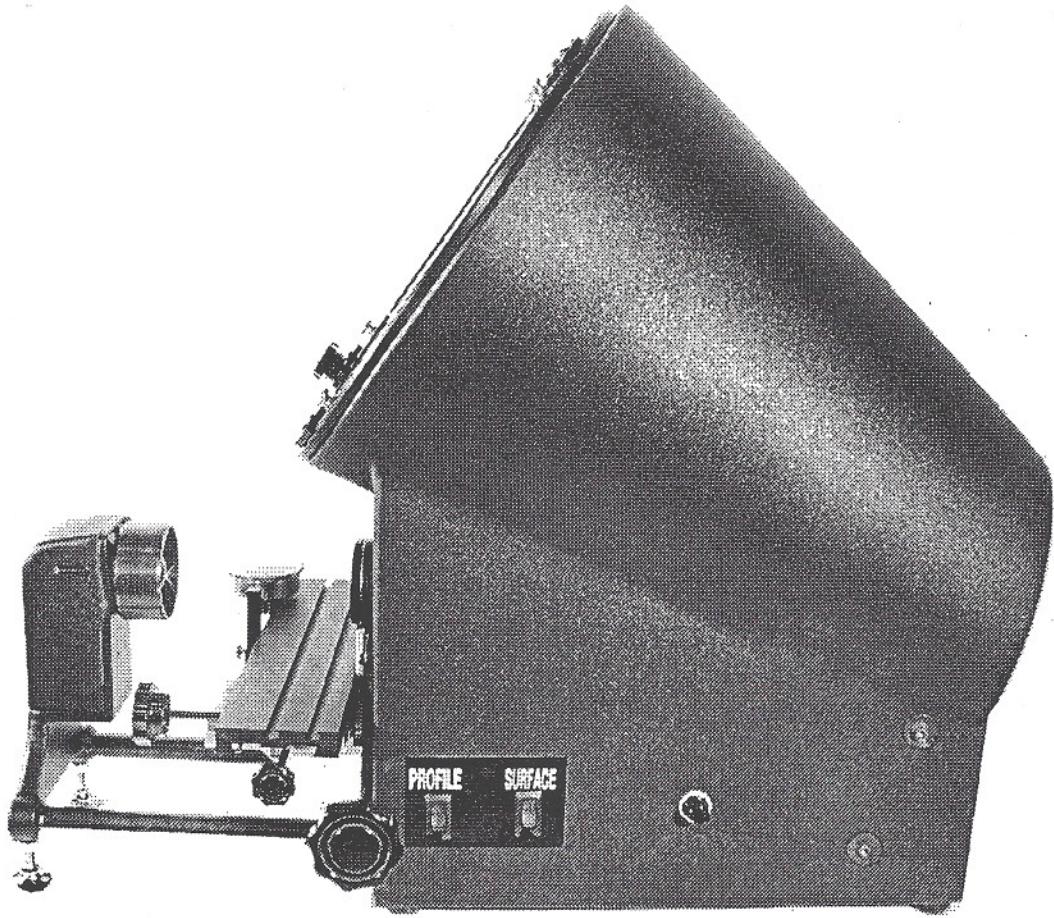




# FOWLER OPTICAL COMPARATOR



Part Number 53-900-000

## INSTRUCTION MANUAL

**Fred V. Fowler Co., Inc.**  
66 Rowe Street, Newton, MA 02466  
For Customer Service call 1-800-788-2353 or Fax 617-332-4137  
[www.fvfowler.com](http://www.fvfowler.com)

# SETUP

The comparator is shipped fully assembled. It is ready to use after unpacking and installing the glass screen included.

1. Remove the comparator from the shipping container. The glass screen is packed in a separate box. Place the comparator on a bench and remove the packing materials.
2. Refer to Figure 1. Remove the glass screen from its protective packaging and install on the front of the comparator case. Loosen the two lower roller brackets on the screen ring and allow the rollers to drop downwards against the screen ring. *(A hole has been provided in the glass screen to allow for a small L-Key to be inserted, to help guide the screen in to place. Be careful not to scratch or chip the glass when using an L-Key in this hole.)* Insert the top edge of the glass screen under the vernier scale attached to the top of the screen ring. Slide the glass screen upwards, butting up against the top rollers. The bottom of the glass screen will now have enough clearance to allow lowering of the entire glass screen gently into place, sitting flush within the screen ring. The glass screen should ride directly on all 4 rollers and should not drag or grind against the outside reticle ring. Therefore readjust the two lower roller brackets so that they lift the glass screen slightly above the reticle ring. Tighten the screws that hold the bottom roller brackets in place. Then adjust the top roller brackets so that they are against the top of the glass screen and tighten the screws that hold the top roller brackets in place.
3. If using drop indicators with lug backs on the "X" and "Y" axis, attach them to their respective mounts. There is a bracket on the left-hand side of the case for mounting the "Y" axis drop indicator. A sliding "Y" stop post is provided to zero out the indicator. Another bracket is screwed into the front left-hand side of the top table (measuring stage). This is where the "X" axis drop indicator is mounted. A sliding "X" axis stop is provided to zero out the indicator. The "X" axis stop is mounted in the front T-slot of the table base. The "X" axis stopped can be positioned by loosening the lock screw and slid to the left or right. Take care to place the indicator shaft parallel to the line of travel.
4. Plug the comparator into a properly grounded 110 V AC receptacle. Turn on the profile lamp and surface lamp, with the switches on the side of the comparator case. Turn the lamps off when not using the comparator. This will extend the life of the lamps.  
NOTE: The alignment of the profile lamp should be checked when the machine is first unpacked, as handling during shipment could cause misalignment. (See Profile Lamp Adjustment Procedure section)

## **Lens Information**

There are two lenses, a condensing lens (mounted in front of the measuring stage, closest to the operator), and an objective lens (mounted to the rear of the measuring stage, through the face of the main case).

To change the objective lens for varying degrees of magnification, loosen the thumbscrew on the backplate and slide the lens out of the mounting bore. Insert the objective lens with the desired degree of magnification, but do not tighten the thumbscrew until the lens is calibrated.

Calibrate the lens by setting a gauge pin upon the measuring stage and projecting the image on the screen. Slide the lens in to decrease magnification, and out to increase magnification. Adjust until the screen image is correct for the degree of magnification marked on the lens face.

If desired, use a certified glass scale:

<b>10X:</b>	use .400 diameter gauge pin
<b>20X:</b>	use .200 diameter gauge pin
<b>40X, 50X:</b>	use .100 diameter gauge pin

After lens is properly calibrated, tighten the thumbscrew. If the objective lens needs to be switched out frequently, it is advised to make a custom spacer or collar to reduce time spent recalibrating.

## **Utilizing Drop Indicators For Point-To-Point Measurement**

After mounting the appropriate "X" and/or "Y" drop indicators, as described above, then zero out the indicators against the appropriate stop. Place your workpiece upon the moveable stage top. Using the stage control knobs, move the measuring stage in the X or Y direction. The distance traveled by the measuring stage will be shown on the appropriate indicator.

Otherwise, a typical application would be to optically line up the workpiece area to be measured on a crossline of the screen. Then zero out the appropriate indicator at that point. Using the stage control knobs, move the measuring stage in the X or Y direction. The distance traveled will be displayed on the appropriate indicator.

## **Overlay Measurements**

Overlay charts can be made of any clear, transparent material. Insert the overlay underneath the spring clips. The overlay should be flush against the glass screen.

## **Glass Reticle Screen**

Do not use acetone or aggressive solvents to clean the glass screen. Clean screen with a mild soap and water solution. Wipe clean using lint free cloth.

## **Internal Glass Mirror**

The internal rear mirror is constructed of glass. The mirror is accessed by removing the front glass reticle screen and reaching into the back of the case. The mirror can carry a heavy coat of dust without reducing light reflection significantly. If cleaning is necessary, wipe the glass lightly with alcohol or a mild glass cleaner using a soft lint free cloth.

## **Rear Mirror Adjustment**

The mirror has been set at the factory to provide consistent magnification of the projected image at any point on the screen. Resetting the mirror should be necessary only if the unit has been bumped or if the mirror mount has come loose.

The mirror is attached to the case by four socket head screws. The screw heads are accessible at the outside rear of the case; two heads on either side. Increasing the distance between the mirror and lens will result in a larger screen image. Decreasing the distance results in a smaller image.

If the magnification appears inconsistent on the screen, check the image size of a gauge pin in each quadrant of the glass screen (i.e. the 1,2,3, and 9 o'clock positions). If the image size is not the same, loosen the screws slightly and tilt the mirror. After tightening the screws, recheck for size.

## **Measuring Stage Adjustments**

All components of the measuring stage that move have dovetailed joints with gibs. The gibs can be adjusted to take up slop in the movement by tightening the socket set screws, which press against the gibs. Do not overtighten the setscrews, as it will cause binding of the joint.

## **Profile Lamp Adjustment Procedure**

The profile lamp is halogen type double bayonet rated at 12v and 20 watts. and has a 2,000 hour life rating.

To adjust the lamp, first unscrew the front cover and lift upward off the locating pins to expose the lamp. All lamp adjustments are made with the lamp turned on. **CAUTION: The lamp is hot and bright. Shield your eyes and do not touch the surface of the lamp.**

Make sure there are no objects on the measuring stage. Move the stage downwards so it does not block the lens. While adjusting the light, the broadest part of the lamp filament should always be facing the condensing lens.

Loosen the two screws holding the lamp bracket. Move the lamp towards the condensing lens until the light ring around the objective lens is slightly larger than the objective lens. If the lamp is too close to the condenser lens, a yellow hue will appear on the screen perimeter. Retighten the bracket screws. The lamp should not have to readjusted, even after changing lamps.

Loosen one of the two lamp bracket screws completely and the other slightly (such that the bracket can be moved by tapping it with a metal object). Remove the objective lens and insure that the undiffused light spot appears in the center of the screen. Replace the objective lens. This is an approximate setting for the lamp.

### **For the final adjustment of the lamp:**

Place a 2-inch gage block on the measuring stage table. View all four edges of the 2-inch block. Adjust the profile lamp by tapping the bracket until all four edges of the block display a very sharp image. Next, lock both bracket screws. Because the filament varies from lamp to lamp, this final adjustment needs to be done each time a lamp is replaced.

## **Surface Illumination Beamsplitter Mirror Adjustment**

Remove the front glass reticle screen. The Beamsplitter mounting box is now visible on the inside of the comparator case.

Loosen the beamsplitter mirror locking thumbscrew slightly and use the thumbscrew as a handle to adjust the position the split mirror in the mounting box until the surface image is consistent upon the screen. You will be able to move the beamsplitter mirror back and forth, or rotate it slightly. NOTE: Use a highly reflective object (such as a shiny gauge block or the blade of a square) on the stage for this test.

Once you have a consistent image, tighten the thumbscrew.

# **MAINTENANCE**

## **Dovetails, Rack and Pinions**

The X, Y, and Z axes utilize dovetail movements as bearing ways, and rack and pinion as a drive. If they appear dirty, wipe them clean with a rag and a light oil as a solvent. When dry, apply a lightweight grease.

## **Lamp Replacement – General Information**

The profile and surface lamps have a fixed life and should be turned off when not in use. If a lamp burns out, unplug the unit off before replacing the lamp.

**The lamps are very hot when lit, so make sure the unit is shut off for 5 minutes before you touch a lamp.** Oil from your fingers can get on the lamp surface and shorten the life of the lamp. Therefore use a clean tissue or cloth to handle the lamp.

## **Profile Lamp Replacement**

Unplug the power to the comparator. Leave comparator unplugged for at least 5 minutes to allow bulb to cool off. To gain access to the profile lamp, the condensing lens must be removed by loosening the thumbscrew located on the right of the lamp housing, and removing the lens. Then remove the 2 socket head cap screws that hold the lamp housing cover on. Lift the cover off of the 2 locating pins and you can now replace the profile lamp. Be sure to replace the lamp with a 12V 20W halogen bulb only. Using a different size bulb will cause the unit to overheat and possibly cause injury. Once the lamp must be seated properly in the socket, no other adjustments will be required. Replace the lamp housing cover and condensing lens.

## **Surface Illumination Lamp Replacement**

Unplug the power to the comparator. Leave comparator unplugged for at least 5 minutes to allow bulb to cool off. To gain access to the surface lamp, the front glass reticle screen needs to be removed from the face of the comparator. The lamp socket is attached to the bottom of the beamsplitter mounting box, and is held in place by an L shaped bracket. The bracket is attached with a thumbscrew to the back of the beamsplitter mounting box. Loosen the thumbscrew, slide the L shaped bracket to one side and allow the lamp socket to drop downwards, away from the beamsplitter mount. Remove the lamp from the socket assembly. Install the new lamp in the socket and reinstall the lamp/socket assembly. The lamp must be seated properly in the beamsplitter box but will require no other adjustment.

## **Notes on Surface Illumination**

Reflectivity varies widely from part to part. If the part is non-reflective, you will not be able to get measurements using the surface illumination feature. Note that if magnification exceeds 20-power, surface viewing becomes nonexistent.

### **Notes on Projected Images**

The optical comparator images project a fixed monocular focal plane. This means there will be problems viewing the end of a round part or grooves in round parts.

**Figure 1**

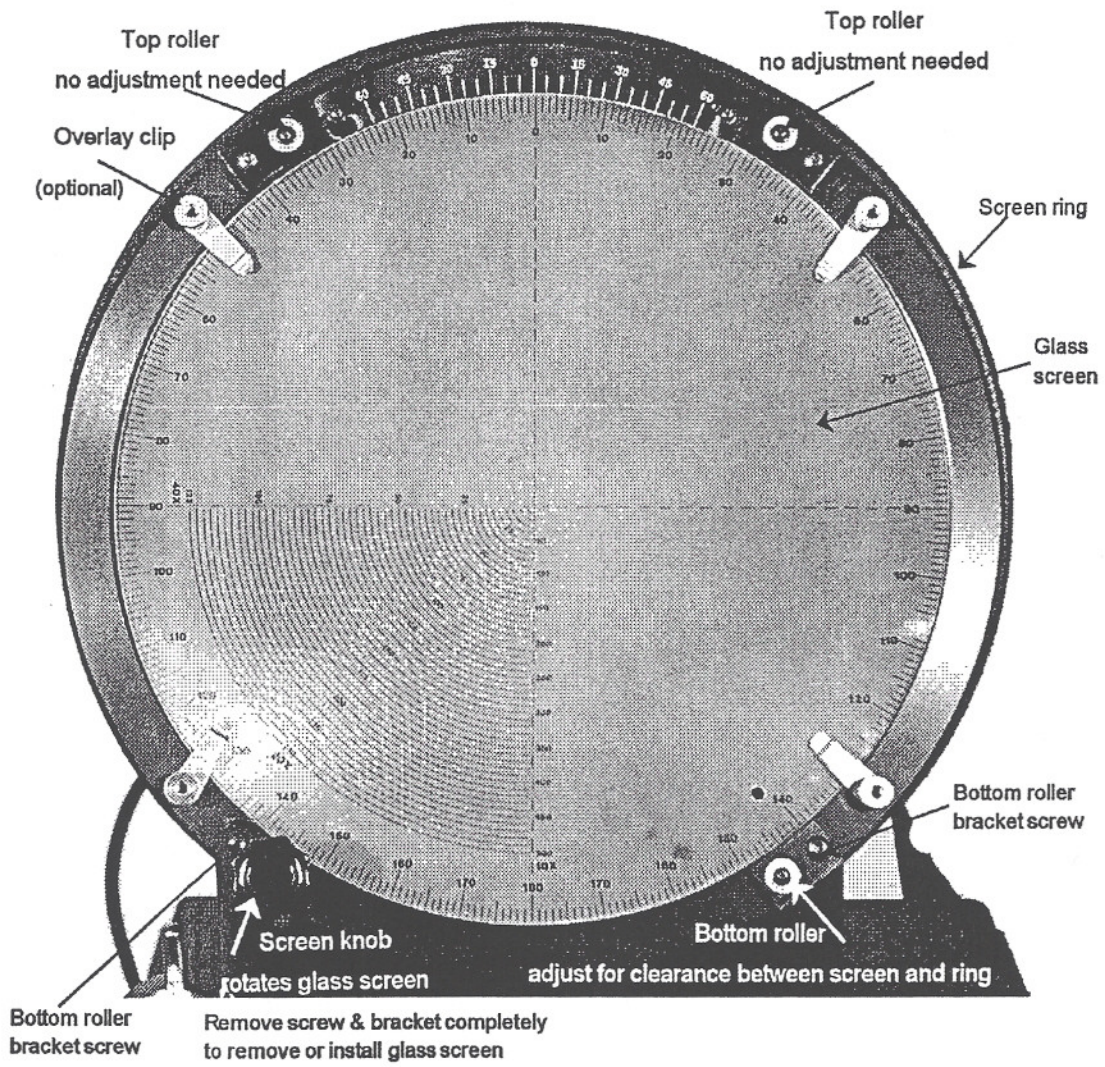




Figure 2

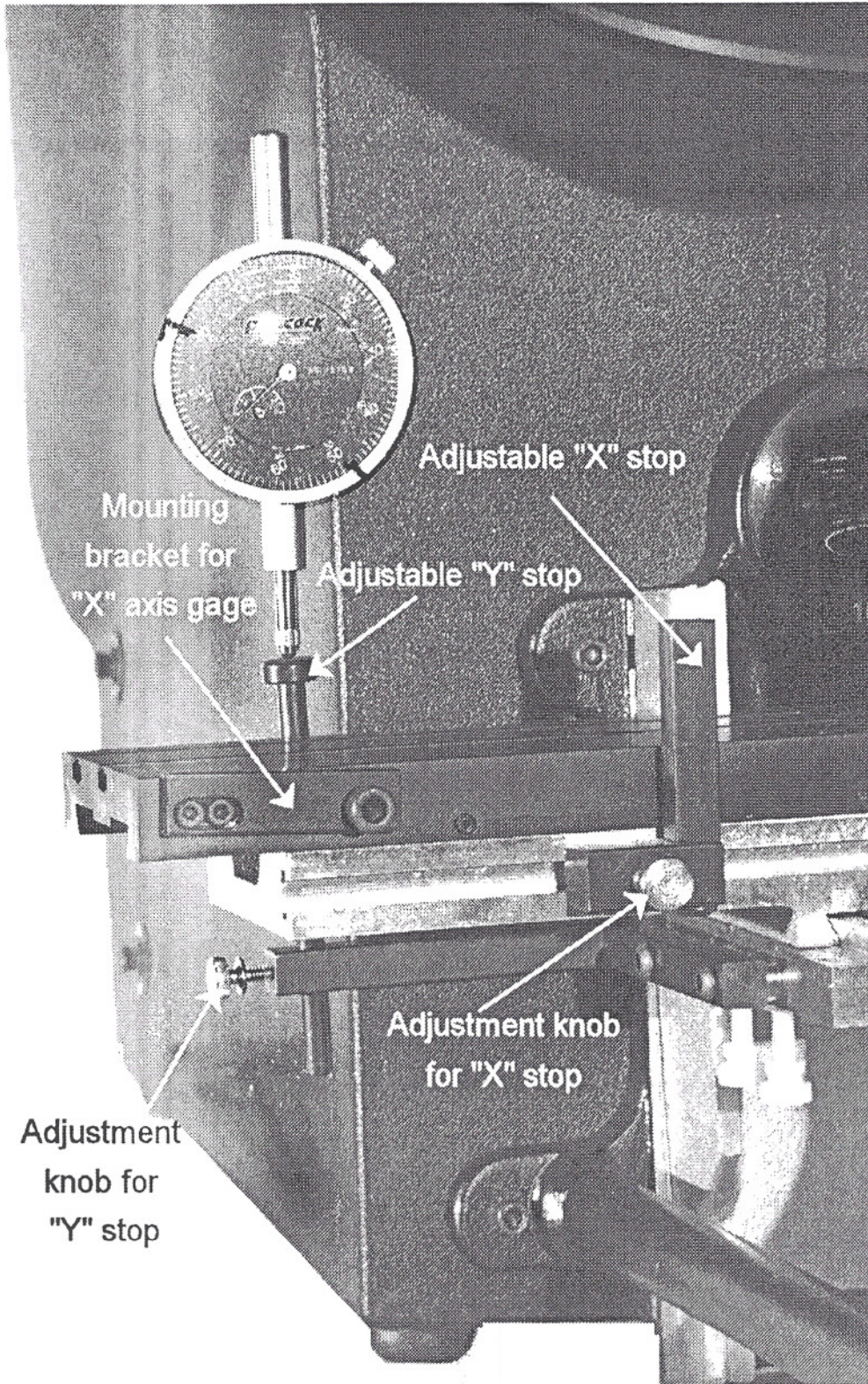


Figure 3

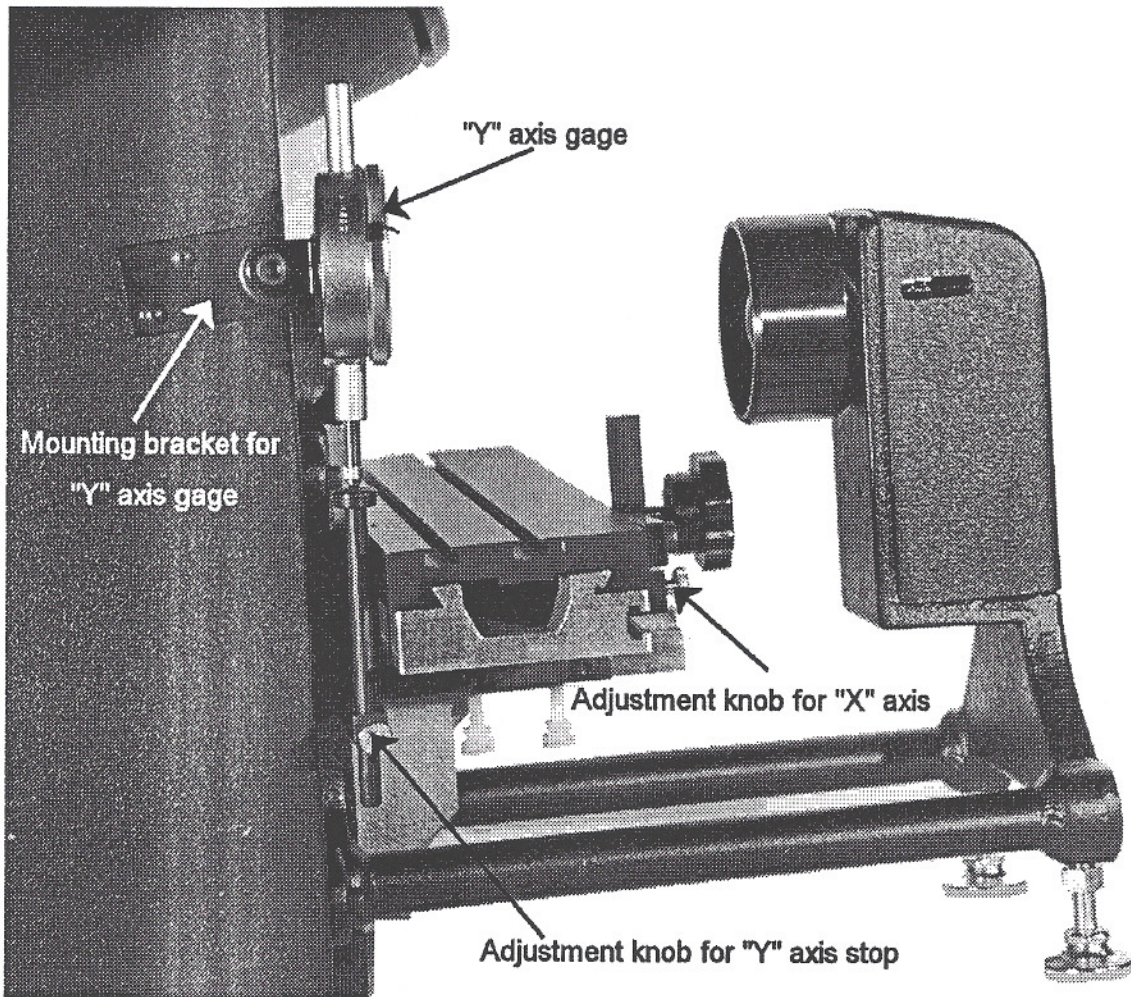


Figure 4

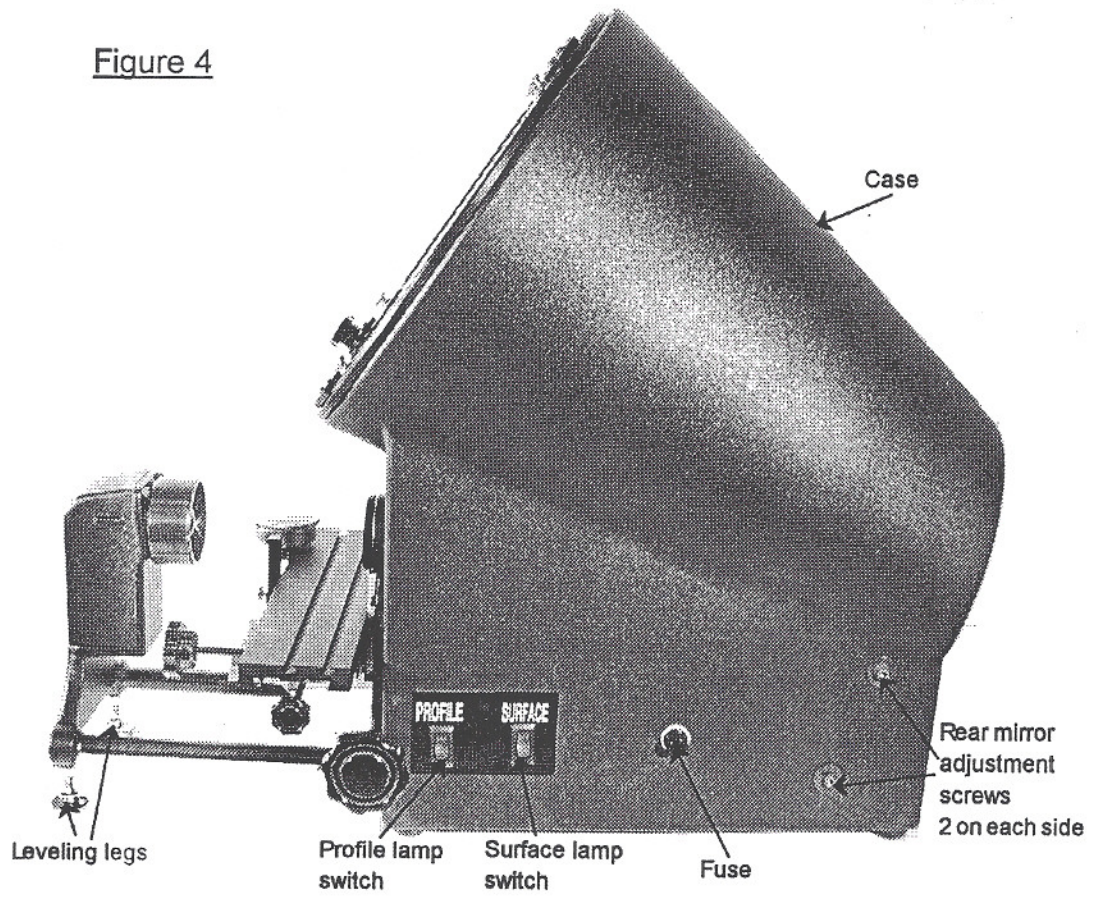


Figure 5

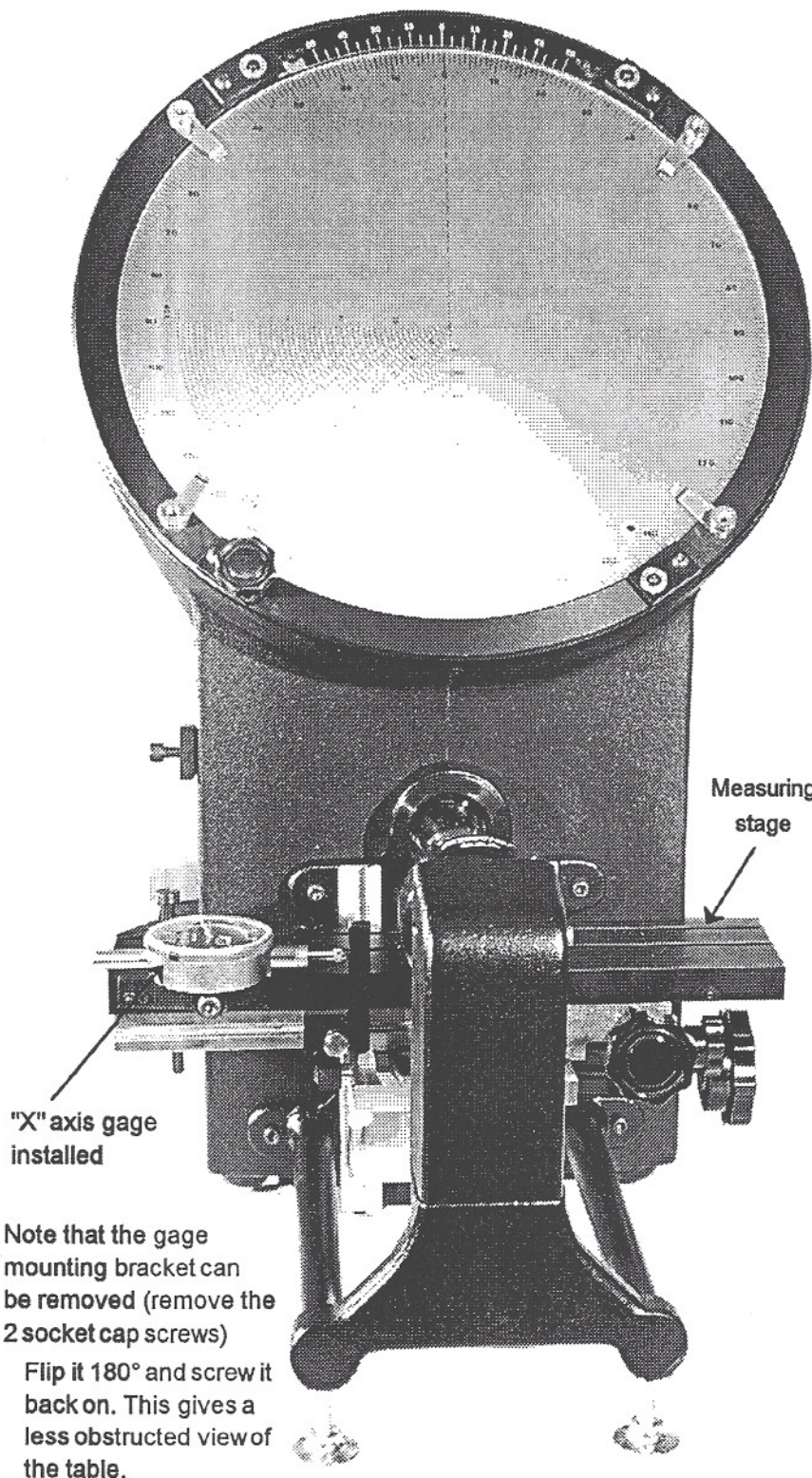


Figure 6

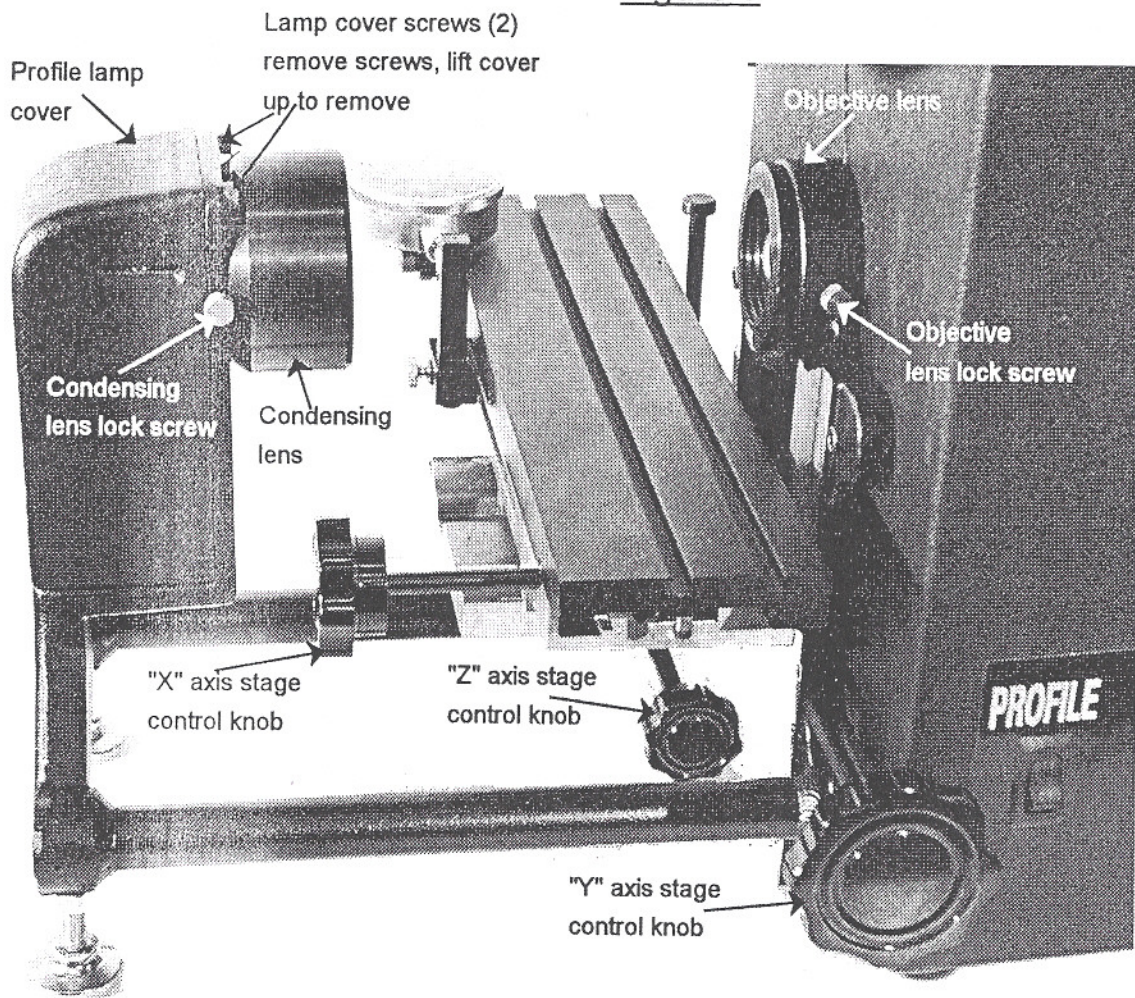
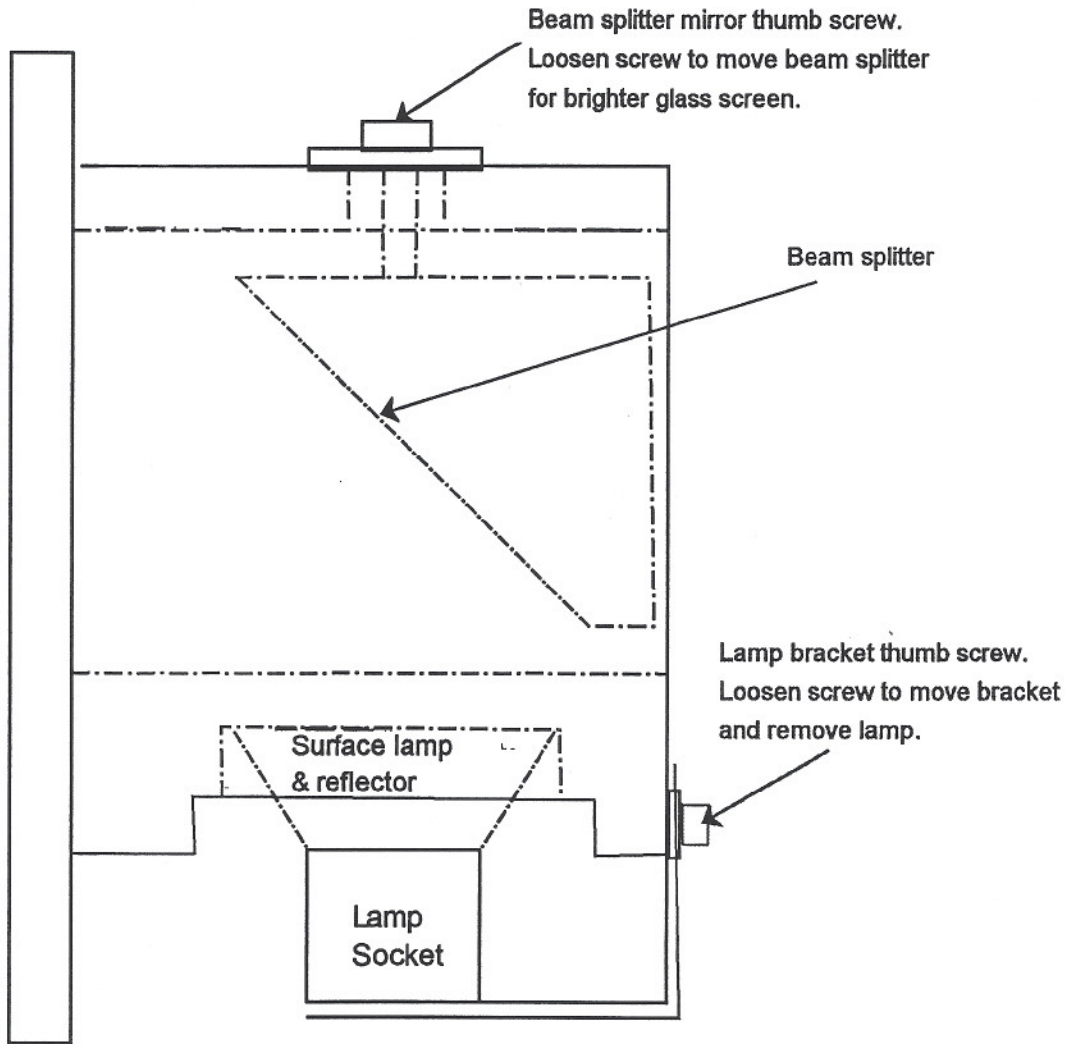


Figure 7



**Beam Splitter Mounting Box**