

Errata

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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, semiconductor products and chemical analysis businesses are now part of Agilent Technologies.

Changes to this Manual

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INSTRUCTION MANUAL

**10722A
PLANE MIRROR CONVERTER**

**ACCESSORY FOR 5501A
LASER TRANSDUCER SYSTEM
REMOTE INTERFEROMETER**

SERIAL PREFIX: 1948A

This manual applies directly to Hewlett-Packard Model 10722A Plane Mirror Converters with serial prefix 1948A. For units with different serial prefixes a manual change sheet is supplied.

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**MANUAL PART NO. 10722-90001
Microfiche Part No. 10722-90002**

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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 Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard system product is warranted against defects in materials and workmanship for a period of 90 days from date of installation. During the warranty period, HP will, at its option, either repair or replace products which prove to be defective.

Warranty service of this product will be performed at Buyer's facility at no charge within HP service travel areas. Outside HP service travel areas, warranty service will be performed at Buyer's facility only upon HP's prior agreement and Buyer shall pay HP's round trip travel expenses. In all other cases, products must be returned to a service facility designated by HP.

For products returned to HP for warranty service, 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, or 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.

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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.

SAFETY PRECAUTIONS

CAUTION



LASER RADIATION

DO NOT STARE INTO BEAM

MAXIMUM OUTPUT: 1 mw
PULSE SPEC: continuous wave
LASER MEDIUM: helium neon

CLASS II LASER PRODUCT

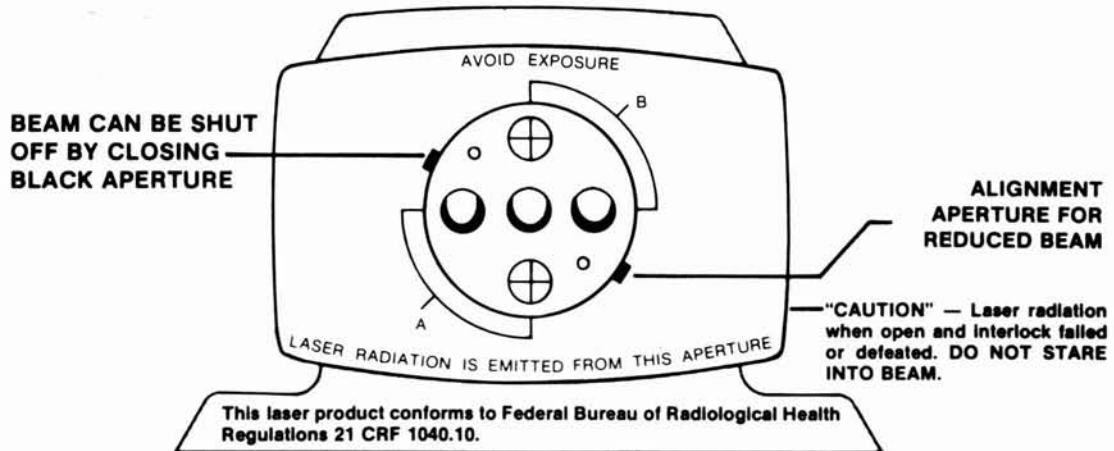


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GENERAL INFORMATION

10722A PLANE MIRROR CONVERTER

The Hewlett-Packard 10722A Plane Mirror Converter (Figure 1) is an accessory for the HP 10702A Linear Interferometer. With the 10722A Plane Mirror Converter, and an additional HP 10703A Retro-reflector, the HP 10702A Linear Interferometer can be converted to a 10706A Plane Mirror Interferometer. This configuration allows the 5501A Laser Measurement System to make measurements of axial displacement of a plane mirror. The stringent angular alignment requirements imposed by roof prisms or single-beam arrangements is eliminated.

Figure 1. Model 10722A Plane Mirror Converter



SPECIFICATIONS

Specifications for the HP 10722A Plane Mirror Converter and Plane Mirror Reflector are as follows:

Plane Mirror Converter

Dimensions: See Figure 2.

Weight: .077 pounds (35 grams)

Performance: As for the Model 5501A Laser Transducer System and 10702A Linear Interferometer

Plane Mirror Reflector (not supplied)

Flatness*: Must not deviate by more than $\lambda/8$ (3 microinches) over any 0.8 inch (20 millimeter) dimension.

Surface Finish: Metal 0.1 - 0.3 microinch arithmetic average.

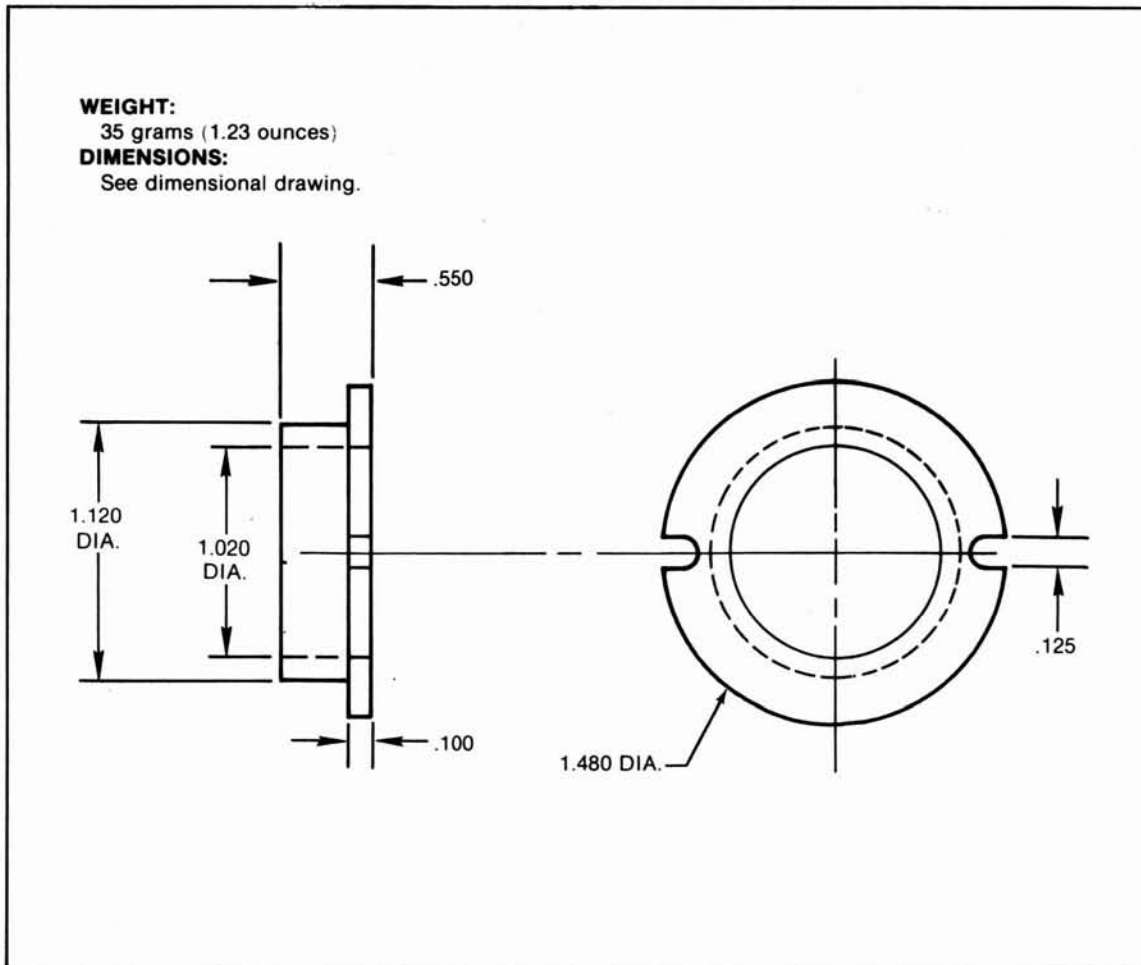
Optical 80 - 40 (Mil-0-13830)

Maximum Angular Misalignment: Depends on distance between interferometer and plane mirror. Typical values are:

- ±25 arc-minutes for 10 inches (254 millimeters)
- ±15 arc-minutes for 20 inches (508 millimeters)
- ±5 arc-minutes for 50 inches (1270 millimeters)

*In X-Y stage applications, mirror flatness affects the overall accuracy of the system.

Figure 2. Plane Mirror Converter Dimensions



INSTRUMENT IDENTIFICATION

Each Hewlett-Packard instrument has a 10-character serial number (e.g., 0000A00000). The four-digit serial prefix identifies a group of identical instruments, and the five-digit suffix is a serial number unique to each instrument. If the serial prefix on your instrument is not on the title page of this manual, your instrument is different from this manual. A Manual Change Sheet is included with this manual to describe the differences. If the manual change sheet is missing, request one from the nearest Hewlett-Packard Sales and Service Office listed at the back of this manual.

INSTRUMENT COMPONENTS SUPPLIED

The Plane Mirror Converter includes the following items:

Table 1. Components Supplied

DESCRIPTION	HP PART NO.	QUANTITY
Plane Mirror Converter	10722A	1
Screw, Cap	3030-0253	4
Wrench, Hex	8710-0896	1

INSTALLATION AND OPERATION

INTRODUCTION

This section provides installation and operating instructions for the 10722A Plane Mirror Converter.

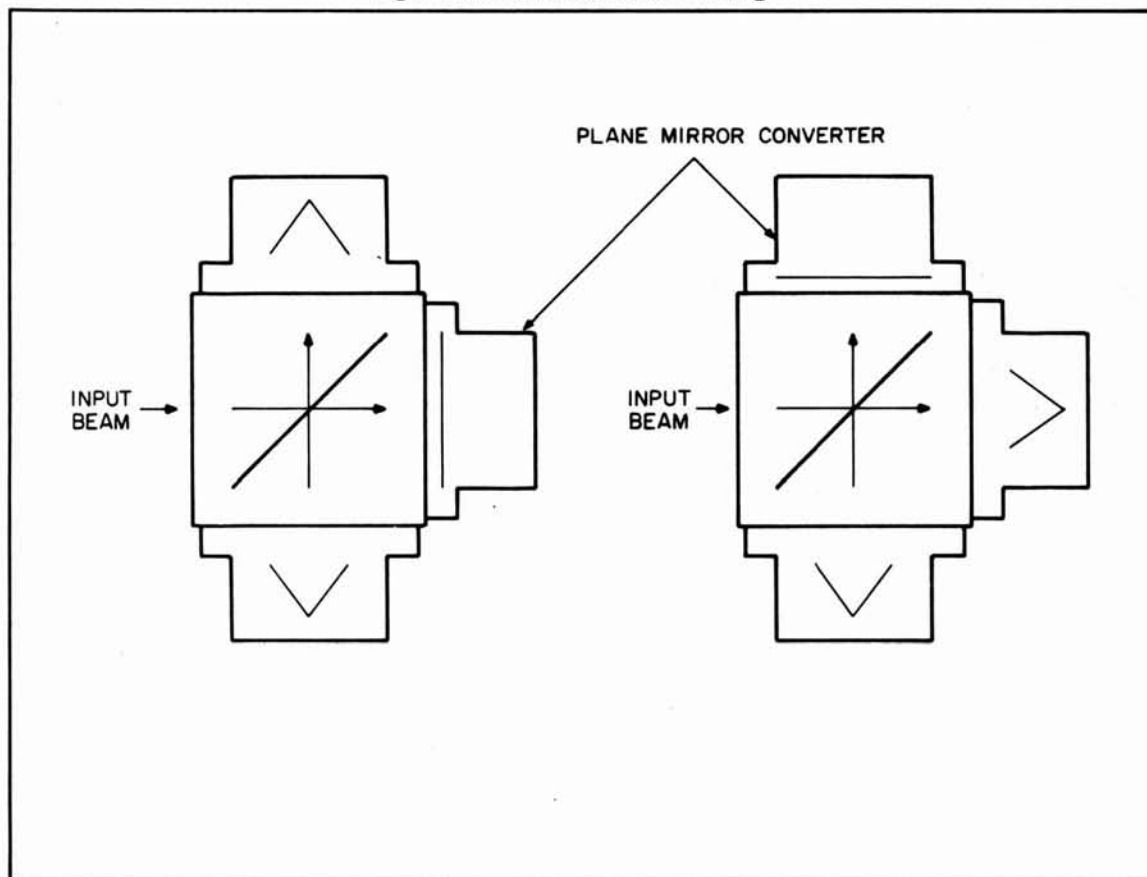
UNPACKING AND INSPECTION

Prior to shipment, this instrument was inspected and met all specifications listed in Table 1. Inspect the shipping container and, if damaged, remove and inspect the Plane Mirror Converter. If the Plane Mirror Converter is damaged, file a claim with the carrier and notify Hewlett-Packard immediately.

INSTALLATION

To mount the 10722A Plane Mirror Converter to the 10702A Linear Interferometer, use two 4-40 cap screws supplied with the Plane Mirror Converter. The Plane Mirror Converter must be mounted to one of the two outlet ports of the Linear Interferometer. The outlet ports of the Linear Interferometer are indicated by the direction of the arrows located on the side. Figure 3 illustrates the correct mounting configurations of the Plane Mirror Converter.

Figure 3. Plane Mirror Mounting



OPERATION

With the Plane Mirror Converter and an additional retroreflector, the Linear Interferometer can be converted to a Plane Mirror Interferometer*. The Plane Mirror Interferometer extends the Laser Measurement System's capability to make axial displacement measurements of a plane mirror reflector. A Plane Mirror Interferometer is illustrated in Figure 4.

Figure 4. Plane Mirror Interferometer



Because the two reflections inherent in the Plane Mirror Interferometer, there is optical resolution doubling.

Measuring Setups

The 5501A Laser Transducer System can perform either single axis or dual axis plane mirror measurements. The dual axis option is particularly useful for X-Y stage applications. The requirements for single axis measurements are: Laser Head, Plane Mirror Interferometer, and a plane mirror reflector. The dual axis requirements are: Laser Head, Beam Splitter, two Plane Mirror Interferometers, and two plane mirror reflectors. Typical measuring setups for single axis and dual axis measurements are shown in Figure 5 and 6.

*The Linear Interferometer includes one retroreflector.

Figure 5. Single Axis Measurement

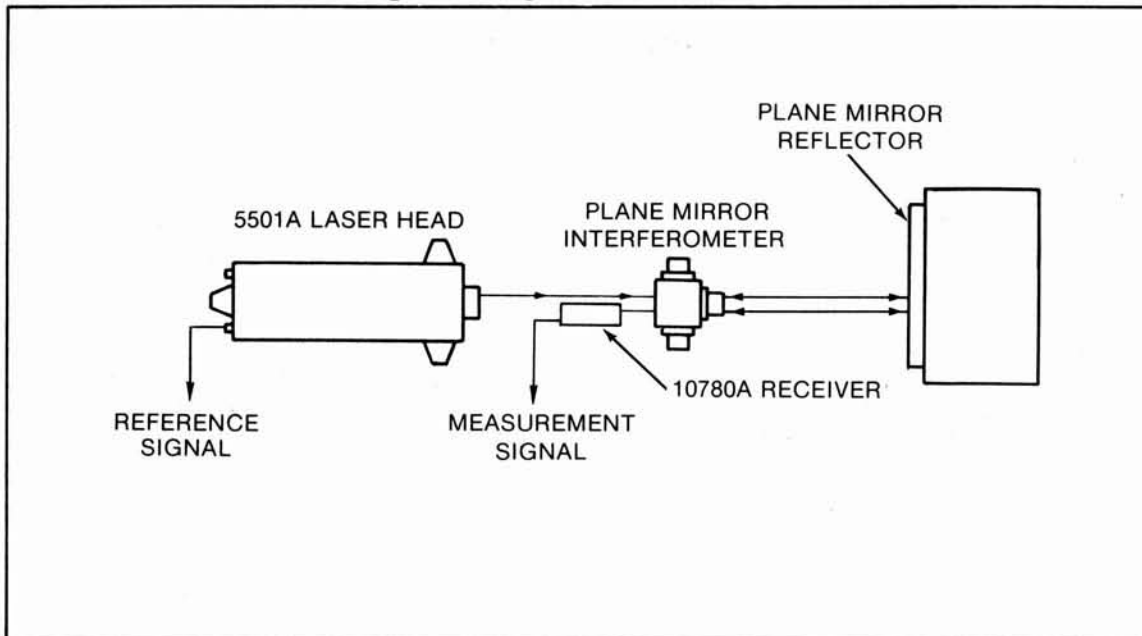
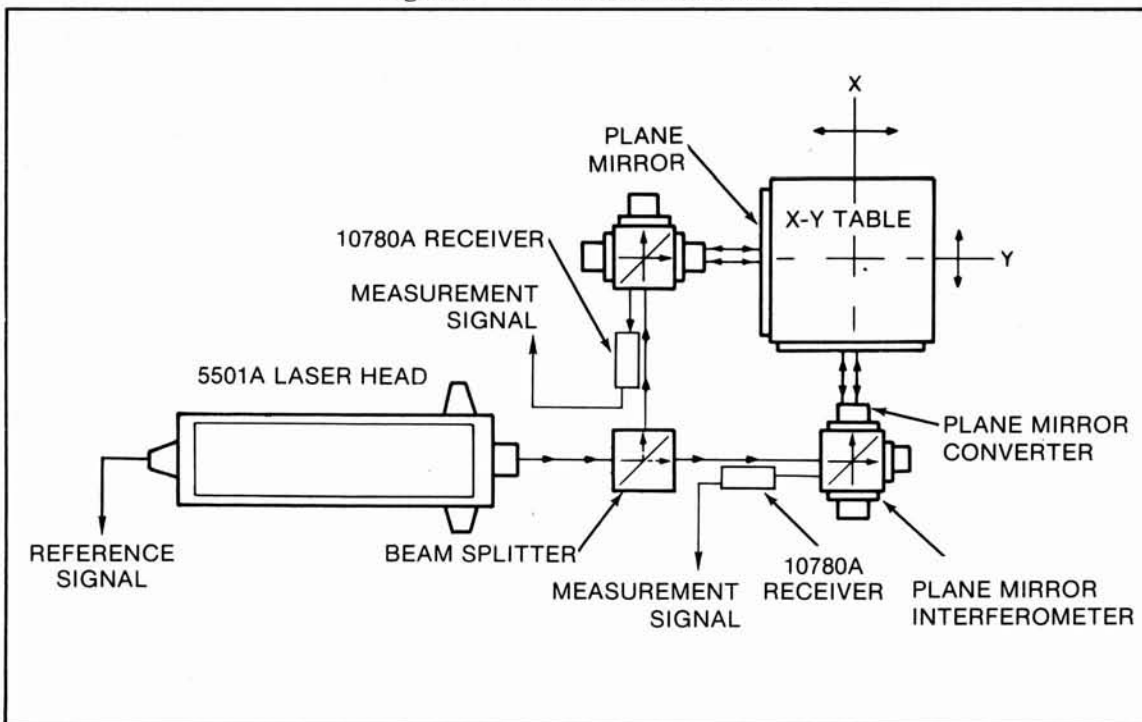


Figure 6. Dual Axis Measurement



The accuracy of the Laser Measurement System can be no better than the mounting of the plane mirror reflector. To maintain system accuracy, the plane mirror reflector must be mounted flat. When performing dual axis measurements, the plane mirror reflectors must be mounted perpendicular to the plane of measurement and at 90° to each other.

Operation Test

For an operational test, refer to the Plane Mirror Alignment procedures in Section 2 of the 5501 Laser Transducer System Manual.

MAINTENANCE

GENERAL

Maintenance of the Plane Mirror Converter consists of cleaning the metal and glass surfaces.

CLEANING

Use a soft camel-hair lens brush to remove dust from the windows of the Plane Mirror Converter. (A good camera lens brush with a rubber bulb blower is recommended.) Dampen a soft cotton swab with optical grade ethyl alcohol, shake off excess alcohol and wipe across window once. Use fresh tissue dampened with alcohol for each wipe. Allow alcohol to dry naturally.

NOTE

DO use only camera or better grade lens tissue.

DO NOT use any of the various impregnated eye glass tissues.

DO NOT use harsh solvents such as acetone or MEK to clean the interferometer.

DO NOT use excessive amounts of alcohol.

DO NOT wipe window if there is any abrasive dust or grit on it.

STORAGE

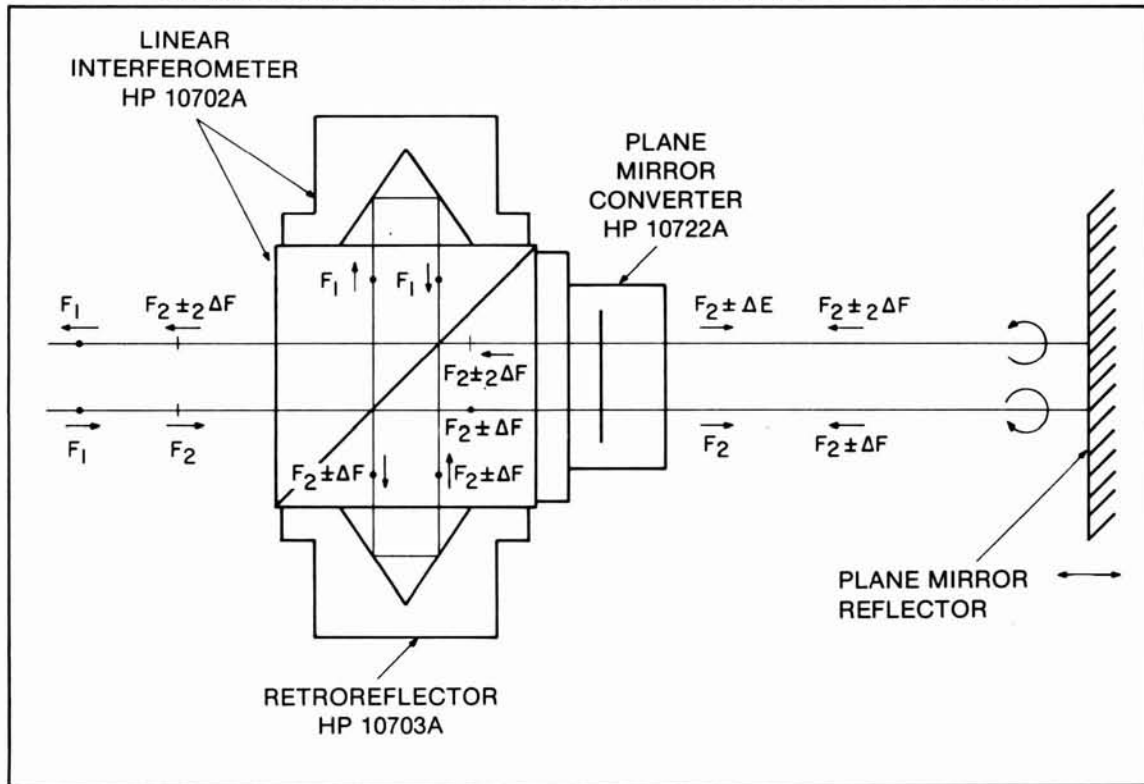
Keep the Plane Mirror Converter in its wooden storage box when it is not in use.

PRINCIPLES OF OPERATION

PLANE MIRROR INTERFEROMETER PRINCIPLES

Figure 7 illustrates the operation of the Plane Mirror Interferometer. The laser light beam containing frequencies f_1 and f_2 , of orthogonal linear polarization, leaves the center aperture of the laser head and enters the inlet port of 10702A Plane Mirror Interferometer. The polarized beam splitter in the interferometer splits the laser beam into its f_1 and f_2 components. The f_1 component is deflected to a cube-corner (retroreflector), which reflects the f_1 component back to the polarized beam splitter.

Figure 7. 5501A Laser Measurement System Plane Mirror Interferometer



The f_2 component passes through the polarized beam splitter and the plane mirror converter where it is changed from vertical polarization to circular polarization by the plane mirror converter. The f_2 component is reflected back on itself by the plane mirror reflector, resulting in $f_2 \pm \Delta f$ by 90° to change the polarization from circular to horizontal. As a result, the polarized beam splitter reflects the $f_2 \pm \Delta f$ to the second cube-corner, as shown in Figure 7. The cube-corner reflects the $f_2 \pm \Delta f$ back to the polarized beam splitter, where it is again reflected through the plane mirror converter. The plane mirror converter changes the beam polarization from horizontal to circular. The plane mirror reflects the $f_2 \pm 2\Delta f$ back through the plane mirror converter, which rotates the $f_2 \pm 2\Delta f$ polarization by 90° , resulting in a vertically polarized beam. The $f_2 \pm 2\Delta f$ beam is passed through the polarized beam splitter and a beam composed of $f_1 - f_2 \pm 2\Delta f$ is applied to the inlet port of the 10780A Receiver. The $2\Delta f$ frequency change is a result of the dual pass feature of the plane mirror interferometer (double Doppler shift).

Any tilting of the plane reflector relative to the beam axis results only in an offset of the return beam. Tilting of the reflected wavefront is compensated by the second reflection.



MANUAL DESCRIPTION

INSTRUMENT: 10722A Plane Mirror Converter
SERIAL PREFIX: 1948A
DATE PRINTED: JAN 1980
HP PART NO: 10722-90001
MICROFICHE NO: 10722-90002

CHANGE DATE: March 24, 1980

(This change supersedes all earlier dated changes)

- Make all changes listed as ERRATA.
- Check the following table for your instrument's serial prefix or serial number and make listed change(s) to manual.

IF YOUR INSTRUMENT HAS SERIAL PREFIX OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL	IF YOUR INSTRUMENT HAS SERIAL PREFIX OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL

► NEW OR REVISED ITEM**► ERRATA**

Page 2, Table 1, Components Supplied:

Change Quantity of cap screws supplied from 1 to "3".