

PSDE 4005 Assignment 2

by Thomas Phillips

FILE	13349_THOMAS_PHILLIPS_PSDE_4005_ASSIGNMENT_2_156961_1524613512.DOCX		
TIME SUBMITTED	12-MAR-2018 12:51AM (UTC+0000)	WORD COUNT	1517
SUBMISSION ID	84485185	CHARACTER COUNT	9127

HNC Electrical Electronic Engineering
PSDE4005 PLCs
Assignment 2

Thomas Phillips
Date: 12/03/18
Word Count: 1,863

Contents

Table of Figures.....	2
1. Hardware Investigation, System Design and I/O List.....	3
2. Program Documentation and Explanation	5
3. System Testing, Maintenance and Reliability	9
4. Conclusions and Recommendations	12

Table of Figures

Figure 1: Test 11 Station 2	10
Figure 2: Test 11 Station 1	10
Figure 3: Test 12 Station 2 UP Position	10
Figure 4: Test 13 Station 3 UP Position	11
Figure 5: Test 13 Station 3	11
Figure 6: Test 14 Station 4	11

1. Hardware Investigation, System Design and I/O List

There are 2 types of reed switches which are normally open and normally closed. The type used in the robot are normally open switches. They work by using magnets, when a magnet is placed nearby the switch will close. This is because of the magnetic poles being opposite on the two contacts thus creating a magnetic circuit. The switch will remain closed until the magnet is removed.

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current which passes through a solenoid. In a two-port valve the flow can be either switched on or off. If a three-port valve is used then the flow can be switched between the two outlet ports.

Below is the I/O list used in the program. The connections of these I/O are shown in the PLC wiring diagram on the next page.

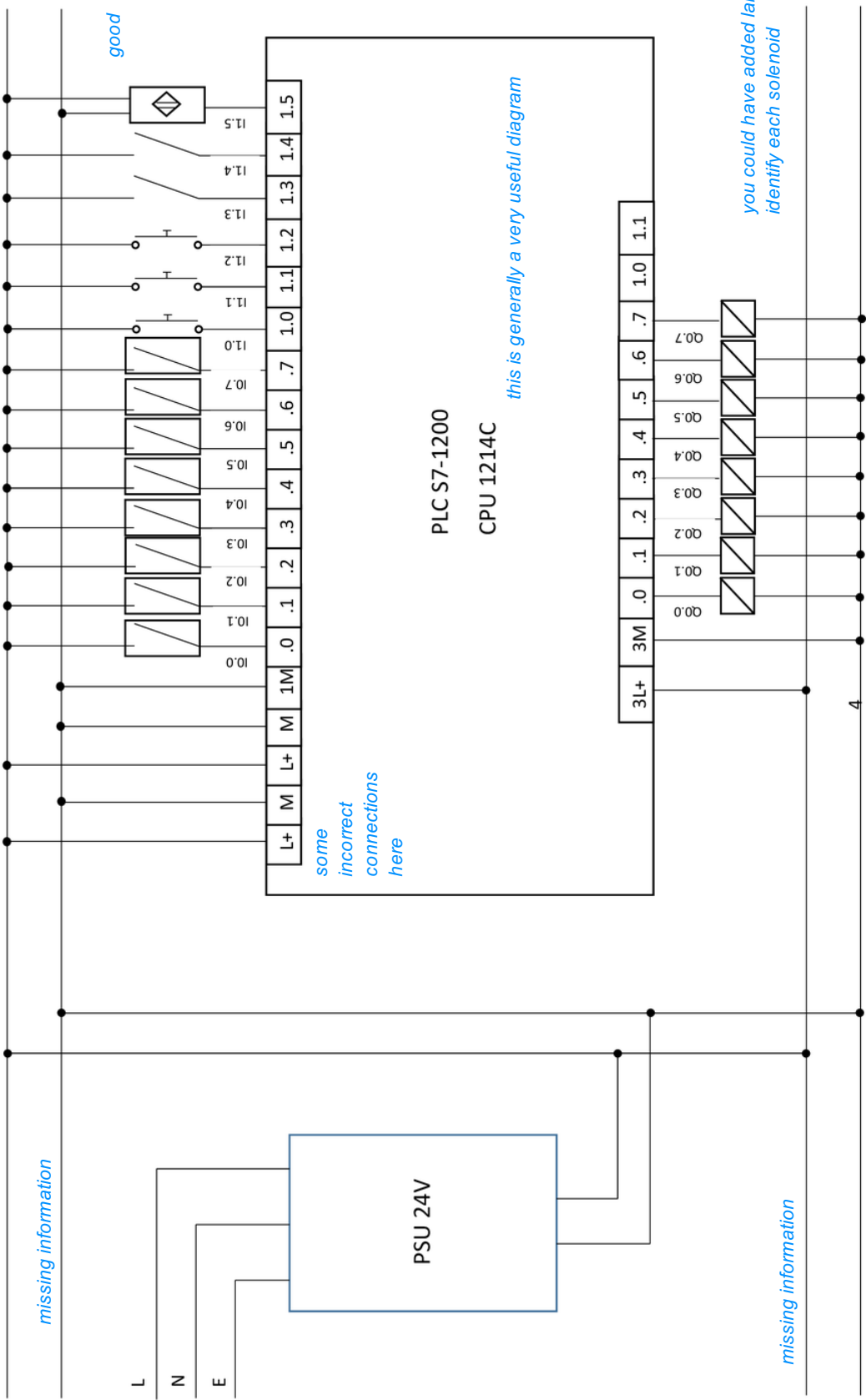
a good I/O list

Input	UP Sensor	I0.0
	DOWN Sensor	I0.1
	Gripper Open Sensor	I0.2
	Gripper Closed Sensor	I0.3
	IN Sensor	I0.4
	OUT Sensor	I0.5
	RIGHT Sensor	I0.6
	LEFT Sensor	I0.7
	Pushbutton X10	I1.0
	Pushbutton X11	I1.1
	Pushbutton X12	I1.2
	Toggle Switch X13	I1.3
	Toggle Switch X14	I1.4
	Object Sensor	I1.5
Output	Move Down Solenoid	Q0.0
	Move Up Solenoid	Q0.1
	Close Gripper Solenoid	Q0.2
	Open Gripper Solenoid	Q0.3
	Move Out Solenoid	Q0.4
	Move In Solenoid	Q0.5
	Move Left Solenoid	Q0.6
	Move Right Solenoid	Q0.7

further explanations could have been given with supporting photos of the system

Thomas Phillips

labels ?



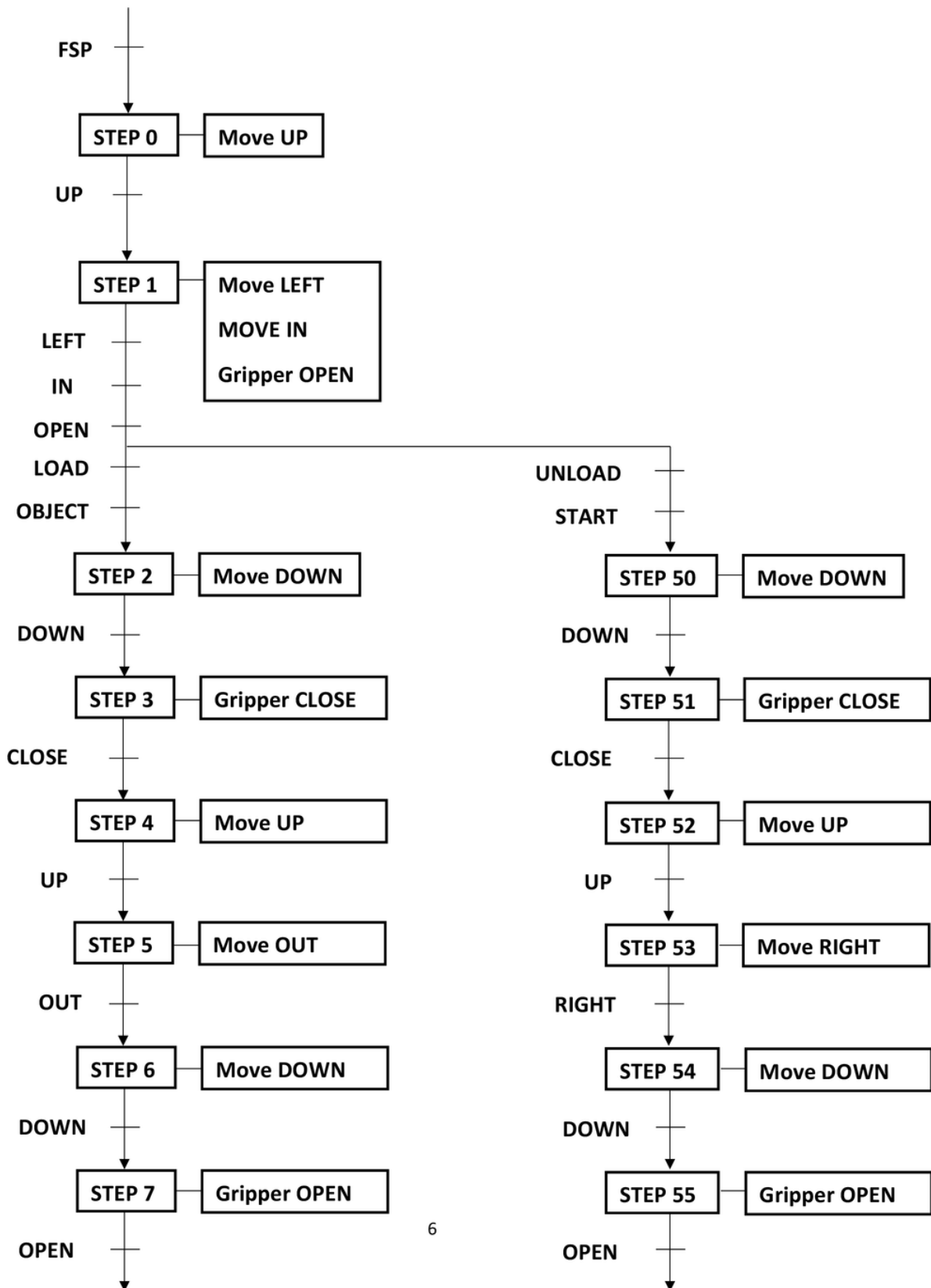
2. Program Documentation and Explanation

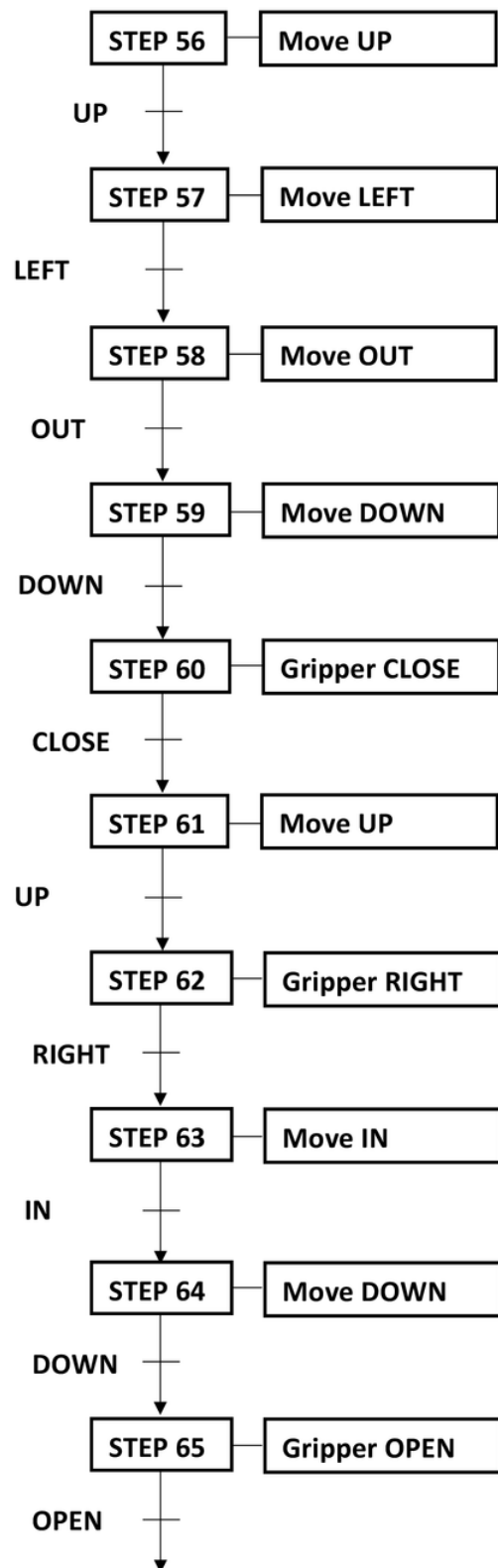
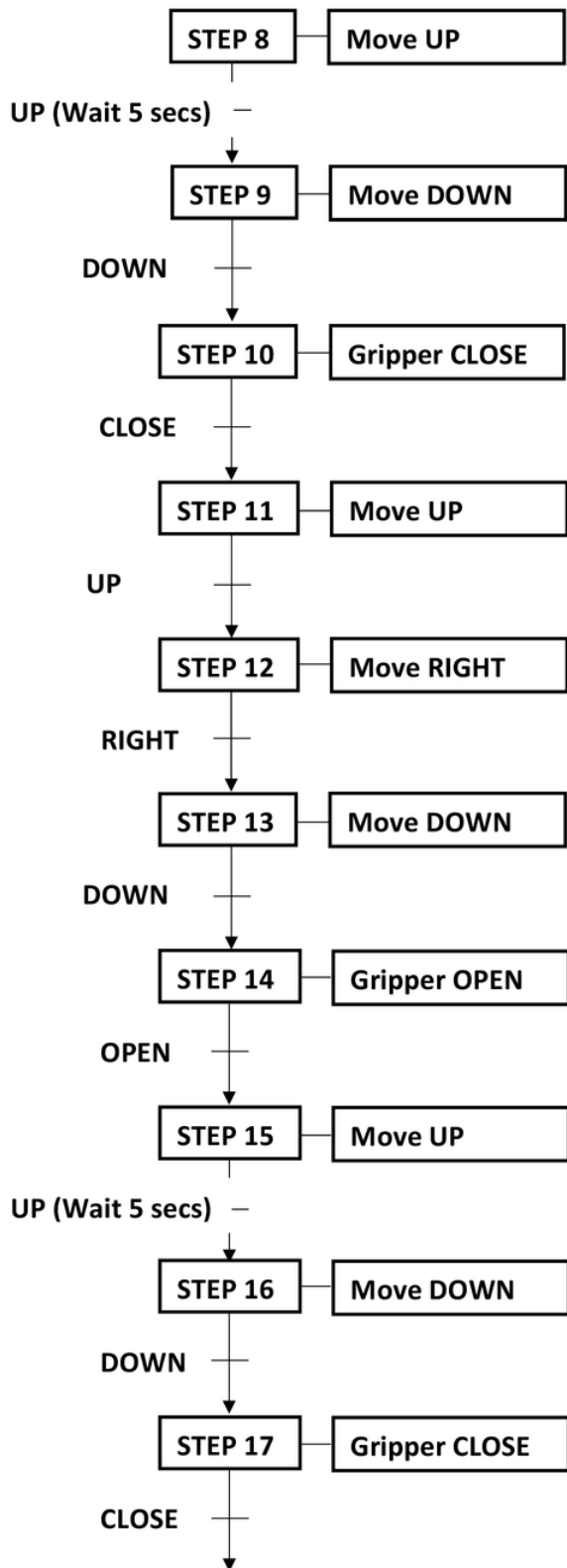
Before writing the program, a SFC (sequential function chart) was created. This helped to ensure that a plan was followed which then helped in minimizing errors within the program. On the SFC chart is the event which is going to happen and the action that will allow it to do that certain event. There were 2 charts produced, one for loading parts and the other for unloading them. They are situated on the next page.

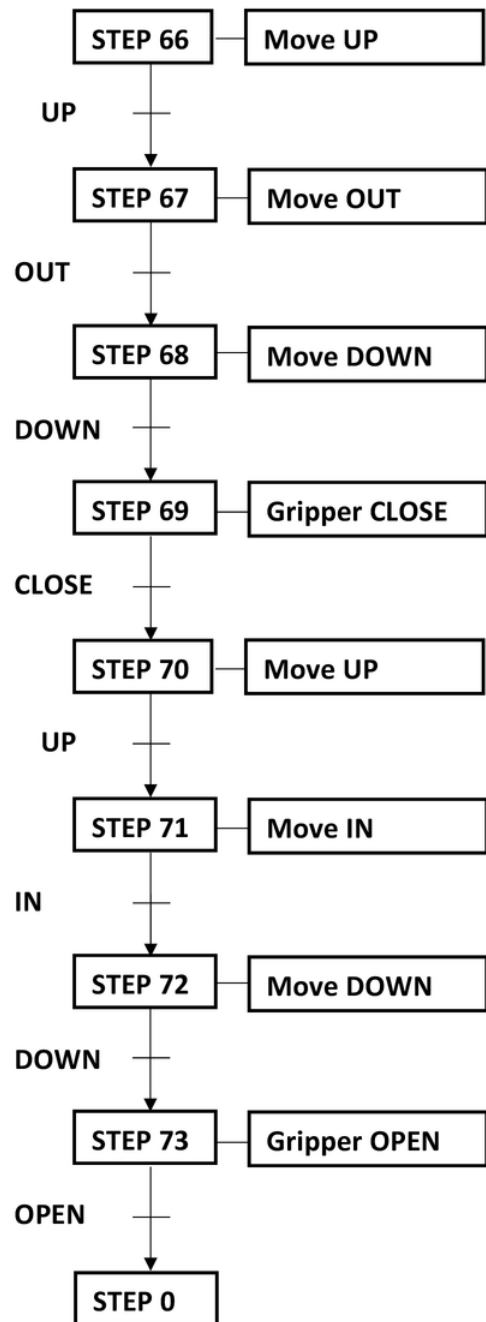
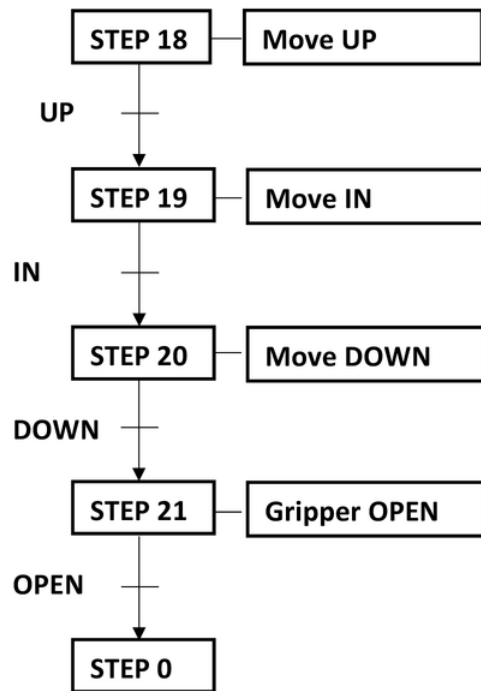
During the loading sequence, a part will be rolled down the chute passing the object sensor. This will allow the machine to know that a part is present at station 1. The robot will then open its gripper, move down and then close its gripper thus ensuring the part is secure. It will then proceed to move up and out towards station 2 where it place the part down. Once done, the robot will move up and wait for a total of 5 seconds before moving the part again to station 3. The same will be repeated again for station 3 and 4. At station 4 the part will be dropped into the exit chute and thus coming out of the machine. Once finished, the robot will go into the up position and remain there until the load or unload button has been pressed.

During the unloading sequence, the robot will start at station 1 in the UP position. When the unload button has been pressed on the HMI screen the sequence will begin. The robot will pick up a part from station 1 and move it straight to station 4 where it will roll down the exit chute and come out of the machine. Then the robot will move to station 2 and again will move it to station 4 where it will exit the machine. This is repeated for station 3 and once finished the robot will move up and remain in its current position until the load or unload button has been pressed.

*Where is the program
??????????????*







3. System Testing, Maintenance and Reliability

Test No.	Description	Pass/Fail
1	When in Auto, Manual buttons will not work.	Pass
2	When in Manual, all manual buttons will work.	Pass
3	When the machine is in 'Manual' and the manual button for 'Move Up' has been pressed, the robot will move up.	Pass
4	When the machine is in 'Manual' and the manual button for 'Move Down' has been pressed, the robot will move down.	Pass
5	When the machine is in 'Manual', the manual button for 'Gripper Close' has been pressed and the down sensor has been made, the robots' gripper will close.	Pass
6	When the machine is in 'Manual' and the manual button for 'Gripper Open' has been pressed, the robots' gripper will open.	Pass
7	When the machine is in 'Manual', the manual button for 'Move Out' has been pressed and the up sensor has been made, the robot will move out.	Pass
8	When the machine is in 'Manual', the manual button for 'Move In' has been pressed and the up sensor has been made, the robot will move in.	Pass
9	When the machine is in 'Manual', the manual button for 'Move Left' has been pressed and the up sensor has been made, the robot will move left.	Pass
10	When the machine is in 'Manual', the manual button for 'Move Right' has been pressed and the up sensor has been made, the robot will move right.	Pass
11	If the load option is selected and an object is rolled down the entry chute, the robot must pick it up and move it to station 2.	Pass
12	It must be left for 5 seconds during which time, the robot must be held in the up position.	Pass
13	After the 5 second delay, the object must be moved to station 3 and left there for 5 seconds during which time the robot must be held in the up position.	Pass
14	After the 5 second delay, the object must be moved to station 4 where it will roll down the exit chute.	Pass
15	During the unloading sequence, the robot will move all parts to station 4.	Pass

During the testing stage of the program, the above tests were taken. As shown, all of the tests passed meaning that each one does what it's intended to do. For example, when testing the manual controls that were added onto the HMI screen, all scenarios were carried out to ensure that the robot doesn't crash or break. This situation could occur when manually moving the robot arm either left or right whilst going down. If this was to occur then the robot arm would crash at one of the stations thus meaning the arm would break. Also, the robot arm is only able to move when in the 'UP' position.

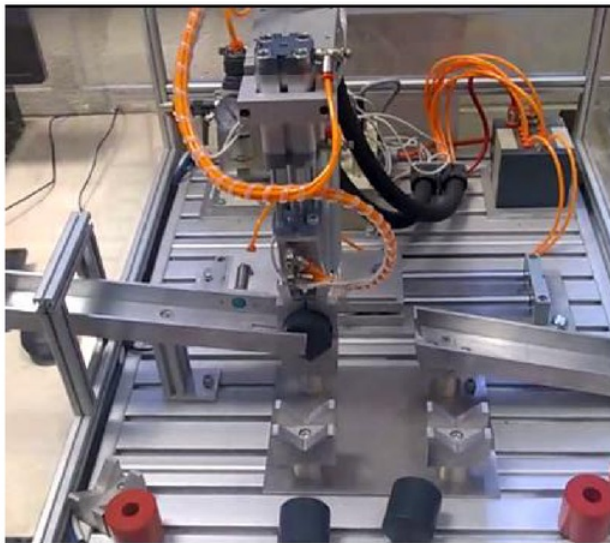


Figure 2: Test 11 Station 1

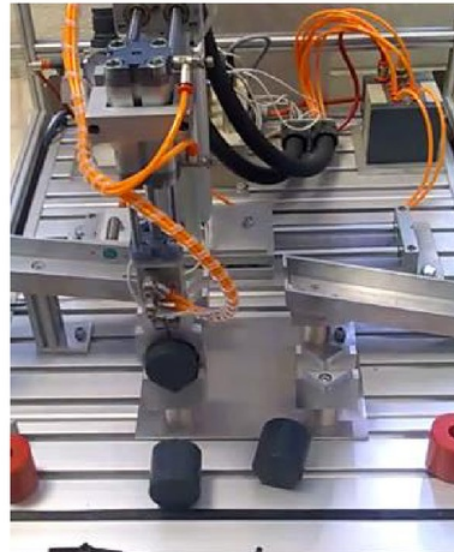


Figure 1: Test 11 Station 2

Above are the images for test 11. Figure 2 shows the robot picking up the part from station 1 after it has been rolled down the chute passing the object sensor. **Error! Not a valid bookmark self-reference.** shows the robot placing the part down at station 2.

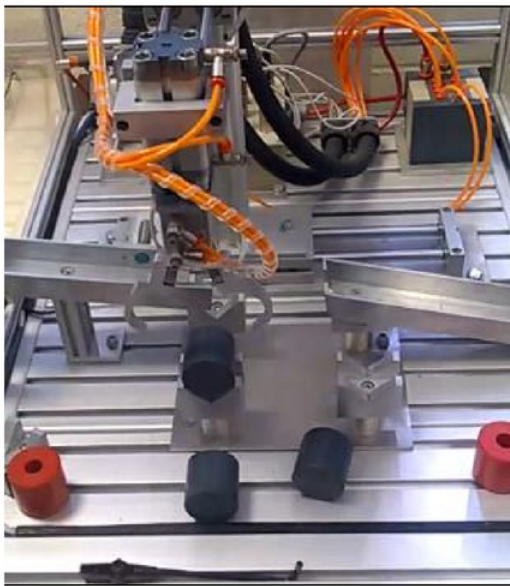


Figure 3: Test 12 Station 2 UP Position

To the right is the image for test 12. Figure 3 shows the robot in the UP position after placing the part down at station 2. It will stay in the UP position for 5 seconds before proceeding with the sequence.

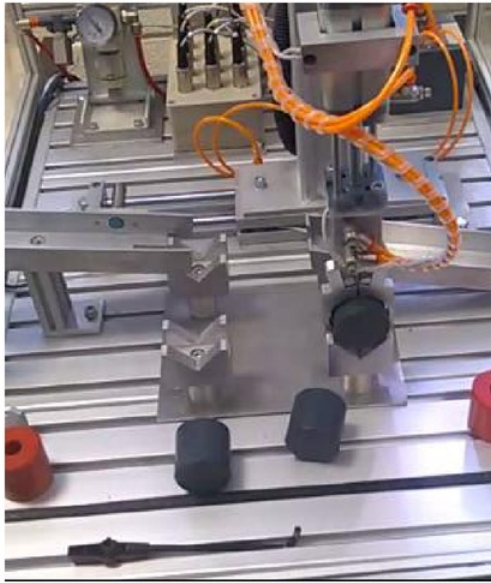


Figure 5: Test 13 Station 3

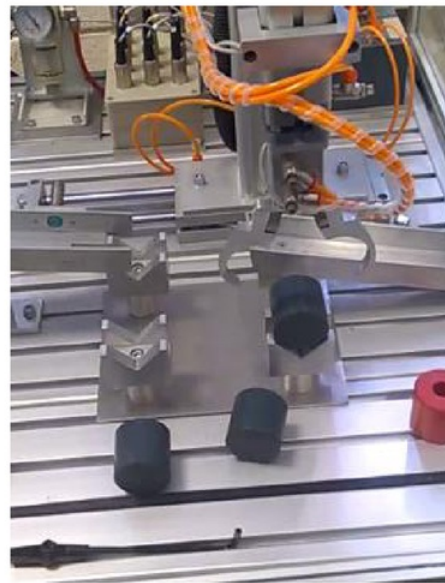


Figure 4: Test 13 Station 3 UP Position

Above are the images for test 13. Figure 5 shows the robot placing the part down at station 3 where it will proceed to move up. Figure 4 shows the robot in the UP position where it will wait 5 seconds before proceeding again.

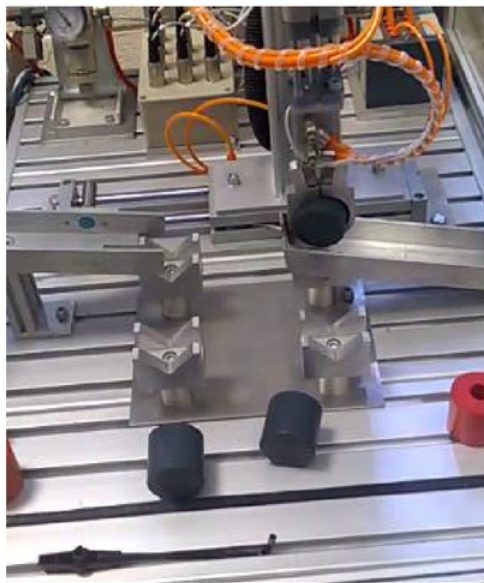


Figure 6: Test 14 Station 4

To the right is the image for test 14. Figure 6 shows the robot placing the part into station 4 which will then allow the part to roll down the exit chute.

4. Conclusions and Recommendations

Overall, the whole process has been a success. The sequence for the robot worked with each test being passed along the way thus meaning the program ran as it was intended to. There was a problem however with station 4. The problem was that when a part was placed there to roll down the exit chute it would be slightly off meaning that the part wouldn't roll down. This meant having to manually open the door and taking the part out manually as well. To help prevent this, the exit chute should be made slightly wider by about 1/2mm to allow room for the part to roll. Also at stations 2 and 3, a box could be made around the station to ensure the part isn't incorrectly placed when the robot places it there. There could be sensors also implemented at each station so the operator knows when a part is still present in the machine. This information can then be placed onto the HMI screen. In the program, an emergency stop feature could be implemented. This would allow the robot to stop operating when in a state of emergency such as the robot arm almost jamming etc.

PSDE 4005 Assignment 2

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

37 / 100

Instructor

PAGE 1

PAGE 2

PAGE 3

Text Comment. a good I/O list

Text Comment. further explanations could have been given with supporting photos of the system

PAGE 4

Text Comment. labels ?

Text Comment. missing information

Text Comment. good

Text Comment. some incorrect connections here

Text Comment. this is generally a very useful diagram

Text Comment. you could have added labels to identify each solenoid

Text Comment. missing information

PAGE 5

Text Comment. Where is the program ???????????????

PAGE 6

PAGE 7

GRADING FORM: CSG-RUBIC

THOMAS PHILLIPS**37****RESEARCH-INFORMED LITERATURE**

n/a

KNOWLEDGE AND UNDERSTANDING

Section 1: Hardware Investigation - Briefly stated but o supporting photos. A good wiring diagram but some information is missing or incorrect. (5/10)

Section 1: System Design and I/O list - A good I/O list provided and very good system design including the SFC chart but no program included. (4/10)

Section 2: Program Explanation – Program has not been included nor explained. (0/10)

9**ANALYSIS**

Section 3: System Testing – A good table of results provided with supporting photos. (8/10) Section 3:

16

Maintenance and Reliability - Some evidence presented but without the program and the screens, it is impossible to verify. (3/10) Section 4: Conclusions and Recommendations - Useful comments made and some suggestions. (5/10)

PRACTICAL APPLICATION AND DEP.



Section 2: Program Network Comments - No program included in the report. (0/10) Section 2: HMI Screen Designs –No information presented. (0/10) Section 3: Presentation of Test Results - Good presentation. (7/10)

7

SKILLS FOR PROFESSIONAL PRAC.



All sections - Report is well structured but incomplete. (5/10)

5