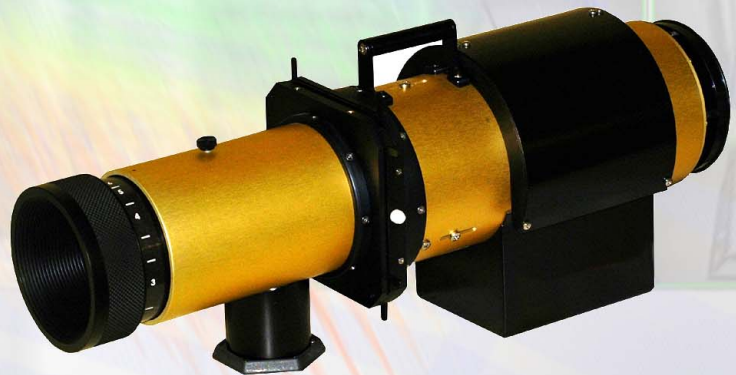


PRO-SPOT User Manual

Picture Perfect Measurements™



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NOTE: CAREFULLY STUDY THIS MANUAL PRIOR TO USING THE PROJECTOR.

PRO-SPOT Equipment List

The diagram below shows the correct way to pack the PRO-SPOT system.

The PRO-SPOT kit consists of:

- One PRO-SPOT projector.
- One PRO-SPOT power unit.
- One high-power AC cable.
- One external sync cable.
- One projector slide (available choices 650, 1400, 5600 points).
- One user manual.
- One glass cleaning cloth.



The following optional accessories are available:

- One Heavy Duty Tripod and Mechanical Pan Head for positioning the projector.
- Additional projector slides – available densities 650, 1400, 5600 points.
- Remote control slave – a wireless (coded infrared) slave for firing the projector externally.

Dimensional Information



Length: 21.0"/534mm
Height: 8.5"/216mm
Width: 6.5"/165mm
Weight: 15lbs / 6.8kg

Length: 19.25"/490mm
Width: 5.5"/140mm
Height: 12.5"/318mm
Weight : 22lbs/10kg

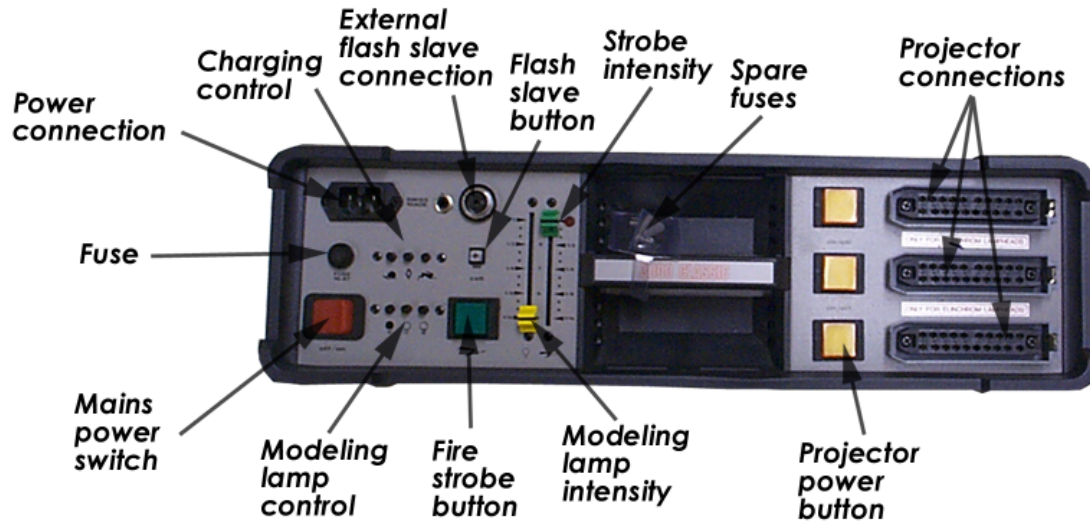


Important Precautions

- **NEVER** connect or disconnect the PRO-SPOT projector cable from the PRO-SPOT power unit while the unit is powered up.
- **NEVER** attempt to change the fuse while the unit is connected to AC power.
- **NEVER** let the equipment get wet. Always keep it dry and free of moisture.
- **NEVER** look directly into the barrel of the projector during firing.
- **NEVER** touch the projector lens or slide with fingers. If the lens or slide are dirty use the cleaning cloth provided with the system to clean them.
- **DON'T** leave the modeling light on longer than necessary or the bulb will burn out prematurely. At full power the bulb has an approximate life of 50 hours.
- After about ten minutes of continual use at full power the modeling light will be automatically switched off by a heat protection system. When the modeling light has cooled off sufficiently, the modeling light will come back on automatically.
- As a rule of thumb allow the projector to cool for one minute for every minute that the modeling light has been on. This will reduce the effects of slide cooling during the measurement.
- **DON'T** operate the power unit outside its operating limits. If you do, you will blow the fuse and perhaps damage the unit. At full power the unit can recycle and be ready for another full power shot in about 5 seconds. However, you should not fire the unit at full power more than once every 20 seconds when operating it for long periods. You can fire the strobe at faster rates for short periods of time. However, do not fire the strobe for more than two minutes at the 5-second rate. Then allow at least 10 minutes for it to cool down before making another such burst.
- **ALWAYS** use the lowest recharge rate possible to maximize the operating life of the power unit.

PRO-SPOT Controls

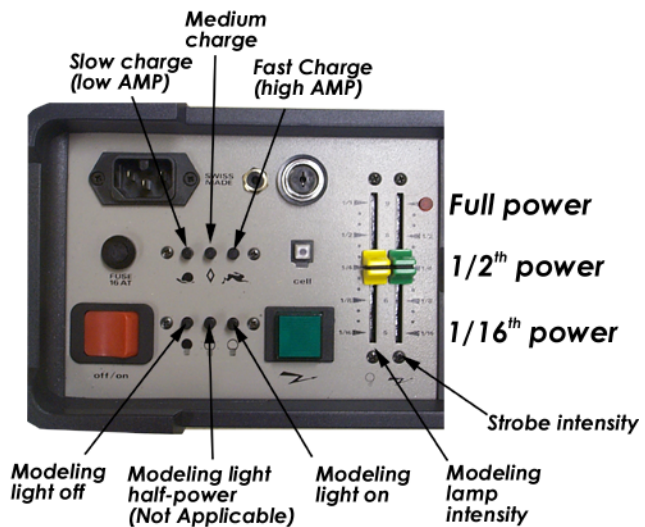
The diagrams below show the location of the primary PRO-SPOT controls.



Power connection – Connection point for power cable. Will only accept high-amp cables. These cables have a slot in the end.

Fuse – Check and replace if unit will not power up. Spare fuses can be found in the bag attached to the handle. Ensure that any replacement fuses used match blown fuse precisely. The fuse of your AC supply should be: 220-240V – 16A / 110V – 25A. Before exchanging a blown fuse switch off the unit and remove the mains cable. Depress and turn the fuse holder anti-clockwise 1/8th turn and remove it. If the new fuse blows immediately upon reconnection contact GSI for further assistance.

Fire strobe button – Press to manually fire the strobe. The light will be illuminated when the power unit has reached the selected flash power level.



Mains power switch – On/Off switch. Will emit a red glow when lit.

Modeling lamp control – Controls to switch the modeling light on and off. The control is a push switch arrangement. The left and right switch are the off and on states respectively. The middle switch is only applicable to units with dual filament.

Modeling light intensity – Adjust the light output of the modeling light. The power can be continuously changed from 1/16th to full power.

Projector power button – Press to apply power to PRO-SPOT projector. The button will be lit when power is applied. Always turn the projector power off when attaching or removing the PRO-SPOT projector cable.

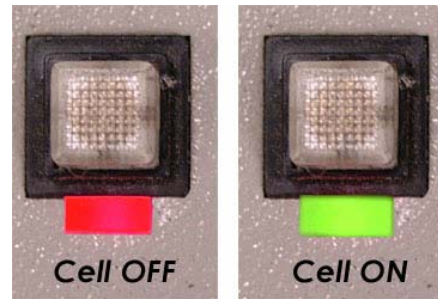
Projector connections – Connection point for PRO-SPOT projector.

Spare fuses – Use only fuses of correct voltage and amperage rating.

Strobe intensity – Adjusts the intensity of the strobe. The power can be continuously changed from 1/16th to full power. When reducing strobe intensity always fire the strobe once to remove the excess charge. Then the next time you fire the intensity will be correct. Always wait until the ready light on the fire strobe button is on, before firing the strobe or the intensity will be wrong.

Flash slave button– Push this switch to enable and disable the flash slave sensor. When this light is green the projector will be fired when any flash in the vicinity is fired. When the light is red the slave sensor is disabled.

External flash slave connection– Used to fire the projector via a standard sync connection.



Charging control – Used to control the charge cycle time of the power unit. The fastest cycle time you can use will depend on the rating of the power outlet. If the outlet has a low amperage rating then the medium or slow charge should be used. If the rating is higher then the fast charge cycle can be used. To prevent tripping breaker circuits it is advisable to avoid connecting other items to the same outlet. The following table is a helpful guide for required amperage and approximate charging time.

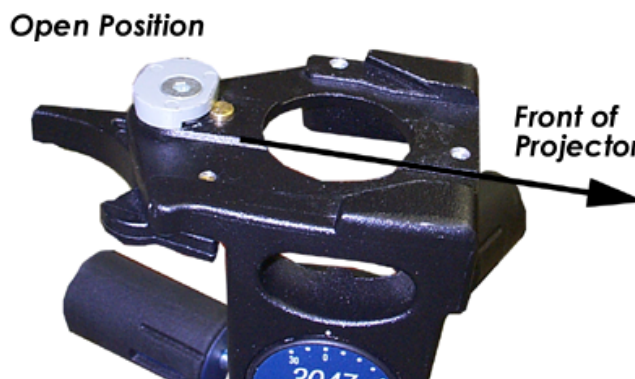
	220-240V	110V
Rapid	16A (3 seconds)	25A (5 seconds)
Medium	10A (6 seconds)	16A (10 seconds)
Slow	6A (18 seconds)	10A (30 seconds)

The charge times are slower for 110V because the reduced voltage requires higher currents that many main fuses may not accept. To maximize the operating life of the power unit, always use the slowest charge rate that you can.

Basic Set Up

Removal from box

1. The PRO-SPOT projector has a standard hexagonal mount that is appropriate for mounting to most standard tripod pan-heads
2. Ensure that the tripod legs are well distributed and that all the appropriate screws are tight.
3. Ensure the tripod quick lock mechanism is in the open position. (Refer to the adjacent diagram).
4. Using the handle, remove the PRO-SPOT projector from the box and carefully align the hexagonal base. Use the adjacent diagram as a guide to the orientation of the projector.
5. Ensure the quick lock mechanism is secure before releasing the projector.
6. Remove the projector power unit from the box and place it in the area beneath the projector (Refer to cover diagram).
7. Ensure the power unit is not powered up and connect the projector to any of the three projector connectors on the power unit. Ensure the cable is secure.



Remember to NEVER connect or disconnect the strobe while the unit is powered up

8. Ensure the power switch is in the "OFF" position and insert the end of the power cable into the power slot. The power pack uses high amperage and hence has a high amp power cable. There is a slot above the middle pin connection that will prevent regular cables from being plugged into the unit. Only use cables supplied with the system.

NOTE: Take special care to not lose the AC power cable! If you do, you will not be able to use a regular AC power cable.

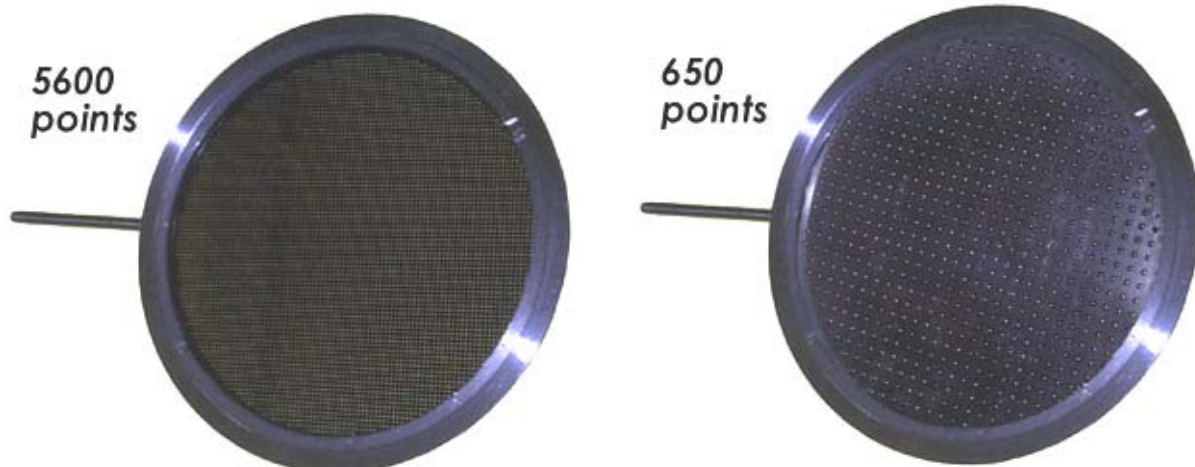
9. Switch on the main power unit and then the individual strobe power switch. The main switch will emit a red light when in the on position. The strobe switch will be orange when connected.



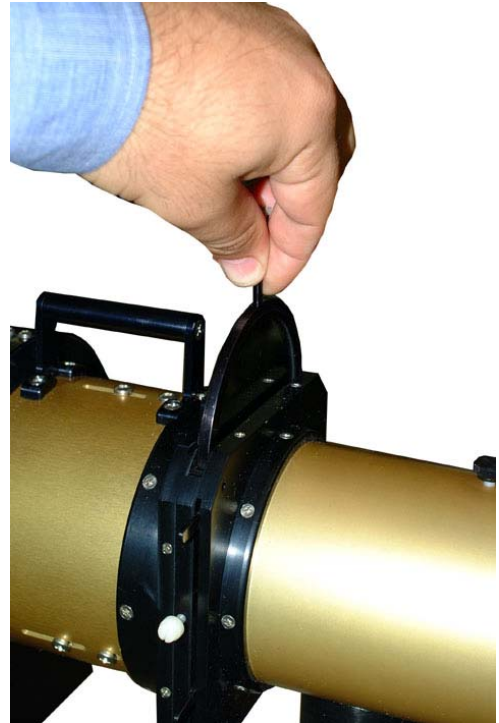
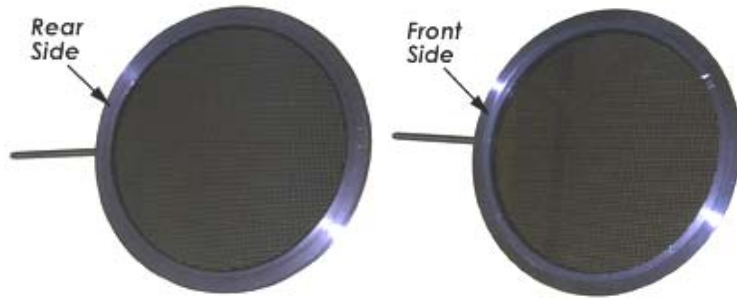
NOTE: The power unit goes thru a very slow charge cycle when power is first turned on to condition the charging capacitors. This slow charge cycle is not needed unless the unit has not been used in some weeks. To prematurely end the slow charge cycle, press the Fire strobe button to fire the projector strobe. Thereafter, the unit will charge at normal speed.

Changing the slide (optional)

1. If multiple slides are available select the slide that best suits the objective of the measurement. The standard slides available with the projector have a circular pattern of dots. Different slides are available with different point densities. The standard densities are: 5600 points, 1400 points, and 650 points.



2. If necessary, remove the current slide. To do so, loosen the white, nylon securing screws on both sides of the slide assembly.
3. Carefully remove the slide and place it in a secure location
4. Take the replacement slide and turn it so that the front face groove faces the front of the projector.
5. Slide the glass plate into the holder until the slide is fully enclosed. DO NOT force the slide. If the slide will not enter the holder then it may be facing the wrong direction.
6. Tighten the securing screws



Using PRO-SPOT

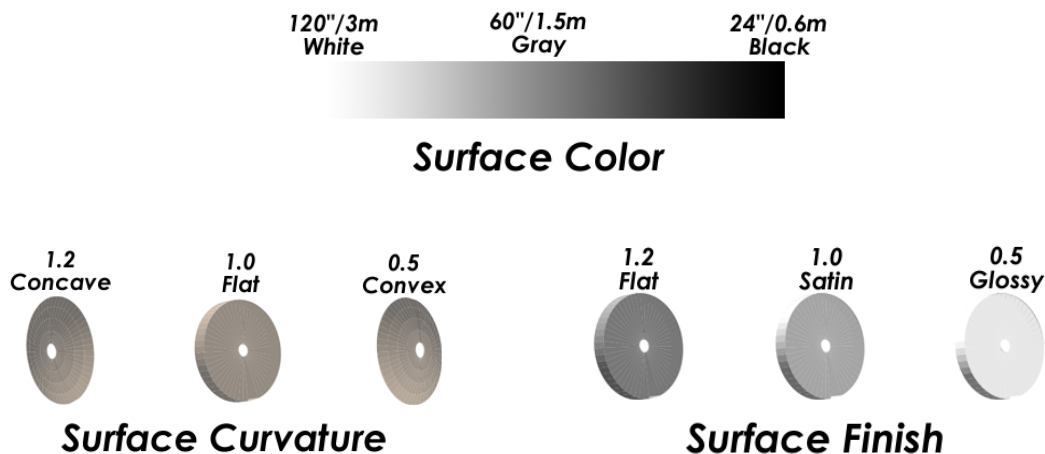
Determining exposure

The projected dots must be bright and of high contrast for a good measurement. The proper exposure depends on several factors. Generally, you set the projector far enough back to cover the object with the dot pattern, and then adjust the strobe intensity so the dots are measurable. If you cannot measure the entire object in a single setup, then multiple setups will be needed that collectively cover the entire object.

The area that can be measured in a single setup of the projector depends on several factors such as

- a) the color of the surface,
- b) its finish and
- c) its curvature

The diagrams below can be used to determine the approximate area that can be measured in a single setup



$$\text{Size (diameter in inches/meters)} = \text{Color} \times \text{Finish} \times \text{Curvature}$$

For example take the case of a white, flat object with a satin finish

$$\begin{aligned} \text{Size (diameter in inches)} &= \text{white} \times \text{satin} \times \text{flat} \\ \text{Size (diameter in inches)} &= 120 \times 1.0 \times 1.0 = 120 \text{ inches} \end{aligned}$$

The guide above can be used as a rough indication only. You will need to take some test shots to determine if the area you are covering can be measured. The easiest way to do this is to use the guide above to estimate the area that can be covered.

Then, setup the projector according to the setup instructions provided below.

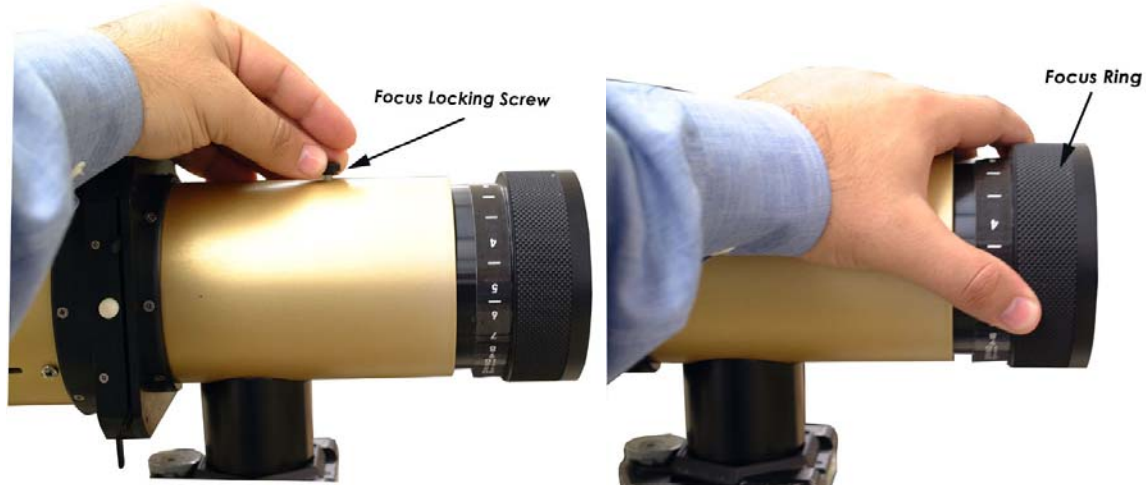
Setup Instructions

1. When setting up the projector, a rough approximation is to put the projector back about the same distance from the object as the size of the object or area of interest.
2. Remove the lens cap and place it in the holder plate on the rear of the projector.
3. Set the focus roughly for the distance from the front of the projector to the surface. The focus distance (in feet) is shown on the lens barrel.
4. Switch on the modeling light. Adjust the modeling light intensity until you can see the dots on the surface.
5. Adjust the location of the tripod, the projector focus, the rotation of the slide and the shape of the dot pattern until the dot pattern covers the area of interest and is in focus. See the detailed instructions below for how to make these adjustments.
6. Ensure that each leg of the tripod is securely set into the floor.
7. Switch off the modeling light.
8. Place the camera in a typical position for the measurement.
9. Take a test picture at full power. Set the camera shutter exposure time for 24ms. Set the ring strobe for proper exposure of the retro-targets.
10. Examine the picture. The dimmest targets (usually at the edges of the object) should be measurable. The brightest targets (usually in the middle) should not be overexposed. If necessary adjust the strobe intensity and take another test shot, and repeat this step until all the dots are of acceptable brightness.
11. If you cannot measure all the dots at the full power setting, you will have to measure a smaller area by repeating steps 1-10 above after moving the projector closer to the object.



Focusing

1. Switch on the modeling lamp.
2. Adjust the modeling light intensity until the pattern is visible on the object.
3. Loosen the focus screw slightly until the focus ring can be easily rotated.



4. Turn the ring until the dots are almost in focus.
5. Partially tighten the focus screw so it is harder to rotate the focus ring.
6. Adjust the focus ring until the dots are in sharp focus. The focus point on objects with greater depth variation will be harder to set. Generally the focus is set about half way between the two depth extremes of the object. If the depth variation of the object is too great then a second set up will be necessary.
7. Once focused tighten the screw so the focus ring is firmly locked.

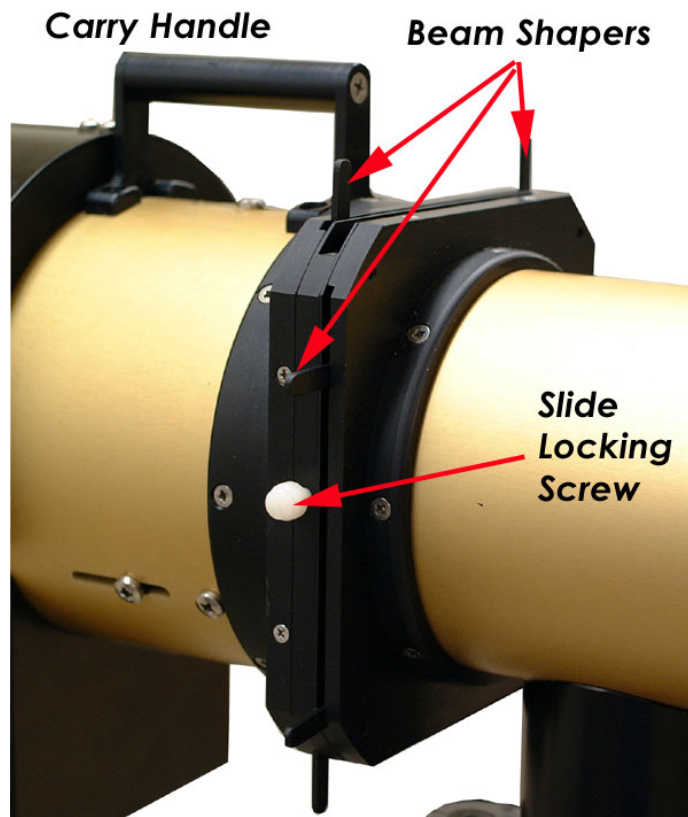
WARNING – If the modeling lamp overheats, it will switch itself off. Wait until the modeling light cools down before proceeding.

Rotating the slide

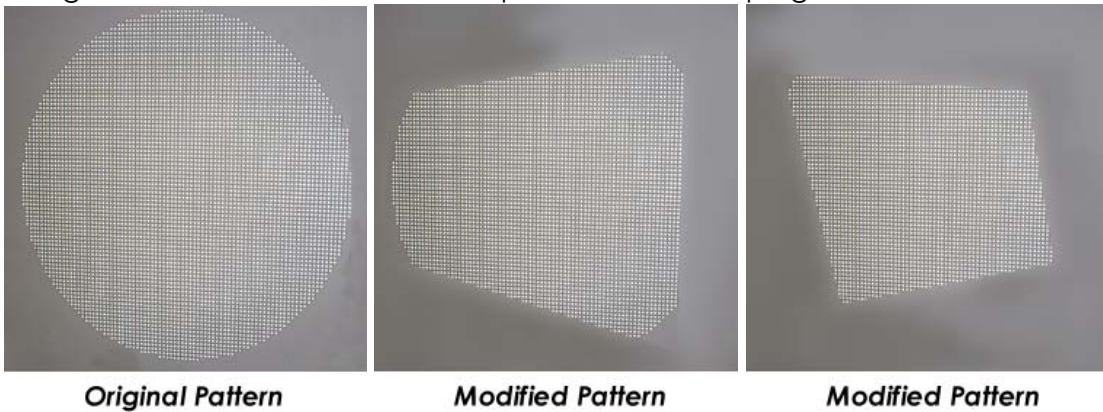
1. Loosen the securing screws slightly on both sides of the slide assembly until the slide can be easily moved.
2. Use the handle to rotate the slide into the desired location
3. Tighten the securing screws until the slide is firmly held in place.
4. Repeat focusing if necessary.

Changing the beam shape

Sometimes it will be necessary to change the shape of the dot pattern to eliminate unnecessary areas. This can be done via the use of the beam shapers. The beam shapers can be manually positioned as required. They are shown in the adjacent diagram. As the shapers are moved the beam changes accordingly.



The diagram below shows some examples of beam shaping



Additional Information

Projector Dot Size

The target size on the object can be calculated as a simple magnification factor.

The dots on the slide are 0.2mm in diameter.

The slide is an 85mm diameter circle.

Therefore, if you were projecting the dots on an 850mm diameter object the diameter of the dots on the object is

$$(850/85) \times 0.2 = 2\text{mm diameter.}$$

The magnification is 10.

The distance from projector to object is dependent on lens focal length and magnification. The formula is

$$((f \times (1+f/m)) \times m);$$

where f=focal length, m= magnification.

For a 90mm lens and magnification of 10,

the distance is $(90+90/10) \times 10 = 990\text{mm.}$

The formula above can be approximated as $f \times m$ which is the correct formula when the lens is focused at infinity.