LASER MEASUREMENT SYSTEM
5526A

OPERATORS HANDBOOK
SUPPLEMENT
FOR
SECOND AXIS ADD-ON
5526A OPTION 011

This handbook supplement applies directly to Model 5525A Option 011 Second Axis Add-On. For later revisions a change sheet is included with this supplement.

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INTRODUCTION

The Hewlett-Packard Model 5526A Option 011 Second Axis Add-On is an element of the 5526A Laser Measurement System. Option 011 completes the system capability to make measurements in two axes simultaneously. The second axis capability requires the basic 5500C Laser Head and 5505A Laser Display, plus the units in Option 010 Linear Interferometer, plus the units in Option 011 Second Axis Add-On.

The complete list of components required is:

1	5500C Laser Head	5526A Basic
1	5505A Laser Display	
1	10565B* Remote Interferometer	Option 010
1	10550B* Reflector Mount	
1	(2nd) 5505A Laser Display	
1	10567A Beam Splitter	Option 011
1	(2nd) 10565B* Remote Interferometer	
1	10556A Retroreflector	

*Includes one 10556A Retroreflector

DISTANCE CHANGE MEASUREMENT ONLY

This system measures only CHANGES in the distance between the 10556A Retroreflector and 10565B Remote Interferometer in each axis of measurement.

5526A LASER MEASUREMENT SYSTEM AND ITS PUBLICATIONS

Each component and each standard option of the 5526A system is described in a separate publication. A current listing of all publications about the 5526A Laser Measurement System is available from:

HEWLETT-PACKARD COMPANY
5301 Stevens Creek Boulevard
Santa Clara, California 95050
United States of America
Attention: Laser Publications

COMPANION PUBLICATIONS

This handbook supplement must be used with the following publications for complete information:

a. Laser Measurement System 5526A Operator's Handbook (Basic).

b. Laser Measurement System 5526A Operator's Handbook Supplement for Linear Interferometer 5526A Option 010.

Put this handbook supplement in the three-ring binder with a. and b. above.

OPTION 011 COMPONENT DESCRIPTION

The Model 10567A Beam Splitter is the only component in the Option 011 system that is not described in the 5526A basic publications or the Option 010 Linear Interferometer publications. The Beam Splitter is described completely in this publication.

Model 10567A Beam Splitter

The Beam Splitter divides the Laser Head output beam into two beams at right angles to each other. By reflecting these two beams with two separate 10550B Retroreflectors and through two separate 10565B Remote Interferometers, two separate linear measurements can be made simultaneously.

The Beam Splitter is an aluminum block, nearly cubical, with an optical glass plate mounted internally at a 45° angle. Figures 1, 2, 3, and 4 show the Beam Splitter details. One third of the glass plate is coated for full reflectance. Another one third is coated for partial reflectance and the final one third has no reflecting coating.

Figure 1. Two Axis Measurement Setup

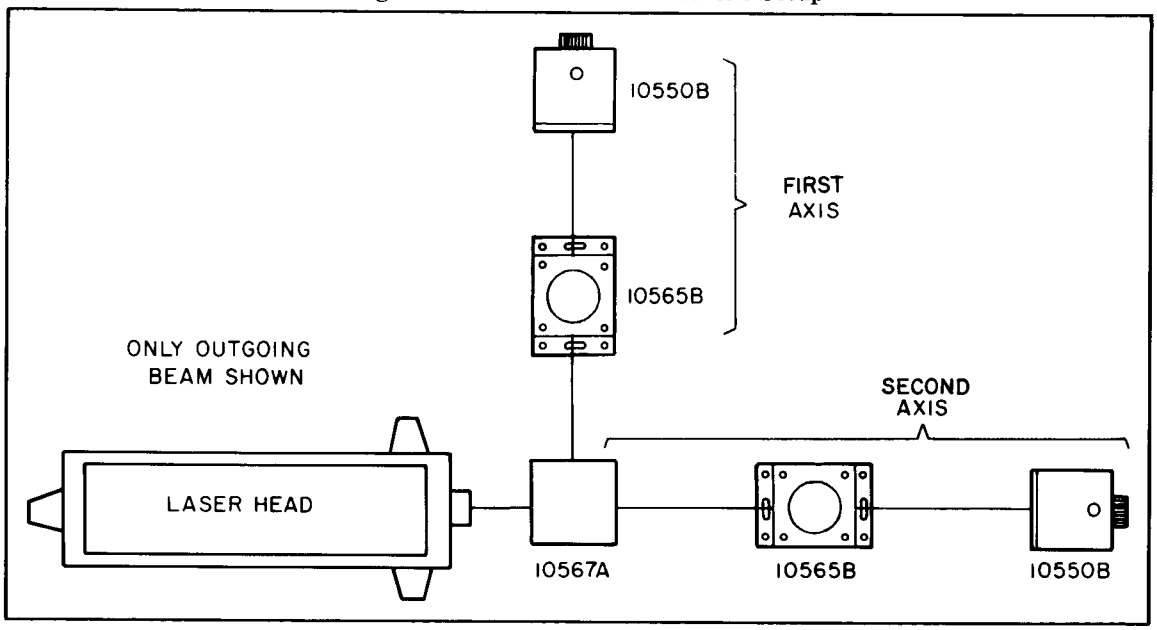


Figure 2. Beam Splitter Mirror Location

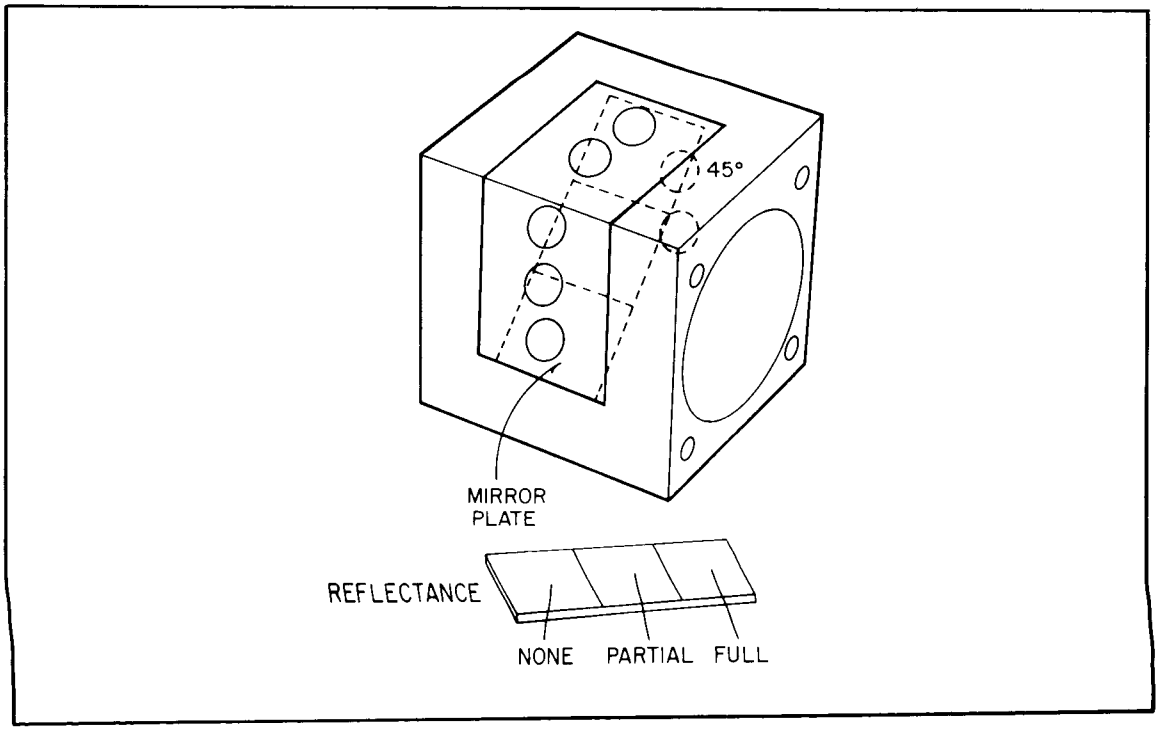


Figure 3. 10567A Beam Splitter Dimensions

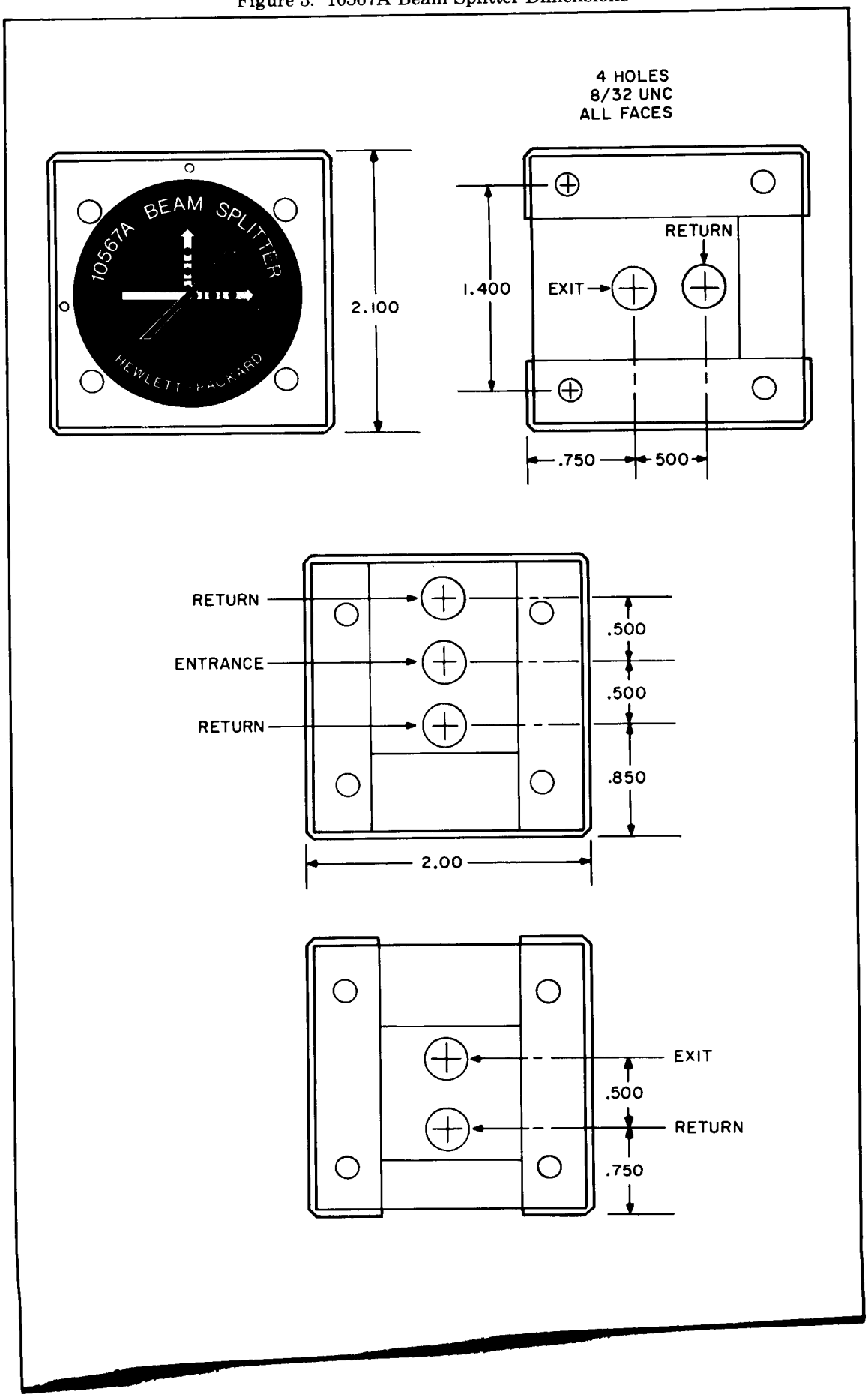
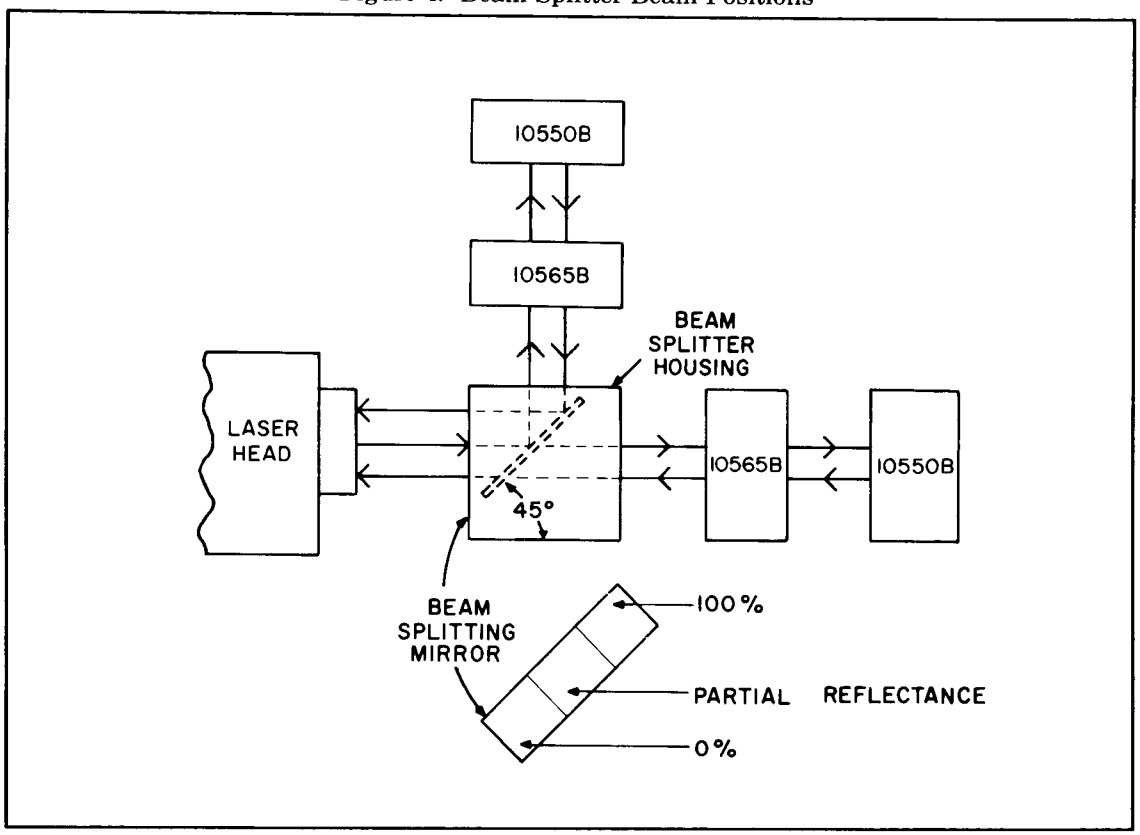


Figure 4. Beam Splitter Beam Positions



SYSTEM CONNECTION AND CHECKOUT

OPTION 011 SYSTEM INTERCONNECTION WITH TWO 5505A LASER DISPLAY UNITS

Interconnection of the Option 011 Two-Axis Laser Measurement System is similar to the Single Axis Option 010 system, but with the added Option 011 units. Connection of the second 5505A Laser Display unit is the same as the first:

1. Determine whether 115 or 230 volt alternating current line power will be used, and on both display units' rear panels set the SELECTOR slide switch so the voltage shown (115 or 230) matches your primary power source.

2. Check that the FUSE receptacles on both Display units contain the correct fuse (as labeled) to match the power source.

NOTE

The rear of the Laser Head has two connectors for two Laser Display unit cables. The connectors are labeled DISPLAY A and DISPLAY B. On the front of the Laser Head the four laser beam return apertures have labels indicating which two apertures are associated with the corresponding Laser Display (A or B).

3. Connect one Laser Display through a cable to the DISPLAY A connector and connect the second Laser Display through a cable to the DISPLAY B connector.

CAUTION

DO NOT connect or disconnect the Laser Head-to-Laser Display cables when a power cable is connected to the Laser Display. The Laser Head and Laser Display may be damaged if you disregard this CAUTION.

4. Set both Laser Display power switches down (off).

5. Connect power cables to both Laser Displays and to a correct source of power.

CAUTION

Always switch both Laser Display units power to ON simultaneously.

DO NOT switch one Laser Display power ON and wait several moments to switch the second unit ON. (The two Display units may not lock together, and the power supply regulators may malfunction.)

NOTE

In a dual Laser Display system the Laser Display connected to the Laser Head "DISPLAY A" connector will control the Laser Head laser tube tuning through the Laser Display "A" TUNE ← → switch.

PRELIMINARY ELECTRONICS CHECKOUT

After the procedures in the preceding paragraphs on System Interconnection are completed, the two axis system should be checked in operation to test all electronics capabilities of each unit. Use the procedure which follows on the next page.

1. Apply power to both Laser Display units simultaneously.

2. On both Laser Displays observe that the following events happen:
   a. Display panel numbers light.
   b. NORMAL pushbutton lights.
   c. RESET pushbutton lights begin flashing.

3. On both Laser Display units press the following buttons separately and observe that each lights up:
   a. SMOOTH
   b. X10
   c. VELOCITY
   d. NORMAL

4. On the Laser Display unit connected to the A DISPLAY connector observe that the LASER TUNING meter needle is in the green area. If the needle is off to one side push the TUNE ← → switch momentarily in the direction the needle should move near the center.

WARNING

THE POWER OUTPUT IN THE LASER BEAM FROM THE LASER HEAD IS LOW COMPARED TO MANY OTHER LASER INSTRUMENTS_ BUT DUE TO THE ONE-COLOR HIGH BRILLIANCE OF THIS LASER BEAM IT SHOULD NOT BE ALLOWED TO SHINE DIRECTLY IN ANYONE'S EYE. IT IS THE CONSIDERED OPINION OF THE HEWLETT-PACKARD COMPANY THAT THE LASER LIGHT BEAM FROM THIS INSTRUMENT IS NOT A HAZARD TO HEALTH AND SAFETY.

5. During operation the laser beam comes out of the center hole in the front turret. Hold a white card in front of the turret and observe the red laser beam shining on the card.

6. On both of the Laser Display front panels, set the UNITS switch to "in", and the DIRECTION SENSE switch to F.

7. On both Laser Displays, open the COMPENSATION doors and press the CHECKS 1 buttons. The number +6230231 should be displayed on the panel of both Laser Displays after about two seconds.

8. Set the UNITS switches to "mm". The number +15824787 should be displayed on both display units.

9. On both Laser Displays, set the COMPENSATION PPM thumbwheel switches to 321.0.

10. On both Laser Displays, set the UNITS switches to $\lambda/4$ (quarter wavelengths). The number +9993210 should be displayed.

NOTE

The four right hand digits 3, 2, 1, and 0 correspond to the settings of the thumbwheel switches. If desired, each thumbwheel can be cycled through all ten digits to check the full sequence. After checking, the thumbwheel switches should be set to an appropriate compensation number. (725.0 is a common average setting.)

11. On both Laser Displays, press the CHECKS 2 buttons. After a few seconds the polarity sign at the left of the displays should change from + to - (minus).

12. On both Laser Displays, change the DIRECTION SENSE switches from F (forward) to R (reverse). The polarity signs should change to +.

13. On both Laser Displays, set the PRINT switches to TIMED. Turn both of the PRINTS-PLOTS/MIN switches to 6 and listen for a relay click in the Laser Display every 10 seconds. Turn the switches to 60 and listen for a click each second. Separately press each PRINT switch down to the MANUAL position. The relay will click as the switch goes down.

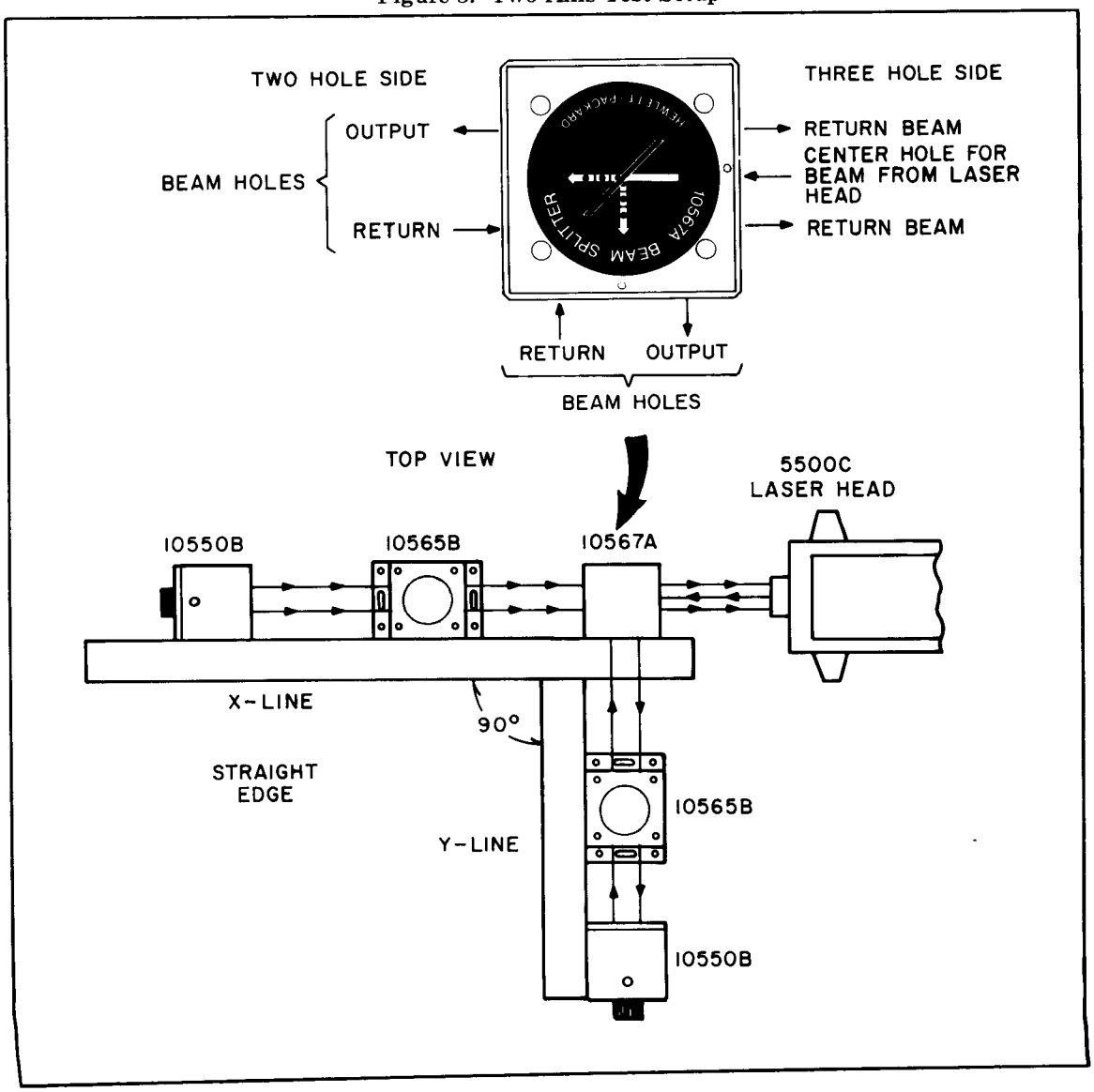
FIRST TEST AND FAMILIARIZATION WITH 5526 OPTION 011 TWO-AXIS LINEAR INTERFEROMETER

After the procedures in the preceding paragraphs on Preliminary Electronics Checkout are completed, the two-axis measurement capability should be checked for test of equipment and operator familiarization. Use the following procedure:

1. Put standard 1/4" bases on the 10567A Beam Splitter, two 10565B Remote Interferometers and two 10550B Retroreflectors.

2. Put the 10567A Beam Splitter two 10565B Remote Interferometers and two 10550B Retroreflectors on a flat stable surface as shown in Figure 5. (A large granite surface plate is recommended.)

Figure 5. Two Axis Test Setup



3. Put the Laser Head on a flat stable surface 1.38 inch below the surface that the 10567A, Beam Splitter, and two 10565B Remote Interferometers are resting on. See Figure 5. (The 10580A Laser Tripod is recommended to mount the Laser Head.)

4. Put the magnetic target templates with their holes along the Horizontal on the input parts of the two 10565B's and the two 10550B's.

5. Align the 10567A, 10565B, and 10550B along the X-line as shown. Align the Laser Head so the laser beam goes into the middle hole of the 10567A. (Refer to the ALIGNMENT section of this book for requirements of alignment.) The following conditions must be met:

   a. Entire system is on a flat stable surface.

   b. The 10567A, Beam Splitter, two 10565B Remote Interferometers, two 10550B Retroreflectors are on standard bases and on flat stable surface.

   c. The base of Laser Head should be 1.38 inch below bases of the 10567A, Beam Splitter, two Remote Interferometers and two 10550B Retroreflectors. (Sets laser beam at correct elevation.)

6. Align the second pair of 10565B Remote Interferometers and 10550B Retroreflectors along the Y-line at right angles to the X-line and on the flat surface. Figure 2 shows the correct holes for the laser beam.

7. Reset both Laser Displays and open the horizontal beam return ports on the Laser Head.

8. If the 10567 Beam Splitter and the two pairs of 10565B Remote Interferometers and 10550B Retroreflectors are properly aligned with the laser beam, the two BEAM ALIGNMENT meters should indicate in the green area. If not, recheck the system alignment.

9. After correct alignment is achieved, test the system in both axes for the ability to make measurements by moving the Remote Interferometers and Retroreflectors. The test is complete.

FIXTURING

INTRODUCTION

Fixturing for two axis measurements is similar to one axis with the addition of the 10567A Beam Splitter. Refer to the FIXTURING section in the Option 010 supplement to the basic 5526A Operator's Handbook. Each measurement axis of the two axes can be fixtured in the same way as a single axis system. Refer to the figures showing the dimensions and locations of the beam holes in the Beam Splitter.

The direct beam going through the Beam Splitter is offset approximately 1/10 inch at the output by the glass plate. This offset must be considered in the original setup.

Inside Mounting of Remote Interferometer

In a two axis measurement setup a Remote Interferometer cannot be mounted inside the Laser Head. (Internal mounting of the Remote Interferometer blocks all but the bottom beam return hole of the Laser Head.)

ALIGNMENT

INTRODUCTION

Alignment for two axis measurements is similar to the one axis alignment described in the Option 010 Supplement to the basic 5526A Operator's Handbook. Each separate axis can be aligned in the same way as a one axis is described in the Option 010 supplement.

The direct beam going through the Beam Splitter is offset approximately 1/10 inch, by the glass plate. This offset must be considered in the original setup.