Robot Programming Lab #12 Call and I/O JD Jones and John Nelson

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Point Value = \_\_\_\_\_\_\_\_\_\_\_/150 points

In this lab you will be learning how the call instruction and I/O’s (inputs and outputs) work. CREATE A BRAND NEW PROGRAM. Save it as lab 12 with your name as the first 6 characters.

Lets understand the CALL command.

For the people who already know PLC’s a Call is like a jump to subroutine

Simple terms a CALL command is where the current program is running and it sees a CALL command and the robot jumps out of its current program to the program in the CALL command and when it hits the end statement in the called program it will return to the first program and run the very next line. Here is an example,

i. Program called MAIN

1. J P[1] 100% Fine

2. R[1] = 0

3. Lbl [1]

4. J P[2] 100% Fine

5. J P[3] 100% Fine

6. R[1]= R[1]+1

7. If R[1] >= 3, Jmp Lbl [2]

8. Jmp Lbl [1]

9. Lbl [2]

10. J P[4] 100% Fine

11. Call Happy

12. J P[5] 100% Fine

13. End

ii. Program called Happy

1. J P[23] 100% Fine

2. J P[24] 100 Fine

3. End

b. This is what would happen for these programs when you run Main.

i. Robot would move to Position 1

ii. Reset Register [1] to 0

iii. Lbl [1] is just a location in the program.

iv. Move to position 2

v. Move to position 3

vi. Register 1 is an up counter. Add one.

vii. If the register is at or above a value of 3 than it will jump OUT of the loop. If it is less than three than it will go to the next line.

viii. Jmp Lbl [1] will make it jump back to Lbl [1] and repeat the steps until the if statement in line 7.

ix. If the register is greater than or equal to 3 than it will jump out of the loop and run line 10 move to position 4.

x. It will then go out of Main program and run Happy program with the CALL command.

xi. Move to position 23

xii. Move to position 24

xiii. End Happy program and go back to Main program start at line 12 (Position 5)

xiv. Move to position 5.

xv. End Main program and stop the automatic mode. Now the start button would have to be pressed to start the programs again.

The other topic to cover in this lab is Inputs and Outputs. Let’s go to the TP (teach pendant).

Press Menu

Choose I/O and press enter

You will see many options.

Digital

Robot

Analog

SOP

UOP

and others. Let me explain what these are.

**Digital** – are the physical inputs located on the inside of the controller. Some of the robots have these prewired to the PLC on the robot cart. These inputs are either ON or Off. They can also be accessed from the Ethernet cable. The addresses we will be using are DI [101] (digital input) or DO [101] (digital output).

**Robot** Inputs and outputs are located on the robot arm. This is how the gripper is opened and closed. There is an electrical connector on the “forearm” of the robot. When you say RO[3] = on you are turning on robot output 3. The arm robots have three 4 way valves prewired and hosed in the robot.

**Analog** is a variable signal you can bring into or out of the robot through the controller connections.

**SOP** and **UOP** are Standard Operator Panel and User Operator Panel. These are I/O on the controller and TP.

**Find the address of the GREEN START push button (not the light) [As many have said this is a trick question] and write it here.\_\_\_\_\_\_\_\_\_\_\_**

Let’s do a palletizing program. Watch this YouTube Video

Put in Palletizing robot into youtube and it will give you an idea of what to look for.

See the picture below.



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**ITEMS that MUST be included in your program!**

All of the DI and DO’s descriptions should have **YOUR INITIALS!**

* The robot should be at the approach point at the conveyor.
* Have the robot wait for DI [101] (box present) to turn on before the robot grabs a box.
  + Command line should be “wait DI101 = On”
* Robot goes to the approach point to pick up the box and turns on DO [101] Robot is NOT clear of conveyor.
  + Command line should be “DO101 = on”
* Robot grabs the box.
* Robot goes back to the approach point and then turns off Robot NOT clear output.
* Robot places the box onto the pallet. Feel free to have the robot go to the same spot. DO NOT ACTUALLY GRAB ANYTHING. It will crash.
* After 3 boxes have the robot turn on DO [102] Pallet is full.
  + Command line should be “DO102 = on”
* When the pallet is full the robot needs to **CALL a previous program you have written** then wait for DI [102] (New pallet).
* You need to figure out how to have the interlocks (communication between machines) so the robot and the pallet will be swapped out and start over with the placing more blocks onto the pallet. The DO 102 should be off after before starting with placing the blocks again.
* The start of the program must include
  + Setting the frames
  + Opening the gripper prior to starting any movements.
  + Setting the speed of the robot. Don’t make it 50 or 100%.
* Position descriptions. Approach A and Pos A will not work. Conveyor approach would be much better.
* Basic program descriptions such as, ”pick up part” or “place part”.
* The approaches only move in the Z axis. Straight above the pick up or place point.
* Inputs and Outputs must be labeled.

Be ready to demonstrate the following to the instructor.

Points for

A) Robot I/O are on and off per the specs. 25 pts

B) The robot performs as directed picking up the box and palletizing it. 25 pts

C) After 3 boxes have the robot turn on DO [102] Pallet is full and wait for a new pallet. 25 pts

D) The start of the program must include

a. Setting the frames 5 pts

b. Opening the gripper prior to starting any movements. 5 pts

c. Setting the speed of the robot. Don’t make it 50 or 100%. 5 pts

E) Position descriptions. 5 pts

F) I/O descriptions with your initials. 5 pts

G) Register descriptions 5 pts

H) Frame values in the remarks. 5 pts

I) Basic program descriptions such as, ”pick up part” or “place part”. 10 pts

J) The approaches only move in the Z axis. Straight above the pick up or place point. 5 pts

K) CALL program command. 10 pts

L) Green start button address is correct. 5 pts

M) Saving your program onto a jump drive and printing the program. 10 pts

INSTRUCTOR’S INITIAL\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_