

Safety Procedures for Nachi Robot in EZONE Central G.005

Version 1.2

Updated March 2021

Induction

Lab access *beyond visitor line* requires:

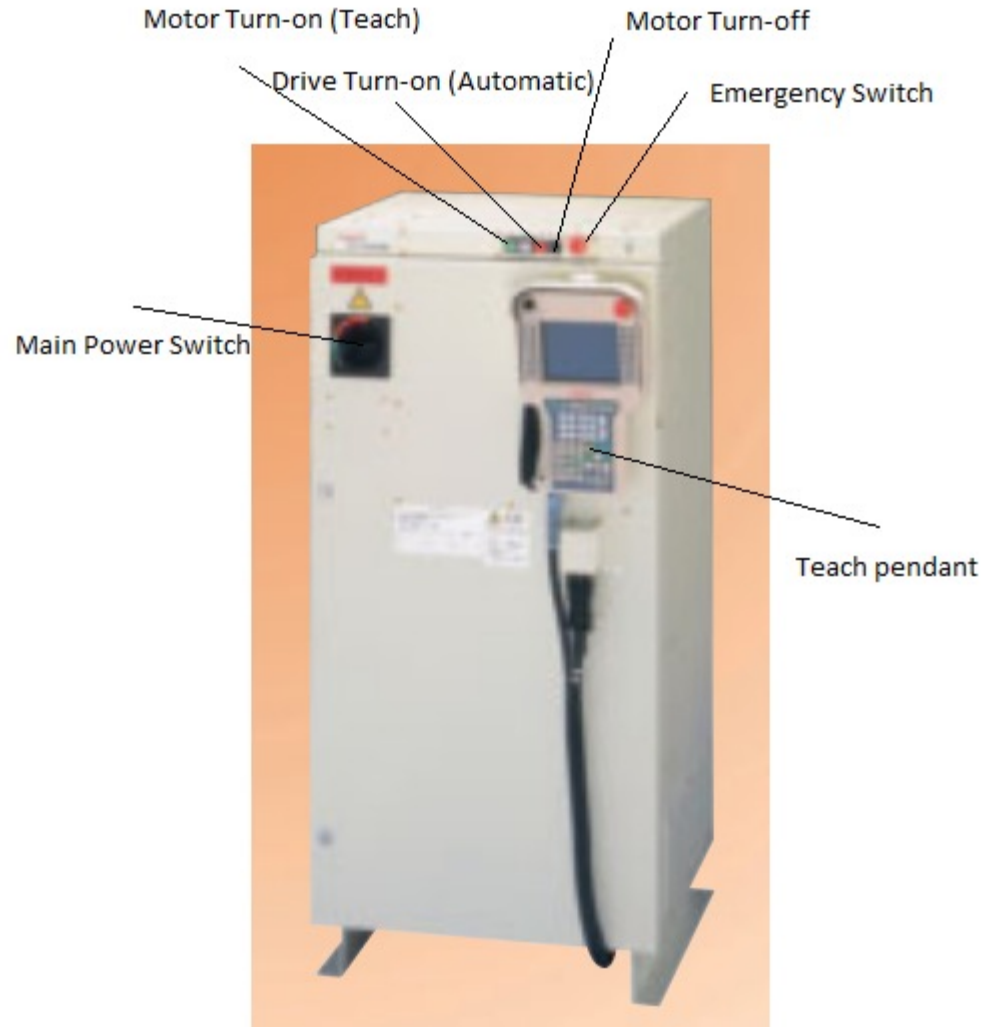
- Steel-cap safety shoes
- Safety glasses

Operation of Nachi robot requires

- Completed Nachi safety induction
- Automated robot control **only** with all people **outside** the safety fencing.

Starting up Robot

- Unlock key and remove padlock from robot console
- Activate circuit breaker at robot's 3-phase connection
- Turn on robot power by rotation switch clockwise
- Turn on motors by pressing green button on console



Shutting down Robot

- Move robot arm into neutral position using touch-pad
- Turn off power by rotating switch on console counter-clockwise
- Turn off circuit breaker at power connector

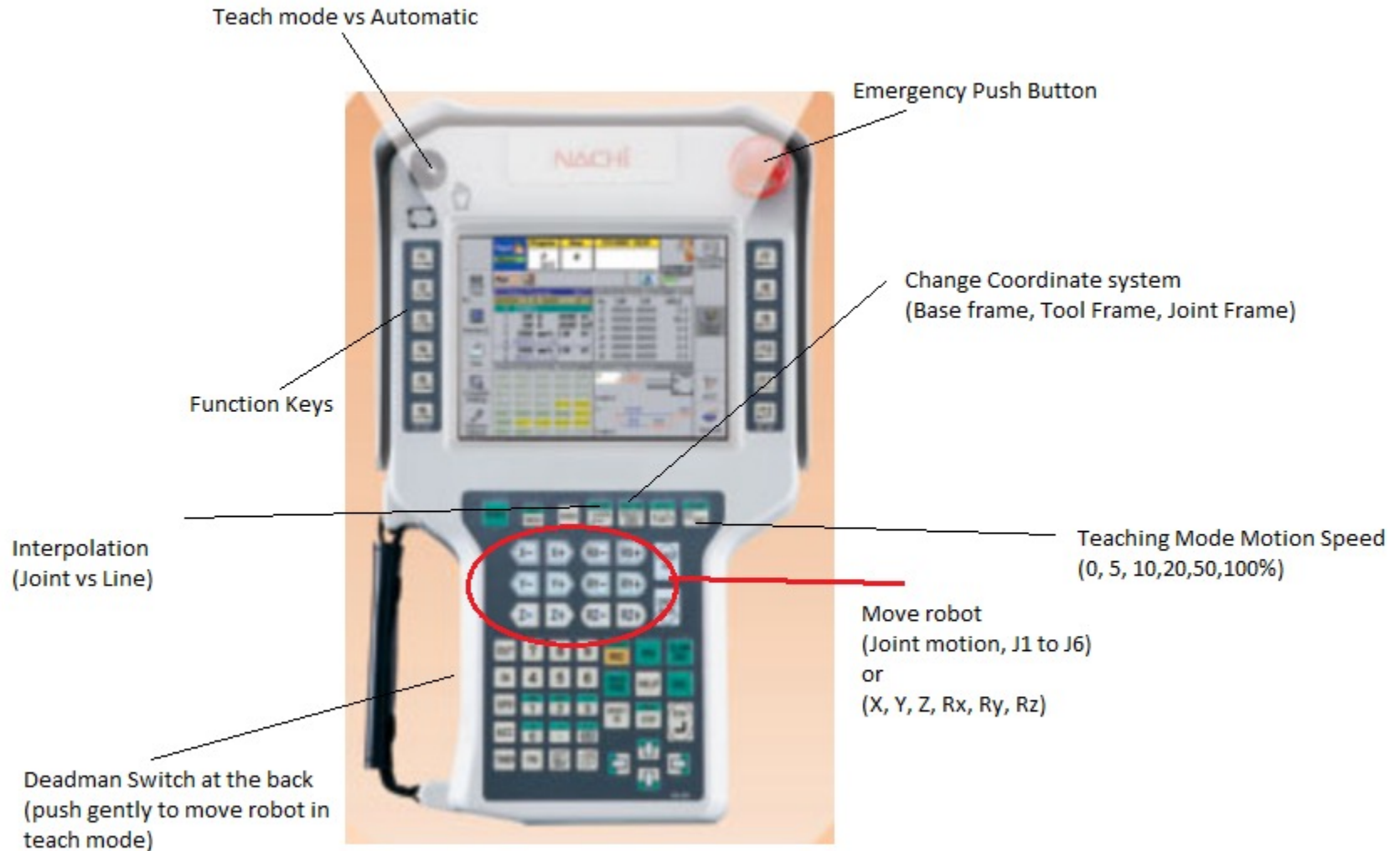


Teach-Pad Operation

Teach-pad operation, e.g. for setting up experiments of storing waypoints can be done when inside the fence:

- Move switch to "teach" symbol on robot console and on teach-pad
- Lightly press left or right deadman-switch on teach-pad
- Use x,y,z buttons to move robot axes

Teach-Pad Operation



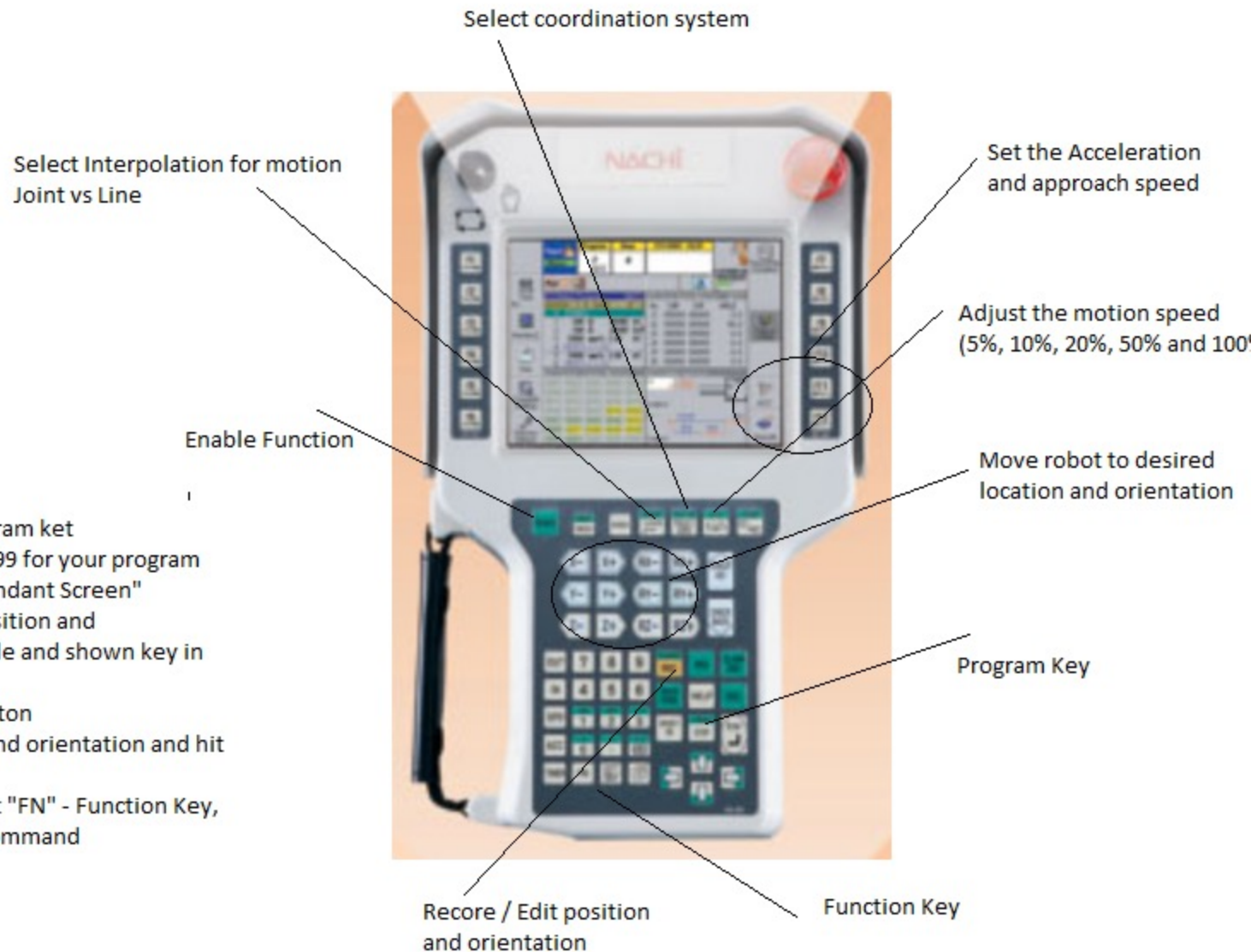
Teach-Pad Operation

Enable key to enable
the functions
highlighted in Green

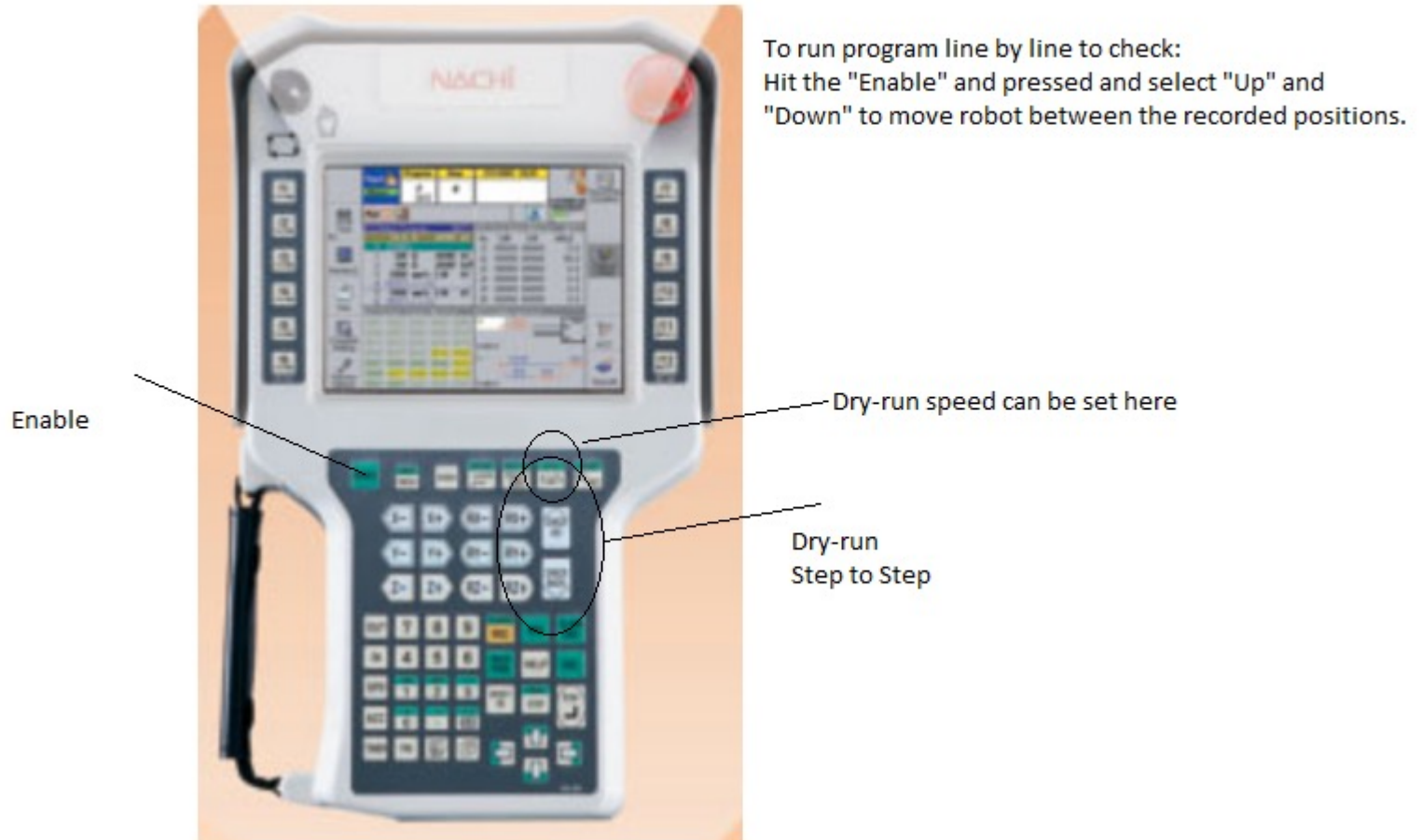


Write a program

- 1- hold "Enable" and select Program ket
- 2- Enter a number between 1 - 999 for your program
- 3 - New program start at the "Pendant Screen"
- 4- Move robot to the desired position and orientation, using the teach mode and shown key in the picture
- 5 - Hit the "Rec" key - Yellow button
- 6- Move robot to new position and orientation and hit "Rec"
- 7- Once finish the motion, Select "FN" - Function Key, and enter code "92" for "END" command



Dry-run (Check) a program



Run a program



Teach mode vs Automatic

Enable



- 1- Press "Enable" and hit "Program" Key
- 2- Select the program number from the menu
- 3- Select the "Program line" key - Without "Enable"
- 4- enter 1 to go to line 1 in the selected program
- 5 - Change the control mode to Automatic at the teach Pendant
- 6- Make sure the safety fence door is locked
- 7 - Change the control mode to Automatic at the controller
- 8- Turn on the driver and the robot should start automatic movement, based on the type of sequence selected (step by step or continuous)

Once program finished, put the robot in teach mode or turn it off if you finish with programming

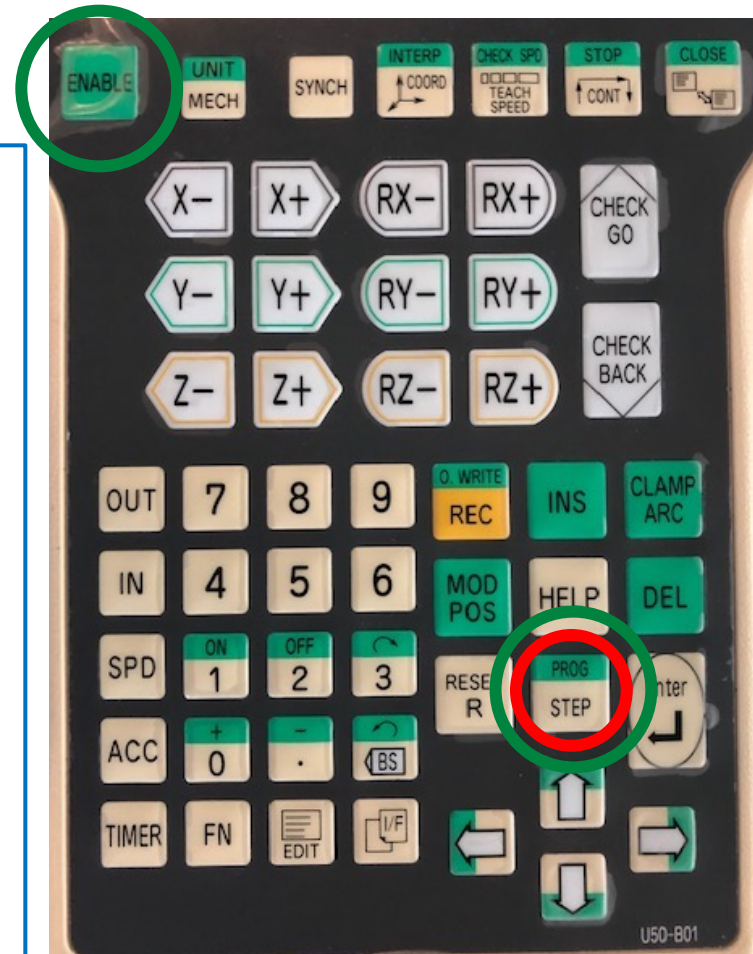
Auto-Mode Instructions

On TEACH PAD

1. Set teach pad & controller to "**Manual**"
2. Select **GREEN "Enable" + "PROG"**
Click: 0 1 <Enter> (Program #1)
3. Select "**STEP**"
Click: 0 1 <Enter> (Step #1)
4. For recording new positions press REC
Repeat this step as necessary
5. Set teach pad switch to "**Automatic**"

On CONTROLLER

1. Set controller to "**Automatic**"
2. Press **RUN button** on controller box



Gate Operation

- Gate key in **DOWN** position and **GATE OPEN** to enable teach operation
- Gate key in **UP** (locked) position and **GATE CLOSED** to enable automatic operation

Automated Operation (1)

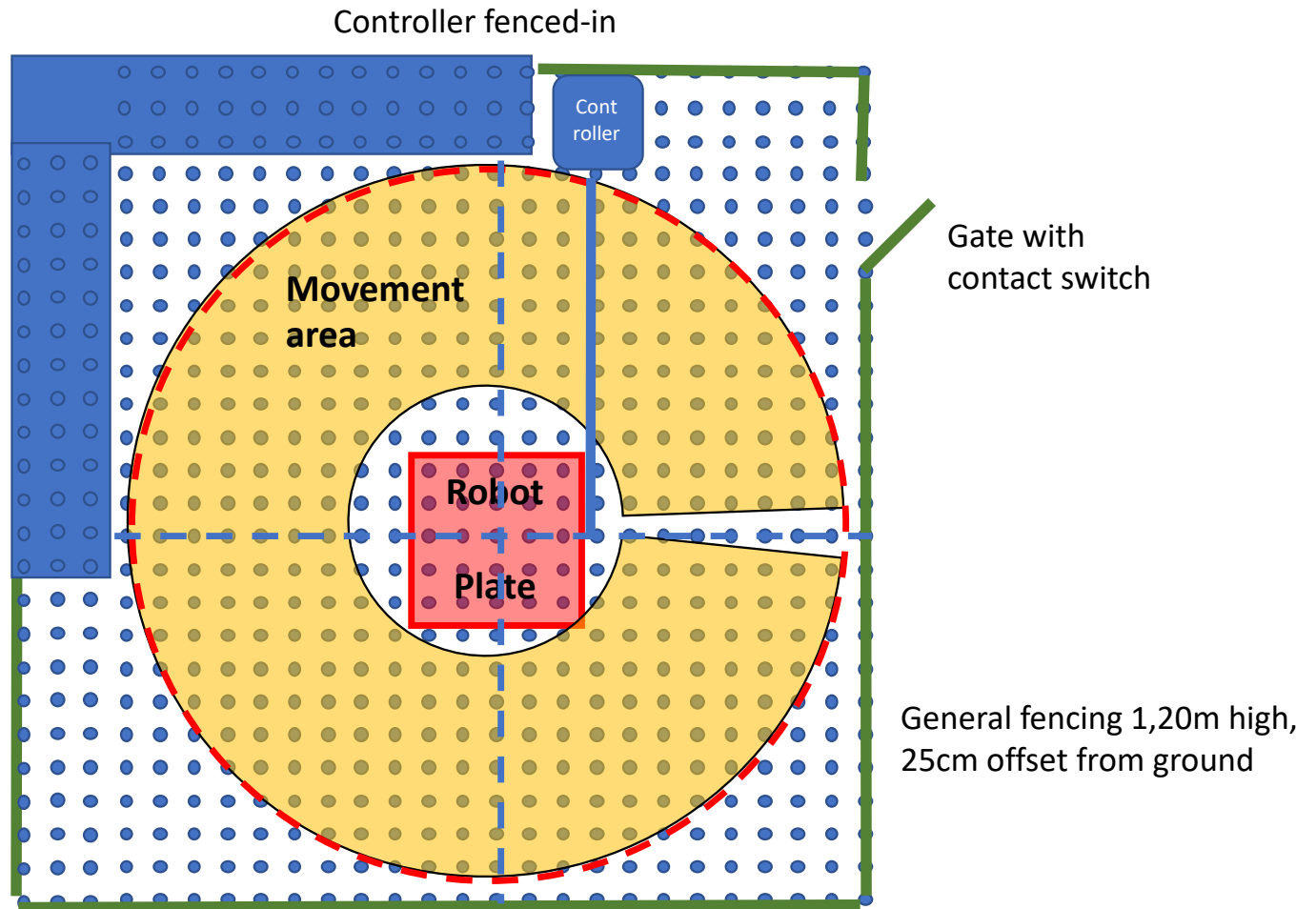
Automated operation is only allowed if all persons are outside the fence.

Before running any automated program run it in slow test-mode to make sure the robot arm does not collide with the floor or any objects (it cannot reach the reaction walls or the ceiling)

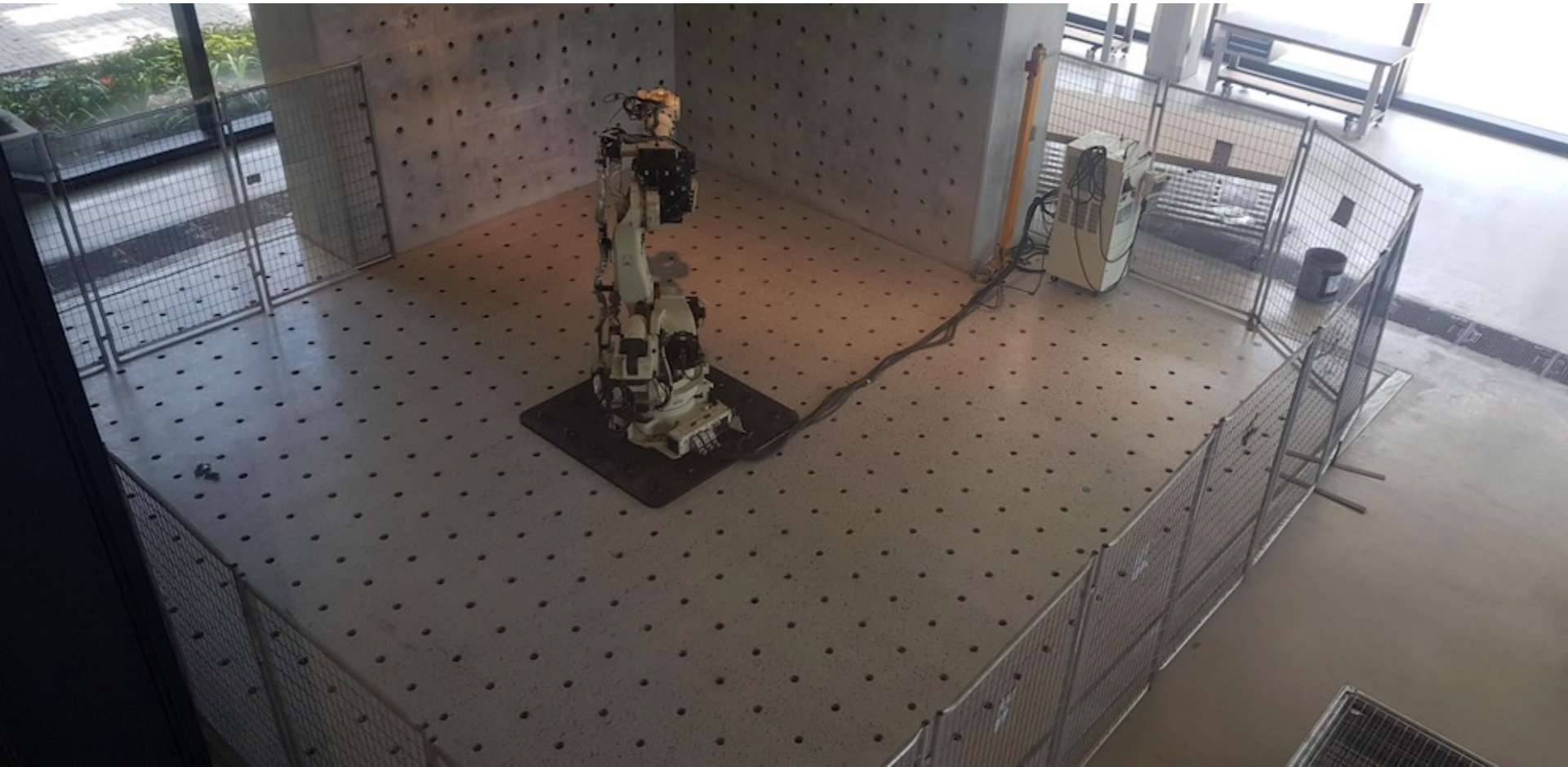
Automated Operation (2)

- Assure nobody is inside the fence
- Lock gate switch (or activate light curtain)
- Move switch to "automate" symbol on robot console and on teach-pad
- Select program to execute on teach-pad
- Start program by pushing white start-button on robot console
- Always have one person have their hand on the emergency stop button on the teach-pad or the console to immediately stop the robot, if necessary

Fencing



Fencing



Incidents

- **Never** enter the fence when the robot is under automated control
- **Never** activate the robot's automated control when another person is inside the fence area.
- If an injury has occurred, call campus security immediately at 6488 **2222** later fill in an incident/injury form.
- Nearest first-aid team is in EZONE North, ground floor.