Errata

Title & Document Type: **HP 81536A Lightwave Multimeter Sensor Module Operating and Programming Manual**

Manual Part Number: **081536-90011**

Revision Date: **May 1990**

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

www.agilent.com

Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

HP 81536A Lightwave Multimeter Sensor Module Operating and Programming Manual

SERIAL NUMBERS

This manual applies to all instruments.

HEWLETT PACKARD

HP Part No. 081536-90011
Printed in the Federal Republic of Germany

First Edition
E0590

Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions contain additional and replacement pages to be merged into the manual by the customer. The date on the title page and back cover of the manual only changes when a new edition is published. When an edition is reprinted, all the prior updates to the edition are incorporated. No information is incorporated into a new edition unless it appears in a prior update.

Control Serial Number: Edition 1 applies directly to all instruments.

Printing History

Edition	Date	Part Number	CODE
Edition 1	1st May 1990	08153-90011	E0590

Safety Considerations

Before operation, you should review the instrument and manual, including the red safety page, for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, you should keep it until you have checked the contents of the shipment for completeness and verified the module both mechanically and electrically.

The Performance Tests give procedures for checking the operation of the module. If the contents are incomplete, mechanical damage or defect is apparent, or if a moduke

does not pass the operator's checks, notify the nearest Hewlett-Packard office.

Warning 

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, etc.).

Power Requirements

The HP 81536A will operate when installed into the HP 8153A Optical Multimeter mainframe.

Operating Environment

The HP 8153A safety information summarizes the HP 81536A operating environment ranges. In order for the HP 81536A to meet specifications, the operating environment must be within the limits specified in this section.

Input/Output Signals

Caution 

A maximum of 15V can be applied as an external voltage to any BNC connectors.

Storage and Shipment

The module can be stored or shipped at temperatures between −40°C and +70°C. The module should be protected from temperature extremes that may cause condensation within it.

Notices

Subject Matter

The information in this document is subject to change without notice.

Hewlett-Packard makes no warranty of any kind with regard to this printed material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Limited Warranty

Warranty

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, HP will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, software, or firmware will be uninterrupted or error free.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Hewlett-Packard specifically disclaims the implied warranties of Merchantability and Fitness for a Particular Purpose.

Exclusive Remedies

The remedies provided herein are Buyer's sole and exclusive remedies. Hewlett-Packard shall not be liable for any direct, indirect, special, incidental, or consequential damages whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products. For any assistance contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

Certification

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory.

Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, NIST (formerly the United States National Bureau of Standards, NBS) to the extent allowed by the Institutes's calibration facility, and to the calibration facilities of other International Standards Organization members.

Funkentstörung Deutschland

Dieses Gerät wurde in einiger typischen Systemkonfiguration geprüft und entspricht den Bestimmungen der Allgemeinen Genehmigung FTZ 1046/84. Als Nachweis ist das Gerät mit dem VDE-Funkschutzzeichen gekennzeichnet.

Herstellerbescheinigung

Hiermit wird bescheinigt, daß dieses Gerät in Übereinstimmung mit den Bestimmungen der Postverfügung 1046/84 funkentstört ist. Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Werden Meß- und Testgeräte mit ungeschirmten Kabeln und/oder in offenen Meßaufbauten verwendet, so ist vom Betreiber sicherzustellen, daß die Funk-Entstörbedingungen unter Betriebsbedingungen an seiner Grundstücksgrenze eingehalten werden.

Electromagnetic Interference Regulations Germany

This device was tested in a typical system configuration and meets the General License requirements in Germany (FTZ 1046/84). As a proof of compliance it carries the VDE Radio Protection Mark

Manufacturers Declaration

This is to certify that this equipment is in accordance with the Radio Interference Requirements of Directive FTZ 1046/84. The German Bundespost was notified that this equipment was put into circulation, the right to check future instruments for compliance with the requirements was granted.

If Test and Measurement Equipment is operated with unscreened cables and/or used for measurements in open set-ups, the user has to assure that under these operating conditions the Radio Interference Limits are still met at the border of his premises.

C.81536

HP 81536A Specifications

Specifications describe the instrument's warranted performance. Supplementary performance characteristics describe the instrument's non-warranted typical performance.

Because of the modular nature of the instrument, these performance specifications apply only to this module. You should insert these pages into the appropriate section of the manual.

HP 81536A Specifications

Sensor Element	InGaAs
Wavelength range	800-1700nm
Power range	+3 to -70dBm
Display resolution	
dBm, dB	0.001dBm, 0.001dB
Watt	100pW
Applicable fiber type	9/125μm - 100/140μm, NA $\leq$0.3
Uncertainty (Accuracy)	$\pm$2.5% (1000-1650nm)[1]
Total Uncertainty	$\pm$5%$\pm$50pW (1000-1650nm)[2]
Linearity	(0 to -50dBm)
18°C to 28°C const. temp	$\pm$0.015dB$\pm$30pW
0°C to 55°C const. temp	$\pm$0.05dB$\pm$50pW
Noise	<50pW (1200-1600nm)
peak-peak, avg. time 1sec	
Dimensions	75mm H, 32mm W, 335mm D (2.8"×1.3"×13.2")
Weight	net 0.6kg (1.3lbs), shipping 1kg (2.2lbs)
Recalibration period	1 year
Warmup time	20 min.

Information on the traceability of power meters is available on request

[1] at the following reference conditions:

- Power level 10μm (-20dBm), Continuous Wave (CW).
- Fiber 50μm graded index, NA=0.2, fully excited.
- Ambient temperature 23$\pm$5°C.
- Connector Diamond HMS-10/HP.
- At day of calibration.

[2] at the following operating conditions:

- Power range as stated under linearity.
- Fiber $\leq 50\mu m$, NA ≤ 0.2.
- For NA >0.2 add 1%.
- Ambient temperature 0 to 55°C.
- Connector HMS-10/HP, FC/PC, DIN 47256, ST. For Biconic add 1%.
- Within 1 year after calibration.

Supplementary Performance Characteristics

To get the **Total Uncertainty** for this module in the 800-1000nm wavelength range, add 1% to the values shown in the specifications.

Outside the specified wavelength range, the noise increases by up to 5 times the value shown above.

Analog output	
bandwidth	DC-700Hz
output voltage	0 to 2V into open
output impedance	600Ω typ.
max. input voltage	±10V

D.81536

Performance Tests

Introduction

The procedures in this section test the electrical performance of the instrument. The complete specifications to which the HP 81536A is tested are given in Appendix C. All tests can be performed without access to the interior of the instrument. The test equipment given corresponds to tests carried out with Diamond^{R} HMS-10/HP connectors.

Equipment Required

Equipment required for the performance test is listed in the table below. Any equipment which satisfies the critical specifications of the equipment given in the table may be substituted for the recommended models.

Recommended Test Equipment

Instrument/Accessory	Rec. Model
Power Meter Standard	HP 8153A Mainframe with HP 81533A Optical Head Interface Module with HP 81521B Optical Head *OR* HP 8152A Power Meter with HP 81521B Optical Head
Multimeter Mainframe	HP 8153A
CW Laser Sources	HP 81552SM and HP 81553SM or HP 81554SM or HP 8155A Opt.002 and HP 8155A Opt.003
Optical Attenuator	HP 8158B Opt.002/011
Connector Adapter	81000AA
Connector Interface	HP 81000AI 2ea (08154-61701)
Multimode Fiber	HP 81501AC 2ea
Plastic Cap	5040-9351 2ea
Cleaning Kit	HP 15475A

Test Record

Results of the performance test may be tabulated on the Test Record provided at the end of the test procedures. It is recommended that you fill out the Test Record and refer to it while doing the test. Since the test limits and setup information are printed on the Test Record for easy reference, the record can also be used as an abbreviated test procedure (if you are already familiar with the test procedures). The Test Record can also be used as a permanent record and may be reproduced without written permission from Hewlett-Packard.

Test Failure

If the HP 81536A fails any performance test, return the instrument to the nearest Hewlett-Packard Sales/Service Office for repair.

Instruments Specification

Specifications are the performance characteristics of the instrument which are certified. These specifications, listed in Appendix C are the performance standards or limits against which the HP 81536A can be tested. Appendix C also lists some supplemental characteristics of the HP 81536A and should be considered as additional information.

Any changes in the specifications due to manufacturing changes, design, or traceability to the National Bureau of Standards will be covered in a manual change supplement or revised manual. The specifications listed here supercede any previously published.

Performance Test

The performance test given in this section includes the Accuracy Test, the Linearity Test and the Noise Test. Perform each step in the tests in the order they are given using the corresponding test equipment.

Note

Make sure that all optical connections of the test setups given in the pro- cedure are dry and clean. DO NOT USE IMMERSION OIL (see cleaning procedure).

The Optical Cables from the Laser Source to and from the 8158B Attenuator to the Power Meter must be fixed on the table to ensure minimum cable movement during the tests.

Accuracy and Linearity Test

Specifications : HP 81536A

Uncertainty : ±5% ±50pw (1000-1650nm)

Linearity : ±0.015dB ±30pW

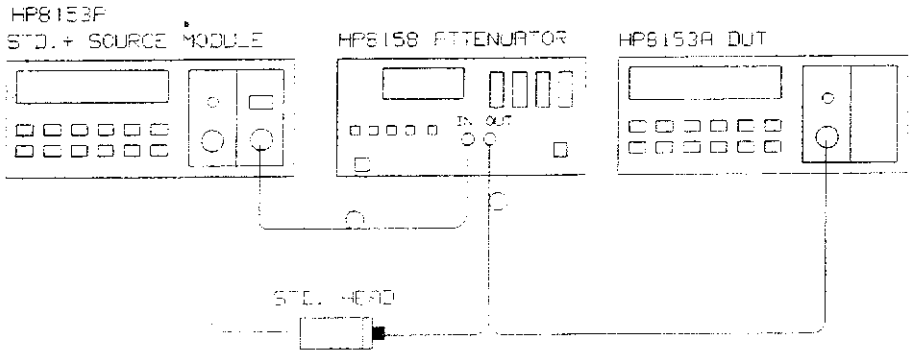

Figure D.81536-1.

Test Set-Up

1. Make sure that cable connectors, detectors and adapters are clean.
2. Turn the instruments on, enable the Laser Source and allow the instruments to warm up for at least 20 minutes.
3. ZERO the power meters with the cable adapter/interface covered with plastic caps (P/N 5040-9361 or 5040-9351).
4. Connect the equipment as shown in the figure above. Ensure that the cables to and from the Attenuator are fixed on the table and both, the Standard Head and the DUT, are close together so that minimum cable movement is achieved when connecting the cable to the Standard Head or to the DUT.

Procedure

Note

The Calibration Accuracy and Linearity Test must be performed at one wavelength setting. The Calibration Accuracy at other wavelengths re- quires then only a test in the -20 dBm range at 10 μW.

1. Set the CAL factor of both power meters to zero.
2. Set the WAVELENGTH of both instruments to the wavelength of the Laser Source.
3. Set both instruments to MEASure, (display in W), switch AUTOrange off and select the -50dBm range.
4. Set the averaging time to 500ms on the HP 8153A.
5. Enable the HP 8158B output, and change the HP 8158B attenuation until the Power Meter Standard displays 1.90nW. (-50dBm range)
6. Connect the attenuator output cable to the DUT and check that the DUT display is between 1.805nW and 1.995nW (-50dBm range) and note the result in the Test Record.
7. Connect the attenuator output cable to the STANDARD and change the HP 8158B attenuation until the STANDARD displays 19.00nW (-50dBm range).

8. Check that the DUT display is between 18.05nW and 19.95nW (-50dBm range) and note the result in the Test Record.
9. On the HP 8153A press (DISP→REF), then (dB) and select the next higher range (-40dBm range) with the (UP) key. Note the deviation displayed in dB in the Test Record.
10. Select display in Watt (dBm W) on the DUT and repeat the level and range comparison as described in steps 7 to 10 at the range and level settings shown in the Test Record up to the 0dBm range.

Noise Test

Note

The noise measurement must be performed either with a module or a blank panel in the second channel position.

1. Select Autorange, Display in Watt and Averaging Time T=1s on the HP 8153A.
2. Cover the HP 81536A optical input with a plastic cap and press Zero.
3. Watch the HP 8153A display a few seconds and note the maximum noise (pW) in the Test Record.

Performance Test Record

Hewlett-Packard Model 81536A Test Performed By _____

Power Sensor Module Date _____

Serial Number _____ Comments _____

Calibration Accuracy. Linearity and Noise Test

Test Conditions: Multimode Fiber with Diamond[R] HMS-10/HP connectors

Accuracy and Linearity Specifications measured at _____nm Wavelength

DUT Range	Reference Power	Min	DUT Actual	Max	Linearity ±0.015dB±30pW	Pass	Fail
-50dBm	1.90nW	1.804nW	_____nW	1.996nW		---	---
-50dBm	19.00nW	18.04nW	_____nW	19.96nW		---	---
-40dBm	19.00nW				____dB	---	---
-40dBm	190.0nW	180.4nW	_____nW	199.6nW		---	---
-30dBm	190.0nW				____dB	---	---
-30dBm	1900nW	1804nW	_____nW	1996 nW		---	---
-20dBm	1900nW				____dB	---	---

DUT Range	Reference Power	Min	DUT Actual	Max	Linearity ±0.015dB±30pW	Pass	Fail
-20dBm	19.00μW	18.05μW	_____μW	19.95μW		---	---
-10dBm	19.00μW				___dB	---	---
-10dBm	190.0μW	180.5μW	_____μW	199.5μW		---	---
0dBm	190.0μW				___dB	---	---

Calibration Accuracy measured at _____nm wavelenth

-20dBm	10.00μW	9.50μW	_____μW	10.50μW		---	---

Noise < 50 pW	_____pW	---	---