

Operating and Programming Manual

HP 81541MM Lightwave Multimeter Source Module

SERIAL NUMBERS

This manual applies to all instruments.



HP Part No. 81541-90011
Printed in the Federal Republic of Germany

First Edition
E1092

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Subject Matter

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Control Serial Number: Edition 1 applies directly to all instruments.
Edition 1 : 1st March 1991 : 81541-90011 : E0391
: 1st October 1992 : 81541-90011 : E1092

Safety Considerations

Before operation, 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, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically.

The Performance Tests give procedures for checking the operation of the instrument. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument 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.).

Line Power Requirements

The HP 81541MM operates when installed into the HP 8153A Lightwave Multimeter mainframe

Operating Environment

The HP 8153A safety information summarizes the HP 81541MM operating environment ranges. In order for the HP 81541MM to meet specifications, the operating environment must be within the limits specified for the HP 8153A.

Storage and Shipment

The module can be stored or shipped at temperatures between -40°C and $+70^{\circ}\text{C}$. Protect the module from temperature extremes that may cause condensation within it.

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C

HP 81541MM 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.

Table C-1. HP 81541MM Specifications

Type	LED
Central Wavelength^[1]	850nm±30nm
Fiber Type	MM 50/125μm
Spectral Bandwidth (FWHM)	<90nm
Output Power	>-17dBm
CW-Stability^[1]	
Short Term (15min, T=Constant)	±0.003dB
Long Term (6h, T=0 to 55°C±1K)	±0.03dB
Dimensions	75mm H, 32mm W, 335mm D (2.8"×1.3"×13.2"×)
Weight	net 0.7kg (1.5lbs), shipping 1kg (2.2lbs)
Recalibration Period	1 year
^[1] After a warmup time of 60min. with output enabled. If previously stored at the same temperature, only 20min. warmup required.	

Suppelementary Performance Characteristics

Internal Digital Modulation

You can select internal modulation frequencies of 270HZ, 1kHz, or 2kHz. All outputs are pulse shaped, with a duty cycle of 50%.

Output Attenuation

The output can be attenuated from 0 to 6dB, in steps of 0.1dB.

Stability

The value of the long term stability doubles with just one minute warmup time (source enabled).


Performance Tests

Introduction

The procedures in this section test the optical performance of the instrument. The complete specifications to which the HP 81541MM is tested are given in Table C-1. All tests can be performed without access to the interior of the instrument. The performance tests refer specifically to tests using the Diamond HMS-10/HP connector.

Equipment Required

Equipment required for the performance test is listed below.

Note  The LED Source module under test can be inserted into the second channel of the Power Meter Standard. In this case, the second multimeter mainframe is not necessary.

Instrument/Accessory	Recommended Model
Power Meter Standard #C01	HP 8153A Mainframe with HP 81533A Optical Head Interface Module with HP 81520A Optical Head
Multimeter Mainframe	HP 8153A
Connector Adapter (head)	HP 81000AA
Connector Interface	HP 81000AI 2ea (08154-61701)
Multimode Fiber	HP 81501AC
BNC to BNC Cable	8120-1840
Oscilloscope	

Test Record

Results of the performance test may be noted in the Performance Test Record. 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 81541MM fails any performance test, return the instrument to the nearest Hewlett-Packard Sales/Service Office for repair.

Instrument Specification

Specifications are the performance characteristics of the instrument that are certified. These specifications, listed in Table C-1, are the performance standards or limits against that the HP 81541MM can be tested. Appendix C also lists some supplemental characteristics of the HP 81541MM 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 in such a change supercede any previously published.

Performance Tests

The performance tests given in this section are separated into Output Power Test and Stability 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 in the test setups given in the procedure are dry and clean.



Output Power and Stability Tests

Specifications:

Optical output power of 50/125 μ m fiber: >-17dBm
Stability over 15 minutes at constant temperature: ± 0.003 dB
Stability over 6h and ± 1 K env. temp. window: ± 0.02 dB

1. Output Power Test

- a. Make sure that cable connectors and detector windows are clean.
- b. Turn instruments on, enable the LED output of the HP 81541MM and allow instruments to warm up for at least 60 minutes.
- c. On the power meter:
 - i. Set λ to the wavelength displayed for the HP 81541MM source channel.
 - ii. Make sure that the CAL parameter on the power meter is set to zero.
 - iii. With the connector adapter, on the optical head, covered with a plastic cap, press **(Zero)** to zero the power meter.
- d. Connect the equipment as shown in Figure D-1.

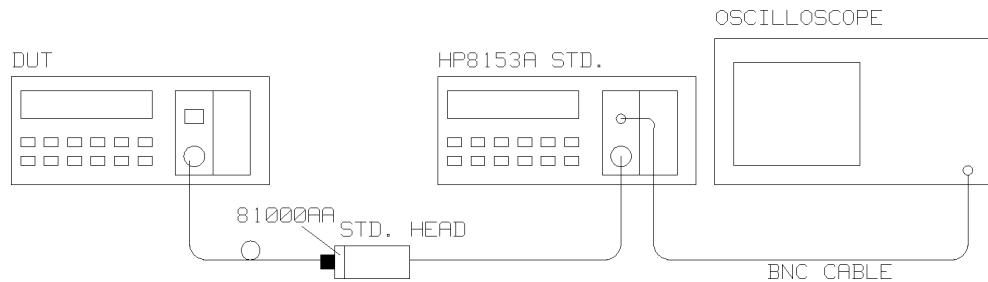


Figure D-1. Performance Test Setup

- e. On the HP 8153A with the module under test:
 - i. Press **(Param)** until the AUX parameter is selected. Make sure that this parameter is set to CW.
 - ii. Press **(Param)** until the ATT parameter is selected. Make sure that this parameter is set to zero.

f. Measure the output power and note the result in the Test Record.

2. Attenuation Function Test

- g. On the power meter, press **(Disp→Ref)**. Press **(dB)** to select a display in dB.
- h. Using the modify keys on the HP 8153A with the module under test, increase the attenuation and check that the output power changes.

Note the reaction on the Test Record.

i. Set the attenuation to 0.0dB.

3. Modulation Function Test

- j. Using a BNC cable, connect the power meter transducer output to the oscilloscope input and set the oscilloscope as follows: 0.5V/DIV DC coupled, 1ms/DIV.
- k. On the power meter, switch the autoranging off and select the -20dBm range.
- l. On the HP 8153A with the module under test, press **(Param)** to select the AUX parameter. Monitor the frequency change on the oscilloscope as you set the modulation to 270Hz, 1kHz, and then to 2kHz. Use **(↑)** and **(↓)** to modify the modulation.

Note the reaction on the Test Record.

4. Stability Test

- a. Enable the HP 81541MM LED output and allow the instruments to warm up for 60 minutes.
- b. Select the channel with the source.
- Press **(Param)** to select the AUX parameter. Set this parameter to CW.
 - Press **(Param)** to select the ATT parameter. Set this parameter to zero.
- c. On the power meter:
- Cover the input to the sensor with a plastic cap and press **(Zero)** to zero the meter.
 - Press **(Param)** to select the λ parameter. Set this parameter to the value displayed for the source.
 - Press **(Param)** to select the T parameter. Set this parameter to 1s.

D-4 Performance Tests

- d. Using the HP 81501AC cable, connect the output of the source to the input of the sensor. Make sure that the cable is fixed and that it cannot be moved during the measurement.
- e. Select the MENU mode on the power meter.
 - i. Press **Record** to select STABILITY.
 - ii. Press **Edit** and select the T_TOTAL parameter. Set the T_TOTAL parameter to 15 minutes.
 - iii. Press **Edit** and then **Exec** to run the stability application.
- f. When the stability test has completed, press **More** to select the SHOW application. Press **Edit** and then **Next**/**Prev** to display the DIFF result. Divide this result by 2 to obtain the value for the stability:

$$\frac{DIFF}{2} = \text{Stability (dB)}$$

Note the result on the Test Record.

- g. Repeat the stability measurement (steps e and f) with T_TOTAL set to 6 hours.

Performance Test for the HP 81541MM

Test Facility:

_____	Report No.	_____
_____	Date	_____
_____	Customer	_____
_____	Tested By	_____

Model HP81541MM Source Module

Serial No. _____ Ambient temperature _____ °C

Options _____ Relative humidity _____ %

Firmware Rev. _____ Line frequency _____ Hz

Special Notes:

Performance Test for the HP 81541MM

Test Equipment Used:

Description	Model No.	Trace No.	Cal. Due Date
1. Lightwave Multimeter (Std.) #C01	HP 8153A	_____	_____
2. Opt. Head Interface Module	HP 81533A	_____	_____
3. Optical Head 850nm	HP 81520A	_____	_____
4. Lightwave Multimeter (DUT)	HP 8153A	_____	_____
5. Connector Interface	HP 81000AI	N/A	N/A
6. Connector Adapter	HP 81000AA	N/A	N/A
7. Multimode Fiber	HP 81501AC	N/A	N/A
8. BNC to BNC Cable	P/N 8120-1840	N/A	N/A
9. Oscilloscope	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
13. _____	_____	_____	_____
14. _____	_____	_____	_____
15. _____	_____	_____	_____
16. _____	_____	_____	_____
17. _____	_____	_____	_____

Performance Test for the HP 81541MM

Model HP 81541MM LED Source Module No. _____ Date _____

Test No.	Test Description	Minimum Spec.	Result	Maximum Spec.	Measurement Uncertainty
I.	Output Power Test Output Power	-17dBm			±0.5dB (±10.14%)
II.	Attenuation Function Test Passed (P)/Failed (F)				
III.	Modulation Function Test Passed (P)/Failed (F)				
IV.	Stability Tests Stability (15min.)	-0.003dB		+ 0.003dB	
	Stability (6h.)	-0.02dB		+ 0.02dB	

Cleaning Procedures

In general, *whenever possible use physically contacting dry connectors*. Fiber connectors may be used dry or wet. Dry means without index matching compound. If there is a need to use an index matching compound, use only HP index matching oil (part number 8500-4922). Clean the connectors, interfaces and bushings carefully each time after use.

Cleaning Materials

	HP P/N
Lens Cleaning Paper	9300-0761
Special Cleaning Tips	9300-1351
Blow Brush	9300-1131
Adhesive Cleaning tape	15475-68701
Isopropyl Alcohol	Not available from HP. This should be available from any local pharmaceutical supplier.
Pipe Cleaner	

Cleaning Fiber/Front-Panel Connectors

1. In order to clean the instrument front panel connector remove the connector interface.
2. Apply some isopropyl alcohol to the lens cleaning paper and clean the surface and the ferrule of the connectors.
3. Using a new dry piece of cleaning paper wipe the connector surface and ferrule until they are dry and clean.
4. Lightly press the adhesive tape several times against the connector surface to remove any remaining particles. After use store the tape in the container.
5. Protect the connector surface with a cap.

Cleaning Connector Interfaces

- Apply some isopropyl alcohol to the pipe cleaner and wash the inside of the connector interface.
- Using a new dry pipe cleaner, dry the inside of the connector interface.
- Remove the brush part from the blow brush and blow air through the inside of the interface to remove any remaining particles.

Note



If any index matching compound was used, use an ultrasonic bath with isopropyl alcohol to clean the connector interfaces.

Cleaning Connector Bushings

As used on the HP 8158B and HP 81000AS/BS.

Normally the connector bushings require no cleaning. However, if it appears that cleaning is necessary, use only the blow brush with the brush part removed.

Caution



- NEVER insert any cleaning tool into the bushing as this may affect the optical system.
 - NEVER use any index matching compound, cleaning fluid or cleaning spray.
-

Cleaning Detector Windows

As used on the HP 81520A and HP 81521B.

1. Use the blow brush to remove any particles from the surface.
2. Wipe the surface with cleaning paper or special cleaning tips.

Cleaning Lens Adapters

Caution Do not use any cleaning fluid or cleaning spray.



-
1. Using the blow brush, remove dust.
 2. Wipe the surfaces with the special cleaning tips.

Cleaning Detector Lens Interfaces

As used on the HP 81522A and HP 8140A and HP 8153A detector modules.

Normally, the lens interface can be cleaned by using the blow brush. If adhesive dirt must be removed perform as follows:

1. Using the blow brush, remove the dust from the lens surface.
2. Press the special cleaning tip to the lens surface and rotate the tip.

Note



Use alcohol for cleaning only then when above procedure does not help or if the dirt is caused by oil or fat.
