100 as a remote source be certain only one wavelength is energized for maximum stability in the PM mode.
6. Do not exceed +25dBm source power or instrument damage may occur.

7.4 HyPerTest Measurements (HPT-5100 only):

To measure the loss and ORL of a fiber link when both ends are not accessible use two instruments set at either end of the link in the HPT mode. The HPT mode is useful for automated multiple wavelength bi-directional loss measurements of a fiber optic link through a single fiber connection. The Hypertest measurement works best with losses greater than 10dB, attenuating the sources can assist if necessary. For improved performance use ORL and LTS/PM instrument modes.

1. Connect the APC end of the test jumper to the test port.
2. Insert the other 2.5mm ferrule of the test jumper into the Power Meter port and press F3:Zero twice.
3. Connect the second end to the fiber under test.
4. Repeat at the other end of the link with another HPT-5100 unit.
5. Press the Test button of the Master to begin testing.
6. Take dB measurements and F1:Store or F3:Xport if necessary.
7. Errors can occur if the fiber loss is greater than ~45dB at any wavelength or either direction.
8. If the fiber loss is <10dB errors can occur. Attenuate the HPT-5100 sources in the LTS mode prior to making low level HPT-5100 measurements then start over.

7.5 Fiber identification:

Identification of an unknown fiber in an unmarked bundle can be accomplished with the HPT-5100. Many fiber optic sources emit a modulated signal for this purpose. The HPT-5100 emits and detects 270Hz, 1000Hz and 2000Hz for this purpose.

1. Connect the APC end of the test jumper to the test port of the source unit.
2. Connect the second end to the fiber under test.
3. Select a modulation mode in the auxiliary menu, then press the test button in the LTS mode.
4. Connect the APC end of the test jumper to the test port of the slave unit in LTS or ORL modes.
5. Connect the second end to the fiber under test.
6. When the correct fiber is connected to the slave, the modulation indicator will automatically blink the modulation frequency.

7.5 Fiber Fill Launch conditions

It is well known in the industry that the results obtained when performing attenuation measurements can be significantly affected by the mode filling in the fiber by the source. Because of this the Electronics Industry Association (EIA) has developed test methods to improve the consistency of measurements (refer to EIA-455-171 & EIA FOTP-50).

Singlemode:

When performing attenuation measurements on singlemode fiber, a source of error is the inclusion of cladding modes as part of the reference measurement. To minimize this source of error, wrap one (1) turn of the source reference patchcord around a 50mm diameter mandrel. Take a zero reference reading, then perform measurements.

8.0 Instrument Specifications

note: specifications subject to change without notice.

Preliminary Specifications:

Insertion Loss

Source Wavelengths (nm)	1310/1550+/-20
Spectral Width (nm)	3 (FP LD)
Output Power (dBm)	0
Dynamic Range (dB)	45(HPT), 60(LTS)
Source Attenuator (dB)	0 to -10 (1dB increments)
Source Modulation & Tone Detection(Hz)	270/1000/2000
Output Stability (dB Long Term)	+/- 0.1

Return Loss

Measurement Range HPT-5100 APC (dB)	0 to -65
Measurement Range HPT-5110 UPC (dB)	0 to -55
Accuracy @45dB	+/- 0.5
Resolution (dB)	0.01

Power Meter

Detector 2.5mm ferrule InGaAs (CATV or High Sensitivity)	
Display Measurement Range (dBm)	+25 to -60 (CATV), +5 to -75 (HiSens)
Calibrated Wavelengths (nm)	850,1300,1310,1490,1550,1625
Accuracy (dB)	+/- 0.3
Resolution (dB)	0.01
Display Units	dB, dBm

General

Display Type	QVGA 4" Graphics LCD, Backlit
Memory	1000 Multiwave Measurements
Laser Classification	Class 1 CFR 1040
Standard Connector Type HPT-5100	FC/APC
Standard Connector Type HPT-5110	FC/UPC
Dimensions (H x W x D)	8.1" x 6.4" x 3.5"; 21 x 16 x 9cm
Weight (w/batteries)	2 lb 13 oz; 1.3Kg
Operating Temperature	0 to +50C
Storage Temperature	-20 to +60C
Power 12VDC (120 or 240VAC)	8 AA NiMH Rechargeable Cells
Battery Life	16-24 hours
PC/Printer Port	Rs-232
Bidirectional Text Communications HPT-5100 only	Single Fiber under Test

9.0 Troubleshooting

<u>Symptom</u>	<u>Possible Cause</u>	<u>Solution</u>
LCD display blank	Power not on. Batteries require recharging. Batteries are missing, in backwards or need replacement	Press ON/OFF key. Recharge batteries. Check polarity, replace batts, or contact factory for servicing
Instrument locked up	Unexpected Operational Mode	Remove input power & batteries for 30 secs to reset instrument
Unstable LTS or PM readings	Using another 5100 source set in dual wavelength mode Dirty Connections	Select a single wavelength in both source and measuring units Clean Connections
Unexpected loss or ORL measurements	Dirty connections	Clean Connections Test a 14.5 dB ORL reflector
Source output power too low	Attenuator set for lower output	Select one source wavelength then select an appropriate output power level with the up/down keys
HPT readings unstable	Not enough loss in fiber under test	Use attenuated source settings Use ORL and LTS/PM modes
RS232 hookup to PC not functioning properly	Baud rate not set properly or too quick for computer.	Set baud rate properly or decrease Baud rate to 57K.

10.0 Warranty and Repair

10.1 Warranty

This product, including all mechanical, electrical, and optical parts and assemblies are unconditionally warranted to be free of defects in workmanship and material for a period of one (1) year from the date of delivery.

This warranty does not apply to expendable parts such as batteries, nor to any instrument or component which has been subjected to misuse, alteration, or fiber connector damage. It is the customer's responsibility to understand all the instructions and specifications prior to operating this instrument. This warranty does not extend to any loss or damage consequent to the failure of the warranted product.

10.2 Repair

If repair is required, simply call the factory at 1(315)736-3642 for return instructions and a RMA number.

11.0 Version Control

Through a program of continuous improvement, we upgrade the features and performance of the instrument in an on going process. The instrument firmware version is accessible at "turn-on" at the battery charge indicator area of the LCD display. The version changes and approximate release dates are as follows:

V1.0 - 07/2005 - original release
Revision B
9/1/2006