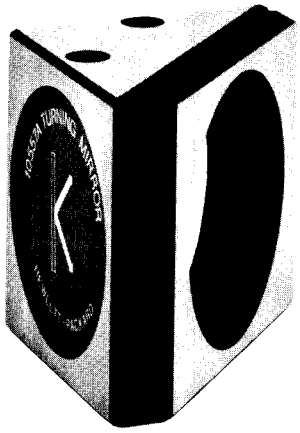
10557A

TURNING MIRROR ACCESSORY FOR

5526A LASER MEASUREMENT SYSTEM

Instruction Manual

Serial Prefix: 1216A



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HEWLETT hp PACKARD

SAFETY PRECAUTIONS

WARNING

LASER BEAM

This instrument emits laser light. The power output of the HP laser is low in comparison to most other lasers, either continuous wave or pulsed, but due to the high brilliance factor, the output beam of any laser should never be allowed to strike the eye directly. It is the considered opinion of Hewlett-Packard Company that the light beam from this device presents NO hazard to health and safety. However, the existence of newly enacted federal regulations with respect to laser devices together with the lack of any widely accepted standards of laser power safety thresholds requires the insertion of this cautionary statement.

WARNING

HIGH VOLTAGE

High voltages are generated within the laser housing. The cover of the Model 5500C Laser is provided with an interlock to prevent accidental access to these voltages. There are no high voltages on the interconnecting cable, however, should it become cut or disconnected.

INTRODUCTION

The Hewlett-Packard Model 10557A Turning Mirror is an accessory for the 5526A Laser Measurement System. The Turning Mirror consists of a high quality front-surface mirror housed in a precision ground block of magnetic stainless steel.

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.

UNPACKING AND INSPECTION

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

SPECIFICATIONS

Accuracy: Mirror face parallel to the front face within ±1 minute, perpendicular to the top and bottom within ±1 minute, and 45° to the sides within ±1 minute.

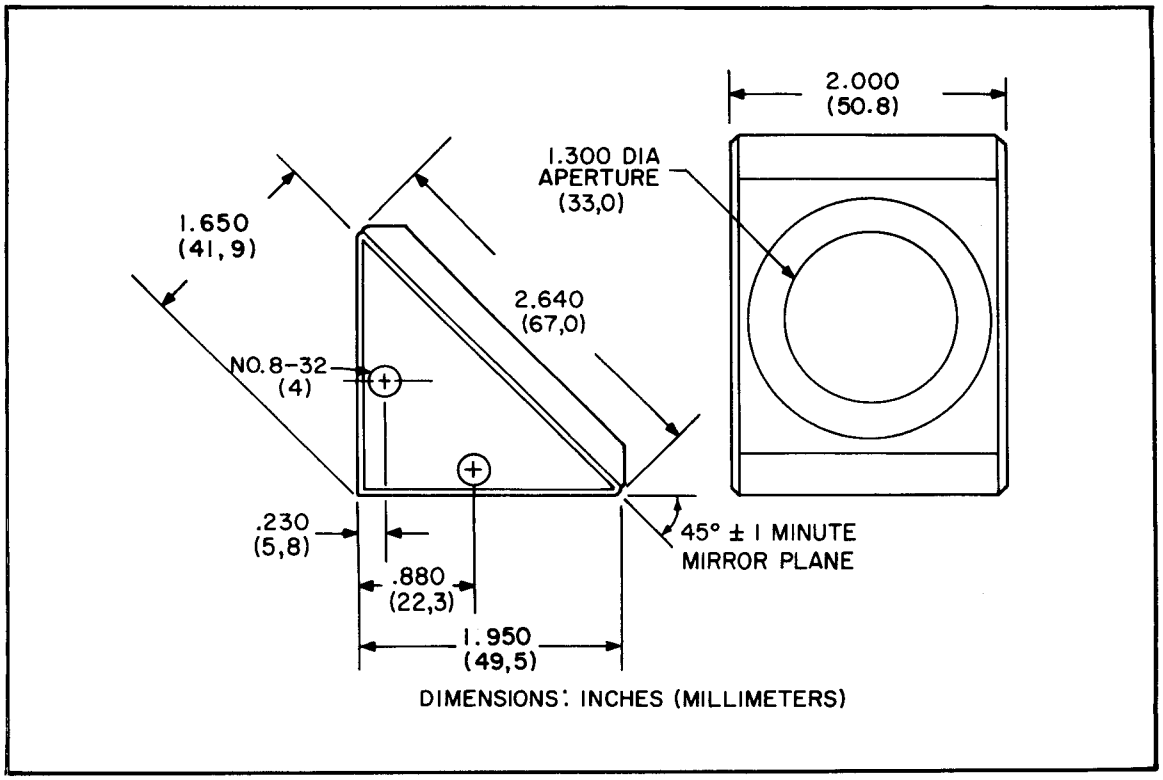
Ground surfaces at 90° and 45° ±1 minute to each other.

Mirror:
Flatness of $\lambda/20$ at 6328Å
Hard dielectric coating
Reflectance of 99.8% normal incidence, at 6328Å

Weight: 1 lb. (0.45 kg)

Dimensions: Refer to Figure 1.

Figure 1. 10557A Turning Mirror Dimensions



CLEANING

Use a soft camel-hair lens brush to remove dust and grit from the Turning Mirror surface. (A good camera lens brush with a rubber blower is recommended.) Dampen a few optical lens cleaning tissue with optical grade ethyl alcohol, shake off excess and wipe across mirror once. Use fresh tissue dampened with alcohol for each wipe. Allow alcohol to dry naturally.

NOTE

USE CAMERA OR BETTER GRADE LENS TISSUE.

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

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

DO NOT use excess amounts of alcohol.

DO NOT WIPE mirror if there is any abrasive dust or grit on the mirror, use lens brush first.

OPERATION

The HP 10557A Turning Mirror was designed for use in surface plate flatness calibration procedures. However, the Turning Mirror can also be used in autoreflection alignment procedures, and for beam bending. When certifying machine tool calibration, the autoreflection alignment technique is recommended to ensure greatest accuracy.

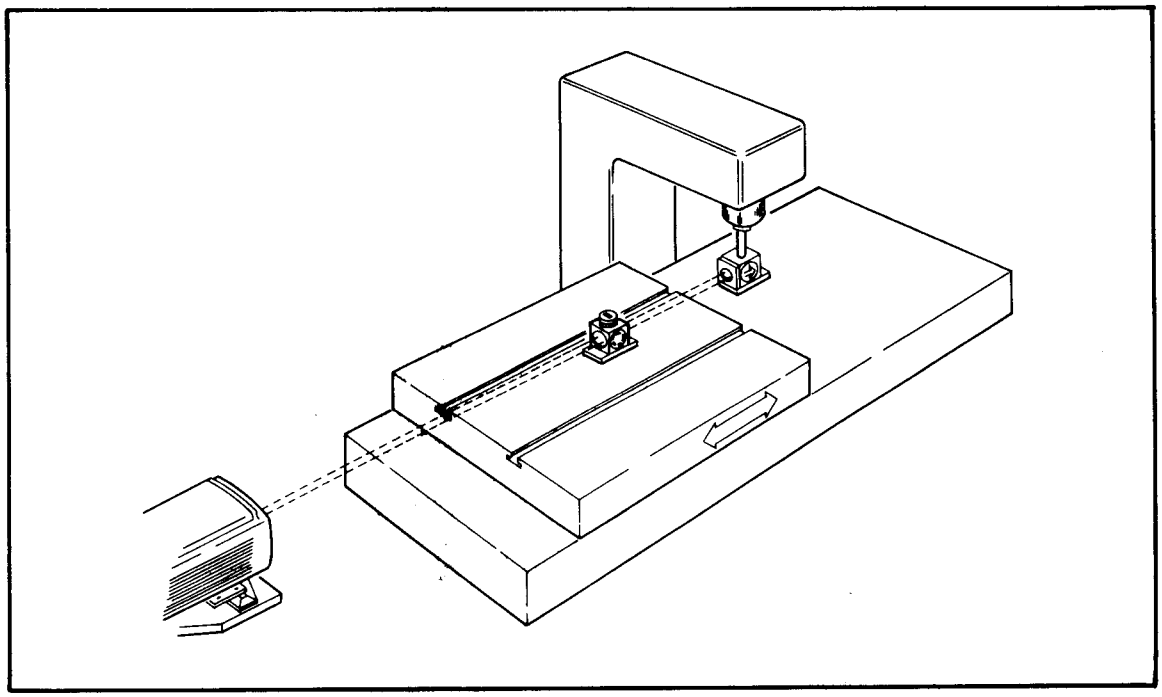
For information regarding surface plate flatness calibration procedures, refer to Application Note 156-1, Calibration of a Surface Plate.

AUTOREFLECTION ALIGNMENT PROCEDURE

In the autoreflection alignment method a plane reflector such as the Model 10557A Turning Mirror is mechanically aligned with its reflecting face perpendicular vertically and horizontally to the measurement line of travel. The Laser Head is set up at least 20 inches, but not more than 20 feet from the mirror and is adjusted so the laser beam is reflected back by the mirror to the center beam exit port of the Laser Head turret.

The purpose of the autoreflection alignment method is to minimize cosine error and ensure that the laser beam is parallel to the measurement surface. Refer to Option 010 supplement to the Laser Measurement System Operator handbook for additional information regarding cosine error. If a measurement similar to the one illustrated in Figure 2 is to be performed, align the Laser Head in the following manner.

Figure 2. Linear Measurement



1. Determine the line of travel to be measured and put the Turning Mirror at the far end of travel, as shown in Figure 3. The Turning Mirror should be positioned more than 20 inches but not more than 20 feet from the Laser Head. Take the magnetic template from the 10565B Remote Interferometer and center it on the front of the Turning Mirror.

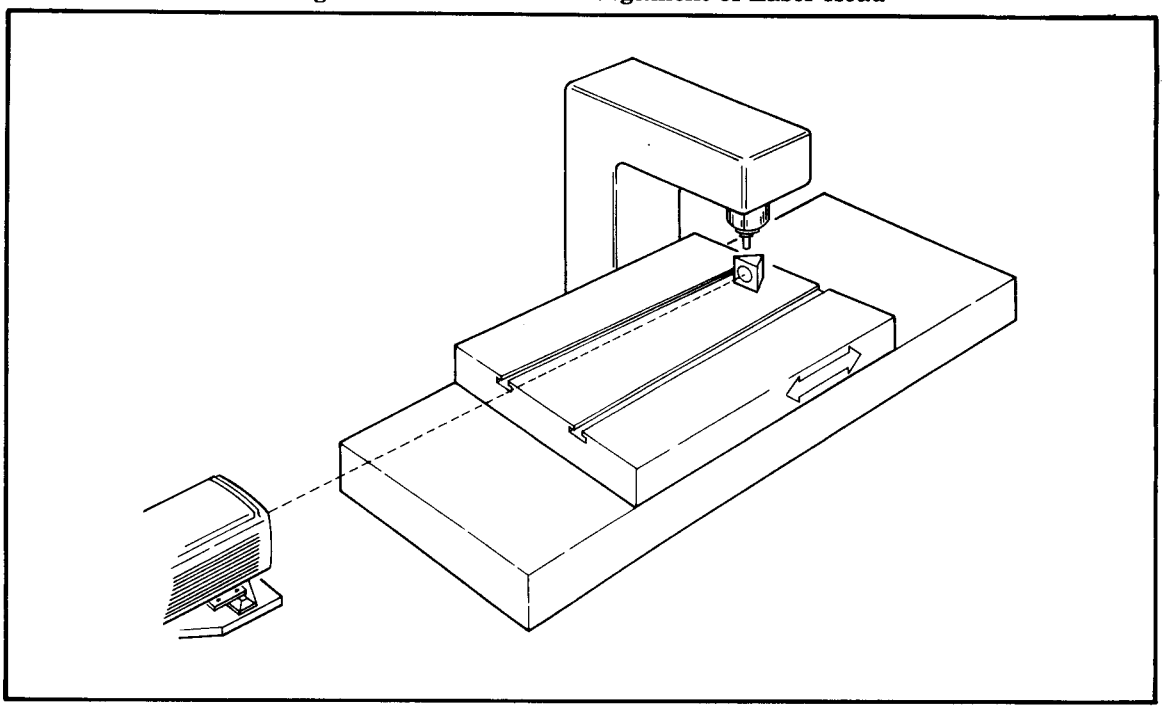
2. Adjust the mirror so the mirror face is perpendicular vertically and horizontally to the line to be measured by indicating the front or front and top surfaces with an accurate gage (an electronic gate is recommended).

3. Position the Laser Head, as shown in Figure 3, so the laser beam is directed at the top aperture of the template. Turn the small aperture in the Laser Head turret to the output hole.

4. Very carefully adjust the Laser Head to center the reflected beam from the mirror on the center beam exit aperture of the Laser Head. The laser beam should remain centered in the aperture of the template. The reflected beam will appear as a "halo" around the small exit port.

5. Install the Remote Interferometer and laser reflecting device on the object to be measured and then position for maximum BEAM ALIGNMENT meter indication. Check alignment at the near and far end of travel and verify that the reflected laser beam remains centered in the appropriate Display A return port.

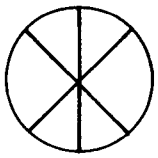
Figure 3. Autoreflection Alignment of Laser Head



TURNING MIRROR ALIGNMENT WITH SINGLE BEAM INTERFEROMETER

1. Determine the line of travel to be measured and put the Single Beam Interferometer at the near end of travel. Take the magnetic template from the Remote Interferometer center it on the front of the Single Beam Interferometer.
2. Position the Laser Head so the laser beam is directed at the top aperture of the template. Turn the small aperture in the Laser Head turret to the output port.
3. Carefully adjust the Laser Head and the Single Beam Interferometer to center the reflected beam in one of the Display A inlet ports. When properly adjusted, the beam pattern should appear as shown in Figure 4.

Figure 4. Laser Beam Return Pattern



4. Put the Turning Mirror at the far end of travel. Carefully adjust the Turning Mirror until the two reflected laser beams are superimposed on the same Display A inlet port.
5. Slide the Turning Mirror to the near end of travel. Verify that the two beams are still superimposed on the same Display A inlet port. Adjust the Laser Head tilt control if the beams are not aligned correctly.
6. Very carefully adjust the Turning Mirror and the Single Beam Interferometer for maximum beam current indication on the 5505A Laser Display BEAM ALIGNMENT meter.

NOTE

If unable to get beam alignment, repeat step 3. The reflected laser beam pattern must be centered on the Display A inlet port as shown in Figure 4.