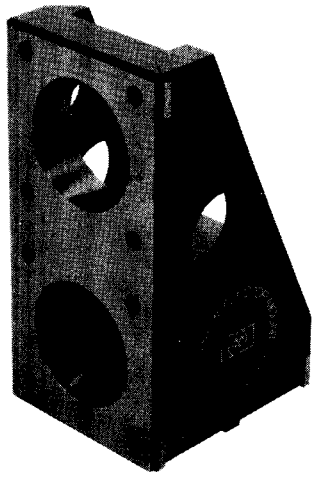
REFLECTOR MOUNT
10559A

ACCESSORY FOR 5526A

LASER MEASUREMENT SYSTEM

INSTRUCTION MANUAL



SERIAL PREFIX: 1208A

This manual applies directly to Hewlett-Packard Model 10559A Reflector Mounts with serial prefix 1208A. For units with different serial prefixes a manual change sheet is supplied.

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INTRODUCTION

The Hewlett-Packard 10559A Reflector Mount is an accessory for the 5526A Laser Measurement System. The Reflector Mount is a small precision, magnetic, stainless steel frame designed to hold two 10556A Retroreflectors (cube corners) in precise alignment. The 10559A can be used with the 5526A Laser Measurement System and other accessories to measure precision surface flatness, pitch and yaw, and small angles.

5526A LASER MEASUREMENT SYSTEM AND ITS PUBLICATIONS

Each component of the 5526A system and each standard option are described in separate publications. 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
Attention: Laser Publications

INSTRUMENT IDENTIFICATION

Each Hewlett-Packard instrument has a ten-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.

PACKING AND INSPECTION

Prior to shipment, this instrument was inspected and met all specifications. Inspect the shipping container; if it is damaged, inspect the Reflector Mount for damage. If the Reflector Mount is damaged file a claim with the carrier and notify your Hewlett-Packard representative.

MOUNTING 10556A REFLECTORS IN THE 10559A

Two 10556A Reflectors must be mounted in the 10559A Reflector Mount for angular measurements. For accurate measurements, the reflectors must be installed carefully. To install the reflectors properly, perform the following steps:

a. Remove 10556A Retroreflector from 10565B Remote Interferometer by removing the four hex head screws.

b. Remove 10556A Retroreflector from 10550B Reflector/Mount by removing the four hex head screws.

c. Properly clean the reflector mount and the two retroreflectors.

d. Insert the two retroreflectors gently in the mount.

NOTE

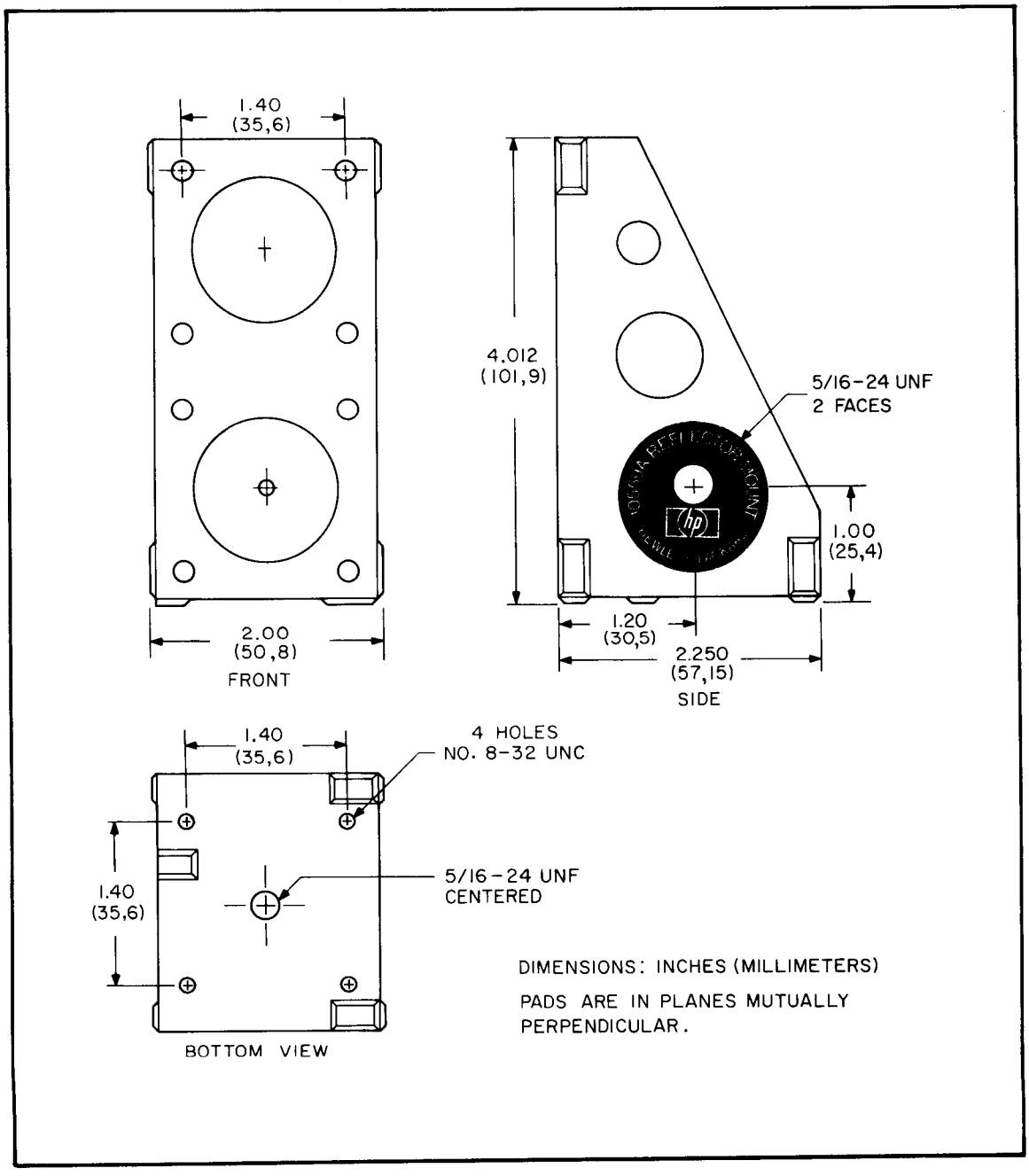
Turn the retroreflectors so that none of the edge lines of the trihedral prisms cut across the ingoing laser beam. (See the Laser Interferometer instructions.)

e. Gently screw the retroreflectors in place with four screws each.

CAUTION

DO NOT tighten the screws more than finger tight.

Figure 1. Reflector Mount Dimensions



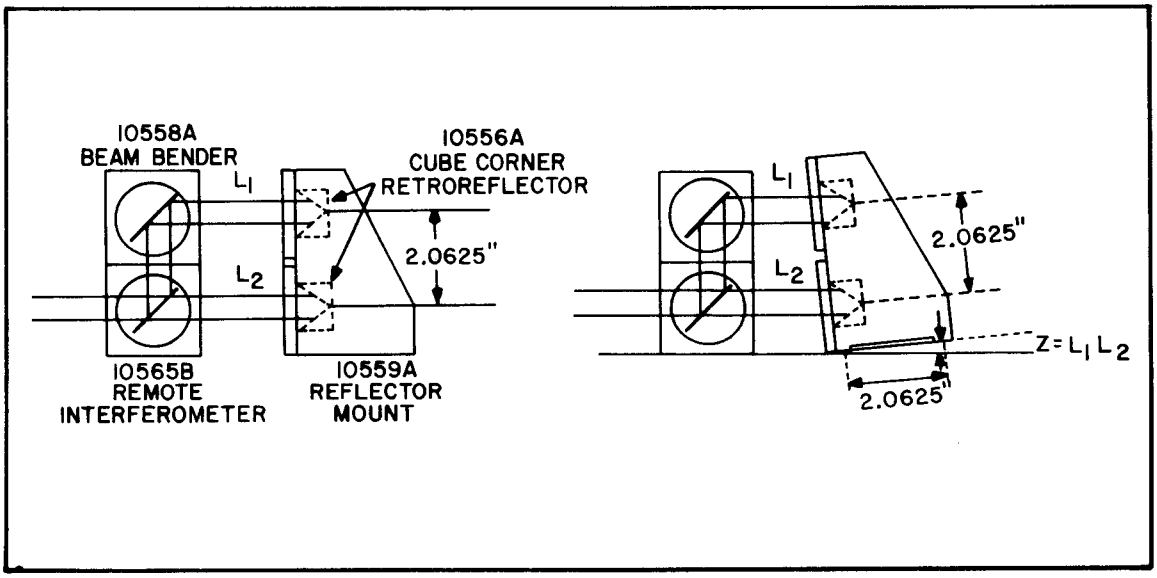
APPLICATIONS

Option 020 supplement to the 5526A Laser Measurement System Operator handbook explains the setup procedures for pitch and yaw, and small angle measurements. Application Note 156-2, Calibration of a Surface Plate, details the setup procedure for surface plate flatness measurements. These publications also describe the correct alignment procedures for each type of measurement.

THEORY OF OPERATION

The Model 5526A Laser Measurement System measures the difference in the length of two laser beam paths (L_1 and L_2 as illustrated below) emerging from the Model 10565B Remote Interferometer.

Figure 2. Angular Measurement



In order to use this difference for angular measurement, the Model 10558A Beam Bender first deflects beam path L_1 to become parallel to path L_2. The two beams are then reflected by two Model 10556A Cube-Corner Retroreflectors mounted in the Model 10559A Reflector Mount and directed back to the interferometer for detection.

Pitch/Yaw

When the Reflector Mount rotates in a counterclockwise direction, L_1 becomes shorter than L_2. The angle of rotation θ is expressed

$$\sin\theta = \frac{L_2 - L_1}{2.0625 \text{ in.}}$$

since the two Cube-Corner Retroreflectors are spaced 2.0625 inches apart. If $L_2 - L_1$ is 0.000,01 inch (the resolution of the NORMAL mode of operation of the laser interferometer), then θ is equal to one arc-second. Thus, a measure of 0.000,001 inch difference between L_1 and L_2 (the resolution of the X10 mode) corresponds to an angle of 0.1 arc-second.

Flatness

The spacing of the feet of the Reflector Mount is 2.0625 inches, the same as the Retroreflector spacing. Consequently, when the Reflector Mount tilts due to an elevation difference "Z" between its front and rear feet, the path difference $L_1 - L_2$ is exactly equal to the difference in feet elevation. The resolution of flatness measurements is the same as the interferometer resolution, namely 0.000,001 inch (in the X10 mode of operation).