Science Olympiad 2011-2012 Optics LSS Tips and Tricks

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NOTE: COMPETITORS ARE NOT REQUIRED TO BUILD AN LSS.
EVENT SUPERVISORS WILL PROVIDE ONE DURING THE COMPETITION.
GET THE MAIN LSS DOCUMENT FOR DETAILS ON HOW TO BUILD A BASIC LSS

The purpose of this document is to show how to make improvements to the basic LSS that allow for more robust usage. All of these are recommended for Event Supervisors in actual competition settings.

Sections:

- Mirror Coverings
- Laser Lock/Adjustment
- Target Marking
- AC Powered Laser

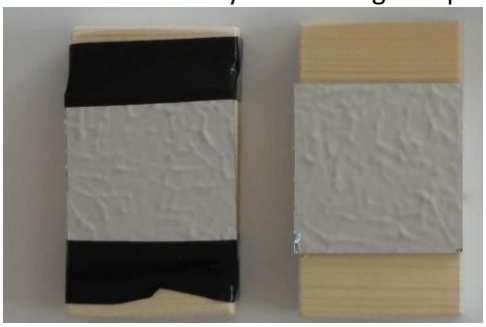
Mirror Coverings

Mirror coverings of some sort are required by the rules. In a pinch, items such as post-it notes can be used, but are not an ideal solution.

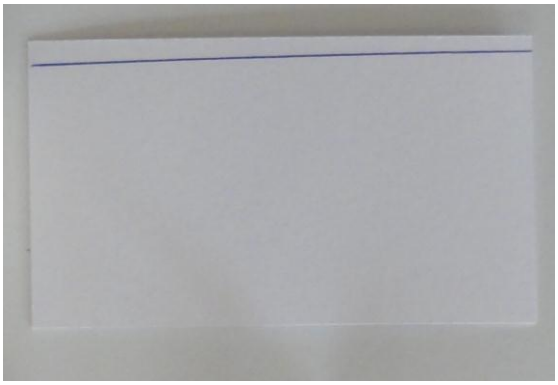
Materials / Tools:

- Standard size business cards
- Scotch tape
- Mounted LSS mirrors
- Scissors

Note this assumes you are using 2” square mirrors mounted on 4” x 2” blocks (as created in the main LSS document).

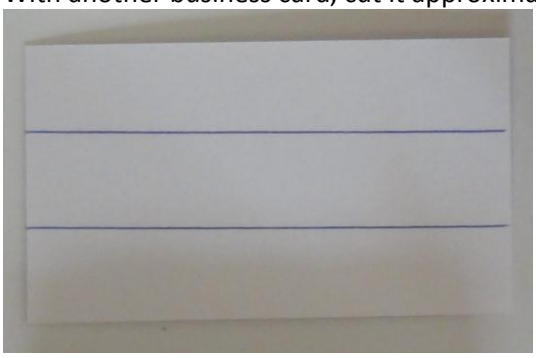


1. A standard business card is 2” wide. Cut off ~1/8” from one side, as indicated by the line in the picture below:



2. Fold the top ~1/2” at a right angle, to create a small ‘handle’. This will be the removable covering:

3. With another business card, cut it approximately in thirds lengthwise, as indicated by the lines below:



4. Fold both ends at ~1/2” so that the middle section is the same width as the mirrors (~2”):

5. Tape the folded card near the top of the mirror, as shown below. Be sure to leave a gap between the mirror and the card:

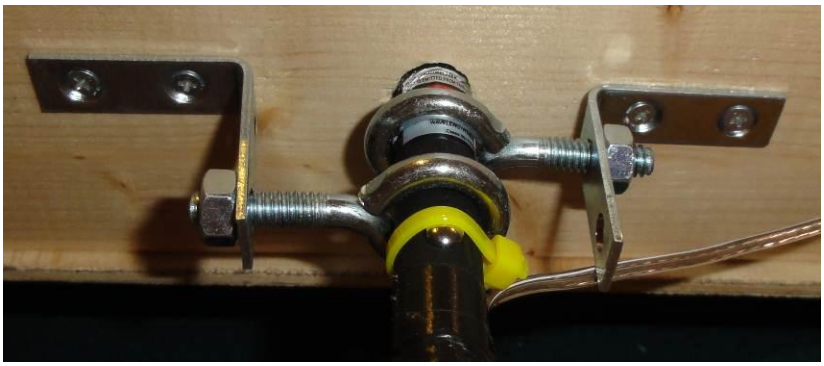
6. Slide the removable covering into the gap. It should loosely fall into place and be held up by the handle.

Laser Lock/Adjustment

Materials / Tools:

- 1 ½" corner braces ("L" brackets)
- #4 ½" wood screws
- ½" threaded eye bolts with nuts
- Screwdriver
- Pliers
- Drill

1. As shown in the pictures below, the eye bolts are passed over the body of the laser.
2. Depending on your specific laser you might need to use the pliers to open up the eye bolts a bit, use another size eye bolt, or use something like electrical tape to increase the effective diameter of the laser so that there is a snug fit.
3. Likewise, you might need to use a drill to increase the size of the holes in the corner braces so that the eye bolt can fit through it.
4. Thread the eyebolts onto the laser and corner braces before screwing the braces to the LSS wall in order to ensure you position them correct.
5. By tightening or loosening one or the other nuts, you can shift the laser left or right to get it aligned properly. Note the up/down adjustment isn't possible, but also isn't needed for the event.



Target Marking

Materials / Tools:

- Roll of calculator tape/paper
- Scotch tape
- Screwdriver
- Scissors

1. As shown in the pictures below, the paper is taped to the target wall above the ruler to allow for marking of the target and results of each team.
2. You might need to use the screwdriver to loosen the ruler a bit from the wall, in order to allow the edge of the paper to slide down between the wall and ruler.
3. Use a pen to indicate with an arrow the target for teams.
4. Also use the pen to mark the location the laser hits the wall for each team. This provides a permanent record that can be used in case of arbitration or questions over the results. Likewise, it's often easier to measure the marks after all the teams are done and the paper is removed from the LSS.

AC Powered Laser

Materials / Tools:

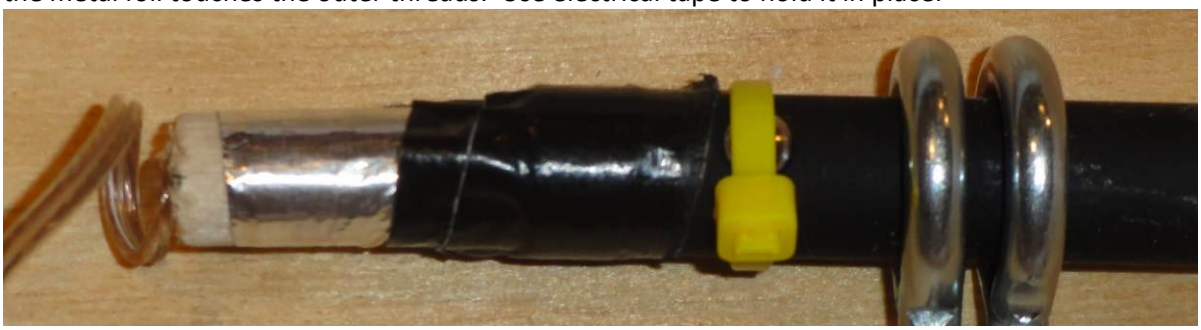
- Thin dual conductor wire (speaker wire works well)
- 3/8” wood dowel rod
- #4 ½” wood screw
- Drill
- Saw
- Electrical tape
- Metal foil tape (used for sealing ductwork typically)
- Zip tie
- 3VDC power supply (Digikey.com P/N: T975-P7P-ND, ~$8)
- Rocker switch (Digikey.com P/N: CH760-ND, ~$1.30)
- Multimeter

Note, this setup assumes your laser pointer is normally powered by 2 AAA/AA batteries.

1. Unscrew the laser pointer and remove the batteries
2. Cut off a ~3” section of the 3/8” dowel rod and ensure it can fit inside the laser pointer snugly
3. Strip the wire so ~1” is bare for both conductors
4. Drill a small hole through the dowel rod lengthwise that one strand of the wire can pass through. Pass the wire through the hole and use a #4 screw to hold the end of it in place
5. Wrap the other strand of wire around the outside of the dowel rod and use the metal foil tape to hold it in place (as shown below)
6. Use the multimeter to test to ensure there is a good electrical connection for both the screw and the metal foil tape and that they aren’t shorted together.

7. Use a zip tie to permanently push the laser pointer button in (as seen with the yellow one below):

8. Push the dowel rod into the laser pointer snugly, ensuring that the screw contacts the spring terminal and that the metal foil touches the outer threads. Use electrical tape to hold it in place:



9. Wire the toggle switch inline with one of the wires.
10. Cut the end connector off of the wire from the power supply and strip the ends of the wires. Connect the power supply wires to the wires coming from the laser and secure with small wire nuts or electrical tape. The positive terminal should connect to the screw that is in contact with the spring. Once the power supply is plugged in, the switch can be used to turn the laser on and off. WARNING: Don't leave the laser on for extended periods of time, or it might burn out! Below is a picture of a complete setup.