

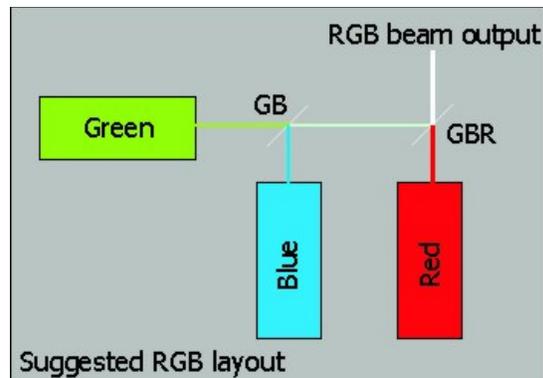
Aligning a multi beam laser set-up - by Rob Stanley of Stanwax Laser

This is written assuming we are mixing Red Green and Blue lasers but the rules apply just as much If you are only mixing 2 colours. Its as well to run your projector for 15-20 mins before beginning to ensure everything is up to temperature as there may be some drift as it warms up so set it up warm not cold. Also try running the lasers in low power mode if you can - at least until the final adjustment stage - just so you don't accidentally send an unwanted beam into a nearby eye. If you have laser eye protection wear it while doing this procedure. If you haven't got any - buy some.

Lets start with a few ground rules. Follow these and you won't go far wrong.

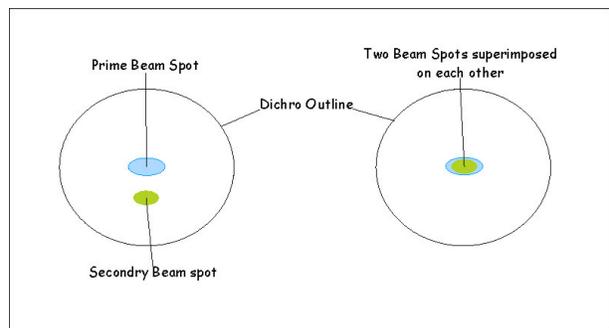
- #1 Make the laser mountings adjustable so you can fine tune the position.
- #2 Hit the dichros at as close to 45 degrees as possible so keep your lasers at 90 degrees.
- #3 Work systematically and methodically - start one task and complete it. Then move to the next task.

First step is to plan your layout and with this you need to decide which laser will be running straight through the dichros & not bouncing off them - we will refer to this as the prime or primary beam. Using Laserwave dichros you would make the Green laser the primary beam (see image right). You need to plan the layout of all the lasers and scanners to fit the base plate you are using. Once you have a good idea of where the lasers are going you can plan where the adjustable mounts for the dichros will go - which will be where the 2 lasers at 90 degrees to the prime beam will intercept it.



Now set the height of the prime laser so that the beam hits the first scanner mirror nice and centrally and this in turn reflects it correctly to the second scanner mirror. If using scanners without spring centre return such as the Laserwave 20k or 30k Scanners you will need to have the scanner powered up for this with no signal input to be certain that the mirrors are in the home position when you point the beam at them.

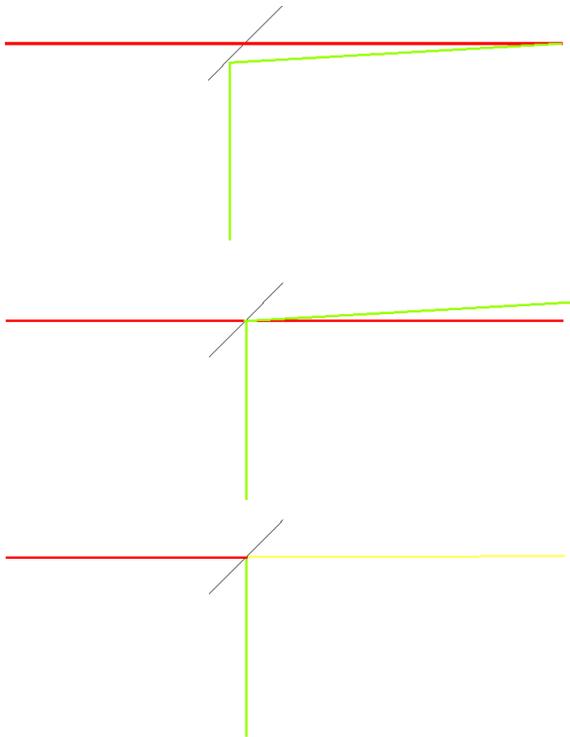
Now start with the second laser (blue) - the first one that will intercept the primary beam. Put the GB dichro in place at roughly 45 degrees and move it around until the 2 laser spots on the coated surface are at the same position across the dichro surface - so they look like they are stacked on top of each other. (see left image in fig. right). Now adjust the height of the secondary beam so that its spot is in exactly the same place as the primary beam spot. (see right image in fig. right) It is very important to get the two as close to the same point as possible as this is your near filed alignment point. The closer you can get this the better the alignment will be at all distances.



Next without losing its position along the axis of the prime beam turn the entire dichro mount to angle it so that the secondary beam is pointing at the scanner mirrors. Get it as close as you can and then firmly screw the mount down. You are now free to set the far field alignment. I do this by scanning a square or circle onto a wall as far away as is possible or practical - its no good if you cant see the scan well enough! Its much easier to see what you are doing with a scanned pattern as opposed to a dot and its much easier on the eye. Hint - position a mirror (make sure it's a front surface mirror) to bounce the scan back to the wall behind or near to where you are working. Its much easier to see and you will double your accuracy but make sure that what is being reflected back has both horizontal and vertical components - so you don't end up with only one direction aligned. Automobile external rear view mirrors tend to have front surface coatings so use one of these.

Now tweak the dichro mount adjustment screws to get the colours to overlap as best you can. Check to make sure the spots on the dichro are still on top of each other and Bingo - you are done.

Now repeat the procedure for the third beam using the GBR dichro - its up to you if you have just 2 lasers on or all 3 when you do the third - I like all 3 but it's a matter of preference.



Near and Far field alignment.

The image left shows the effects of getting the alignment right or wrong. The top graphic shows that if the beams do not hit the dichro at the same place there can only be one point where the beam spots meet. This is bad.

The second graphic shows the beams hitting the dichro at the same point - the near field alignment is correct. All that is needed now is to adjust the dichro so that the beams converge at some far away point. If the near field alignment is maintained when this is achieved all points along the beam path will be aligned, as per the final graphic. This rule obviously applied to both the horizontal and the vertical axis, so care must be taken when setting the laser height and altering the dichro position when assembling.