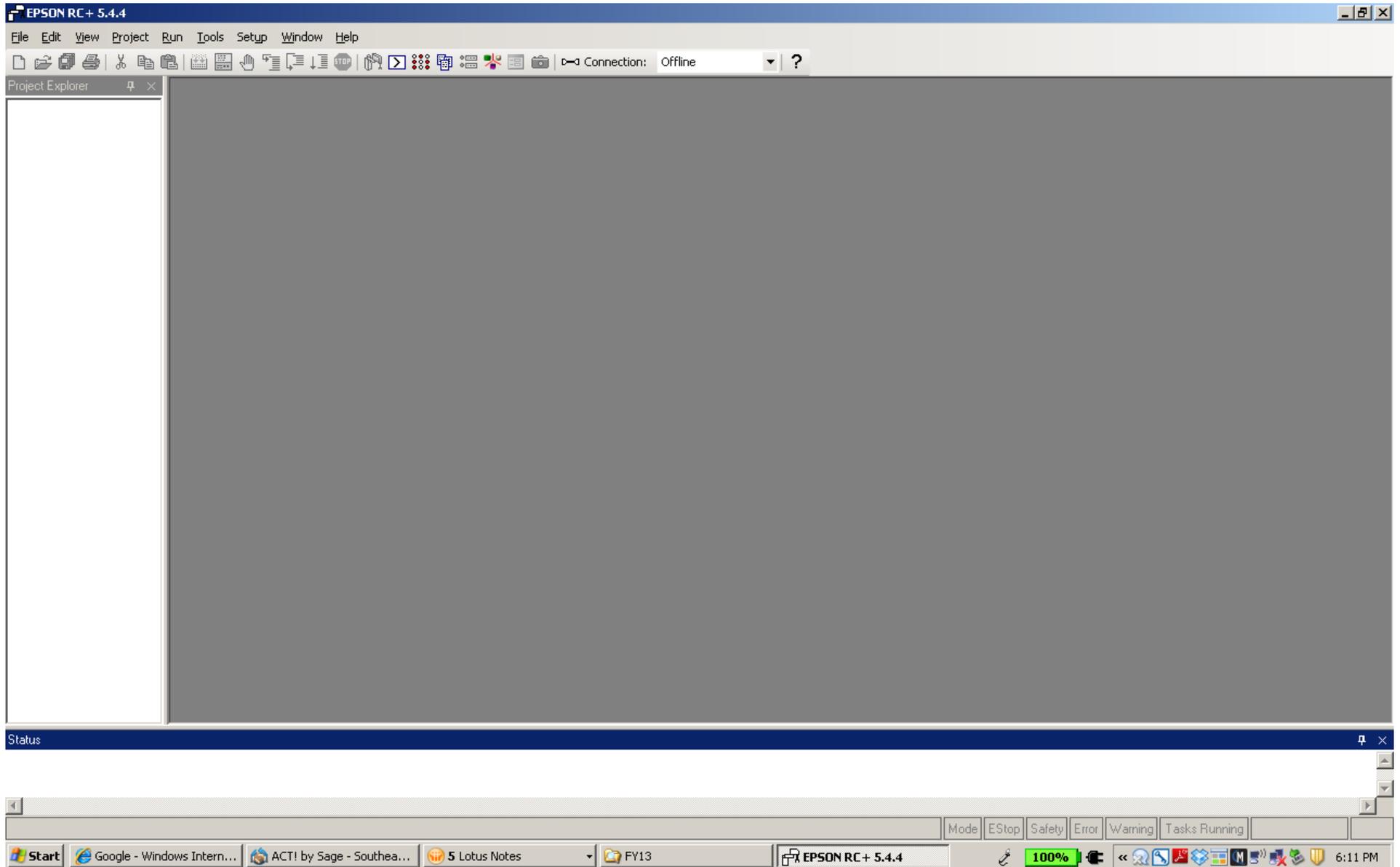


Step by Step Instruction to create a
New Project and Use our
Simulator.

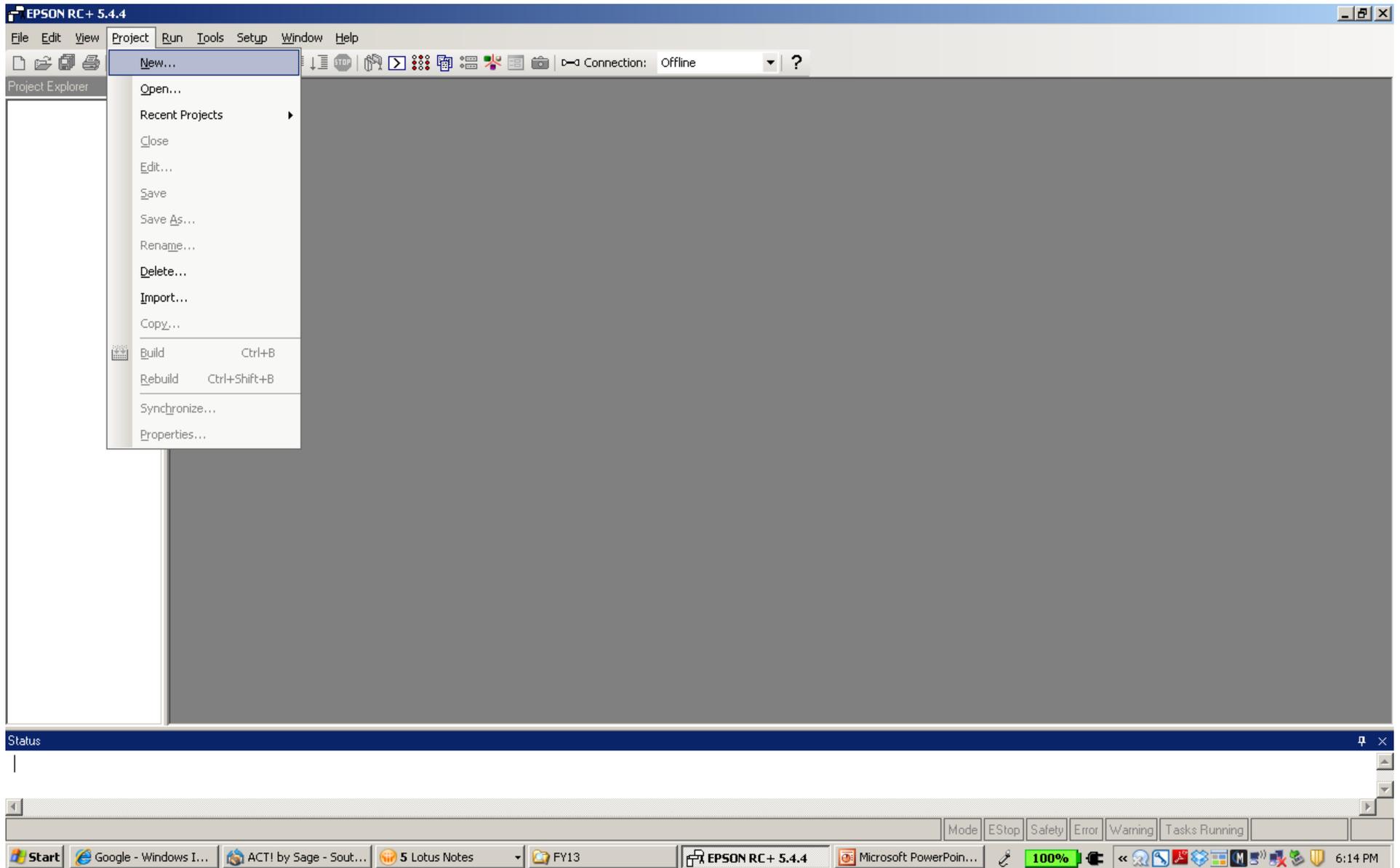
On the next page is an example to
be used for this training exercise.
See next page.

```
Long cycleCount
  Call InitRobot
Do
  Jump Start
    Wait Sw(PartInPos) = On
  Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
  Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
  Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
  Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
  Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
  Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
  cycleCount = cycleCount + 1
  Print "Cycle count: ", cycleCount
Loop
```

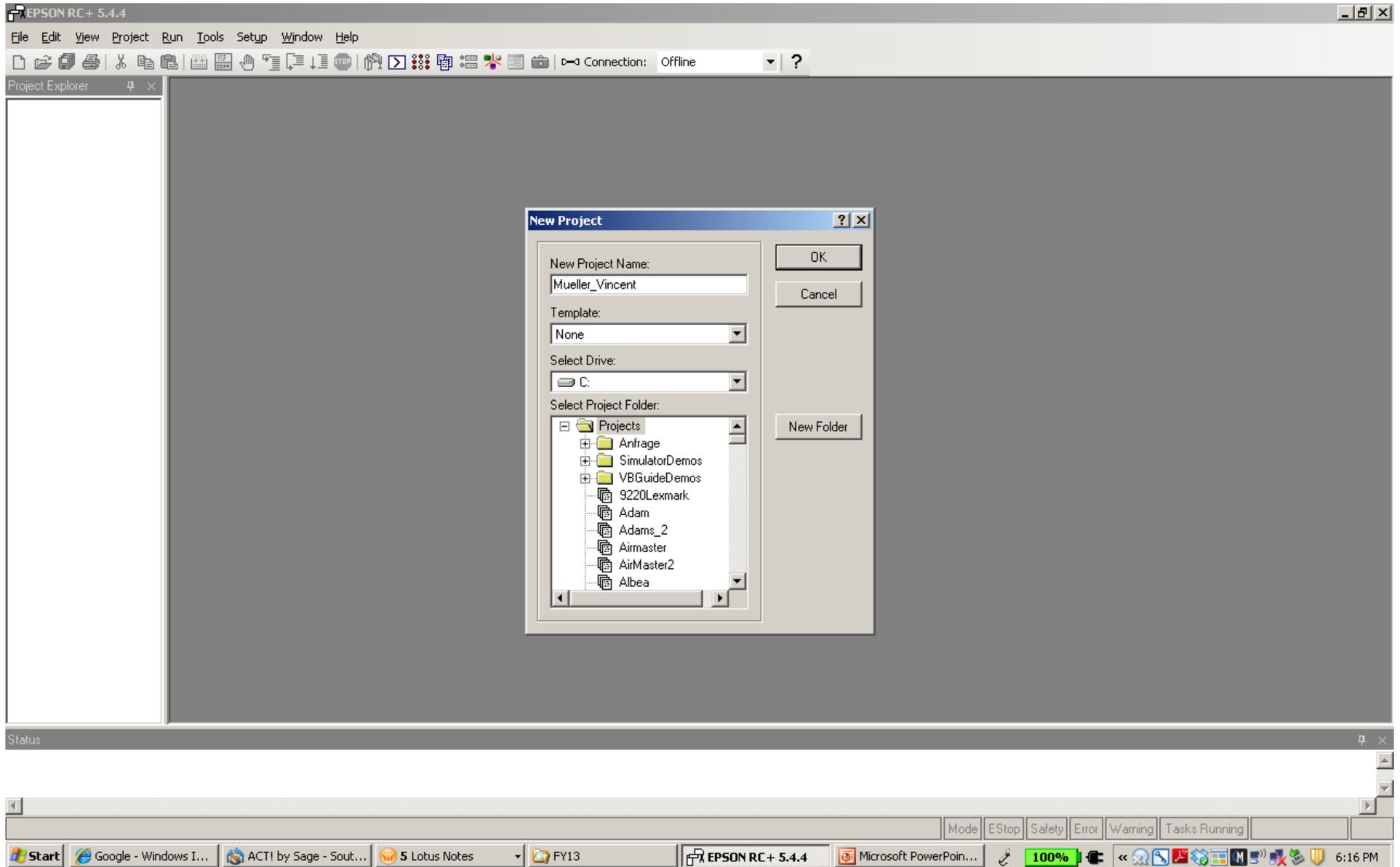
Open EPSON RC+ 5.4.4



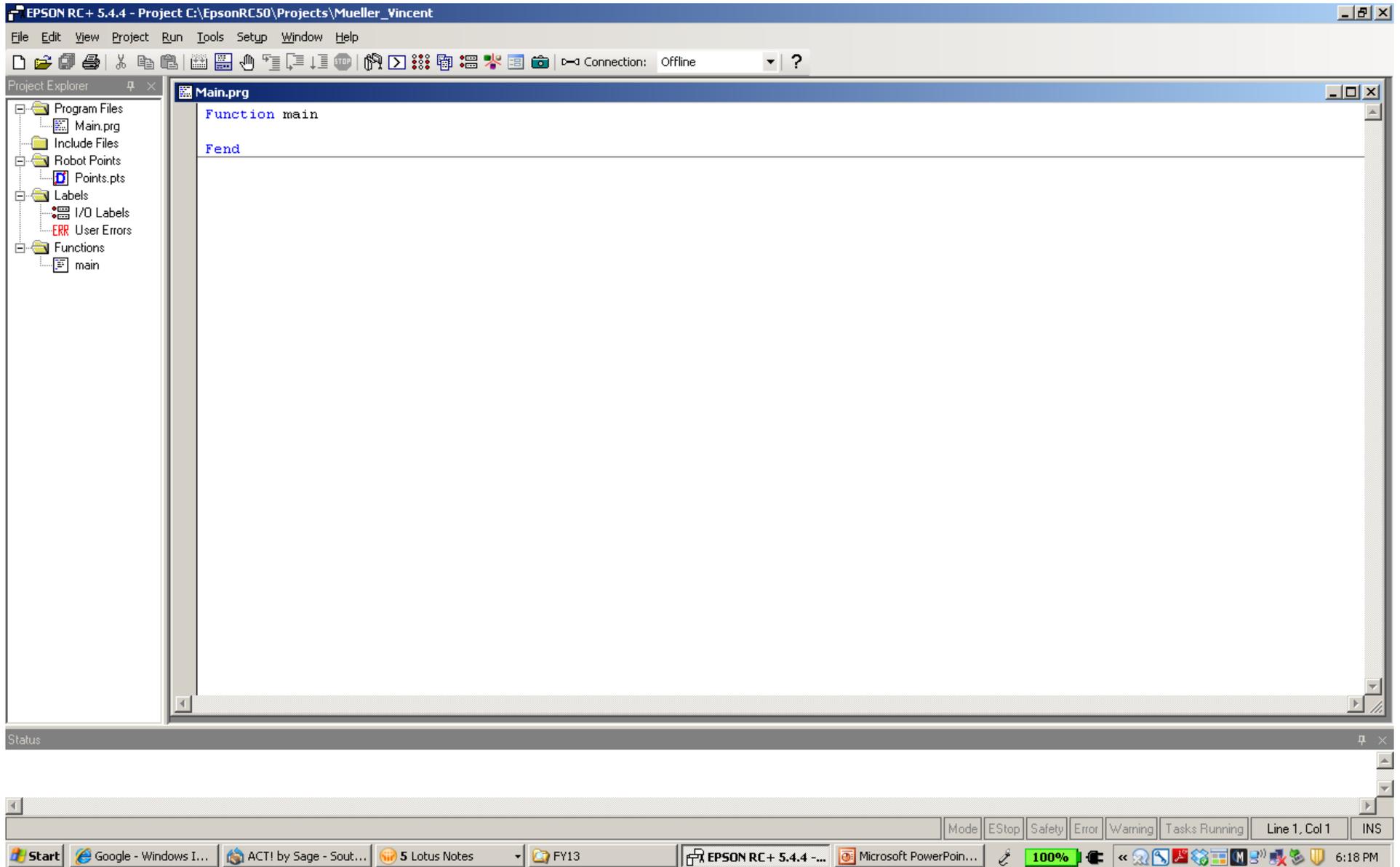
Start a New Project



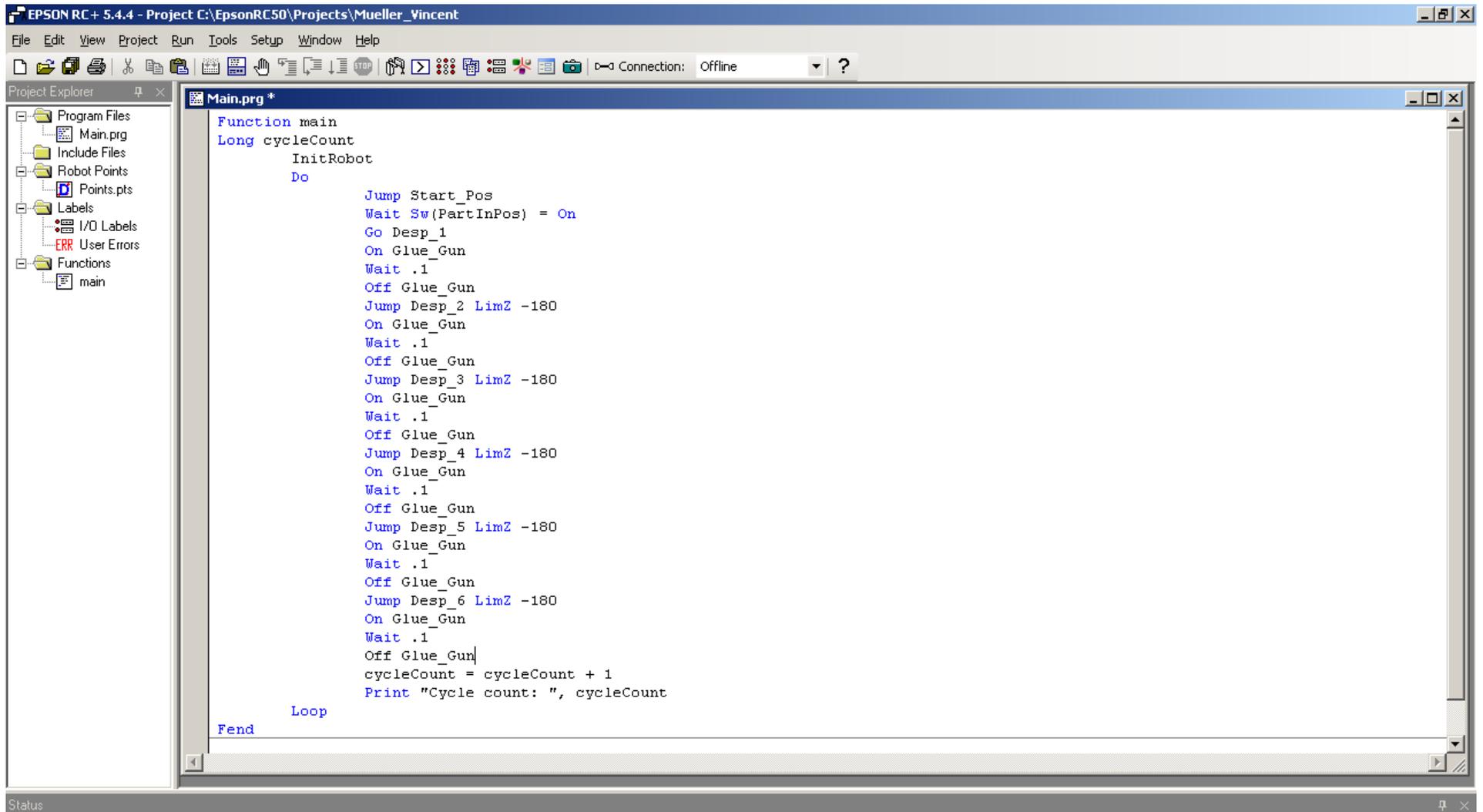
Give the New project a Name. Click OK!
Note; Do not use a template!



This is what will come up. Then copy the text from the second page and paste it between the “Function main” and “Fend”



This is what it should look like!



The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a ladder logic program for 'Main.prg'. The program starts with a 'Function main' block, followed by a 'Long cycleCount' declaration and an 'InitRobot' instruction. A 'Do' loop contains a sequence of instructions: 'Jump Start_Pos', 'Wait Sw(PartInPos) = On', 'Go Desp_1', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_2 LimZ -180', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_3 LimZ -180', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_4 LimZ -180', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_5 LimZ -180', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_6 LimZ -180', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'cycleCount = cycleCount + 1', and 'Print "Cycle count: ", cycleCount'. The loop ends with 'Loop' and 'Fend'.

```
Function main
Long cycleCount
  InitRobot
  Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
  Loop
Fend
```

After you paste in the text, then you'll need create a Virtual Controller!
Fist click on the connect icon. Second click on ADD! You will get another popup menu!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a code editor with the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 Limit = 100
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

The 'PC to Controller Communications' dialog box is open, showing a table of connections:

| Number | Name | Type | IP Address |
|--------|---------|---------|------------|
| 11 | ADAMS | Virtual | N/A |
| 12 | Mueller | Virtual | N/A |
| 13 | ATC | Virtual | N/A |
| 14 | TE | Virtual | N/A |

The dialog box also includes buttons for 'Connect', 'Disconnect', 'Add', 'Delete', 'Apply', and 'Restore'. The 'Add' button is highlighted by an arrow labeled 'Second'. The 'Connect' button is highlighted by an arrow labeled 'first'. The status bar at the bottom of the dialog box shows 'Current Connection: 1' and 'Connection Status: Disconnected'. There are also checkboxes for 'Work Offline' and 'Auto Connect', and a 'Close' button.

The Windows taskbar at the bottom of the screen shows the Start button, several open applications including Google Chrome, Mail, Microsoft Excel, and Microsoft PowerPoint, and the system tray with a 100% battery indicator and the time 10:00 AM.

Click on Connection to New Virtual Controller. Then click OK.

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window shows a ladder logic program for 'Main.prg'. The code includes a 'Function main' block with a 'Long cycleCount' variable. The program starts with 'InitRobot' and enters a 'Do' loop. Inside the loop, it performs several actions: 'Jump Start_Pos', 'Wait Sw(PartInPos) = On', 'Go Desp_1', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_2', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_3', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_4', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_5', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun', 'Jump Desp_6', 'On Glue_Gun', 'Wait .1', 'Off Glue_Gun'. After the loop, it increments 'cycleCount' and prints the value: 'Print "Cycle count: ", cycleCount'.

The 'New Controller Connection' dialog box is open, showing a table of 'Current Connections' with columns for 'Number' and 'Name'. The table contains four entries with numbers 11, 12, 13, and 14. Below the table, there are two radio buttons: 'Connection to real controller via Ethernet' and 'Connection to new virtual controller'. The second radio button is selected. Below the radio buttons is a dropdown menu labeled 'Copy from existing virtual controller'. At the bottom of the dialog are 'OK' and 'Cancel' buttons. An arrow points to the selected radio button.

The screenshot shows the Windows taskbar at the bottom of the screen. The taskbar includes the Start button, several open applications (Google - Win..., Mail - Sent - I..., > RE: Lost F..., > RE: Lost F..., Microsoft Excel, QuoteWerks..., EPSON RC+..., New Control...), and the Microsoft PowerPoint application. The system tray on the right shows the battery level at 100%, the time as 10:07 AM, and other system icons.

This will take you back to the previous Menu Screen, and you'll have a new controller under the Name Tab call Virtual1. Change the name to anything you like! Then Click Apply!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a code editor for 'Main.prg' with the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 Limit = 100
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

The 'PC to Controller Communications' dialog box is open, showing a table of controllers:

| Number | Name | Type | IP Address |
|--------|-----------|---------|------------|
| 11 | ADAMS | Virtual | N/A |
| 12 | Mueller | Virtual | N/A |
| 13 | ATC | Virtual | N/A |
| 14 | TE | Virtual | N/A |
| 15 | Virtual 1 | Virtual | N/A |

Arrows point to the 'Add' button (labeled 'first'), the 'Virtual 1' row (labeled 'Second'), and the 'Apply' button (labeled 'Third').

The Windows taskbar shows several open applications: Start, Google - Windo..., Mail - Sent - IBM..., > RE: Lost Foa..., Microsoft Excel, QuoteWerks - [...], EPSON RC+ 5..., and Microsoft Power... The system tray shows 100% battery and the time 10:10 AM.

After you click Apply, the screen will change to highlight the Connect Tab.
Click the Connect tab! You will get a hourglass indicating a change is taking place.
You will need to until you get a message!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a code editor for 'Main.prg' with the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 Limit = 100
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

A dialog box titled 'PC to Controller Communications' is overlaid on the code editor. It shows a table of connections:

| Number | Name | Type | IP Address |
|--------|-----------|---------|------------|
| 11 | ADAMS | Virtual | N/A |
| 12 | Mueller | Virtual | N/A |
| 13 | ATC | Virtual | N/A |
| 14 | TE | Virtual | N/A |
| 15 | Mueller_3 | Virtual | N/A |

The 'Connect' button is highlighted with a mouse cursor. Below the table, there are checkboxes for 'Work Offline' and 'Auto Connect', and a 'Close' button at the bottom.

The Windows taskbar at the bottom of the screen shows the Start button, several open applications including Google Chrome, Mail, Microsoft Excel, and EPSON RC+ 5.4.4, and system tray icons for Mode, EStop, Safety, Error, Warning, Tasks Running, Line 37, Col 1, and INS. The system clock shows 10:17 AM on 10/17/2011.

The message "Warning" There is currently on robot configured for the controller.
Click ok!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a code editor with the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 Limit = 100
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

A dialog box titled "PC to Controller Communications" is overlaid on the code editor. It shows a table of connections:

| Number | Name | Type | IP Address |
|--------|---------------|---------|------------|
| 11 | ADAMS | Virtual | N/A |
| 12 | Mueller | Virtual | N/A |
| 13 | EPSON RC+ 5.0 | | |
| 14 | | | |
| 15 | Warning | | |

The dialog box also contains the text: "There is currently no robot configured for the controller." and an "OK" button. A red circle highlights the dialog box, and a red arrow points to the "Warning" entry in the table.

The Windows taskbar at the bottom of the screen shows several open applications: Start, Google - Windo..., Mail - Sent - IBM..., > RE: Lost Foa..., Microsoft Excel, QuoteWerks - f..., EPSON RC+ 5..., and Microsoft Power... The system tray on the right shows the time as 10:20 AM and the date as 11/20/2010. The taskbar also displays the status of various components: Program, EStop, Safety, Error, Warning, Tasks Running, Line 37, Col 1, and INS.

You will then be connected to the new controller! The controller will appear in the Connection window, the connect tab will turn gray. You can close this menu!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a code editor with the following code:

```
Function main
Long cycleCount

InitRobot

Do
  Jump Start_Pos
  Wait Sw(PartInPos) = On
  Go Desp_1
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_2 1
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_3 1
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_4 1
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_5 1
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_6 Limit = 100
  On Glue_Gun
  Wait .1
  Off Glue_Gun

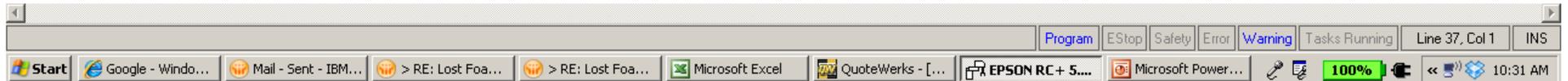
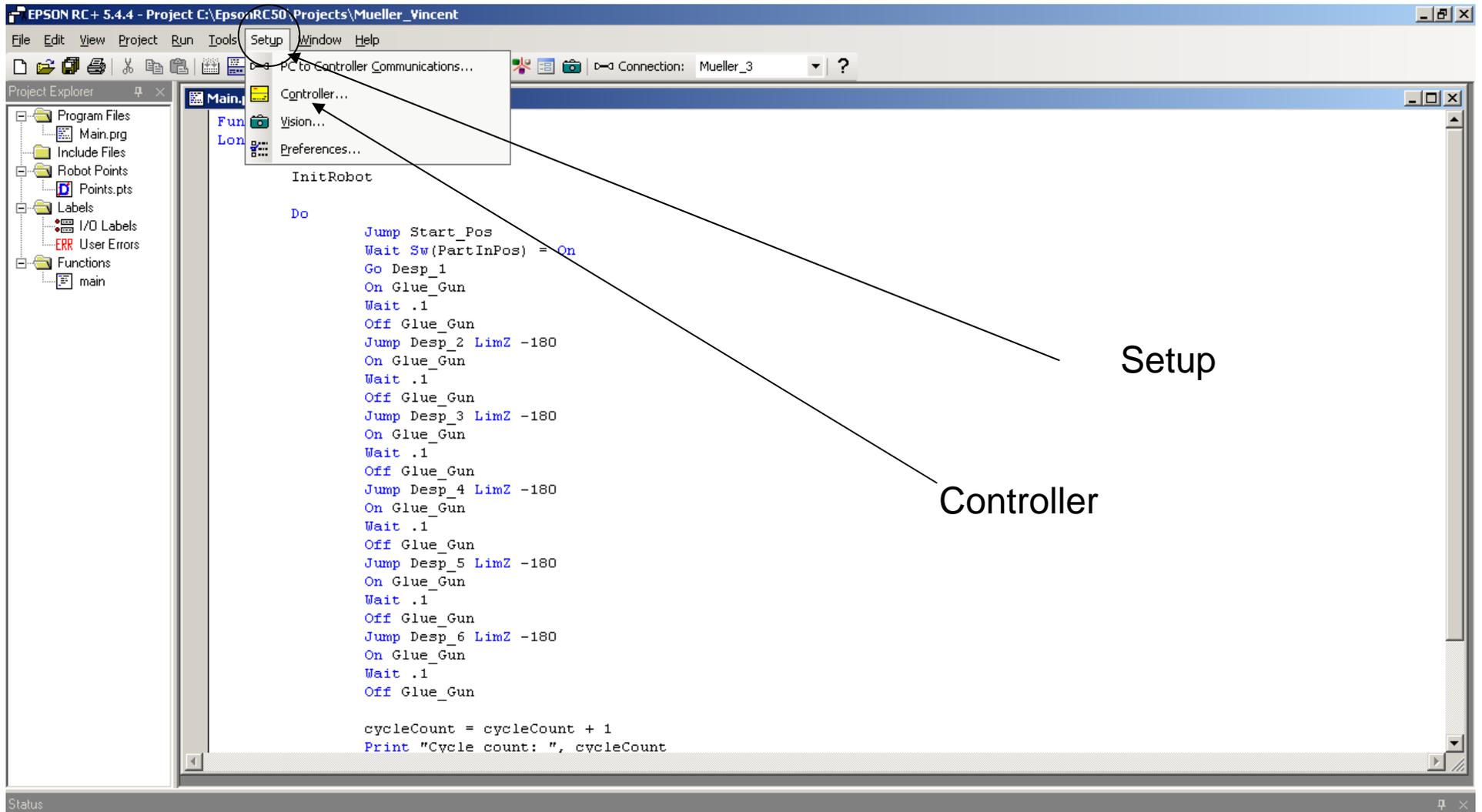
  cycleCount = cycleCount + 1
  Print "Cycle count: ", cycleCount
```

The 'PC to Controller Communications' dialog box is open, showing a table of available controllers:

| Number | Name | Type | IP Address |
|--------|-----------|---------|------------|
| 11 | ADAMS | Virtual | N/A |
| 12 | Mueller | Virtual | N/A |
| 13 | ATC | Virtual | N/A |
| 14 | TE | Virtual | N/A |
| 15 | Mueller_3 | Virtual | N/A |

The 'Connect' button is highlighted, and the 'Mueller_3' entry in the table is selected. The 'Close' button is also visible. The status bar at the bottom indicates 'Program | EStop | Safety | Error | Warning | Tasks Running | Line 37, Col 1 | INS'.

The you will need to go to Setup!
Then click the Controller Tab! You'll need to wait until the next Menu appears.



This is the new Menu that will appear!

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "Main.prg *" and contains the following code:

```
Function main
Long cycleCount

    InitRobot

    Do

        Jump Start_Pos
        Wait
        Go De
        On G1
        Wait
        Off G
        Jump
        On Glue_Gun
        Wait .1
        Off Glue_Gun

        cycleCount = cycleCount + 1
        Print "Cycle count: ", cycleCount
```

A "Setup Controller" dialog box is open, showing the "General" tab. The dialog box contains the following information:

| Controller General | |
|--------------------|----------------------|
| Serial #: | |
| MAC Address: | 00-27-10-78-EA-C8 |
| Firmware Version: | 10.4.0.0 |
| Date / Time: | 4/5/2013 10:33:28 AM |
| Project Name: | |

The dialog box also features buttons for "Close", "Apply", "Restore", and "Defaults".

The Windows taskbar at the bottom of the screen shows the following elements from left to right:

- Start button
- Google - Windo...
- Mail - Sent - IBM...
- > RE: Lost Foa...
- > RE: Lost Foa...
- Microsoft Excel
- QuoteWerks - [...]
- EPSON RC+ 5...
- Microsoft Power...
- System tray: 100% battery, network, volume, and system clock showing 10:36 AM.

First click the Preferences Tab and check the boxes as shown below!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays a code editor for 'Main.prg' with the following code:

```
Function main
Long cycleCount

  InitRobot

  Do

    Jump Start_Pos
    Wait
    Go De
    On G1
    Wait
    Off G
    Jump
    On Glue_Gun
    Wait .1
    Off Glue_Gun

  cycleCount = cycleCount + 1
  Print "Cycle count: ", cycleCount
```

The 'Setup Controller' dialog box is open, showing the 'Preferences' tab. The 'Controller Preferences' section has the following checked options:

- Outputs off during emergency stop
- Walk stops for output commands
- Dry run
- Virtual I/O
- Include project files when status exported

The 'Status' bar at the bottom of the software window shows 'Program', 'EStop', 'Safety', 'Error', 'Warning', 'Tasks Running', 'Line 37, Col 1', and 'INS'.

The Windows taskbar shows the following open applications from left to right: Start, Google - Windo..., Mail - Sent - IBM..., > RE: Lost Foa..., > RE: Lost Foa..., Microsoft Excel, QuoteWerks - [...], EPSON RC+ 5..., and Microsoft Power... The system tray on the right shows a 100% battery icon, a network icon, and the time 10:37 AM.

I selected the G20-A04SR-II. Then click Apply. You will need to wait until the configuration is complete! When complete, the Apply Tab will turn gray and you can close the menu.

The screenshot shows a software interface with a code editor on the left and a 'Setup Controller' dialog box on the right. The code editor contains the following text:

```
Function main
Long cycleCount

  InitRobot

  Do

    Jump Start_Pos
    Wait
    Go De
    On G1
    Wait
    Off G
    Jump
    On Glue_Gun
    Wait .1
    Off Glue_Gun

  cycleCount = cycleCount + 1
```

The 'Setup Controller' dialog box has a tree view on the left with the following items:

- General
- Configuration
- Preferences
- Simulator
- Robot
 - Model
 - Configuration
- Inputs / Outputs
- Remote Control
- RS232
- TCP / IP

The 'Robot Model' section on the right contains the following fields:

- Model: G20-A04SR-II (selected in a dropdown menu)
- Type: Scara
- J1 + J2 Length: 1000 mm
- Z Length: 420 mm

Buttons on the right side of the dialog box include 'Close', 'Apply', 'Restore', and 'Defaults'.

Now you'll need to click on the Simulator!

The screenshot shows the EPSON RC+ 5.4.4 software interface. The title bar reads "EPSON RC+ 5.4.4 - Project C:\EpsonRC50\Projects\Mueller_Vincent". The menu bar includes File, Edit, View, Project, Run, Tools, Setup, Window, and Help. The toolbar contains various icons, with a red circle highlighting the simulator icon (a green robot head). The Project Explorer on the left shows a tree view with folders for Program Files, Include Files, Robot Points, Labels, I/O Labels, User Errors, and Functions, with a file named "main" selected under Functions. The main editor window displays the following code for "Main.prg":

```
Function main
Long cycleCount

    InitRobot

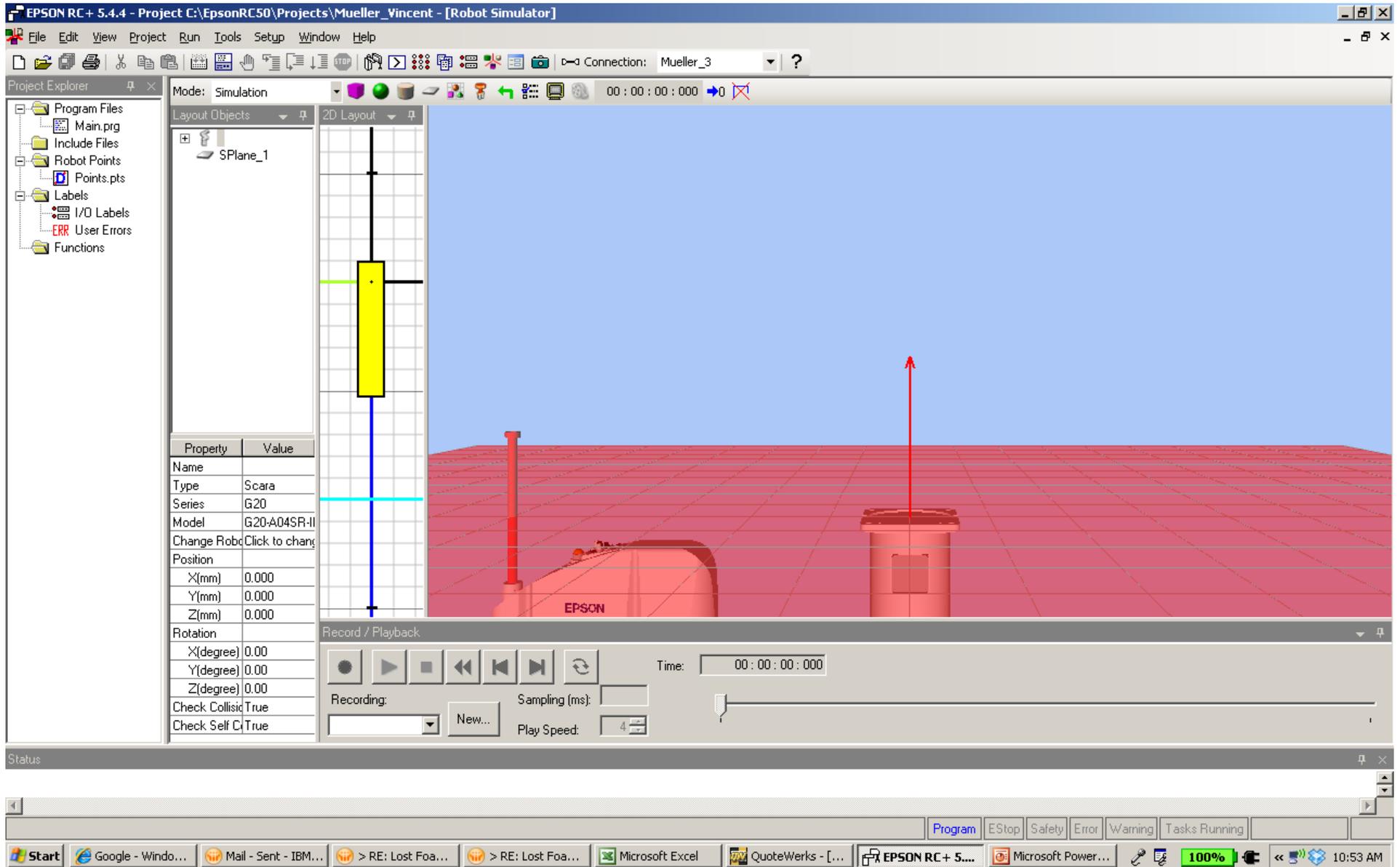
    Do
        Jump Start_Pos
        Wait Sw(PartInPos) = On
        Go Desp_1
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_2 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_3 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_4 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_5 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_6 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

The status bar at the bottom of the window shows "Status".

The screenshot shows the Windows taskbar. The Start button is on the left. Open applications include Google - Windows I..., Mail - Sent - IBM Lo..., > RE: Lost Foam Pl..., > RE: Lost Foam Pl..., Microsoft Excel, QuoteWerks - [Unti..., and EPSON RC+ 5.4.4 ... The system tray on the right shows a 100% battery icon, a network icon, and the time 9:56 AM.

You most likely will get something like this!



With your mouse, zoom out so you can see a larger work area!
The click on the robot icon, and look at the Z-Axis Position Value.

The screenshot displays the Robot Simulator software interface. The main window is titled "C:\EpsonRC50\Projects\Mueller_Vincent - [Robot Simulator]". The interface includes a menu bar (Run, Tools, Setup, Window, Help), a toolbar, and a status bar. The main area is divided into a 2D Layout view on the left and a 3D view on the right. The 2D Layout view shows a yellow rectangular robot icon on a grid. The 3D view shows a red grid floor with a red robot model. A red arrow points upwards from the robot, and a purple arrow points downwards. A black arrow points from the robot icon in the 2D view to the 3D view. A table in the bottom-left corner shows the robot's properties and position.

| Property | Value |
|----------------|----------------|
| Name | |
| Type | Scara |
| Series | G20 |
| Model | G20-A04SR-II |
| Change Robc | Click to chang |
| Position | |
| X(mm) | 0.000 |
| Y(mm) | 0.000 |
| Z(mm) | 0.000 |
| Rotation | |
| X(degree) | 0.00 |
| Y(degree) | 0.00 |
| Z(degree) | 0.00 |
| Check Collisic | True |
| Check Self C | True |

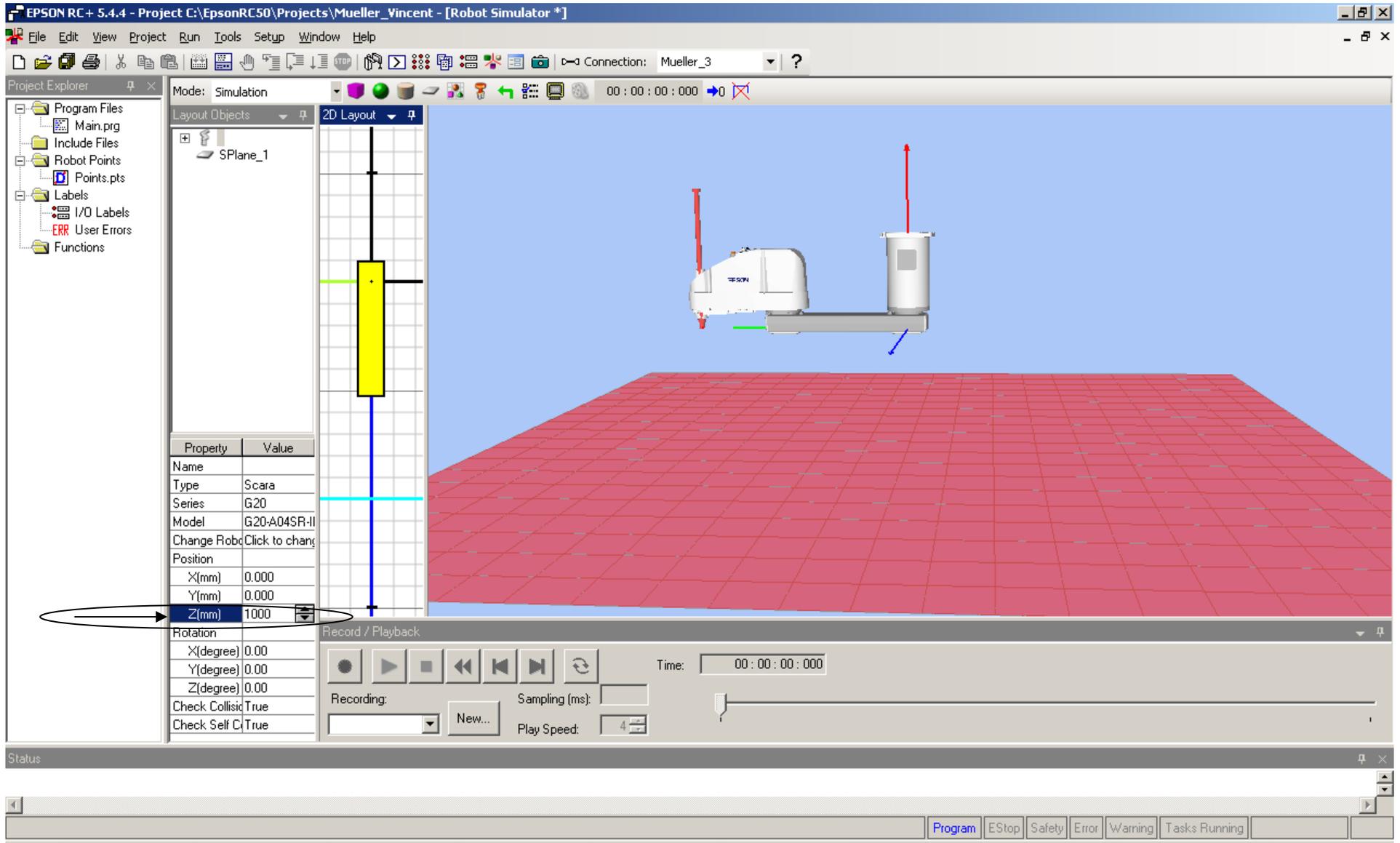
Record / Playback

Time: 00:00:00:000

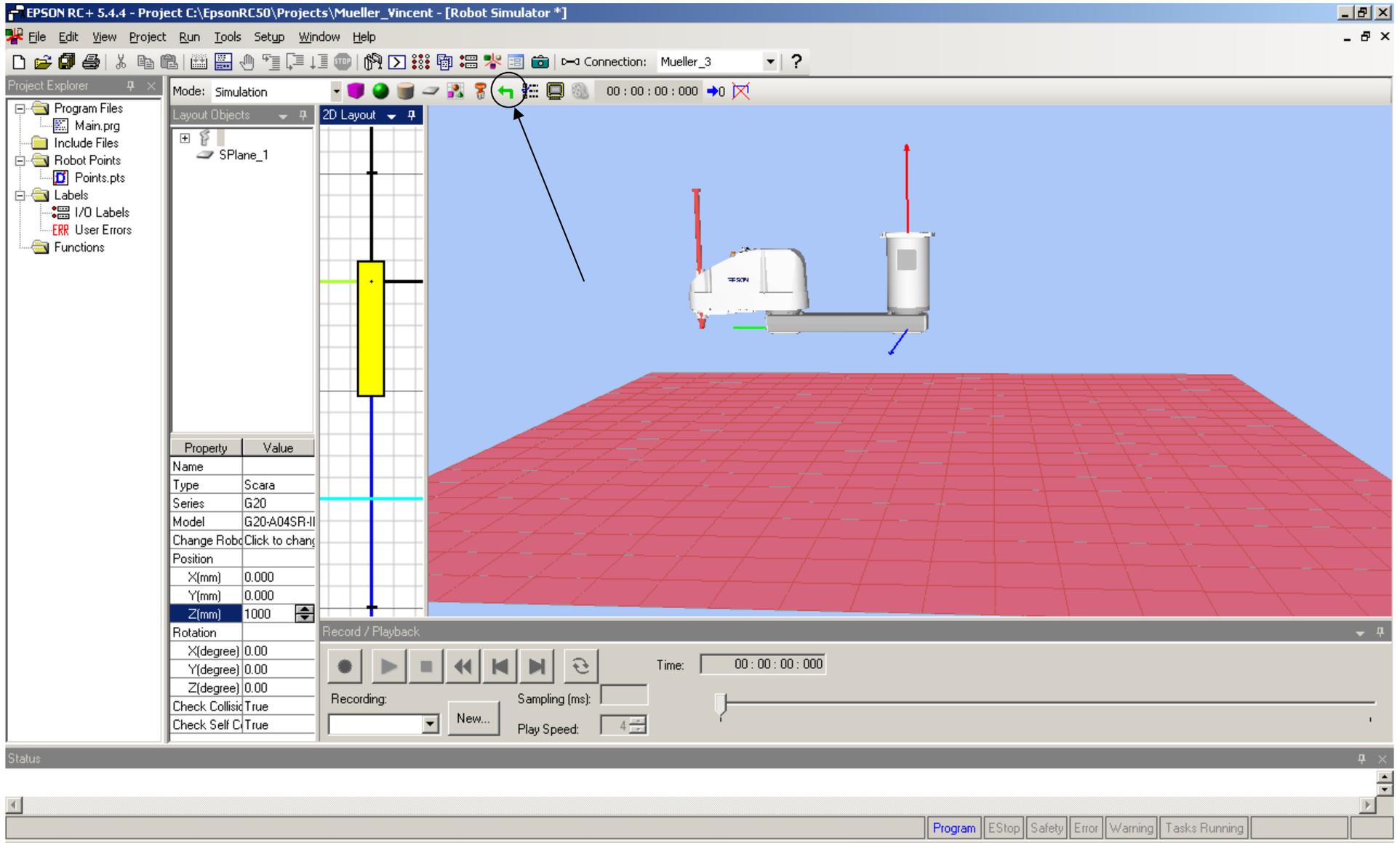
Recording: [] Sampling (ms): []

New... Play Speed: 4

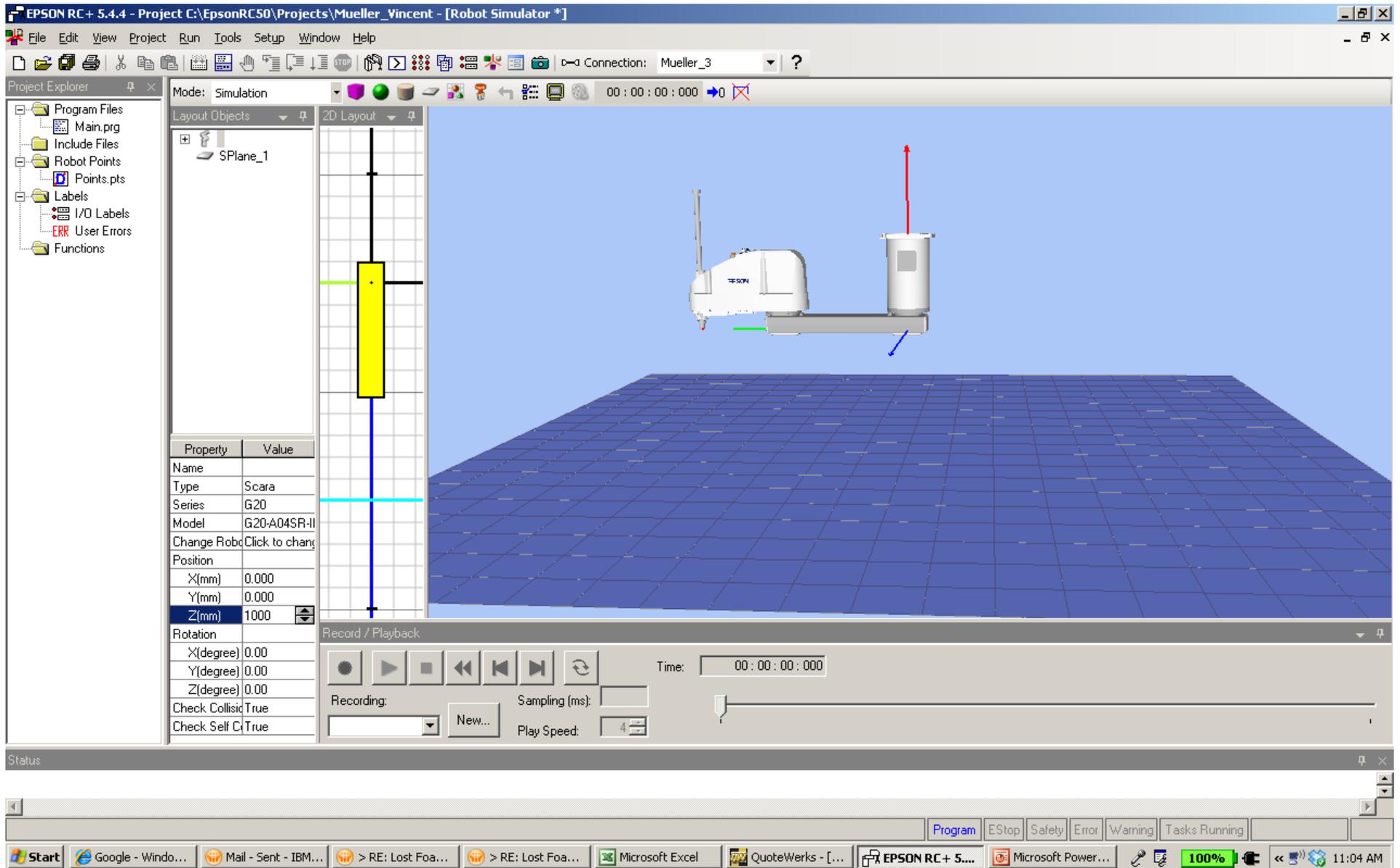
Change the Robot's position by clicking on the Z-Value as shown below.
Change to 1000.



Then click on the “Reset Collision” icon to clear the Red collision indicator!

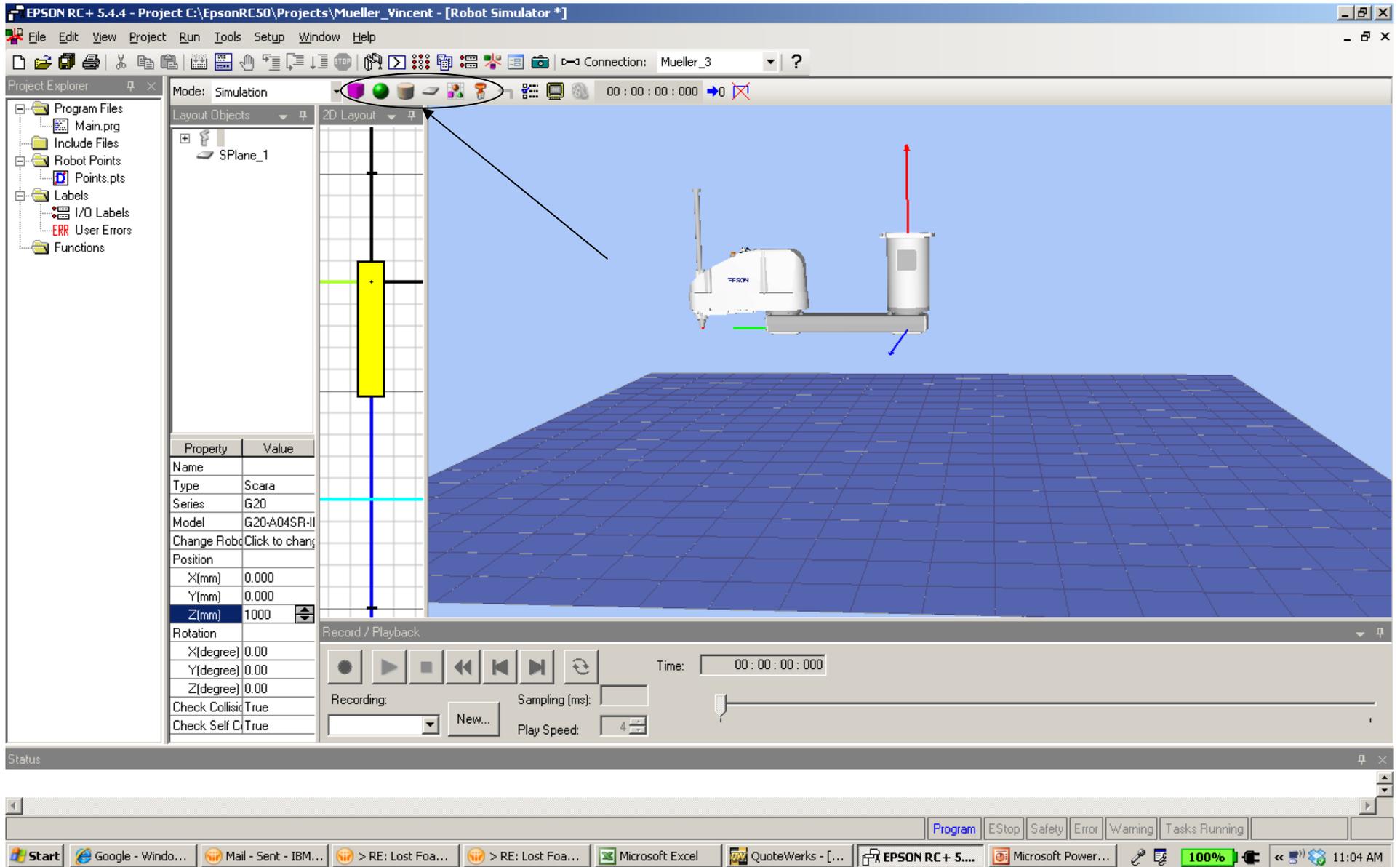


“Reset Collision” will clear the Red collision indicator and turn objects and robot to normal colors!

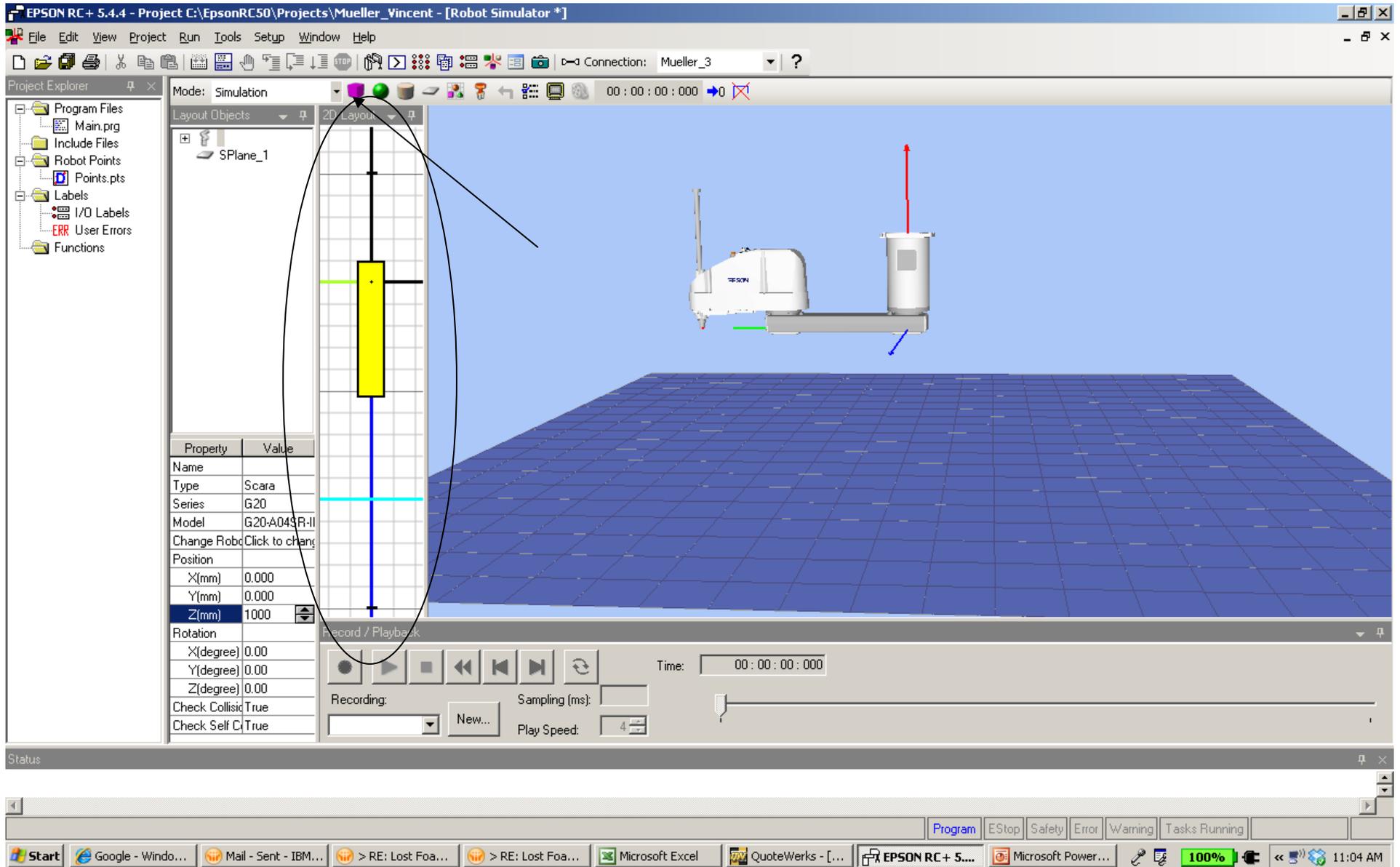


Now we are ready to create objects in the work area.

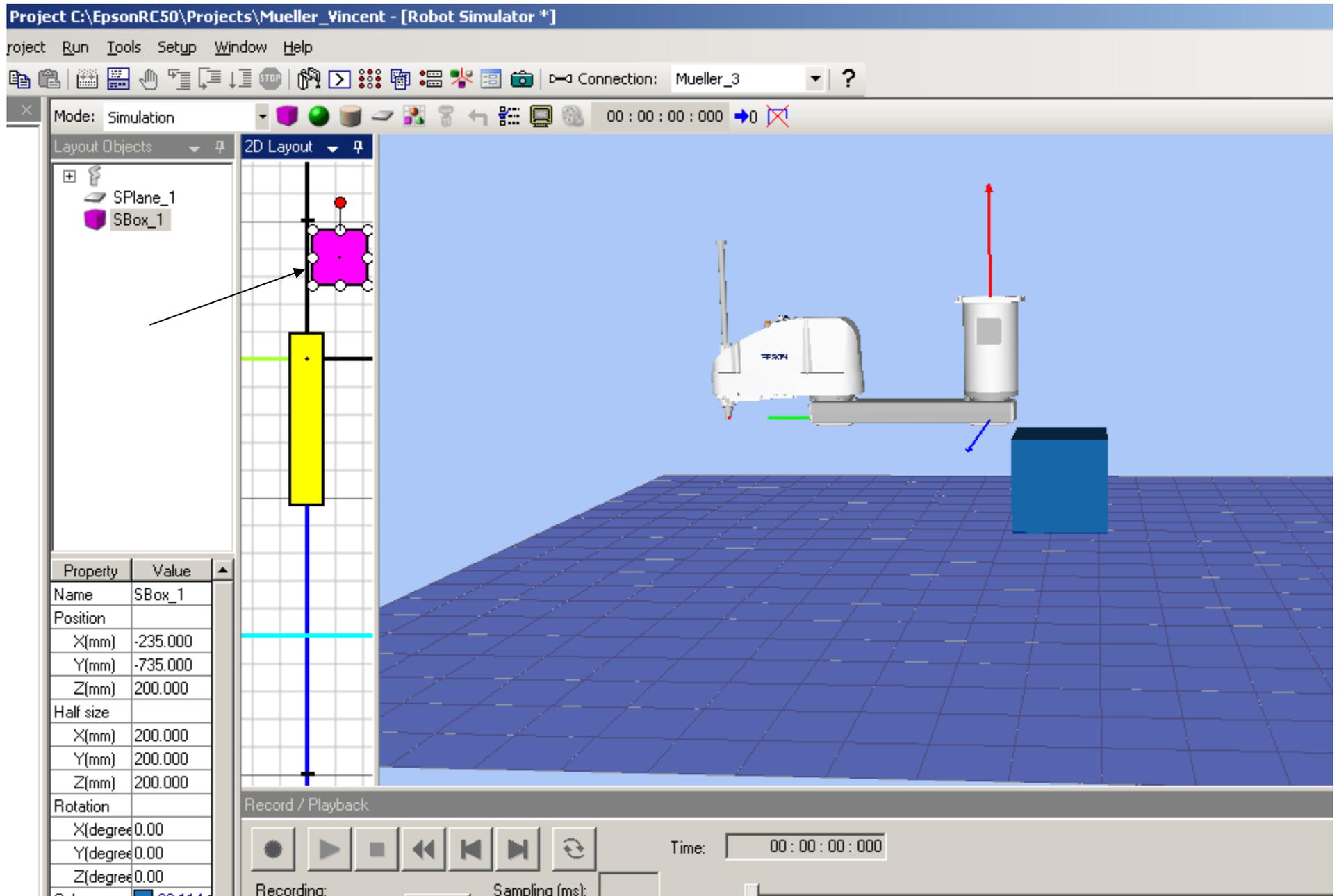
These are the tools we have to work with.



Create an object in the work area to interact with the robot. Select the Layout Box to create a pallet by clicking and holding the Layout Box icon while dragging it into the 2D Layout, shown below in the circle area, then release.



This will put the Layout Box in both the 2D & 3D Layouts. Working from the 2D layout you can click on the Layout Box and allow you to move this object.



Note the Name under Value under the property for the Layout Box; SBox_1. You can change this to any name you like, in this case I'll change it to Pallet_1

Project C:\EpsonRC50\Projects\Mueller_Vincent - [Robot Simulator *]

Project Run Tools Setup Window Help

Connection: Mueller_3

Mode: Simulation 00:00:00:000

Layout Objects

- SPlane_1
- SBox_1

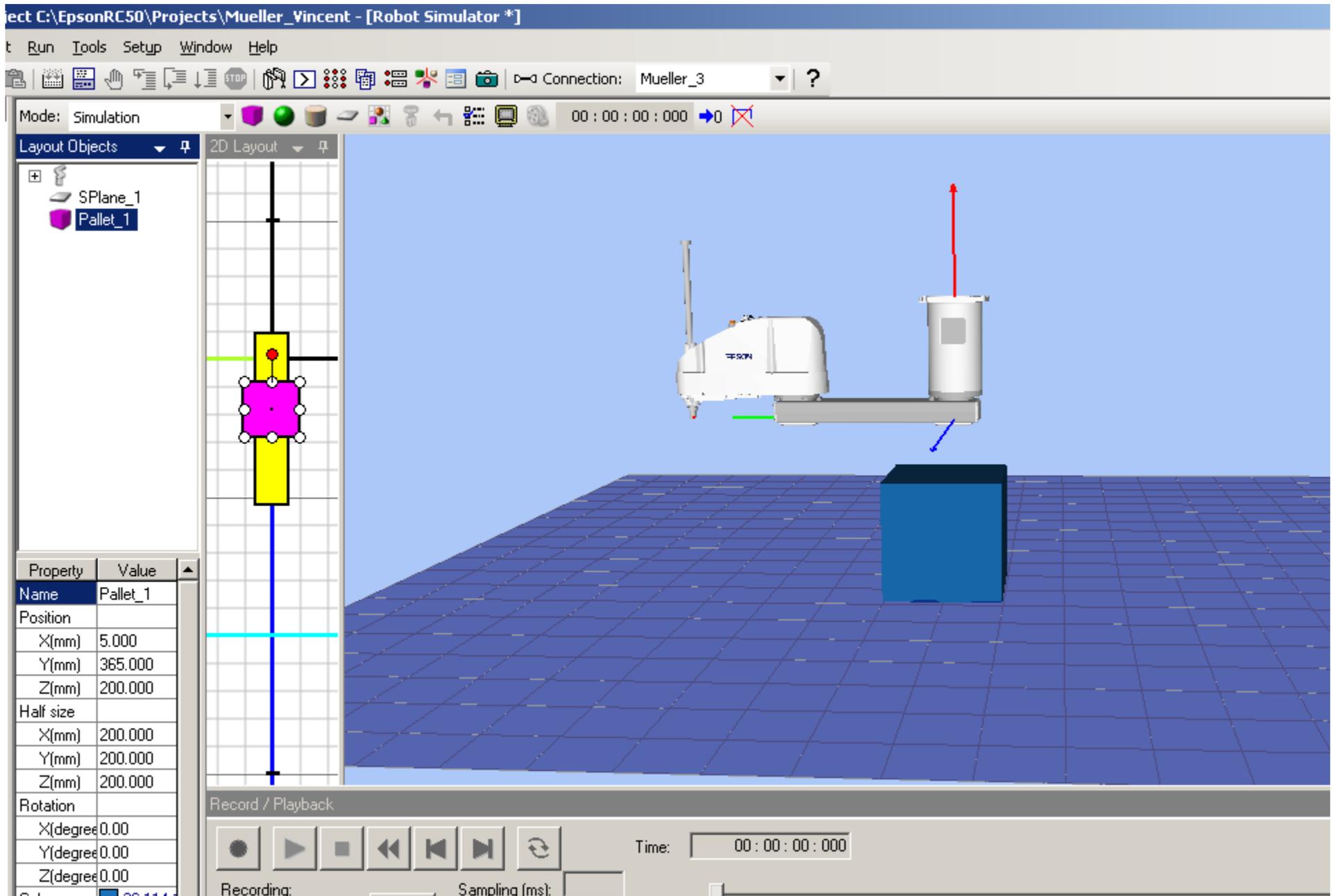
| Property | Value |
|-----------|----------|
| Name | SBox_1 |
| Position | |
| X(mm) | -235.000 |
| Y(mm) | -735.000 |
| Z(mm) | 200.000 |
| Half size | |
| X(mm) | 200.000 |
| Y(mm) | 200.000 |
| Z(mm) | 200.000 |
| Rotation | |
| X(degree) | 0.00 |
| Y(degree) | 0.00 |
| Z(degree) | 0.00 |

Record / Playback

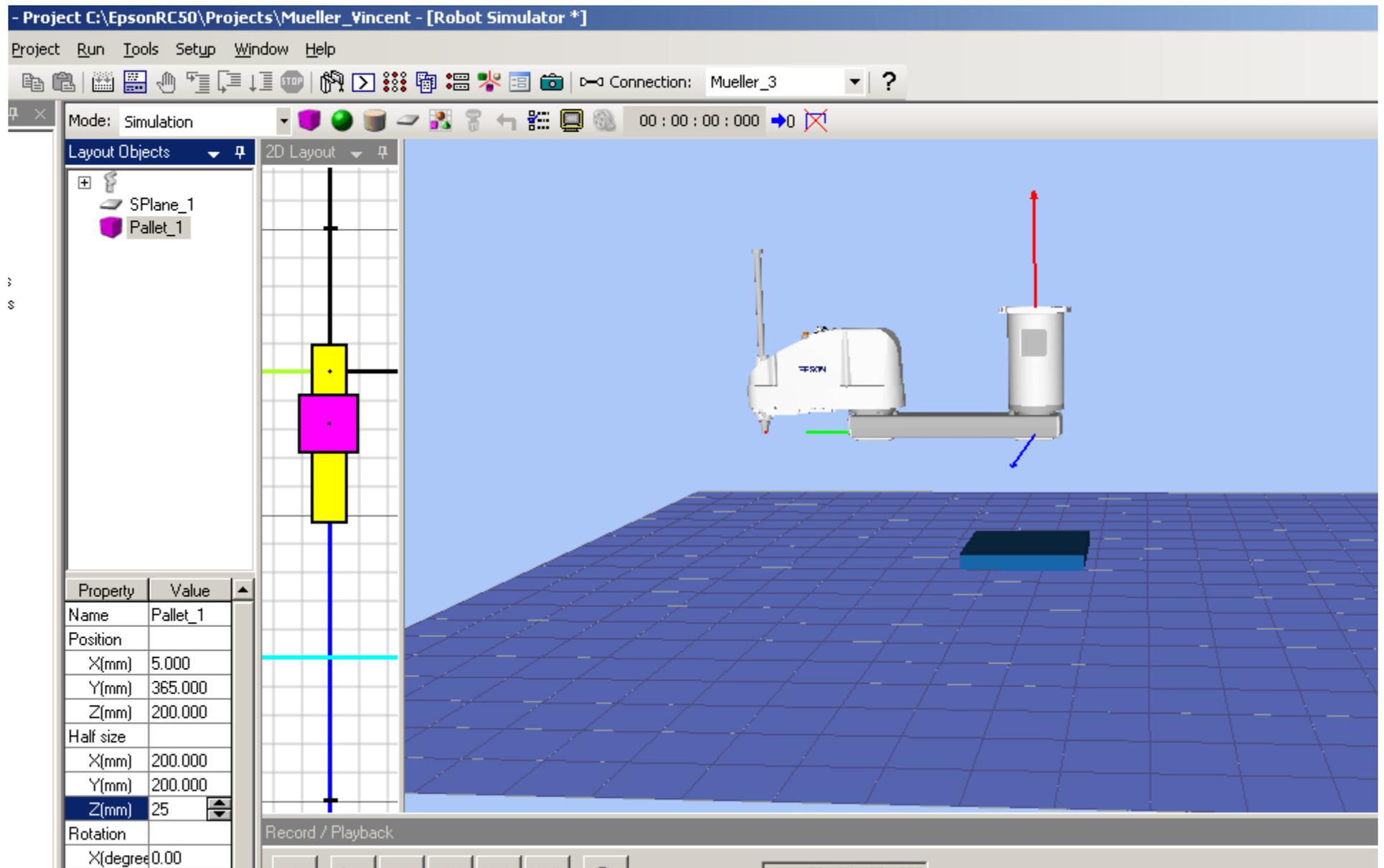
Time: 00:00:00:000

Recording: Sampling (ms):

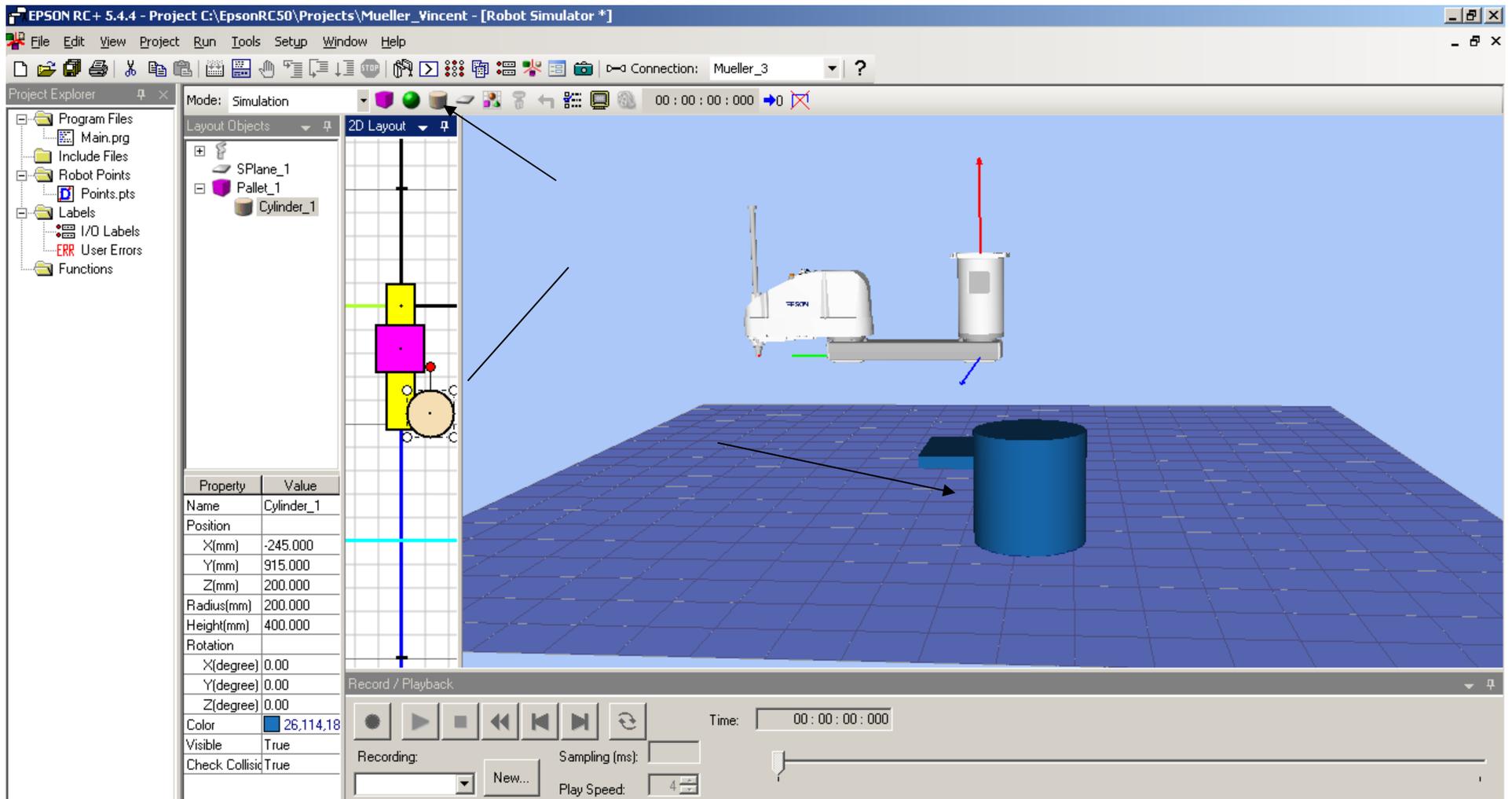
Move the Pallet in front of the robots and within it's work envelope as shown below!
Now we can resize the pallet. Make sure to click on the 2D object for the Property values.



Click on the Z under the Half Size property, change the Value to 25. Note the changes to the object.



Now lets create another object, by selecting the Layout Cylinder and dragging the Layout Cylinder into the 2D Layout area.
Note before doing this make sure that the Pallet object is highlighted so the cylinder object will be associated with the pallet.



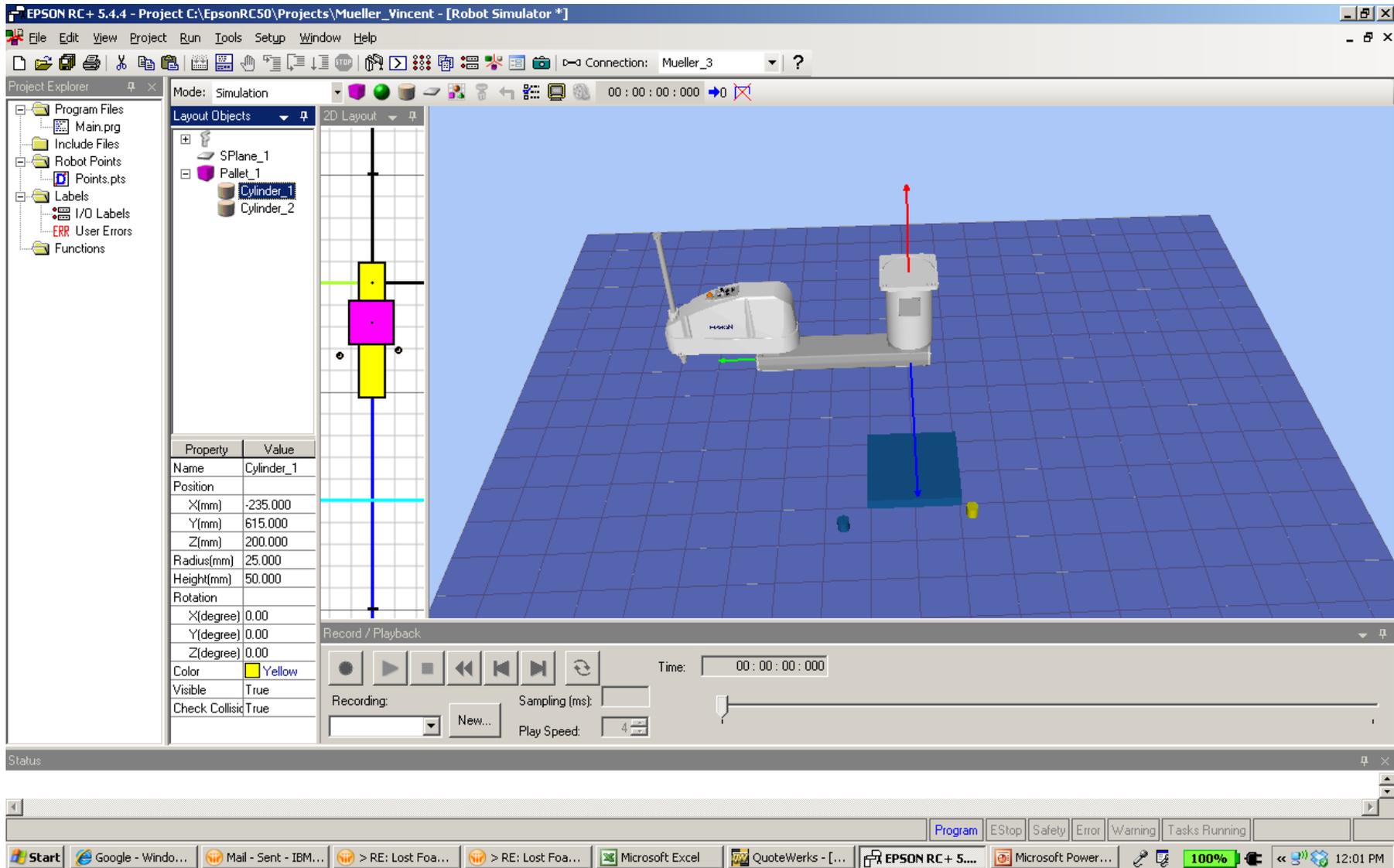
Now lets change the Values of the Cylinder; Radius, Height & Color. See below!

The screenshot displays a Robot Simulator interface with the following components:

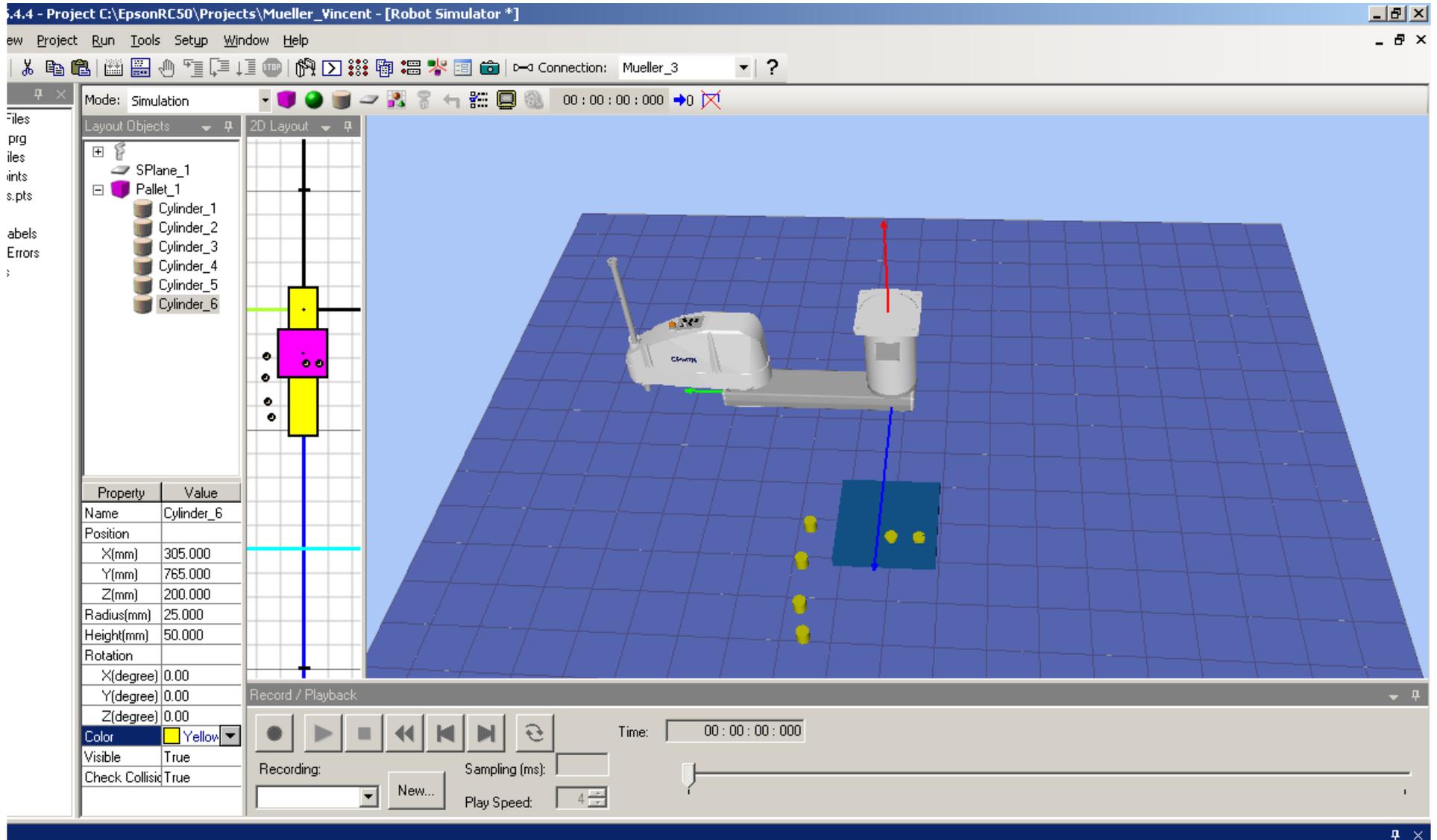
- Project Name:** Project C:\EpsonRC50\Projects\Mueller_Vincent - [Robot Simulator *]
- Menu:** Project Run Tools Setup Window Help
- Connection:** Mueller_3
- Mode:** Simulation
- Layout Objects:** SPlane_1, Pallet_1, Cylinder_1
- Property Table:**

| Property | Value |
|-----------------|------------|
| Name | Cylinder_1 |
| Position | |
| X(mm) | -235.000 |
| Y(mm) | 615.000 |
| Z(mm) | 200.000 |
| Radius(mm) | 25 |
| Height(mm) | 50 |
| Rotation | |
| X(degree) | 0.00 |
| Y(degree) | 0.00 |
| Z(degree) | 0.00 |
| Color | Yellow |
| Visible | True |
| Check Collision | True |
- Record / Playback:** Time: 00:00:00:000, Play Speed: 4

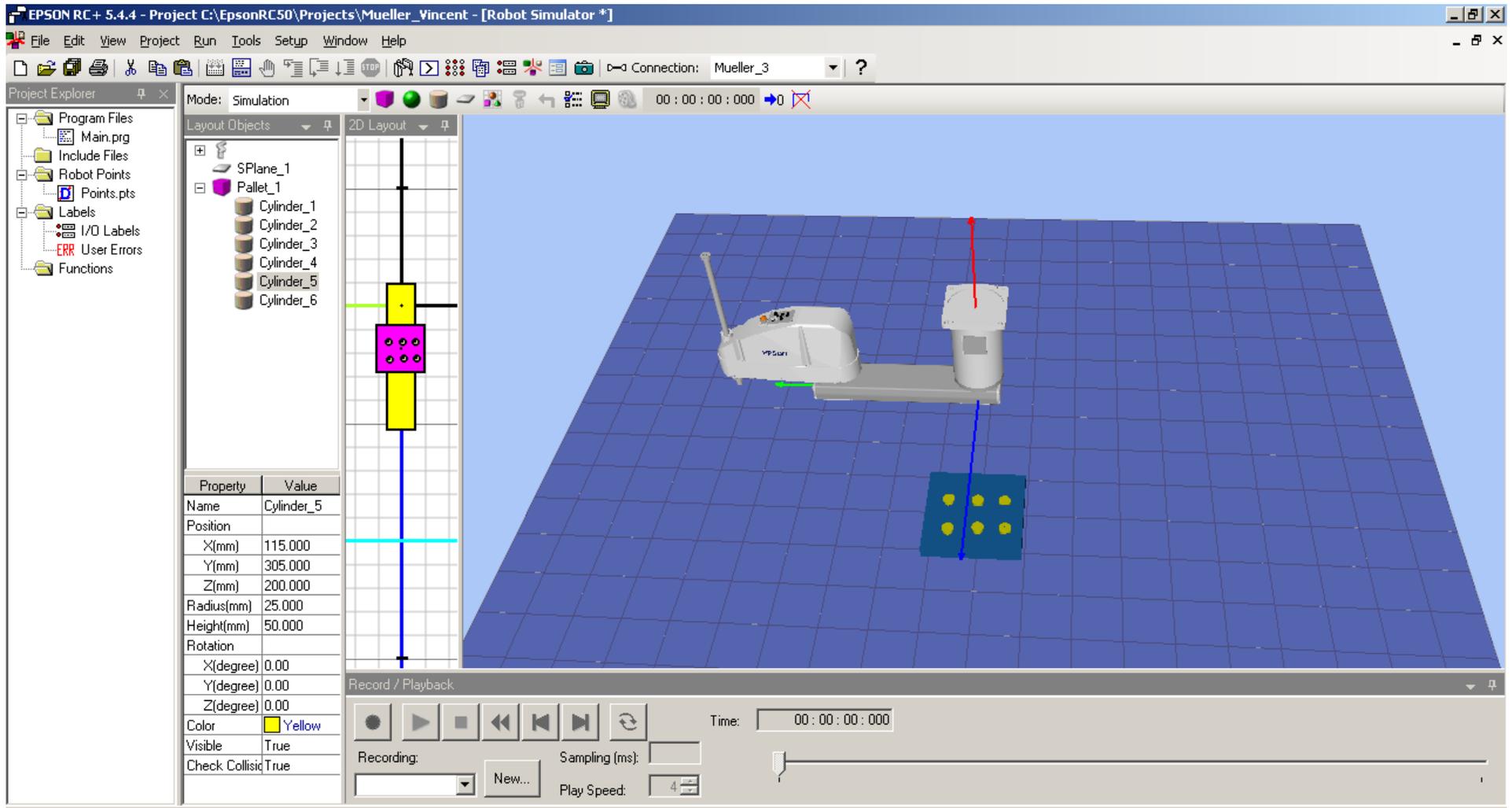
After you have created the first cylinder, you can copy it by highlighting cylinder_1, Clicking “Ctrl” “C”, then click pallet_1 to highlight and then use “Ctrl” “V” to paste as many cylinders as you need. In this case I used 6 cylinders. Note you will have to Change the color for each cylinder. See next page.



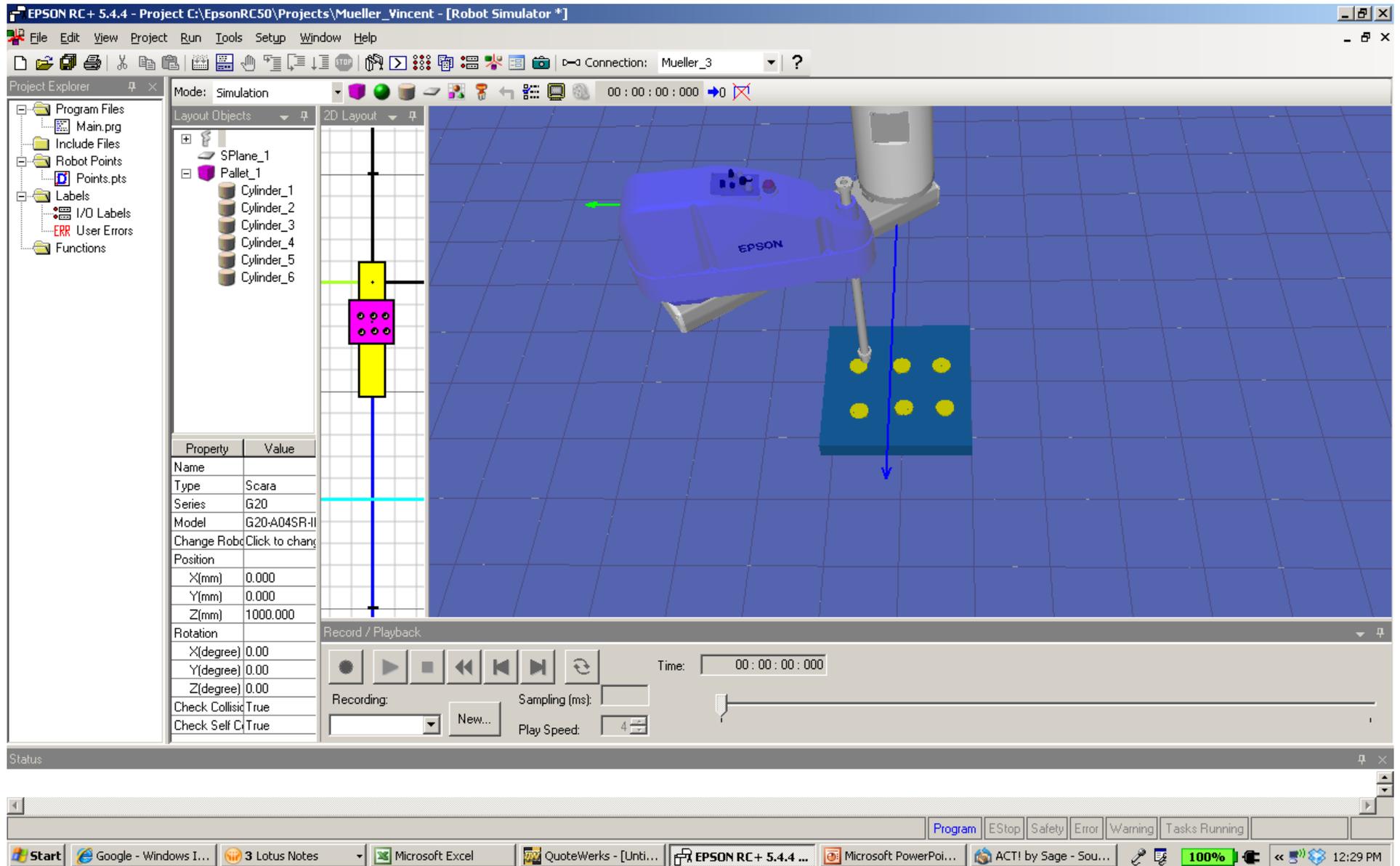
Then you will have to move each cylinder, the easiest way is to click on the object in the 2D Layout and move the object. Note that when pasting the cylinders they may paste on top of each other but you can still click on the cylinder in the 2D layout and Move the objects, one at a time. See next page.



Now that we have moved the cylinder object onto the pallet we are ready to teach The robot points.

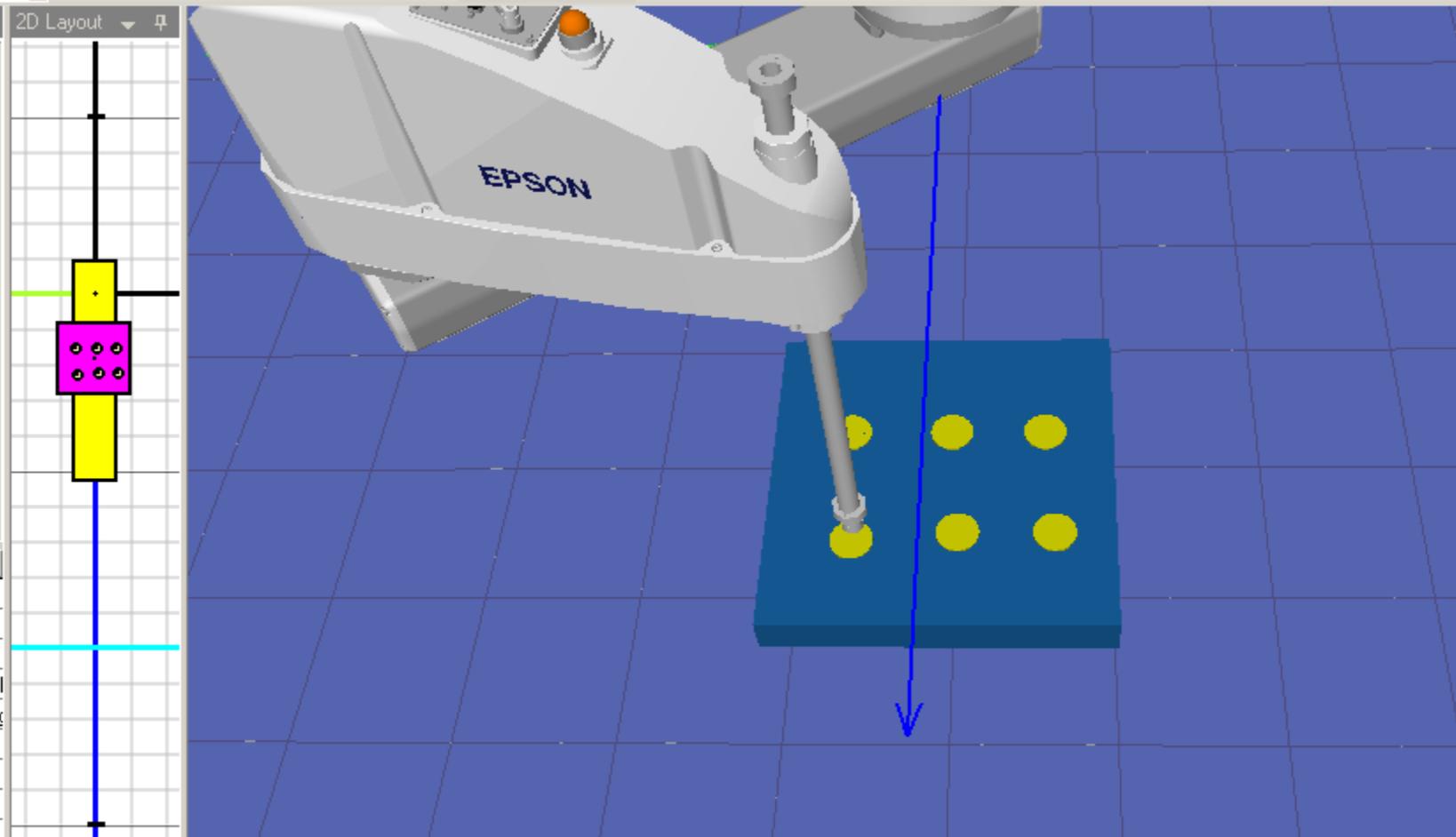


To move the robot arm you can use the “Ctrl” key and left click your mouse.
Note only one Axis at a time is allowed.
Or you can use the Jog & Teach, see next page.



- SPlane_1
- Pallet_1
 - Cylinder_1
 - Cylinder_2
 - Cylinder_3
 - Cylinder_4
 - Cylinder_5
 - Cylinder_6

| Property | Value |
|----------------|----------------|
| Name | |
| Type | Scara |
| Series | G20 |
| Model | G20-A04SR-II |
| Change Robo | Click to chang |
| Position | |
| X(mm) | 0.000 |
| Y(mm) | 0.000 |
| Z(mm) | 1000.000 |
| Rotation | |
| X(degree) | 0.00 |
| Y(degree) | 0.00 |
| Z(degree) | 0.00 |
| Check Collisic | True |
| Check Self C | True |



Record / Playback

Time: 00 : 00 : 00 : 000

Recording: New...

Sampling (ms):

Play Speed: 4

Click on the Robot icon!

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "EPSON RC+ 5.4.4 - Project C:\EpsonRC50\Projects\Mueller_Vinrent". The interface includes a menu bar (File, Edit, View, Project, Run, Tools, Setup, Window, Help) and a toolbar with various icons. A "Project Explorer" pane on the left shows a tree view of files and folders, including "Program Files", "Include Files", "Robot Points", "Points.pts", "Labels", "I/O Labels", "ERR User Errors", and "Functions".

The "Robot Manager" window is the central focus, featuring a "Control Panel" with several sections:

- Status:** Emergency Stop: OFF, Safeguard: OFF, Motors: OFF, Power: LOW
- Motors:** A green "MOTOR OFF" button and a grey "MOTOR ON" button.
- Free Joints:** Checkboxes for J1, J2, J3, and J4, with "Free All" and "Lock All" buttons.
- Power:** "POWER LOW" and "POWER HIGH" buttons.
- Reset and Home:** "Reset" and "Home" buttons.

Below the control panel is a code editor showing the following program code:

```
Wait .1
Off Glue_Gun
Jump Desp_6 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun

cycleCount = cycleCount + 1
Print "Cycle count: ", cycleCount
```

To the right of the control panel is a 3D visualization of a robot arm on a blue grid. The robot is white with a blue base. A red vertical line and a blue vertical line are visible. Below the 3D view is a "Time" display showing "00:00:00:000" and a "Play Speed" slider set to "4".

The bottom of the window shows a "Status" bar with various indicators: Program, EStop, Safety, Error, Warning, and Tasks Running.

The Windows taskbar at the bottom of the screen shows the Start button and several open applications: Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., and Microsoft PowerPoi... The system tray on the right includes a volume icon, a network icon, a battery icon showing 100% charge, and a clock displaying 12:32 PM.

Click on the "Motor On"

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "Robot Manager" and features a control panel with several sections:

- Status:** Emergency Stop: OFF, Safeguard: OFF, Motors: ON, Power: LOW
- Motors:** A "MOTOR OFF" button and a highlighted "MOTOR ON" button.
- Free Joints:** Checkboxes for J1, J2, J3, and J4, with "Free All" and "Lock All" buttons.
- Power:** "POWER LOW" and "POWER HIGH" buttons.

A 3D simulation of a robot arm is visible on the right side of the interface. Below the control panel, a code editor shows the following program code:

```
Wait .1
Off Glue_Gun
Jump Desp_6 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun

cycleCount = cycleCount + 1
Print "Cycle count: ", cycleCount
```

The Windows taskbar at the bottom shows the Start button and several open applications: Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., Microsoft PowerPoi..., and ACT! by Sage - Sou... The system tray indicates 100% battery and the time is 12:34 PM.

Click on the Jog & Teach Tab

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "EPSON RC+ 5.4.4 - Project C:\EpsonRC50\Projects\Mueller_Vincent". The "Robot Manager" window is open, showing the "Jog & Teach" tab selected in the "Control Panel".

The "Jogging" section includes:

- Mode: World
- Speed: Low
- Local: 0, Tool: 0, Arm: 0, ECP: 0
- Current Position: X (mm) 94.913, Y (mm) 291.935, Z (mm) -319.655
- U (deg) 187.500, V (deg), W (deg)
- Current Arm Orientation: Hand (Righty), Elbow, Wrist, J4Flag, J6Flag
- Jog Distance: X (mm) 1.000, Y (mm) 1.000, Z (mm) 1.000; U (deg) 1.000, V (deg), W (deg)
- Execute Motion Command: Command: Move, Execute
- Teach Points: Point File: Points.pts, Point: P0 - (undefined), Teach, Edit

The 3D visualization shows a robot arm positioned over a blue grid. The time display shows 00:00:00:000.

The command console at the bottom contains the following code:

```
Wait .1
Off Glue_Gun
Jump Desp_6 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun

cycleCount = cycleCount + 1
Print "Cycle count: ", cycleCount
```

The Windows taskbar shows the Start button and several open applications: Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., Microsoft PowerPoi..., and ACTI by Sage - Sou... The system tray on the right shows a 100% volume indicator and the time 12:36 PM.

Using the directional buttons move the robot.

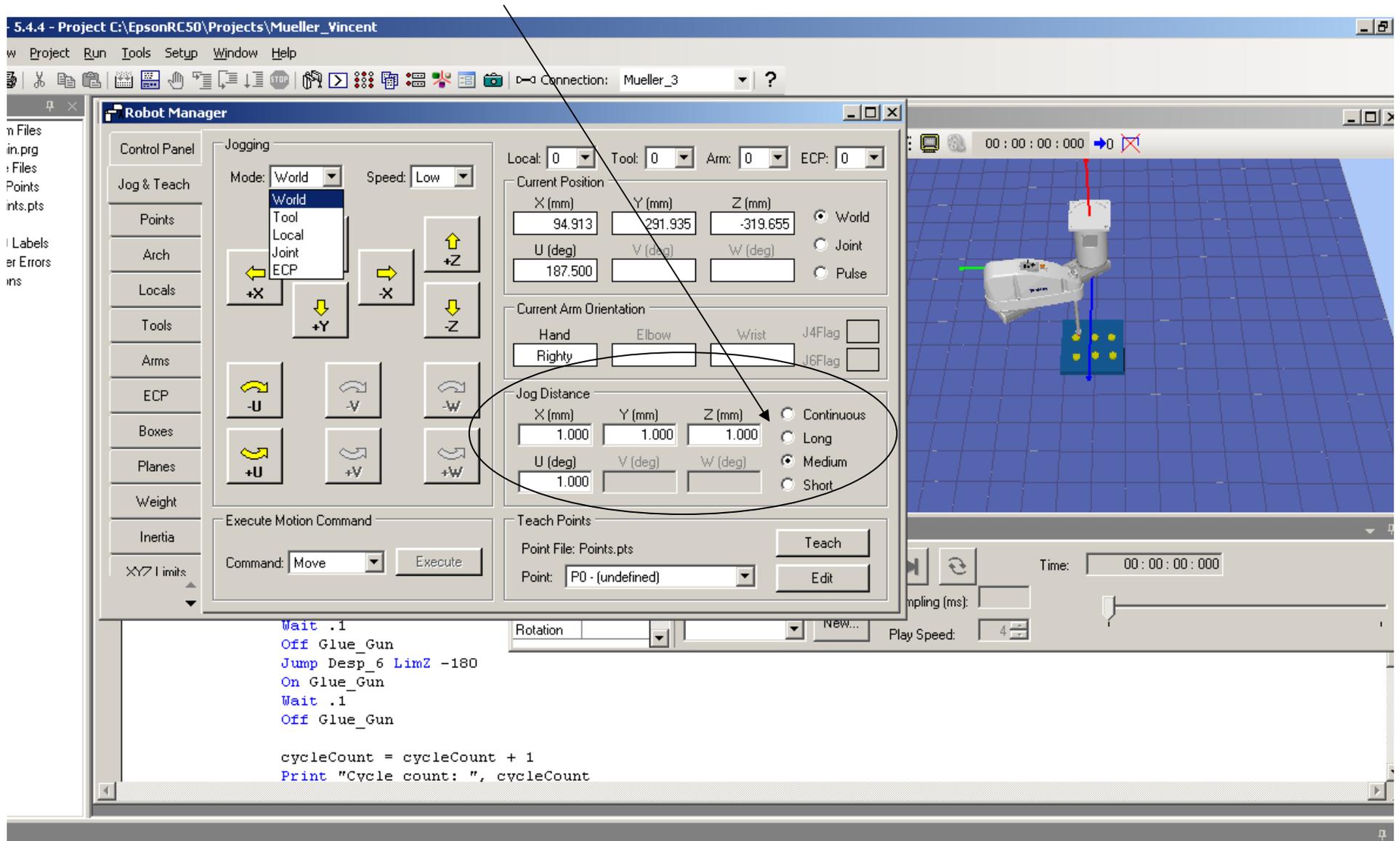
The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "EPSON RC+ 5.4.4 - Project C:\EpsonRC50\Projects\Mueller_Vincent". The interface includes a menu bar (File, Edit, View, Project, Run, Tools, Setup, Window, Help), a toolbar, and a Project Explorer on the left. The central "Robot Manager" window is divided into several sections:

- Control Panel:** Includes "Jogging" mode (set to "World") and speed (set to "Low"). A grid of directional buttons (+X, -X, +Y, -Y, +Z, -Z, +U, -U, +V, -V, +W, -W) is circled in black, with an arrow pointing to it from the text above.
- Current Position:** Displays X (94.913 mm), Y (291.935 mm), and Z (-319.655 mm) coordinates. It also shows orientation angles U, V, and W.
- Current Arm Orientation:** Shows settings for Hand (Righty), Elbow, and Wrist, along with J4Flag and J6Flag checkboxes.
- Jog Distance:** Allows setting jog distances for X, Y, and Z (all set to 1.000 mm) and orientation angles U, V, and W (all set to 1.000 deg).
- Execute Motion Command:** Features a "Command" dropdown set to "Move" and an "Execute" button.
- Teach Points:** Includes a "Point File" (Points.pts) and a "Point" dropdown (PO - (undefined)), with "Teach" and "Edit" buttons.

On the right, a 3D simulation window shows a white robot arm on a blue grid floor. Below the simulation is a "Time" display (00:00:00:000) and a "Play Speed" slider set to 4. The bottom status bar shows "Status" and various system icons.

The Windows taskbar at the bottom of the screen shows the Start button and several open applications: Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., and Microsoft PowerPoi... The system tray on the right includes icons for Program, EStop, Safety, Error, Warning, Tasks Running, a 100% volume indicator, and the system clock showing 12:36 PM.

You can also select the type of move the robot makes by using the Jog Dist.



Because we did not use a template, we will need to enter the point names as they are in the program code. For example “Start” & “Desp_1” are positions or points that we need to teach. The easy way is to copy & paste the names for the program to the Points Menu or you can type the name. So copy or enter Start, Desp_1 through Desp_6 . See next page.

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window shows the 'Main.prg' code editor with the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

The 'Robot Manager' window is open, showing a table with the following columns: Number, Name, X, Y, Z, U, Local, Hand. The table is currently empty, and a 'copy' label with arrows points from the 'Desp_1' through 'Desp_6' lines in the code to the 'Name' column of the table.

| Number | Name | X | Y | Z | U | Local | Hand |
|--------|------|---|---|---|---|-------|------|
| 0 | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

After you enter the points name, then we need to save our information for this project.
Click on this icon, Save All Files!
Now teach the points by moving the robot to each position and teach. See next page.

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window shows a program editor with the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```

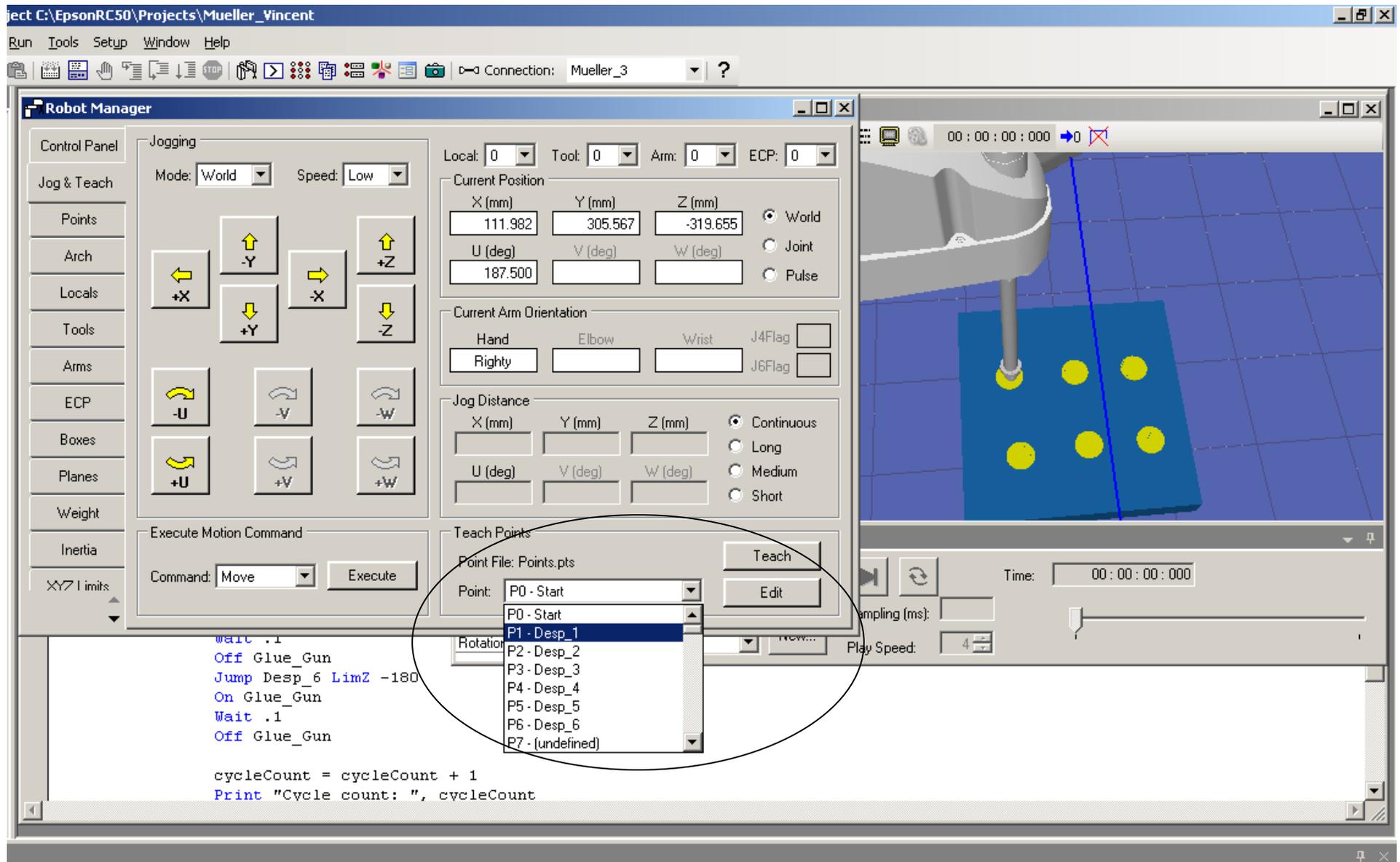
The Robot Manager dialog box is open, showing a table of points. The 'Point File' is set to 'Points.pts'. The table contains the following data:

| Number | Name | X | Y | Z | U | Local | Hand |
|--------|--------|-------|-------|-------|-------|-------|--------|
| 0 | Start | 0.000 | 0.000 | 0.000 | 0.000 | 0 | Righty |
| 1 | Desp_1 | | | | | 0 | |
| 2 | Desp_2 | | | | | 0 | |
| 3 | Desp_3 | | | | | 0 | |
| 4 | Desp_4 | | | | | 0 | |
| 5 | Desp_5 | | | | | 0 | |
| 6 | Desp_6 | | | | | 0 | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

The 'Planes' tab is selected, and point 11 is highlighted. The dialog box also includes buttons for 'Delete P11', 'Delete All', 'Save', and 'Restore'.

The Windows taskbar at the bottom of the screen shows the following open applications: Start, Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., and Microsoft PowerPoi... The system tray on the right displays the time as 1:13 PM and the battery level at 100%.

To teach Desp_1 position, move the robot to Desp_1 position, click on the pull down
And click on Desp_1, this will highlight the name.



After you click teach and menu will appear, asking you if you are Reach to re-tech point. Click Yes! Repeat process for each point.

The screenshot displays the Epson Robot Manager software interface. The main window is titled "Robot Manager" and shows a 3D simulation of a robot arm positioned over a blue rectangular workpiece with six yellow circular markers. The interface includes a "Control Panel" on the left with various jog and teach controls, and a central area for "Jogging" with fields for "Local", "Tool", "Arm", and "ECP" settings. Below these are fields for "Current Position" (X, Y, Z in mm and U, V, W in deg) and "Current Arm Orientation" (Hand, Elbow, Wrist). A "Jog Distance" section is also visible. A dialog box titled "EPSON RC+ 5.0" is overlaid on the interface, asking "Ready to re-teach point P1 - Desp_1?" with "Yes" and "No" buttons. The bottom of the window shows a command window with the following text:

```
wait .1  
Off Glue_Gun  
Jump Desp_6 LimZ -180  
On Glue_Gun  
Wait .1  
Off Glue_Gun  
  
cycleCount = cycleCount + 1  
Print "Cycle count: ", cycleCount
```

Note, for the Start Position, I only moved the Z-Axis up to a position above the Desp_1 position.

The screenshot displays a robotic control software interface. At the top, the window title is "Projects\Mueller_Vincent". Below it, there's a menu bar with "Window" and "Help". A toolbar contains various icons, including a "STOP" button and a "Connection" dropdown set to "Mueller_3".

The main interface is divided into several sections:

- Jogging:** Includes a "Mode" dropdown set to "World" and a "Speed" dropdown set to "High". It features a grid of directional buttons: +X, -Y, +Z, -X, +Y, -Z, -U, -V, -W, +U, +V, +W.
- Current Position:** Shows coordinates for X (111.982 mm), Y (305.567 mm), and Z (-110.564 mm). It also includes fields for U (187.500 deg), V, and W. Radio buttons for "World", "Joint", and "Pulse" are present.
- Current Arm Orientation:** Fields for "Hand" (Rightly), "Elbow", and "Wrist", along with "J4Flag" and "J6Flag" checkboxes.
- Jog Distance:** Fields for X, Y, Z, U, V, and W, with radio buttons for "Continuous", "Long", "Medium", and "Short".
- Execute Motion Command:** A "Command" dropdown set to "Move" and an "Execute" button.
- Teach Points:** A "Point File" field set to "Points.pts" and a "Point" dropdown set to "P0 - Start", with "Teach" and "Edit" buttons.

On the right side, a 3D simulation shows a white Epson robot arm positioned above a blue square base with six yellow dots. A blue arrow points downwards from the robot's end effector towards the base. A timer at the top right of the simulation area shows "00 : 00 : 00 : 000" with a play button and a red 'X' icon.

At the bottom left, a code editor displays the following text:

```
Wait .1  
Off Glue_Gun  
Jump Desp_6 LimZ -180  
On Glue_Gun  
Wait .1  
Off Glue_Gun
```

At the bottom right, there are controls for "Sampling (ms)" and "Play Speed" set to "4".

After you teach each point it is a good practice to click the save all file icon. After all point have been taught and saved, you can check to make sure the robot can move these Points position by going to the Jog & Teach Menu and Execute a motion to each position. See next page.

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "Robot Manager" and shows a table of points. The table has columns for Number, Name, X, Y, Z, U, Local, and Hand. The points are as follows:

| Number | Name | X | Y | Z | U | Local | Hand |
|--------|--------|----------|---------|----------|---------|-------|--------|
| 0 | Start | 111.982 | 305.567 | -110.564 | 187.500 | 0 | Righty |
| 1 | Desp_1 | 111.982 | 305.567 | -319.655 | 187.500 | 0 | Righty |
| 2 | Desp_2 | 103.134 | 460.345 | -319.655 | 187.500 | 0 | Righty |
| 3 | Desp_3 | -12.333 | 456.350 | -319.655 | 187.500 | 0 | Righty |
| 4 | Desp_4 | -7.334 | 311.245 | -319.655 | 187.500 | 0 | Righty |
| 5 | Desp_5 | -110.283 | 311.246 | -319.655 | 187.500 | 0 | Righty |
| 6 | Desp_6 | -124.832 | 452.803 | -319.655 | 187.500 | 0 | Righty |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

The interface also includes a 3D model of a robot arm on the right, a control panel on the left, and a code editor at the bottom. The code editor shows the following code:

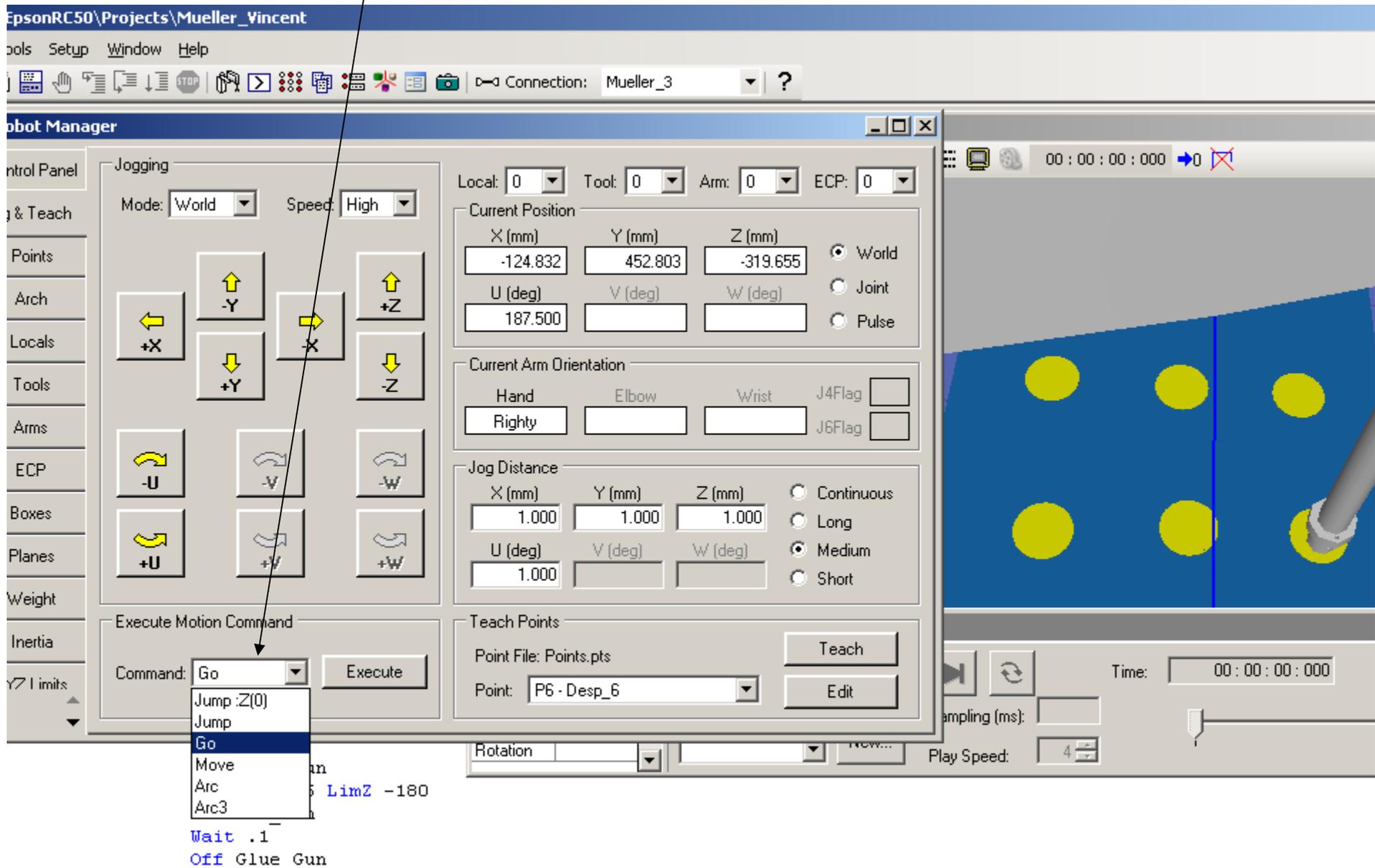
```

wait .1
Off Glue_Gun
Jump Desp_6 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun

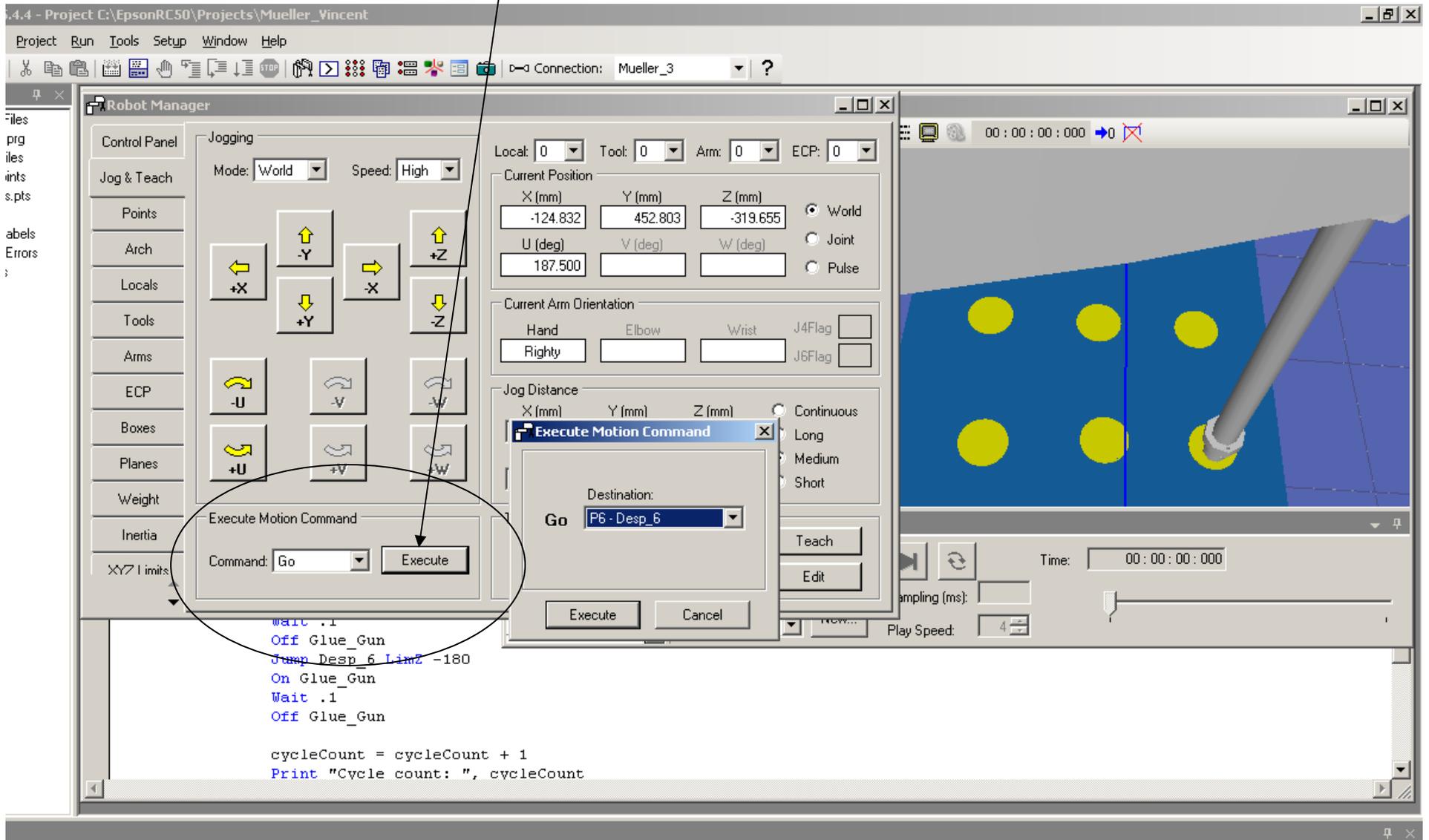
cycleCount = cycleCount + 1
Print "Cycle count: ", cycleCount
    
```

The screenshot shows the Windows taskbar at the bottom of the screen. It includes the Start button, several open applications (Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., Microsoft PowerPoi...), and the system tray with the time 1:42 PM and a 100% CPU usage indicator.

You can select the type of motion command from the pull down



After you have selected the type of motion command from the pull down, click Execute. This will bring up another menu, asking you to Execute or Cancel. After you have tested each position and you are satisfied, you can then run your program. Save & Close Robot Manager.



Click on the Open run Window or Click F5 key. This will compile all file for the project and download them into your controller. See next page.

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "EPSON RC+ 5.4.4 - Project C:\EpsonRC\50\Projects\Mueller_Vincent". The interface is divided into several panes:

- Project Explorer:** Shows a tree view of the project files, including "Program Files", "Main.prg", "Include Files", "Robot Points", "Points.pts", "Labels", "I/O Labels", "User Errors", and "Functions".
- Code Editor:** Displays the main program code. A tooltip "Open run window (F5)" is visible over the "Run" button in the toolbar. The code includes:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun

    cycleCount = cycleCount + 1
    Print "Cycle count: ", cycleCount
```
- Robot Simulator:** Shows a 2D layout of a robot arm (Scara) and a pallet. The pallet has six yellow cylinders. The robot arm is yellow and pink. The simulator includes a "Layout Objects" list, a "Property Value" table, and a "Record / Playback" control panel.

| Property | Value |
|-----------|--------------|
| Name | |
| Type | Scara |
| Series | G20 |
| Model | G20-A045R |
| Change Ro | Click to cha |
| Position | |
| X(mm) | 0.000 |
| Y(mm) | 0.000 |
| Z(mm) | 1000.000 |
| Rotation | |

The Windows taskbar at the bottom of the screen shows several open applications: Start, Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., Microsoft PowerPoi..., ACT! by Sage - Sou..., and a system tray with a 100% battery indicator and a clock showing 2:03.

Note, if you have a mistake, the compiler will give you an Error message in the Status Window. You can double click the error which will take you to the line of code with the error. In this case I have a Point Name error. To correct I need to change the name in the point file or in my code to match.

The screenshot displays the EPSON RC+ 5.4.4 software interface. The main window is titled "EPSON RC+ 5.4.4 - Project C:\EpsonRC50\Projects\Mueller_Vincent". The interface is divided into several panes:

- Project Explorer:** Shows a tree view of the project files, including "Program Files", "Include Files", "Robot Points", "Labels", "I/O Labels", "User Errors", and "Functions".
- Main.prg:** Contains the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start_Pos
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
```
- Robot Manager:** A dialog box with a "Point File" dropdown set to "Points.pts". It contains a table of points with columns: Number, Name, X, Y, Z, U, Local, and Hand.
- Status:** Displays the following error message:

```
14:08:52 ##Error: 3205, File: Main.prg, Line: 7, Point is not specified.
14:08:52 Build aborted due to errors
```

The table in the Robot Manager dialog is as follows:

| Number | Name | X | Y | Z | U | Local | Hand |
|--------|--------|----------|---------|----------|---------|-------|--------|
| 0 | Start | 111.982 | 305.567 | -110.564 | 187.500 | 0 | Righty |
| 1 | Desp_1 | 111.982 | 305.567 | -319.655 | 187.500 | 0 | Righty |
| 2 | Desp_2 | 103.134 | 460.345 | -319.655 | 187.500 | 0 | Righty |
| 3 | Desp_3 | -12.333 | 456.350 | -319.655 | 187.500 | 0 | Righty |
| 4 | Desp_4 | -7.334 | 311.245 | -319.655 | 187.500 | 0 | Righty |
| 5 | Desp_5 | -110.283 | 311.246 | -319.655 | 187.500 | 0 | Righty |
| 6 | Desp_6 | -124.832 | 452.803 | -319.655 | 187.500 | 0 | Righty |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |

The Windows taskbar at the bottom shows the Start button, several open applications (Google, Lotus Notes, Microsoft Excel, QuoteWerks, EPSON RC+ 5.4.4, Microsoft PowerPoint, ACT! by Sage), and the system tray with a 100% volume indicator and the time 2:09 PM.

After a second compile, I have another error; I have not named my inputs or outputs. I need to go to the I/O Labor Editor to make the correction. See next page.

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays the code for 'Main.prg'. The code is as follows:

```
Function main
Long cycleCount

    InitRobot

    Do
        Jump Start
        Wait Sw(PartInPos) = On
        Go Desp_1
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_2 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_3 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_4 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_5 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
        Jump Desp_6 LimZ -180
        On Glue_Gun
        Wait .1
        Off Glue_Gun
```

The Project Explorer on the left shows the file structure, including 'Main.prg' and 'User Errors'. The status bar at the bottom displays the following messages:

```
Status
14:16:07 Compiling Main.prg
14:16:07 Linking...
14:16:07 ##Error: 3052, File: Main.prg, Line: 8, Variable does not exist.
14:16:07 Build aborted due to errors
```

Click on the I/O Labels. The I/O label editor will appear.

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window is titled "I/O Label Editor" and contains a table with the following columns: "Input Bit", "Label", and "Description". The "Inputs" section is expanded, showing a list of input bits from 0 to 19. Below the table, there is a code editor with the following text:

```
Off Glue_Gun
Jump Desp_5 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun
Jump Desp_6 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun
```

The status bar at the bottom of the window displays the following log:

```
14:19:32 Sending Points.pts
14:19:32 Sending Mueller_Vincent.sprj
14:19:33 Loading project in controller...
14:19:34 Controller point files update complete
```

The taskbar at the bottom of the screen shows several open applications: Start, Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., Microsoft PowerPoi..., ACT1 by Sage - Sou..., and a system tray with a 100% battery indicator and the time 2:20 PM.

Under the Input Bit Label for Input 0, I entered the name “PartInPos” then click Save.

The screenshot shows a software interface with a ladder logic program on the left and an "I/O Label Editor" window on the right. The ladder logic program includes a main loop with various control instructions like "Jump Start", "Wait Sw", "Go Desp", "On Glue_Gun", and "Off Glue_Gun". The "I/O Label Editor" window displays a tree view of I/O components and a table of input bits.

```
ion main
cycleCount

InitRobot

Do
  Jump Start
  Wait Sw(PartInPos) = On
  Go Desp_1
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_2 LimZ -180
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_3 LimZ -180
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_4 LimZ -180
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_5 LimZ -180
  On Glue_Gun
  Wait .1
  Off Glue_Gun
  Jump Desp_6 LimZ -180
  On Glue_Gun
  Wait .1
  Off Glue_Gun
```

I/O Label Editor *

| Input Bit | Label | Description |
|-----------|-----------|-------------|
| 0 | PartInPos | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |

Under the Output Bit 0 Label, I entered the name; Glue_Gun and then click Save!

The screenshot shows a software interface with a code editor on the left and an I/O Label Editor window on the right. The code editor displays the following code:

```
Function main
Long cycleCount

InitRobot

Do
    Jump Start
    Wait Sw(PartInPos) = On
    Go Desp 1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
```

The I/O Label Editor window is titled "I/O Label Editor *". It contains a tree view on the left and a table on the right. The tree view shows a hierarchy of I/O components: Standard I/O, Inputs (Bits, Bytes, Words), Outputs (Bits, Bytes, Words), Extended I/O, Fieldbus I/O, and Memory. The table on the right has three columns: Output Bit, Label, and Description. The first row is selected, showing Output Bit 0 and Label Glue_Gun.

| Output Bit | Label | Description |
|------------|----------|-------------|
| 0 | Glue_Gun | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |

After the third compile, I discover that I do not have anything for “InitRobot” which is a “Call” command to execute another Function. To correct this I will add another call Function named “InitRobot” and write some code. See next page.

The screenshot shows the EPSON RC+ 5.4.4 software interface. The main window displays the code for 'Main.prg' with the following content:

```
Function main
Long cycleCount

    InitRobot

Do
    Jump Start
    Wait Sw(PartInPos) = On
    Go Desp_1
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_2 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_3 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_4 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_5 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
    Jump Desp_6 LimZ -180
    On Glue_Gun
    Wait .1
    Off Glue_Gun
```

The status bar at the bottom of the software window shows the following messages:

```
14:29:45 Compiling Main.prg
14:29:45 Linking...
14:29:45 ##Error: 3051, File: Main.prg, Line: 4, Function does not exist.
14:29:45 Build aborted due to errors
```

The Windows taskbar at the bottom shows the Start button and several open applications: Google - Windows I..., 3 Lotus Notes, Microsoft Excel, QuoteWerks - [Unti..., EPSON RC+ 5.4.4 ..., Microsoft PowerPoi..., and ACT! by Sage - Sou... The system tray on the right shows a 100% battery icon and the time 2:30 PM.

After I created another Function named "InitRobot" and enter my code I saved all file. Then Click on the Open run Window or Click F5 key. This will compile all file for the project and download them into your controller. See next page.

```
ct C:\EpsonRC50\Projects\Mueller_Vincent
un Tools Setup Window Help
Connection: Mueller_3
Jump Desp_3 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun
Jump Desp_4 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun
Jump Desp_5 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun
Jump Desp_6 LimZ -180
On Glue_Gun
Wait .1
Off Glue_Gun

cycleCount = cycleCount + 1
Print "Cycle count: ", cycleCount

Loop

Fend

Function InitRobot
Reset
If Motor = Off Then
Motor On
Power High
Speed 50
Accel 50, 50
Else
Print "Motor On"

EndIf
Fend
```

Before Clicking Start, open the I/O Monitor & the Simulator. See next pages

Project C:\EpsonRC50\Projects\Mueller_Vincent

Run Tools Setup Window Help

Connection: Mueller_3

Main.prg

On Glue Gun

Run

Motor On

Form Function

main

Start Pause

Stop Continue

Display Video

Scale: 3/4

Camera: Any

Low Power Speed Factor: 100%

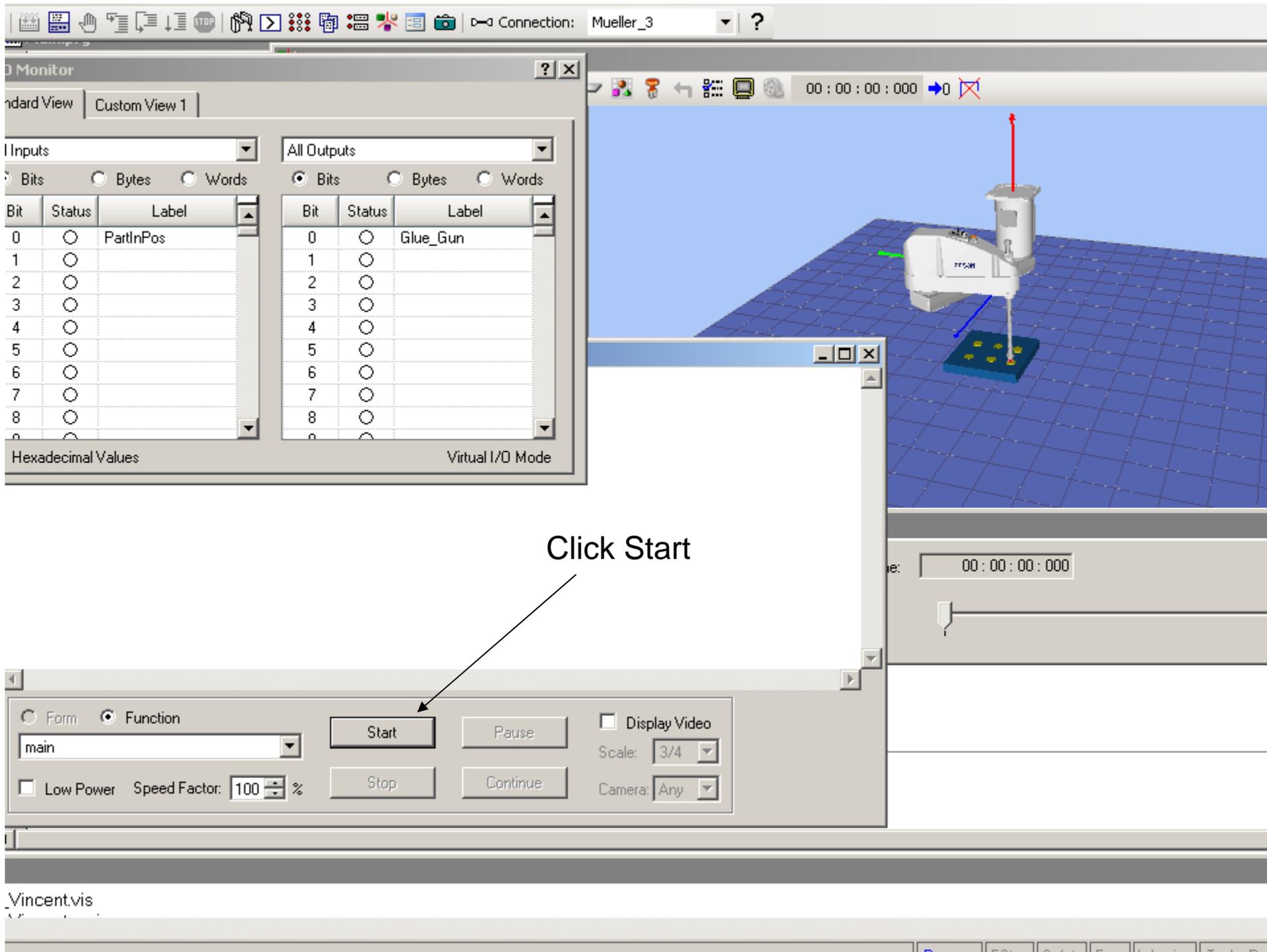
```
Function InitRobot
  Reset
  If Motor = Off Then
    Motor On
    Power High
    Speed 50
    Accel 50, 50
  Else
    Print "Motor On"
  EndIf
```

Open the I/O Monitor

Open the Simulator

The screenshot shows a software interface with a menu bar (Run, Tools, Setup, Window, Help) and a toolbar. A connection dropdown menu is set to 'Mueller_3'. The main workspace displays 'Main.prg' with a sub-window titled 'Run' showing 'Motor On'. Below the workspace is a control panel with radio buttons for 'Form' and 'Function', a dropdown menu for 'main', and checkboxes for 'Low Power' and 'Display Video'. A 'Speed Factor' is set to 100%. Buttons for 'Start', 'Pause', 'Stop', and 'Continue' are present. A 'Scale' dropdown is set to '3/4' and a 'Camera' dropdown is set to 'Any'. At the bottom, a code editor shows the following code:

```
Fend
Function InitRobot
  Reset
  If Motor = Off Then
    Motor On
    Power High
    Speed 50
```



Double clicking the input “PatInPos” Status light will initialize the program.

The screenshot displays a CNC control software interface. At the top, the title bar reads "5.4.4 - Project C:\EpsonRC50\Projects\Mueller_Vincent". The main menu includes "Project", "Run", "Tools", "Setup", "Window", and "Help". A toolbar contains various icons, including a "STOP" button, and a connection status indicator showing "Mueller_3".

The "I/O Monitor" window is open, showing two columns: "All Inputs" and "All Outputs". Both columns have radio buttons for "Bits", "Bytes", and "Words", with "Bits" selected. The "All Inputs" table has a "Status" column where the "PatInPos" input (Bit 0) is active, indicated by a red light icon. The "All Outputs" table shows "Glue_Gun" (Bit 0) as an output.

The main window displays a 3D model of a machine on a blue grid. A red arrow points upwards from the machine. A timer at the top right shows "00:00:14:790".

At the bottom, there is a control panel with buttons for "Start", "Pause", "Stop", and "Continue". A "Speed Factor" is set to "100%". A "Display Video" checkbox is checked. A "Scale" dropdown is set to "3/4" and a "Camera" dropdown is set to "Any".

For more information please review manual, located under; Help, EPSON RC+5.0 User Guide

The screenshot displays the EPSON RC+5.0 software interface. The main window title is "ject C:\EpsonRC50\Projects\Mueller_Vincent". The menu bar includes Run, Tools, Setup, Window, and Help. The Help menu is open, showing options: How Do I (Ctrl+F1), Contents, Index, Search..., Manuals (highlighted), and About EPSON RC+ 5.0... The Manuals submenu is also open, listing various manuals such as EPSON RC+ 5.0 User's Guide, SPEL+ Language Reference, Remote Control Manual, RC180 Safety and Installation Manual, RC180 Controller Manual, RC90 Safety and Installation Manual, RC90 Controller Manual, Vision Guide 5.0 User Manual, Vision Guide 5.0 Properties and Results Reference, CV1 Safety and Installation Manual, VB Guide 5.0 Manual, GUI Builder 5.0 Manual, TP1 Manual, TP2 Manual, OP1 Safety and Installation Manual, OP1 Manual, ProSix P53 Robot Manual, ProSix P53L P53LP Robot Manual, ProSix P55 Robot Manual, G1 Robot Manual, G3 Robot Manual, and G6 Robot Manual.

The interface also features a "0 Monitor" section with "Standard View" and "Custom View 1" options. Below this is a "All Inputs" section with radio buttons for "Bits", "Bytes", and "Hexadecimal Values". A table displays input data:

| Bit | Status | Label | Bit | Status | Label |
|-----|----------------------------------|-----------|-----|-----------------------|--------|
| 0 | <input checked="" type="radio"/> | PartInPos | 0 | <input type="radio"/> | Glue_0 |
| 1 | <input type="radio"/> | | 1 | <input type="radio"/> | |
| 2 | <input type="radio"/> | | 2 | <input type="radio"/> | |
| 3 | <input type="radio"/> | | 3 | <input type="radio"/> | |
| 4 | <input type="radio"/> | | 4 | <input type="radio"/> | |
| 5 | <input type="radio"/> | | 5 | <input type="radio"/> | |
| 6 | <input type="radio"/> | | 6 | <input type="radio"/> | |
| 7 | <input type="radio"/> | | 7 | <input type="radio"/> | |
| 8 | <input type="radio"/> | | 8 | <input type="radio"/> | |
| 9 | <input type="radio"/> | | 9 | <input type="radio"/> | |

Below the table is a "Hexadecimal Values" section with a list of values: 5, 6, 7, 8, 9. At the bottom, there are control buttons: "Start", "Pause", "Stop", and "Continue". A "Speed Factor" is set to 100%. On the right side, a 3D simulation shows a robot arm with a red vertical axis and a blue base with yellow dots. A timer at the bottom right shows "Time: 00:00:00:000".

Under Simulator

The screenshot shows the Adobe Acrobat Standard interface. The main window displays a PDF document with the following structure:

- EM12XS2357F_EPSON RC+ ...
- PREFACE
- TABLE OF CONTENTS
- 1. Introduction
- 2. Safety
- 3. Getting Started
- 4. Operation
- 5. The EPSON RC+ 5.0 GI
- 6. The SPEL+ Language
- 7. Building SPEL+ Applica
- 8. Simulator**
 - 8.1 Simulator Functions**
 - 8.2 Using the Simulator
 - 8.3 Description of Funct
 - 8.4 Simulator Specificat
- 9. Robot Configuration
- 10. Inputs and Outputs
- 11. Remote Control
- 12. RS-232 Communicatio
- 13. TCP / IP Communicat
- 14. ECP Motion
- 15. Installing Controller Opt
- 16. Software License Agrex
- Appendix A: Software Instal
- Appendix B: Project Import

The main content area shows the following text:

8. Simulator

8.1 Simulator Functions

Simulator functions enable easy robot motion checking on your PC, which gives you flexibility to consider the system layout, measure the operation time, and create robot programs.

They are useful from the introduction stage to the launch of robot system.

The Simulator is supported in EPSON RC+ 5.0 Ver.5.4 or later.

8.1.1 Overview

The following are the major simulator functions:

- Robot motion 3D display**
 - Shows robot orientation and motion in a 3D display from various viewpoints.
 - Offers accurate display data based on design data.
- Interference check**
 - Checks whether the robot (including the hand) interferes with itself or its peripherals.
- Robot operation time prediction**
 - Predicts the robot operation time for a program.
 - Considers the speed setting (Speed, etc.) and acceleration / deceleration setting (Accel, etc.) when predicting the robot motion time.
- SPEL+ program execution**
 - Allows you to create, execute, and debug SPEL+ programs.

The restrictions on the simulator functions are described in 8.4. Specification and

The taskbar at the bottom shows the Start button, Google - Win..., Lotus Notes, Microsoft Excel, QuoteWerks, 2 erc50, Microsoft Po..., ACT! by Sag..., Simulator.pdf, e_EPSONRC..., 100% battery, and the system clock showing 3:38 PM.