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About This Manual

Introduction

Introduction

This Laser and Optics User's Manual is intended for system designers concerned with designing and installing the optics, laser heads, and receivers for Agilent laser measurement systems into precision measuring or positioning equipment. Typical applications are for equipment used in the integrated circuit, disk drive, and precision machine industries.

This manual does not provide information about laser head or receiver electronics. That information is provided in the manual for the particular unit. Refer to the section titled "Manuals Available" at the end of this chapter for details.

Information about measurement system electronic components (such as printed circuit boards, and air and material temperature sensors) is also not in this manual. Contact Agilent Technologies for help in ordering the documentation you want.

How to Locate Information

Three methods are used to assist in locating information: a short table of contents, a tab system that divides the manual into major parts, and an alphabetical index of subjects.

Manual Organization

This manual is organized as follows:

Chapter 1, About this Manual (this chapter), introduces you to the content and organization of this manual and gives information about available supplementary manuals.

Chapter 2, Familiarization, describes a typical single-axis laser interferometer positioning system. It provides a simple "Getting Started" procedure that describes how to quickly set up and operate an Agilent laser interferometer positioning system, using PC-based electronics. Only essential information is included.

Chapter 3, System Design Considerations, provides general information that you should know and consider when designing Agilent laser measurement systems. Topics include: the basic components of an Agilent laser measurement system, effect of motion

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of any of the components, accuracy considerations, measurement range, adjustment considerations, laser beam and optics protection, system grounding, mounting plane tolerance, fastening, clearance, pointing stability, thermal isolation, vibration isolation, magnetic shielding, effect of optics on measurement direction sense, and vacuum application.

Chapter 4, System Installation and Alignment, provides you with general procedures on how to install and align the various optics and accessories in various Agilent laser measurement systems. This chapter includes the alignment procedure for linear interferometers.

Chapter 5, Laser Heads, provides descriptions and specifications for each of the current six Agilent laser heads (Agilent 5517A, Agilent 5517B, Agilent 5517C, Agilent 5517D, Agilent 5519A, and Agilent 5519B).

Chapter 6, Beam-Directing Optics, provides descriptions, specifications, and other information for the beam splitters, beam benders, and beam translator that are available for Agilent laser measurement systems.

Chapter 7, Measurement Optics, introduces the Agilent's measurement optics—interferometers, straightness optics, retroreflectors (also called cube corners)—available for Agilent Technologies laser measurement systems. The first part of this chapter presents material that should be useful to the user of any of the interferometers. Following this introductory material, the chapter is divided into subchapters that describe individual interferometer types, including characteristics and specifications. Each subchapter provides descriptions, specifications, installation, and (except for linear interferometers) alignment information for each interferometer that is available for Agilent laser measurement systems. The alignment procedure for linear interferometers is in Chapter 4 of this manual.

The subchapters are:

- **Chapter 7A**, Agilent 10702A and 10766A Linear Interferometers, and Agilent 10703A and 10676A Retroreflectors
- **Chapter 7B**, Agilent 10705A Single Beam Interferometer and Agilent 10704A Retroreflector
- **Chapter 7C**, Agilent 10706A Plane Mirror Interferometer
- **Chapter 7D**, Agilent 10706B High Stability Plane Mirror Interferometer
- **Chapter 7E through 7F**, reserved for future use.

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- **Chapter 7G**, Agilent 10715A Differential Interferometer
- **Chapter 7H**, Agilent 10716A High-Resolution Interferometer
- **Chapter 7I**, Agilent 10717A Wavelength Tracker
- **Chapter 7J**, Agilent 10719A One-Axis Differential Interferometer
- **Chapter 7K**, Agilent 10721A Two-Axis Differential Interferometer
- **Chapter 7L through 7M**, reserved for future use.
- **Chapter 7N**, Agilent 10735A, 10736A, and 10736A-001 Three-Axis Interferometers
- **Chapter 7O**, Agilent 10737L and Agilent 10737R Compact Three-Axis Interferometers
- **Chapter 7P through 7U**, reserved for future use.
- **Chapter 7V**, Agilent 10770A Angular Interferometer with Agilent 10771A Angular Reflector
- **Chapter 7W through 7X**, reserved for future use.
- **Chapter 7Y**, Agilent 10774A Short Range Straightness Optics and Agilent 10775A Long Range Straightness Optics

Chapter 8, Receivers, provides descriptions and system information for the Agilent 10780C, Agilent 10780F, Agilent E1708A, and Agilent E1709A receivers.

Chapter 9, Accessories, provides descriptions of hardware such as adjustable mounts, height adjuster/post, base, and cables. This chapter also provides descriptions, specifications, and system information for the optics which are not interferometers, and are not usually referred to as “beam-directing optics”, such as plane mirror reflectors.

Chapter 10, Maintenance, provides general maintenance information and procedures for cleaning the lens of the Agilent 10780C, Agilent 10780F, Agilent E1708A, and Agilent E1709A receivers, the measurement optics, and the beam-directing optics. A “Before and After Service Product Safety Check” procedure is also provided.

Chapter 11, Troubleshooting, provides information to help you find defective components in an Agilent laser measurement system when a problem occurs. It can help determine whether the problem source is in the system electronics, environmental sensor, laser head, receiver, or the optics.

Chapter 12, Unpacking and Incoming Inspection, provides information for unpacking and inspection, and warranty claims.

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Chapter 13, Packaging for Storage or Shipment, provides specific detailed information on packaging the laser tube assembly for storage or for shipment to Agilent for an exchange laser tube.

Chapter 14, Principles of Laser Interferometry, provides basic concepts, techniques, and principles that determine the overall measurement performance of Agilent laser measurement systems.

Chapter 15, Accuracy and Repeatability, provides basic concepts, techniques and principles that determine the overall measurement performance of Agilent laser measurement systems.

Chapter 16, WOL Compensation Numbers, provides tables of Wavelength-of-Light (WOL) compensation values for different environmental conditions, and step-by-step instructions on how to calculate the compensation factor if your system operates in an environment other than those covered by the tables.

Chapter 17, Material Expansion Coefficients, provides the linear thermal expansion coefficients of the most frequently used metals and alloys.

Chapter 18, Glossary

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Manuals Available

Table 1-1 lists manuals currently available for Agilent laser heads and receivers. These manuals provide component-level troubleshooting and adjustment information.

In addition to these manuals, manuals are available describing the electronic components of a laser measurement system. Contact Agilent Technologies for help in ordering the information you need.

Table 1-1. Laser Head and Receiver Manuals

Product	Name of Manual	Current Agilent Part Number (See NOTE below)
Agilent 5517A Laser Head	Agilent 5517A Laser Head Operating and Service Manual	05517-90046
Agilent 5517B Laser Head or Agilent 5517C Laser Head or Agilent 5517D Laser Head	Agilent 5517B/C/D Laser Head Operating and Service Manual	05517-90047
Agilent 5519A /BLaser Head	Agilent 5519A/B Laser Head Service Manual	05519-90006
Agilent 10780C Receiver or Agilent 10780F Remote Receiver	Agilent 10780C/F Operating and Service Manual	10780-90028
Agilent E1708A Remote Dynamic Receiver	Agilent E1707A/E1708A Operating Manual	E1708-90010
Agilent E1709A Remote High-Performance Receiver	Agilent E1709A Operating Manual	E1709-90006

NOTE: The Agilent part number of a manual may be changed when the manual is updated.

How to Order Manuals

The Agilent Part Number of this manual is given on the front title page and back inside cover. Use it to order additional copies of this manual.

How to Order Manuals

Product specifications and descriptions in this document subject to change without notice.
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This is a chapter from the manual titled:
Laser and Optics User's Manual
For complete manual, order:
Paper version: p/n 05517-90045
CD version: p/n 05517-90063
This chapter is p/n 05517-90101