

**Robotics and Manufacturing Automation Laboratory (Mechanical Eng'g Dept.)
STANDARD OPERATING PROCEDURE (SOP)**

Name of SOP	Mitsubishi RV-E2 Robot Arm
Effective Date	September 1, 2005
Author	Mark MacKenzie / Dr. G. Bone
Reason for SOP	Risk of injury while operating Mitsubishi Robot Lab
Approved by (supervisor)	
Date approved by JHSC	

Definitions

Terms	none
acronyms	RMM – Risk Management Manual JHSC - Joint Health and Safety Committee EOHSS - Environmental Occupational Health & Support Services

Requirements

Applicable OSHA regulations and / or codes of practice.
<ol style="list-style-type: none"> 1. OSHA code. 2. ANSI/RIA R15.06-1999 Standard for Industrial Robots and Robot Systems - Safety Requirements 3. McMaster University Risk Management Policies
Training and competency.
<ol style="list-style-type: none"> 1. Technical Staff in the Mechanical Engineering Department. 2. Competency to be demonstrated by the individual after training.

Description of the Task

Location and time of work	JHE B109 during normal working hours
Individuals and skills required	Graduate Students with adequate training as defined above. Undergrad students under direct supervision of Teaching Assistant.
Equipment and supplies required	Mitsubishi Robot Arm controlled by either the teach pendant or a computer with the light curtain safety devices operational.
Personal protective equipment required	Safety Glasses
Sequential steps to complete the work safely.	
General safety instructions	
<ol style="list-style-type: none"> 1. All users must obey the safety instructions listed in the Mitsubishi E-Series Training Manual. 2. The operator should only access the robot arm's working space when the robot controller is turned off. Otherwise, the light curtain barrier will be breached, triggering an emergency stop condition and robot error alarm. 3. When operating the robot arm always have an emergency stop button close at hand in case the robot needs to be immediately stopped. This can be the emergency stop button on the teach pendant, the emergency stop button on the front of the control unit or the emergency stop button located at the rear of the table. 4. Never place yourself in a location that confines you between the robot arm and another object. 	
Specific instructions for the operation of the Mitsubishi RV-E2 robot arm:	
<ol style="list-style-type: none"> 1. Place yourself in a location safely outside the robot arm's operating zone. 2. Ensure all of the emergency stop buttons are in the run position (not pressed). 3. Set the robot teach pendant to DISABLE using the switch at the top center of the teach pendant. 4. Turn on the robot control unit and the computer. Once the controller has booted, the green light on the indicator beacon should be lit to indicate arm power is on and there are no errors. If there are no errors proceed to step number 6. 5. If the robot reports an error at startup (red light flashing on indicator beacon and audible alarm 	

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<p>sounding), make sure all of the emergency stop buttons are in the run position (not pressed) and press RESET on the front of the robot controller. If there is still an error, call a Technician in room JHE205 (ext. 24628).</p> <ol style="list-style-type: none"> Launch the RoboWare Millennium Edition software on the PC and click the “Connect to Robot” button. Open the robot program you want to run from the C:\Labs directory and read through it to understand exactly what the robot is supposed to do. (File → Open → Disk → C:\Labs) Each program requires a particular setup which is specific to its associated program. READ THE LAB NOTES BEFORE RUNNING THE PROGRAM TO MAKE SURE THE SETUP IS CORRECT! Failure to do so could result in personal injury or damage to the robot. Download the program into the robot controller. (File → Save → Download Program with Positions to Controller). To run the program that has just been downloaded into the controller, press the START button on the front of the controller. Keep your hand on the emergency stop button until the robot has successfully completed one program cycle and be prepared to quickly stop the robot if it looks like it will collide with any object. If you needed to use the emergency stop button, shut the robot off and call a technician in JHE205 (ext. 24628). When you are done working with the robot, turn off the controller using the switch on the front of the controller. Exit RoboWare Millennium Edition and shut down the computer.

Contingency Plan and Reporting

<p>Accident / injury response Report all minor cuts and bruises to the Technical Staff in room JHE 205, ext. 24628.</p> <p>In the Case of Critical Injuries</p> <ol style="list-style-type: none"> Shutdown equipment and secure the area to prevent further injury Immediately arrange for medical and emergency assistance by calling Security at ext. “88”. Apply first aid as required Notify EOHSS immediately, ext 24352 Notify Technical Staff immediately. Ext. 24628 <p>For all injuries complete a “Injury/Incident Report” and provide a copy to the Chair and EOHSS</p>
<p>Equipment Malfunction In the event of an equipment malfunction, (unexpected motion, non-resetable robot errors, abnormal sounds, etc.) shut the robot off using the switch on the front of the controller and immediately contact the Technical Staff in room JHE 205.</p>
<p>Equipment shutdowns</p> <ol style="list-style-type: none"> <u>To stop the robot in an emergency</u>, push one of the emergency stop buttons located on the teach pendent, the front of the control unit or the rear of the table. <u>For a controlled shut down of the robot</u>, allow the program to finish normally or push the STOP button on the front of the controller to stop the program execution. Then turn off the robot using switch located on the front of the controller and shut down the computer.

Environmental Responsibility

<p>Waste disposal procedures Procedure does not require disposal</p>
<p>Building air quality Procedure does not effect air quality</p>

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References (OHSA/ regulations, EPA and Municipal environmental regulations, McMaster University Program/ Policy, Material Data Sheets (MSDS).

1. RMM #300 Safety Orientation and Training Program
2. RMM #301 Standard Operating Procedure
3. RMM #309 Laboratory safety manual
4. RMM #310 Eye Protection Program

Distribution

1. Faculty of Engineering JHSC
2. Dr. G. Bone JHE 326F ext. 27591
3. Technical Staff of Mechanical Engineering JHE 205 ext. 24628