Name of SOP	5mW Class 3R Laser Alignment
Effective Date	4 June 2009
Author	Mark Mihaljevic
Reason for SOP Safety of the operator, people around and equipment	Check All that Apply: [ ] Procedure/Process could cause critical injury. [X] Procedure/Process could cause occupational illness. [ ] Procedure/Process could cause environmental impairment. [ ] Procedure/Process could damage University property. [ ] Supervisor's discretion. Provide Details:
Approved by (supervisor)	Dr. R.L. Judd
Date reviewed by JHSC	

Definitions

Terms	none
Acronyms	RMM – Risk Management Manual JHSC - Joint Health and Safety Committee EOHSS - Environmental and Occupational Health Support Services EPA – Environmental Protection Act OHSA – Occupational Health and Safety Act

Requirements

Applicable OHSA regulations and / or codes of practice. 1. RMM #101 - McMaster University Risk Management System
Training and Competency 1. Laser Training provided by EOHSS and on-site training by individual who operates the facility. 2. Competency is shown by the individual after training

Description of the Task

Location and time of work	**Building 16 JHE 206 during normal working hours**
Individuals involved	Undergraduate and Graduate Students with adequate training as defined above.
Equipment and supplies required	Adjustable wrench and 9/64” Allen key
Personal protective equipment required	Glasses designated for laser use, screen if others are present in room

Sequential Steps to Complete the Work Safely

General safety instructions

1. Do not overreach
2. Guard against electric shock
3. Wear appropriate safety glasses whenever laser is on
4. Do not look into laser
5. Use camera viewer to align laser
6. Ensure prism is not reflecting or diffracting the laser light in an unintended direction
7. Keep the work area clean

Part I: Laser Alignment

1. Put on appropriate safety glasses
2. If other people are present in the room, use welding screens from machine shop to prevent unintentional exposure
3. Establish co-ordinate system: x-axis is horizontal, y-axis is vertical, and z-axis is along the laser
4. Unlock padlocks, uncover laser, and remove black guard piece from in front of laser (see **Figure 1**)
5. Set up high speed camera to check alignment (see **Figure 2**)
    a. Unlock bottom cabinet (locked with bar) and remove camera, lens, and viewer from middle compartment
    b. Make sure power switch is in the off position and plug power cable into camera (see **Figure 3**)
    c. Install lens in lens mount and connect to the camera (see **Figure 4** and **Figure 5**)
    d. Connect viewer to camera (see **Figure 6**)
    e. Turn camera and then viewer on
6. Turn laser on (see **Figure 7**)
7. Adjust level of laser using four jam nuts underneath assembly (see **Figure 8**)
    a. To slope the laser downward, loosen rear jam nuts (at back of laser) and drive rear screws further in. When satisfied, tighten front jam nuts to lock in place.
    b. To slope the laser upward, loosen front jam nuts (at front of laser) and drive front screws further in. When satisfied, tighten rear jam nuts to lock in place.
8. To adjust position along x-axis: (see **Figure 9**)
    a. Loosen six holding screws only enough to allow assembly to travel
    b. Loosen jam nut in direction of travel (e.g. to move laser toward the wall loosen jam nut on side away from wall)
    c. Retreat jam nut and Allen Head Cap Screw on opposite side
    d. Drive Allen Head Cap Screw on the side where jam nut was loosened forward until assembly is at desired position along x axis
    e. Tighten jam nuts and screw on opposite side
    f. Tighten holding screws
9. To adjust position along y-axis: (see **Figure 10**)
    a. Loosen screw holding assembly slightly
    b. Coarsely adjust position by hand
    c. Tighten holding screw until assembly does not travel freely
    d. Use fine adjustment screw to place assembly accurately
    e. Tighten holding screw fully
10. To adjust position along z-axis: (see **Figure 11**)
    a. Loosen two holding screws which are used to clamp onto the diamond bar
    b. Move assembly as desired
    c. Tighten holding screws
11. Repeat steps 7-10 as needed to obtain optimal surface illumination of 10x5mm rectangle defined by camera lens optics.
12. Turn laser off
13. Disassemble high speed camera
    a. Turn camera and viewer off
    b. Disconnect viewer and lens from camera and unplug camera
    c. Place all equipment back in cabinet and lock it
14. Replace and lock cover over laser, return guard piece, and remove personal protective equipment

Contingency Plan and Reporting

Equipment Malfunction

In the event of an equipment malfunction, turn off the laser at the control or, if necessary, unplug from wall. Replace black guard piece.

Equipment shutdowns

1. **For a controlled shut down of the Laser:**
    - Turn off with controller
    - Replace black guard piece
    - Close metal covering and lock with padlocks

Accident / injury response

1. Apply first aid as required
2. Notify Mechanical Engineering technical staff immediately
3. For all injuries complete a "Injury/Incident Report" and provide a copy to the Chair and EOHSS
4. In case of critical injury call security (dail 88).
5. In case of critical injury notify EOHSS immediately, ext 24352

In the Case of Critical Injuries

1. Shutdown equipment and secure the area to prevent further injury
2. Immediately arrange for medical and emergency assistance by calling Security at ext. "88".
3. Apply first aid as required
4. Notify EOHSS immediately, ext 24352
5. Notify Technical Staff immediately. Ext. 24628

For all injuries complete a "Injury/Incident Report" and provide a copy to the Chair and EOHSS

Environmental Responsibility

Waste disposal procedures

Procedure does not require disposal

Building air quality

Procedure does not affect air quality

References

1. OHSA/ regulations
2. EPA and Municipal Environmental Regulations
3. RMM #100 McMaster University Environmental Health and Safety Policy
4. RMM #300 Safety Orientation and Training Program
5. RMM #301 Standard Operating Procedures
6. RMM #304 Persons Working Alone
7. RMM #309 Laboratory Safety Manual
8. RMM #310 Eye Protection Program
9. RMM #703 Laser Safety Program

Distribution

1. Faculty of Engineering JHSC (for review)
2. Technical Staff of Mechanical Engineering JHE 205 ext. 24628
3. Posted in JHE 206

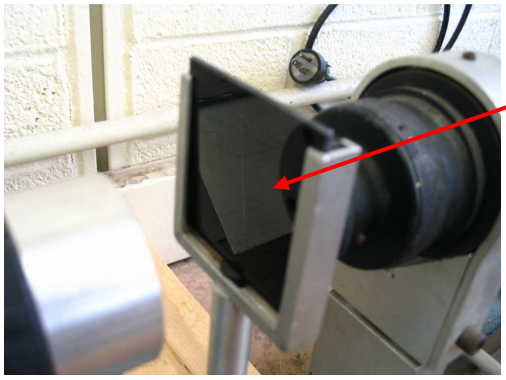


Figure 1

Figure 2

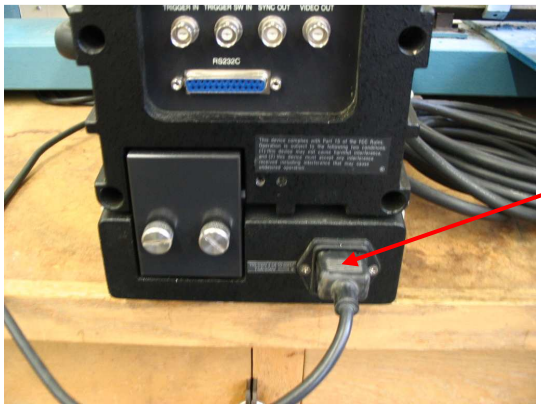


Figure 3

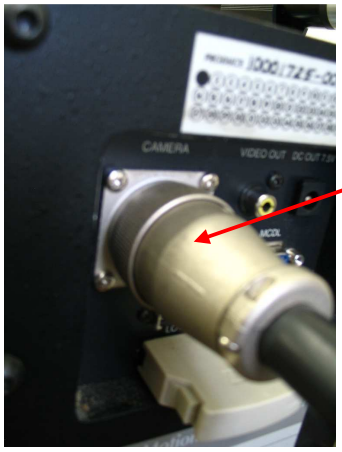


Figure 4

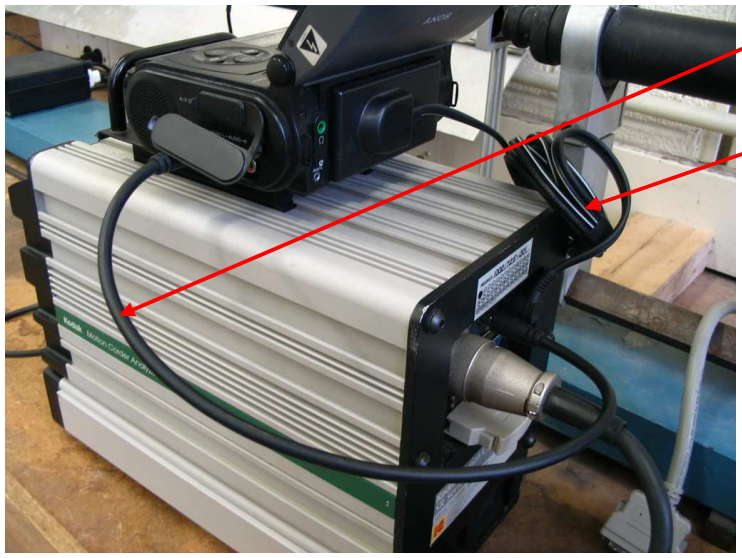


Figure 5

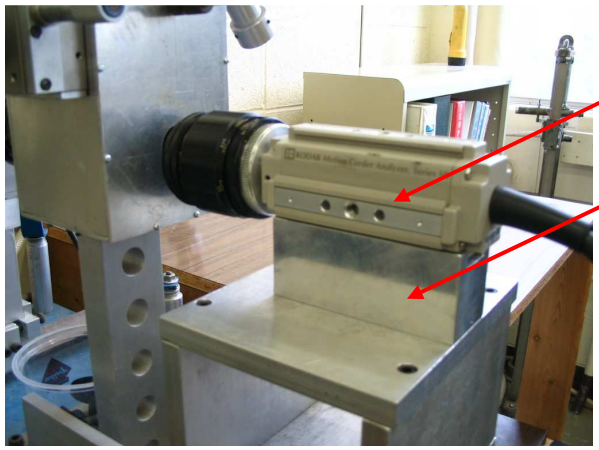
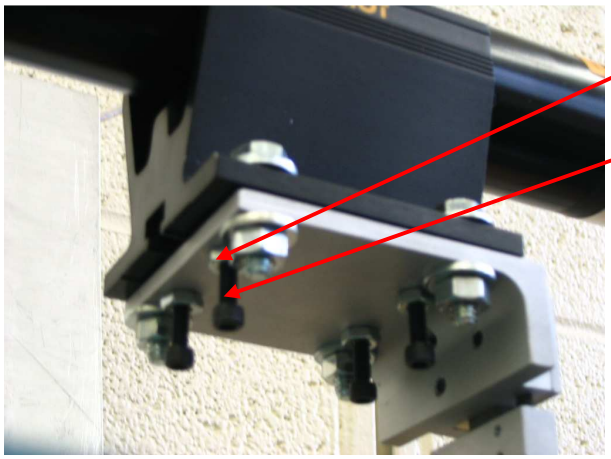


Figure 6

Laser Power Control

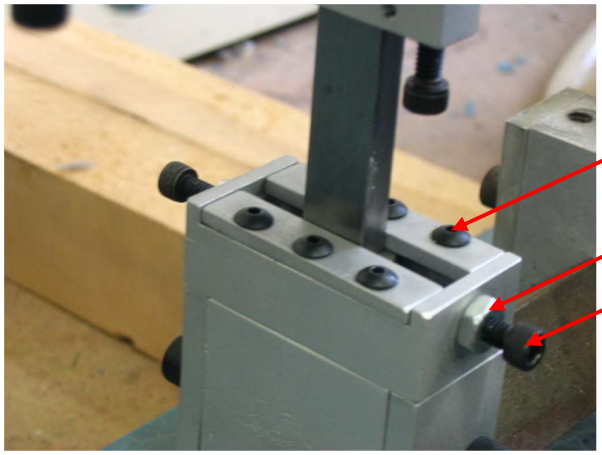
Figure 7



Jam Nuts

Screws

Figure 8



Holding Screws

Jam Nuts

Screws

Figure 9

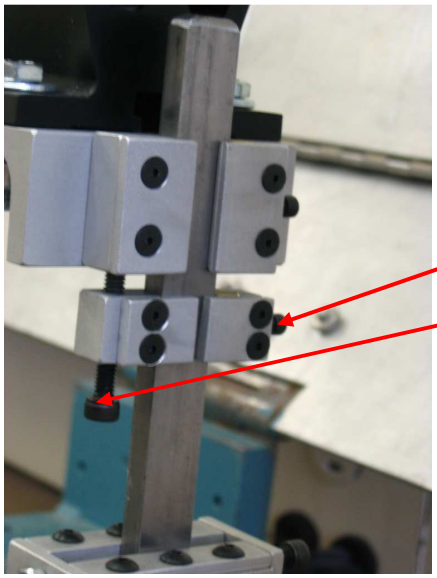


Figure 10

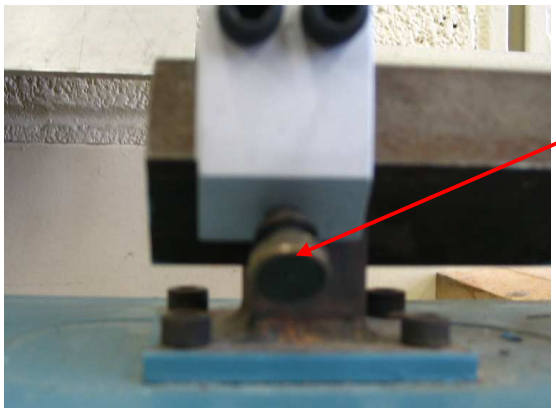


Figure 11