PLC **System Applications** Name :_____

Temperature Proportional Control reading Part E Practical 1

Record the temperature in your oven every 30 seconds in the table below , then complete the graph

Hand this in with your file

Reading #	Temp	Reading #	Temp	Reading #	Temp
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

Setpoint = _____ deg

Temp

OB1:CYCL_EXC

Cycle Execution

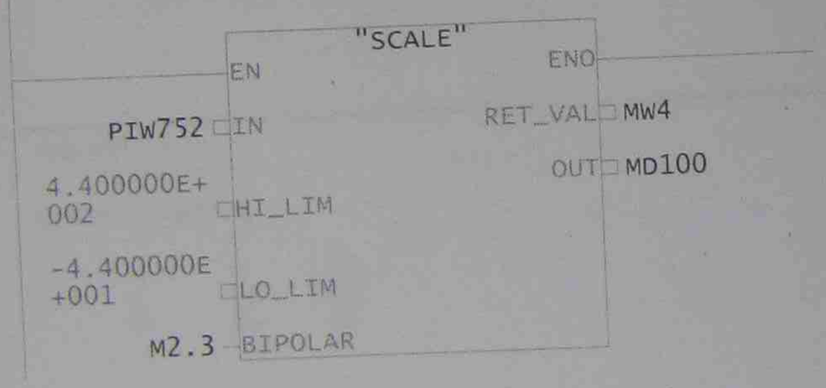
Name:
Author:
Family:
Version: 0.0
Code version: 2

Time stamp Code: 05/07/09
Interface: 01/20/04
Lengths Block: 00646
Code: 00474
Data: 00028

Block: OB1 "Main Program Sweep (Cycle)"

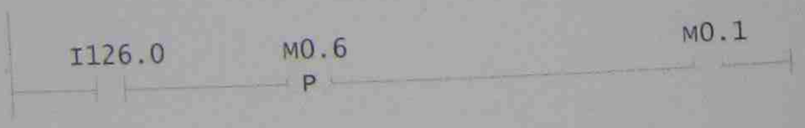
Address	Declaration	Name	Type	Start value	Comment
0.0	temp	OB1_EV_CLASS	BYTE		Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
1.0	temp	OB1_SCAN_1	BYTE		1 (Cold restart scan 1 of OB 1), 3 (Scan 2-n of OB 1)
2.0	temp	OB1_PRIORITY	BYTE		1 (Priority of 1 is lowest)
3.0	temp	OB1_OB_NUMBR	BYTE		1 (Organization block 1, OB1)
4.0	temp	OB1_RESERVED_1	BYTE		Reserved for system
5.0	temp	OB1_RESERVED_2	BYTE		Reserved for system
6.0	temp	OB1_PREV_CYCLE	INT		Cycle time of previous OB1 scan (milliseconds)
8.0	temp	OB1_MIN_CYCLE	INT		Minimum cycle time of OB1 (milliseconds)
10.0	temp	OB1_MAX_CYCLE	INT		Maximum cycle time of OB1 (milliseconds)
12.0	temp	OB1_DATE_TIME	DATE_AND_TIME		Date and time OB1 started

Network: 1 Analog input-4-20ma from RTD transmitter converted to a 1-5 vo

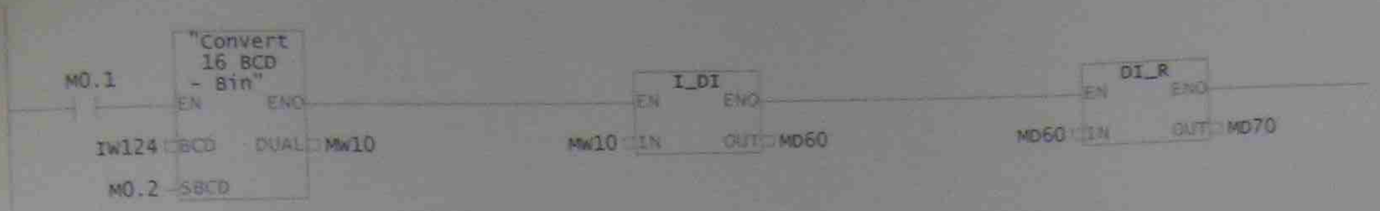


Network: 2

One shot for setpoint loading

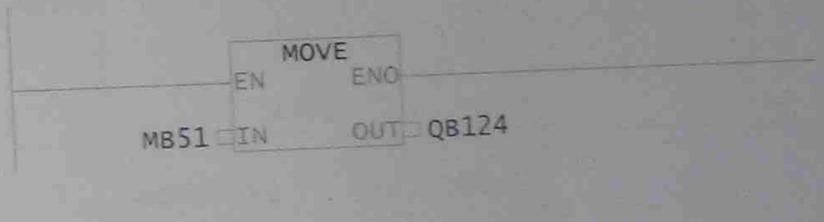


Network: 3



Network: 4

Network: 5



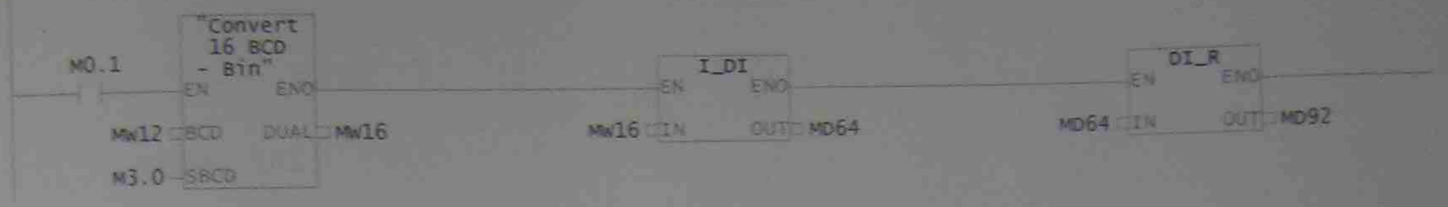
Network: 6

Hysterisis masking

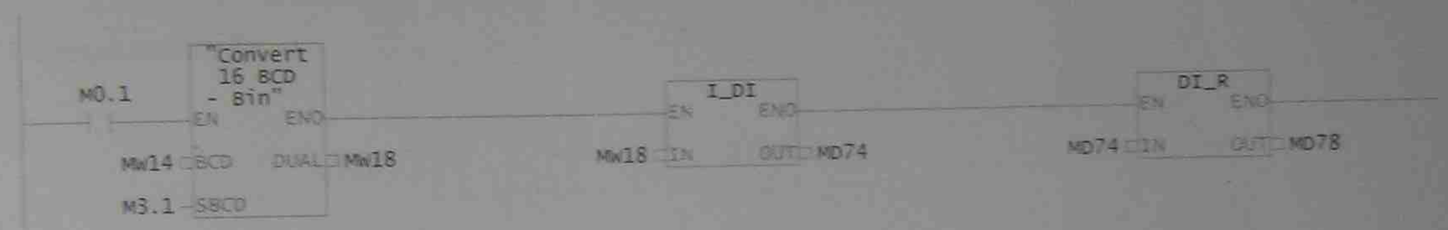
```
A       M       0.1
L       IB      124
T       MW      12

A       M       0.1
L       IB      125
T       MW      14
```

Network: 7

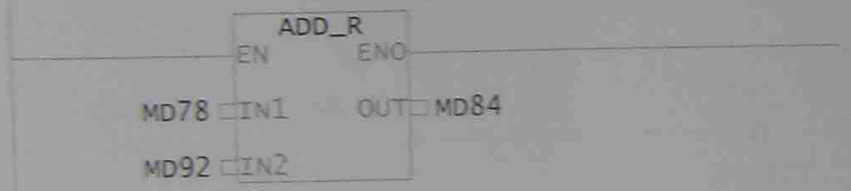


Network: 8



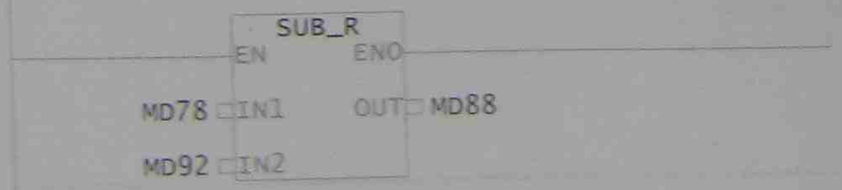
Network: 9

Addition



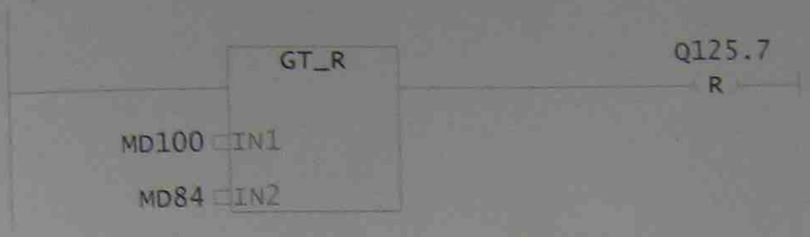
Network: 10

subtraction



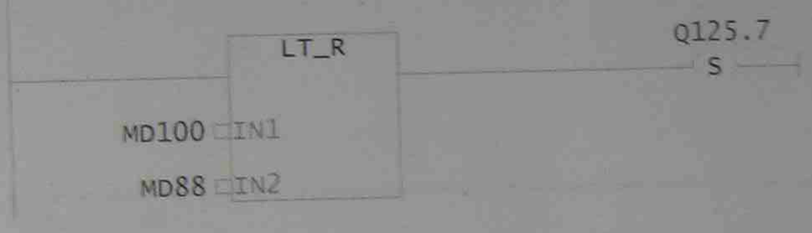
Network: 11

comparator for upt

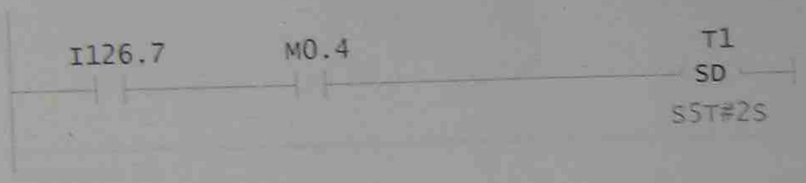


Network: 12

comparator for lpt

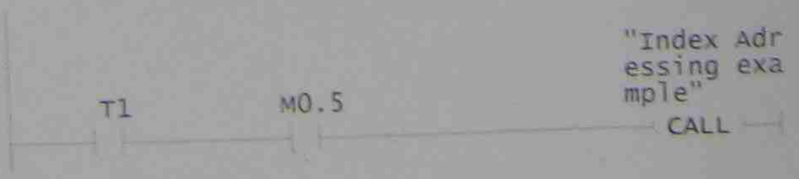


Network: 13

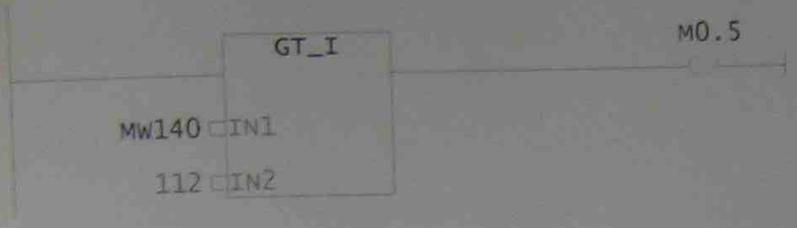


Network: 14

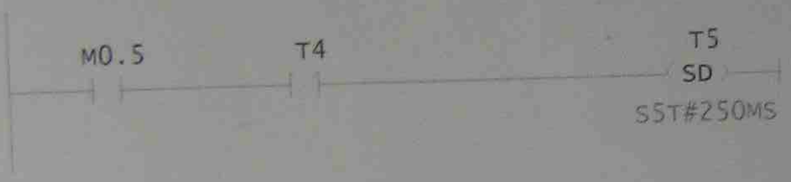
Network: 15



Network: 16



Network: 17



Network: 18

Network: 19

Network: 20

FC1:Index Adressing example

Name:		Time stamp	Code:	04/29/09
Author:			Interface:	04/08/09
Family:	Lengths	Lengths	Block:	00140
Version:	1.0		Code:	00046
Code version:	2		Data:	00008

Block: FC1

Address	Declaration	Name	Type	Start value	Comment
	in				
	out				
	in_out				
	temp				

Network: 1

```
      OPN   "Data Recording"

      L     MW   140
      L     112
      >=I
      JC    here

      L     MW   140
      SLD   3
      LAR1


      L     MD   100
      T     DBW [AR1,P#0.0]


      L     MW   140
      L     4
      +I
      T     MW   140

      BEU
here: L     0
      T     MW   140
```

FC2

Name:		Time stamp	Code:	04/29/09
Author:			Interface:	04/08/09
Family:		Lengths	Block:	00222
Version:	1.0		Code:	00130
Code version:	2		Data:	00008

Block: FC2

Address	Declaration	Name	Type	Start value	Comment
	in				
	out				
	in_out				
	temp				

Network: 1

```
      OPN   "Data Recording"

      L     0
      T     DBW     0
      T     DBW     4
      T     DBW     8
      T     DBW    12
      T     DBW    16
      T     DBW    20
      T     DBW    24
      T     DBW    28
      T     DBW    32
      T     DBW    36
      T     DBW    36
      T     DBW    40
      T     DBW    44
      T     DBW    48
      T     DBW    52
      T     DBW    56
      T     DBW    60
      T     DBW    64
      T     DBW    68
      T     DBW    72
      T     DBW    76
      T     DBW    80
      T     DBW    84
      T     DBW    88
      T     DBW    92
      T     DBW    96
      T     DBW   100
      T     DBW   104
      T     DBW   108
      T     DBW   112
      T     MW    140
```

DB10 Data Recording

Name:
Author:
Family:
Version: 1.0
Code version: 2

Time stamp Code: 04/09/09
Interface: 04/09/09
Lengths Block: 00298
Code: 00140
Data: 00040

Block: DB10

Address	Declaration	Name	Type	Start value	Comment
0.0	stat		STRUCT		
+0.0	stat	Temperature	REAL	0.000000E+000	
+4.0	stat	Temperature1	REAL	0.000000E+000	
+8.0	stat	Temperature2	REAL	0.000000E+000	
+12.0	stat	Temperature3	REAL	0.000000E+000	
+16.0	stat	Temperature4	REAL	0.000000E+000	
+20.0	stat	Temperature5	REAL	0.000000E+000	
+24.0	stat	Temperature6	REAL	0.000000E+000	
+28.0	stat	Temperature7	REAL	0.000000E+000	
+32.0	stat	Temperature8	REAL	0.000000E+000	
+36.0	stat	Temperature9	REAL	0.000000E+000	
+40.0	stat	Temperature10	REAL	0.000000E+000	
+44.0	stat	Temperature11	REAL	0.000000E+000	
+48.0	stat	Temperature12	REAL	0.000000E+000	
+52.0	stat	Temperature13	REAL	0.000000E+000	
+56.0	stat	Temperature14	REAL	0.000000E+000	
+60.0	stat	Temperature15	REAL	0.000000E+000	
+64.0	stat	Temperature16	REAL	0.000000E+000	
+68.0	stat	Temperature17	REAL	0.000000E+000	
+72.0	stat	Temperature18	REAL	0.000000E+000	
+76.0	stat	Temperature19	REAL	0.000000E+000	
+80.0	stat	Temperature20	REAL	0.000000E+000	
+84.0	stat	Temperature21	REAL	0.000000E+000	
+88.0	stat	Temperature22	REAL	0.000000E+000	
+92.0	stat	Temperature23	REAL	0.000000E+000	
+96.0	stat	Temperature24	REAL	0.000000E+000	
+100.0	stat	Temperature25	REAL	0.000000E+000	
+104.0	stat	Temperature26	REAL	0.000000E+000	
+108.0	stat	Temperature27	REAL	0.000000E+000	
+112.0	stat	Temperature28	REAL	0.000000E+000	
+116.0	stat	Temperature29	REAL	0.000000E+000	
+120.0	stat	Temperature30	REAL	0.000000E+000	
+124.0	stat	Temperature31	REAL	0.000000E+000	
+128.0	stat	Temperature32	REAL	0.000000E+000	
+132.0	stat	Temperature33	REAL	0.000000E+000	
+136.0	stat	Temperature34	REAL	0.000000E+000	
+140.0	stat		END_STRUCT		

P.I.D

Proportion, Integral & Derivative Control

OB1:CYCL_EXC

Cycle Execution

```
Name:                    Time stamp Code:      05/13/09
Author:                             Interface: 01/20/04
Family:                  Lengths    Block:     00234
Version:        0.0                 Code:      00122
Code version:   2                   Data:      00028
```

Block: OB1 "Main Program Sweep (Cycle)"

Address	Declaration	Name	Type	Start value	Comment
0.0	temp	OB1_EV_CLASS	BYTE		Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
1.0	temp	OB1_SCAN_1	BYTE		1 (Cold restart scan 1 of OB 1), 3 (Scan 2-n of OB 1)
2.0	temp	OB1_PRIORITY	BYTE		1 (Priority of 1 is lowest)
3.0	temp	OB1_OB_NUMBR	BYTE		1 (Organization block 1, OB1)
4.0	temp	OB1_RESERVED_1	BYTE		Reserved for system
5.0	temp	OB1_RESERVED_2	BYTE		Reserved for system
6.0	temp	OB1_PREV_CYCLE	INT		Cycle time of previous OB1 scan (milliseconds)
8.0	temp	OB1_MIN_CYCLE	INT		Minimum cycle time of OB1 (milliseconds)
10.0	temp	OB1_MAX_CYCLE	INT		Maximum cycle time of OB1 (milliseconds)
12.0	temp	OB1_DATE_TIME	DATE_AND_TIME		Date and time OB1 started

Network: 1

```
      L     DB30.DBW    6
      T     DB60.DBW    0

      L     DB30.DBW   10
      T     DB60.DBW    4

      L     DB30.DBW   20
      T     DB60.DBW    8

      L     DB30.DBW   72
      T     DB60.DBW   12

      L     DB30.DBW   80
      T     DB60.DBW   20

      L     DB30.DBW   84
      T     DB60.DBW   24

      L     DB30.DBW   88
      T     DB60.DBW   28

      L     DB30.DBW   96
      T     DB60.DBW   16

      L     DB40.DBW   28
      T     DB60.DBW   32

      L     DB40.DBW   30
      T     DB60.DBW   36
```

OB35:CYC_INT5

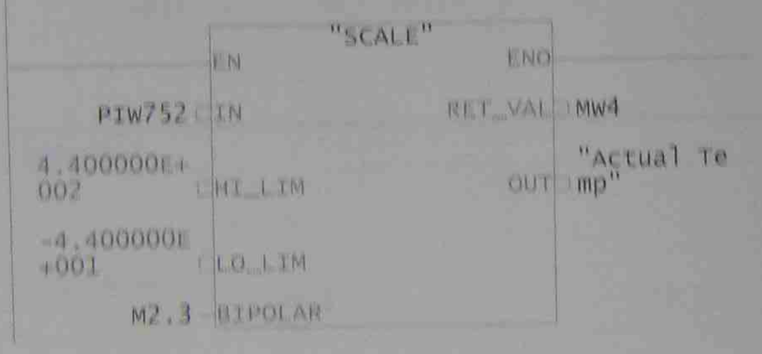
Cyclic Interrupt 5

Name:		Time stamp	Code:	06/01/09
Author:			Interface:	01/20/04
Family:		Lengths	Block:	00992
Version:	1.0		Code:	00844
Code version:	2		Data:	00028

Block: OB35 "Cyclic Interrupt"

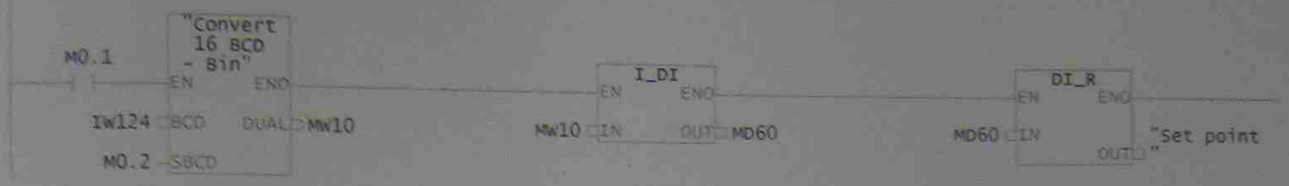
Address	Declaration	Name	Type	Start value	Comment
0.0	temp	OB35_EV_CLASS	BYTE		Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
1.0	temp	OB35_STRT_INF	BYTE		16#36 (OB 35 has started)
2.0	temp	OB35_PRIORITY	BYTE		11 (Priority of 1 is lowest)
3.0	temp	OB35_OB_NUMBR	BYTE		35 (Organization block 35, OB35)
4.0	temp	OB35_RESERVED_1	BYTE		Reserved for system
5.0	temp	OB35_RESERVED_2	BYTE		Reserved for system
6.0	temp	OB35_PHASE_OFFSET	WORD		Phase offset (msec)
8.0	temp	OB35_RESERVED_3	INT		Reserved for system
10.0	temp	OB35_EXC_FREQ	INT		Frequency of execution (msec)
12.0	temp	OB35_DATE_TIME	DATE_AND_TIME		Date and time OB35 started

Network: 1



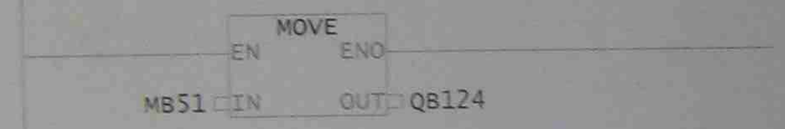
Network: 2

Network: 3

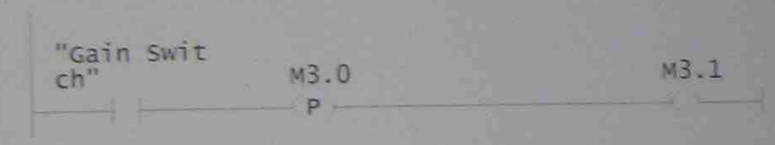


Network: 4

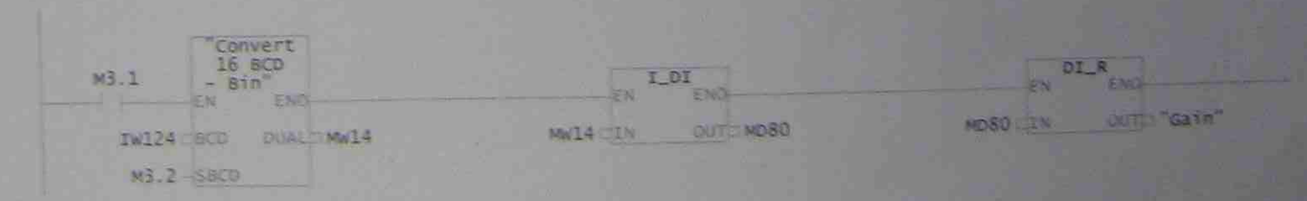
Network: 5



Network: 6



Network: 7



Network: 8

P

Network: 9

I

Network: 10

D

```
                                  [NAME]
                                "Multivariate"
                    Sex                                 Cost
MALE                (Int)                    [95%, 1]  "Quad"
  [0,1]             Prob_no                  [min, 1]
  [1,Inf)           Prob_no_lo_lo
1 [-Inf,Inf)        Bernoulli
Cost                Bernoulli(p=1)
  mf_3              0.7121_555_
  mf_1              [1.2]47_[2]
  mf_2              [0.1]_[3]
  mf_5              [-2]_2_[2]
  mf_4              [0]_2_[3]
  mf_3              [-1]_[2]
  mf_6              [-2]_[1]
[-Inf,Inf)          [-1,1]
```

DC Motor Speed Control

OB1:CYCL_EXC

Cycle Execution

Name:
Author:
Family:
Version: 0.0
Code version: 2

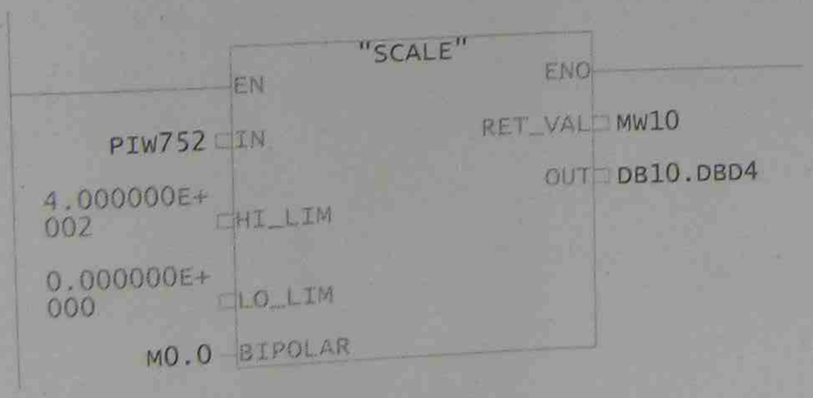
Time stamp Code: 06/03/09
Interface: 01/20/04
Lengths Block: 00904
Code: 00762
Data: 00028

Block: OB1 "Main Program Sweep (Cycle)"

Address	Declaration	Name	Type	Start value	Comment
0.0	temp	OB1_EV_CLASS	BYTE		Bits 0-3 = 1 (Coming event), Bits 4-7 = 1 (Event class 1)
1.0	temp	OB1_SCAN_1	BYTE		1 (Cold restart scan 1 of OB 1), 3 (Scan 2-n of OB 1)
2.0	temp	OB1_PRIORITY	BYTE		1 (Priority of 1 is lowest)
3.0	temp	OB1_OB_NUMBR	BYTE		1 (Organization block 1, OB1)
4.0	temp	OB1_RESERVED_1	BYTE		Reserved for system
5.0	temp	OB1_RESERVED_2	BYTE		Reserved for system
6.0	temp	OB1_PREV_CYCLE	INT		Cycle time of previous OB1 scan (milliseconds)
8.0	temp	OB1_MIN_CYCLE	INT		Minimum cycle time of OB1 (milliseconds)
10.0	temp	OB1_MAX_CYCLE	INT		Maximum cycle time of OB1 (milliseconds)
12.0	temp	OB1_DATE_TIME	DATE_AND_TIME		Date and time OB1 started

Network: 1

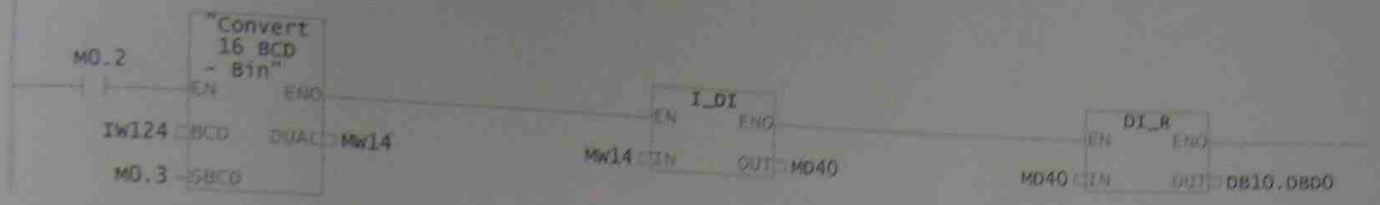
Scaling feedback



Network: 2

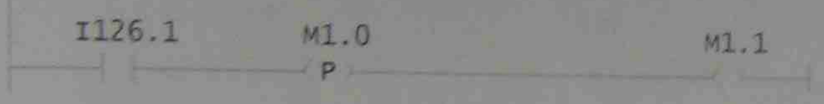
Set point

Network: 3

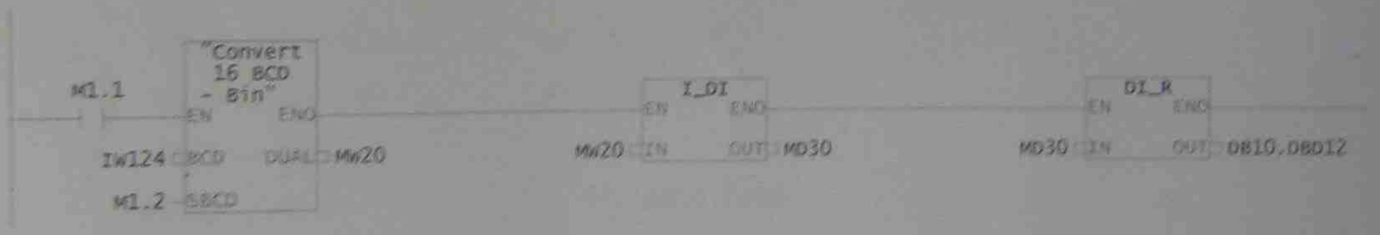


Network: 4

Gain switch



Network: 5



Network: 6

Propotional

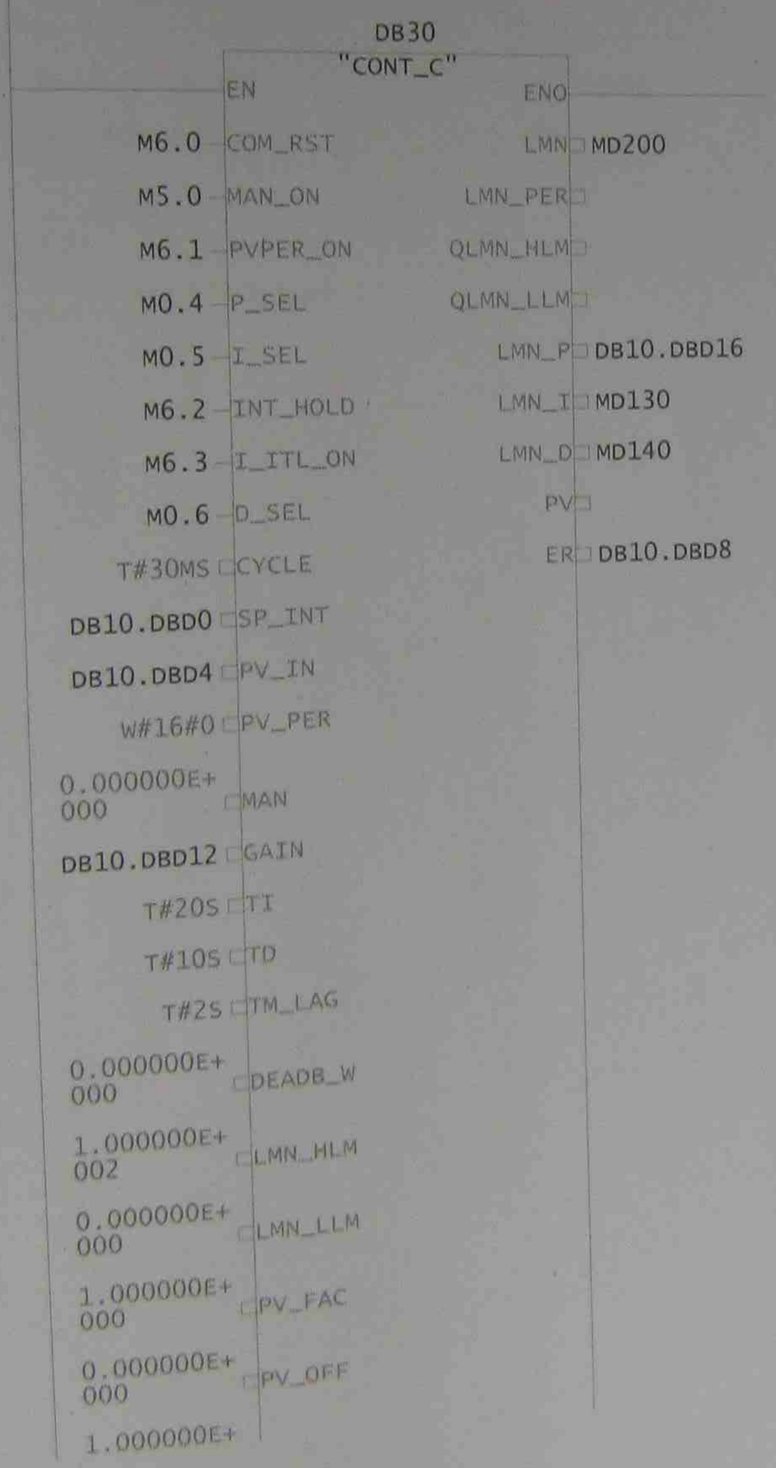
Network: 7

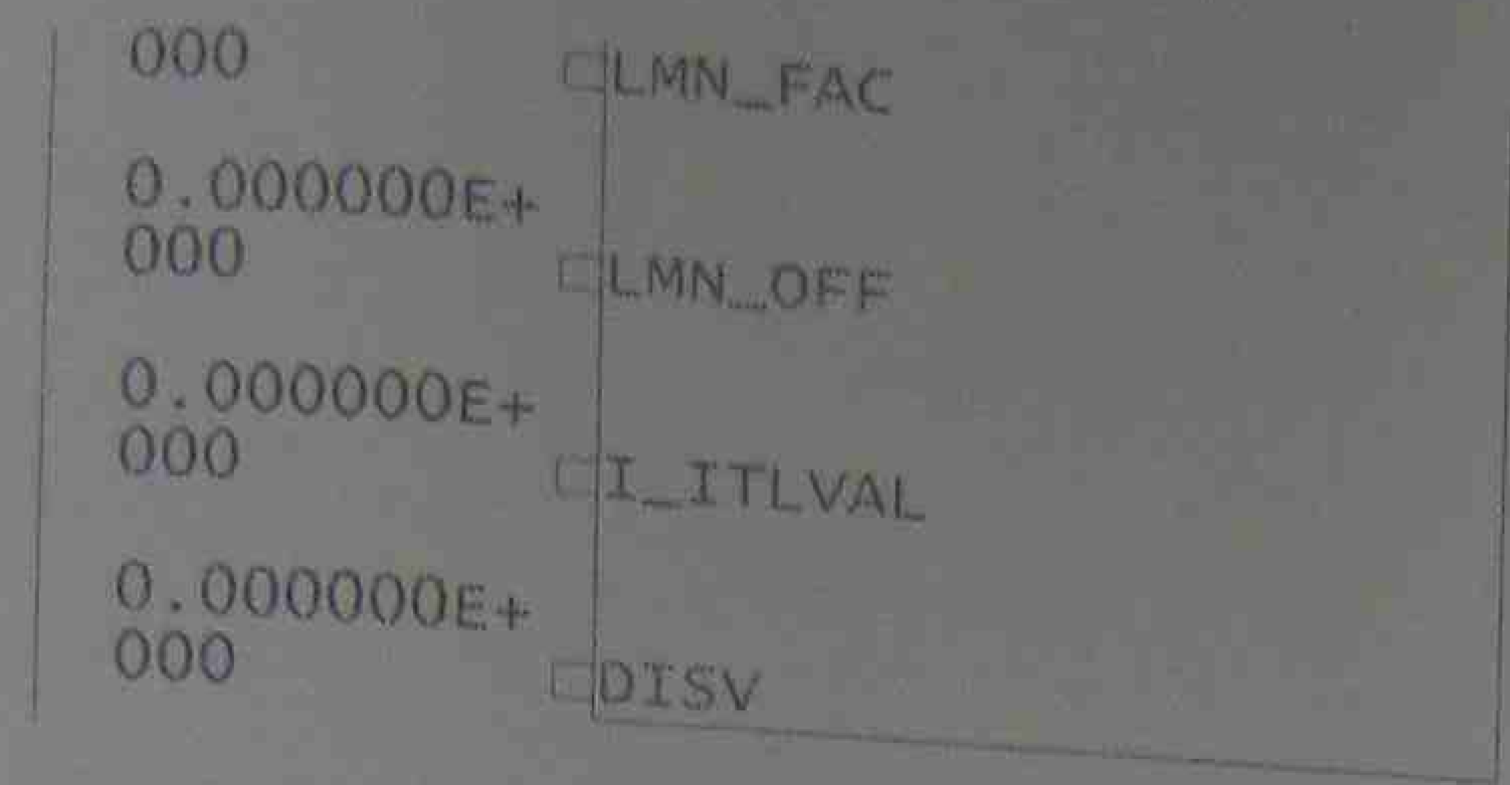
Integral

Network: 8

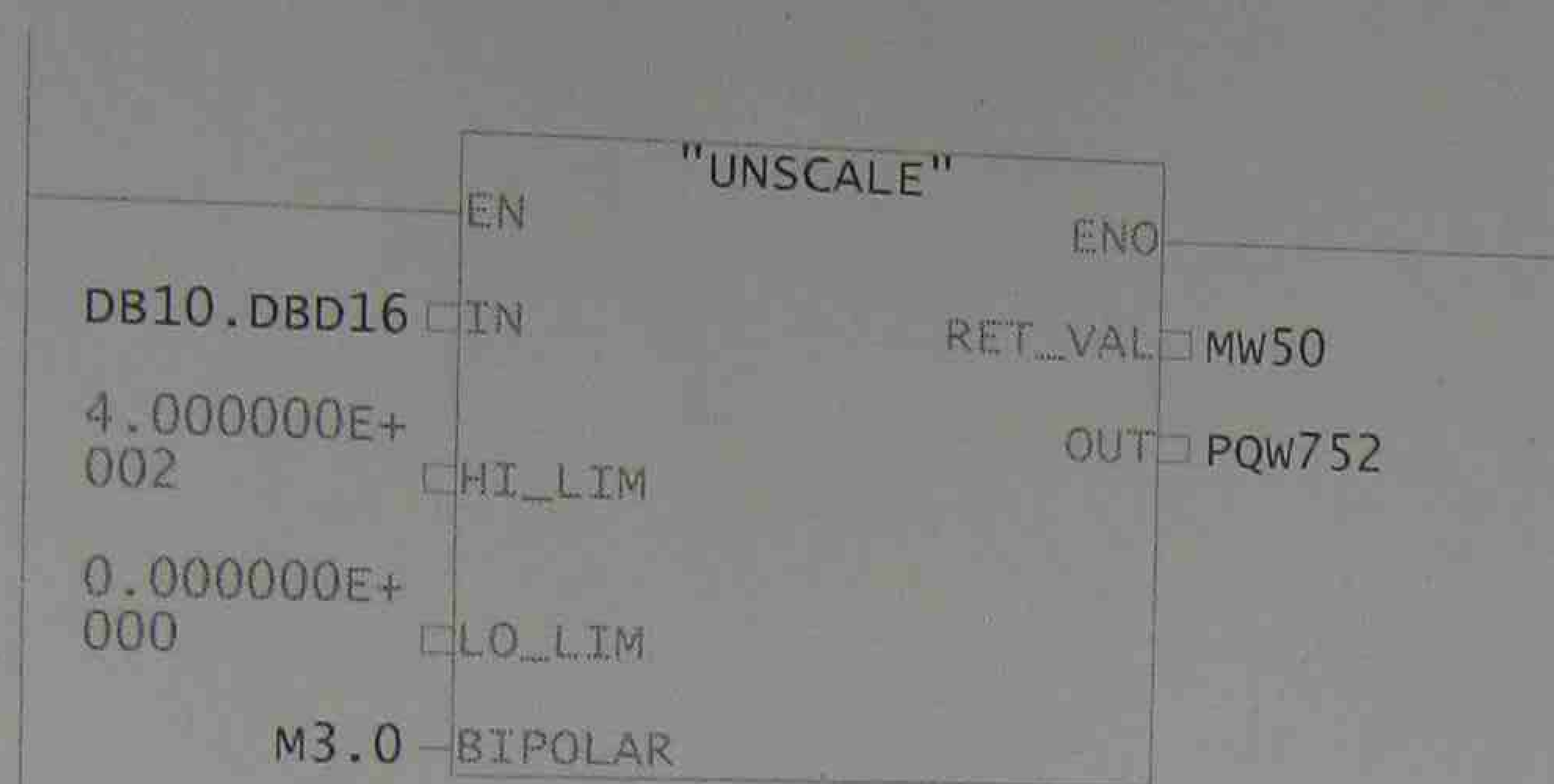
Derivative

Network: 9




000
LMN_FAC
0.000000E+
000
LMN_OFF
0.000000E+
000
I_ITLVAL
0.000000E+
000
DISV

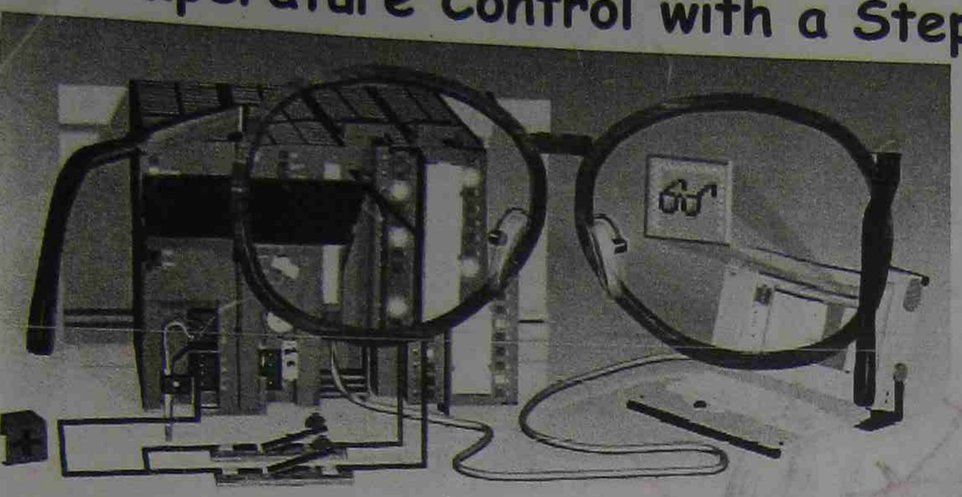
Network: 10


"UNSCALE"
EN
ENO
DB10.DBD16
IN
RET_VAL
MW50
OUT
PQW752
4.000000E+
002
HI_LIM
0.000000E+
000
LO_LIM
M3.0
BIPOLAR

Example

Name: SAAMI BIN MOINUDDIN
Std ID: 3325873 82

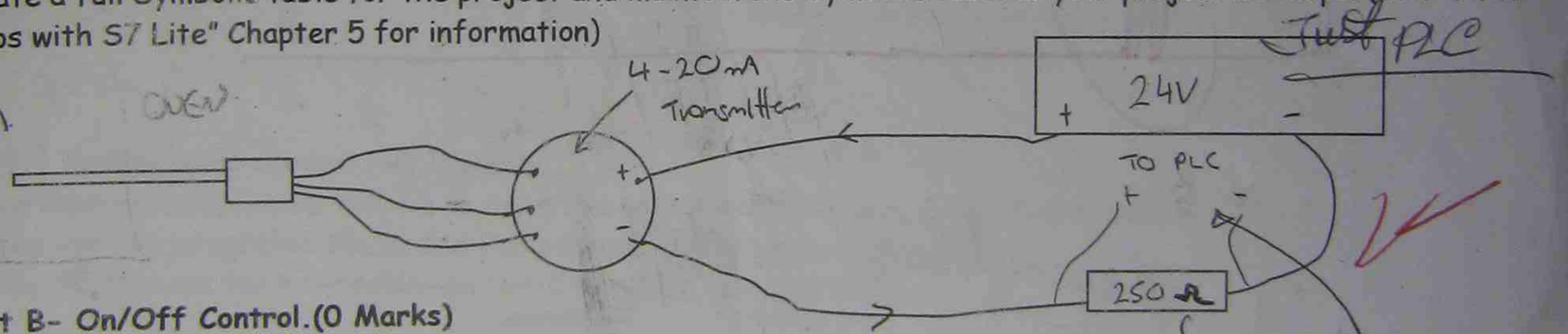
PLC System Applications –Major Project
Temperature Control with a Step 7 PLC



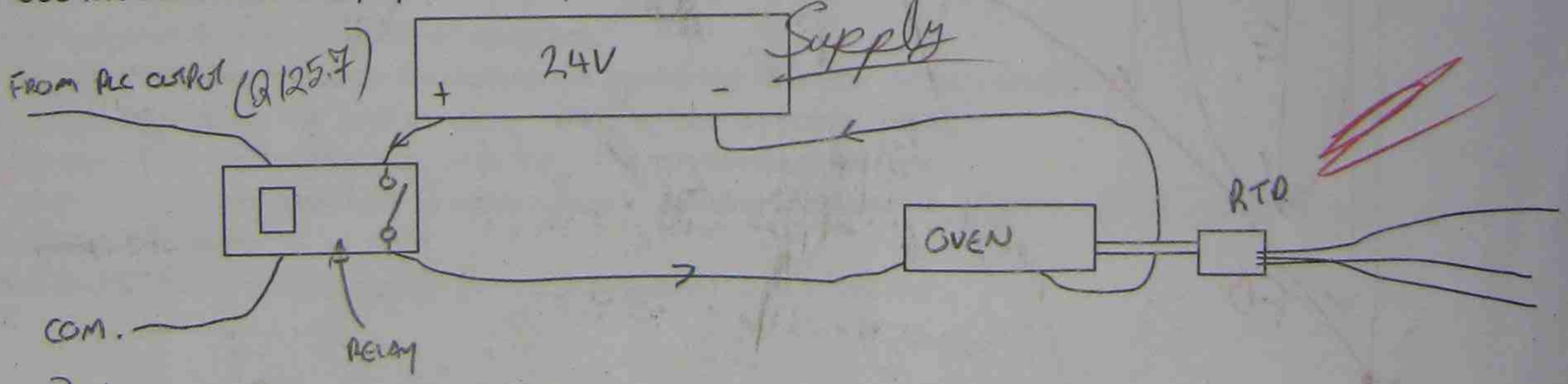
Aim: the aim of this major project is to assess student abilities to apply their knowledge to a new system. Building on previous knowledge the students will adapt this to a newer model PLC and software.

Procedure :
Examine the temperature control system that was used in a previous assignment.
Demonstrate that you are capable of connecting this system to your S7 313C plc.
Familiarize yourself with the S7 "lite" software , use the supplied PDF documents for reference material.

Part A – Analog Inputs.(0 Marks)
Connect the RTD input and scale this input to accurately display the temperature in a variable block or 7 segment display.
Create a full Symbolic table for the project and maintain the Symbolic table as your project develops. (See "First steps with S7 Lite" Chapter 5 for information)



Part B- On/Off Control.(0 Marks)
Use the scaled analog input as a feedback signal to control the temperature in an oven.
Sketch a block diagram of your system and explain the operation in your report.
Use the Thumbwheel switch as your setpoint.
Use the Monitor/Modify option in Step 7 Lite to demonstrate your functional project)



PLC System Applications — DC motor speed controller

Aim :-

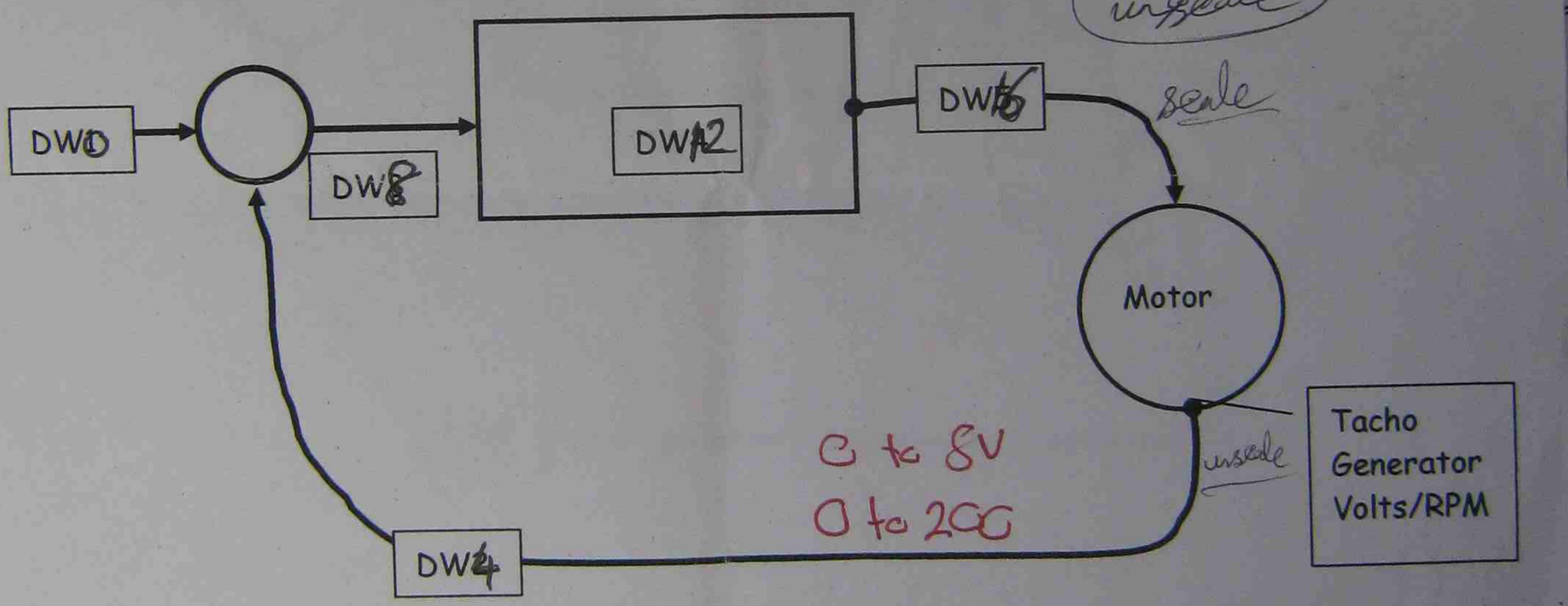
- To design a program using analog inputs and outputs that will control the speed of a DC Motor using Proportional Control.
- Observe and record the operation of the system.
- Add some Integral control to improve system performance.
- Add a control system for operator interfacing.

Procedure A - Proportional Control (10 Marks)
Use Data Block 10 for storing all settings.

- The speed of the motor is set by the thumbwheel switch after a one shot from an input. The setpoint is to be stored in data word 1 (Setpoint = DW1)
- The feedback is taken from a tacho generator connected to an analog input.(Feedback = DW2)
- The feedback is compared to the setpoint and the error is produced.(Error = DW3)
- The gain of the system is set by the same thumbwheel switch after a one shot. (Gain = DW4) (use I 2.1)
- The output of the controller is sent to the servo drive from an analog output .(Output = DW5)

Motor Drive Parameters	PLC Address	Set by One Shot
Motor Speed Set point	DW0	I 126.0
Proportional Gain	DW12	I 126.1

Scale unscale



- Demonstrate your program's function and record the offset when the setpoint is set to 100 RPM with a range of gains.

NO LOAD with LOAD

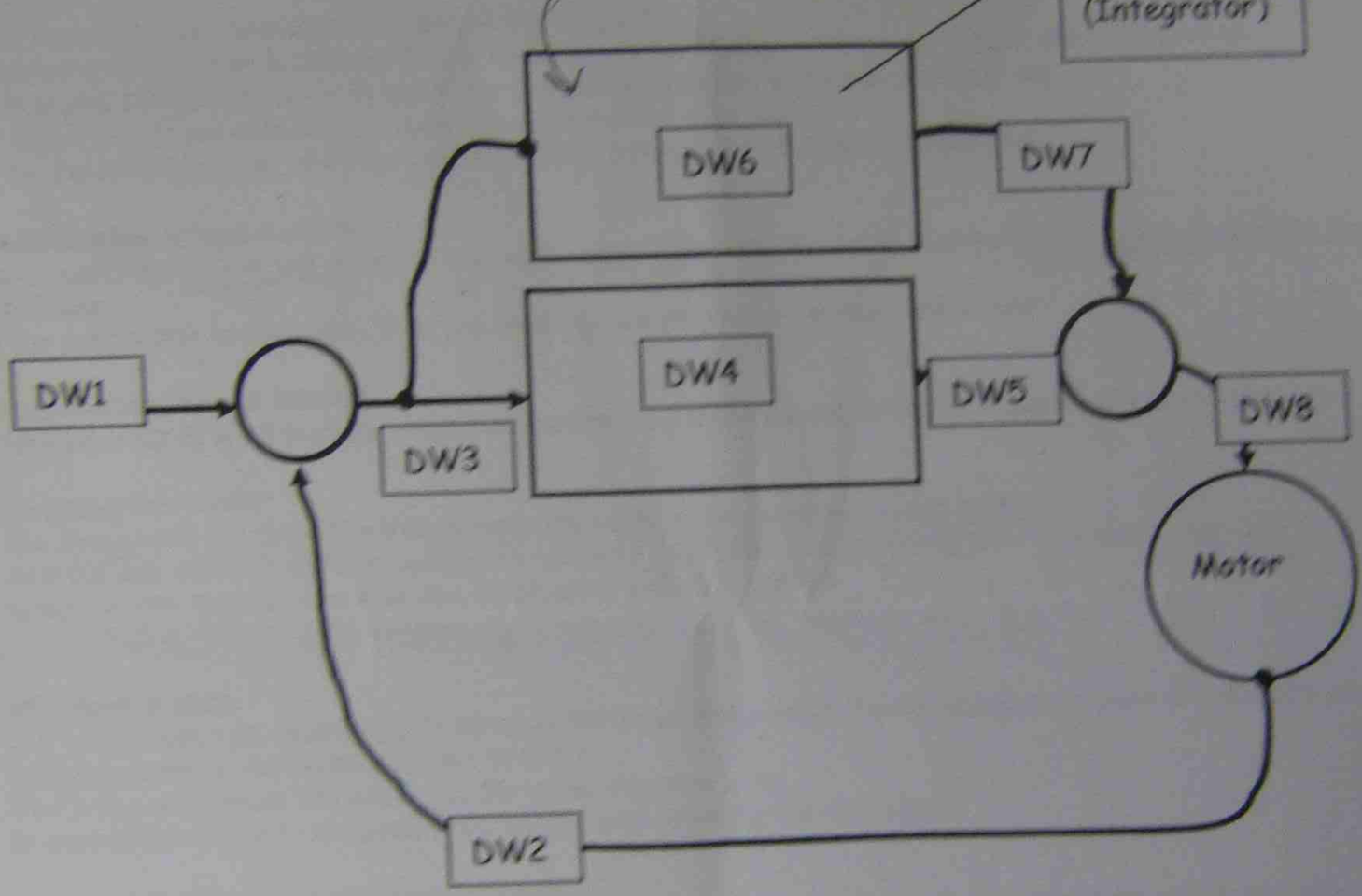
Gain	Offset	Offset
2	31.4	37.7
4	18.75	23.6
6	12.5	16.4
8	9.722	13.4
10	7.4	10.6
12	6.4	9.4

10V — 5V — 400

Procedure B - Proportional + Integral action (20 Marks)

Aim - To add integral action to the control system and remove the offset.

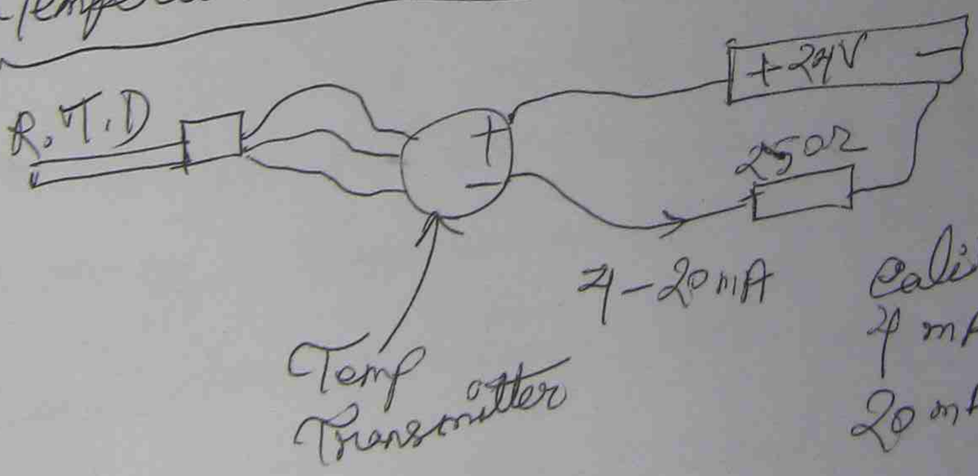
Design a system that will improve the performance of your control system by adding some form of Integral control. The Integral action will remove the offset , we will use a scada system to test your project for changed in load and see if the offset can be removed.
The Integral action rate should be adjustable via the thumbwheel switch and a one shot. Use Counter when error Value counts up.
Marks will be awarded for accuracy , simplicity and reliability of your system.



On/off Control:

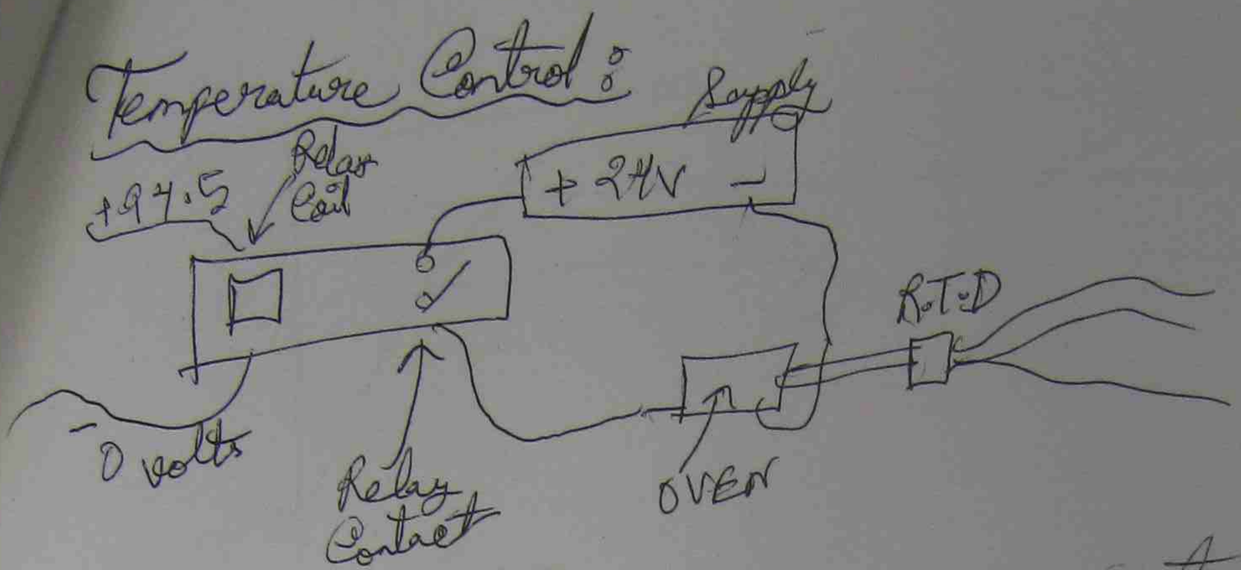
An on/off controller is the simplest form of temperature control device. The output from the device is either on or off with no middle state. An on/off controller will switch the output ~~on~~ ~~off~~ only when the temperature crosses the set point. For heating Control, the output is on when the temperature is below the set point, and above set point. Since the temperature crosses the set point to change the output state, the process temperature cycles continually, going from below set point to below and back below

Temperature measurement:



Connect a 4-20mA current loop and measure the temperature of the room.

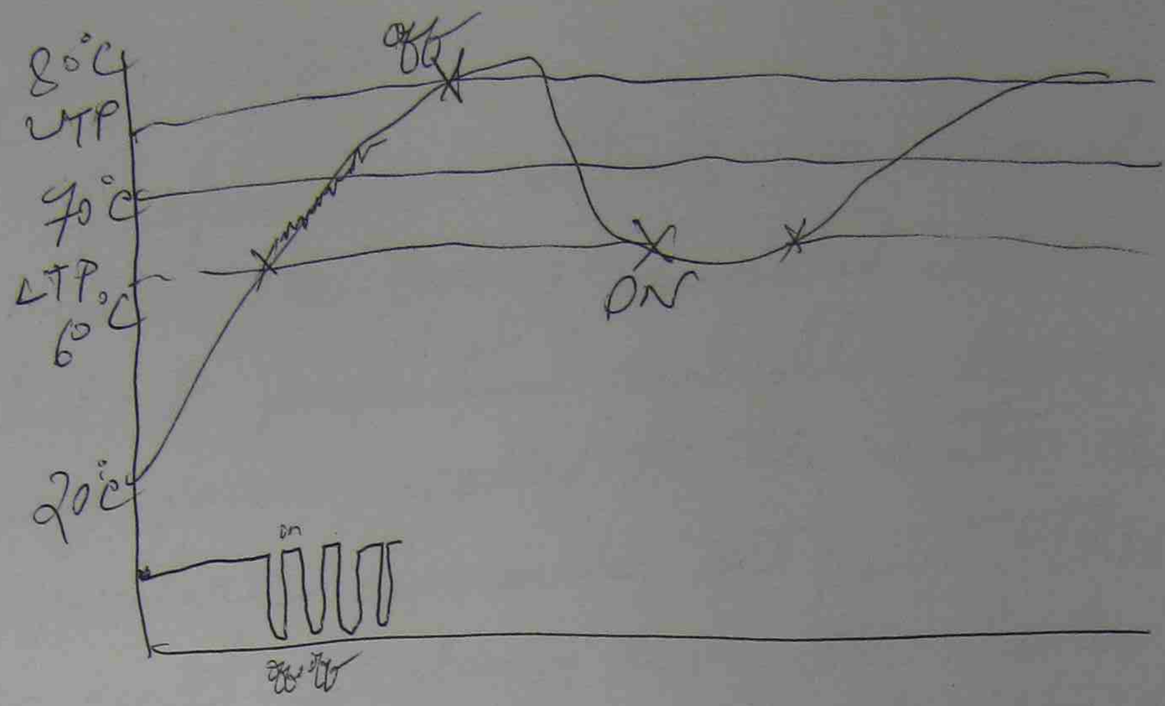
Temperature Control:



The temperature in an oven is to be controlled by the PLC, a digital output will control the power to the heater element. The temperature will be set by the left two digits of the thumbwheel switch (0-99 degrees celcius)

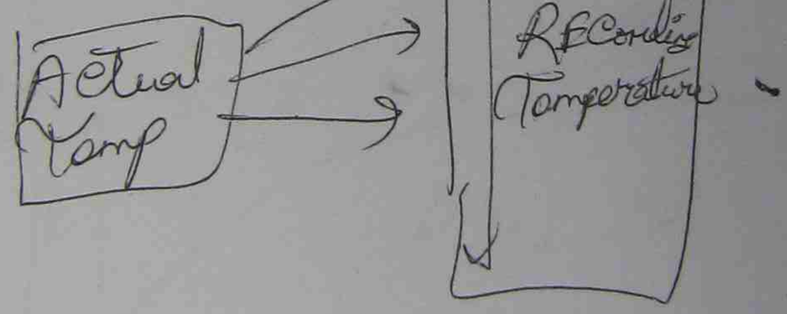
Hysterisis:

When the cycling occurs rapidly and to prevent damage to contactors and coolers, an on-off differential or "Hysterisis" added to the controller operations. This differential requires that the temperature exceed setpoint by a certain amount before the output will turn off or on again. On-Off differential prevents the output from "chattering" or making fast, continual switches if the cycling above and below the setpoint occurs very rapidly.



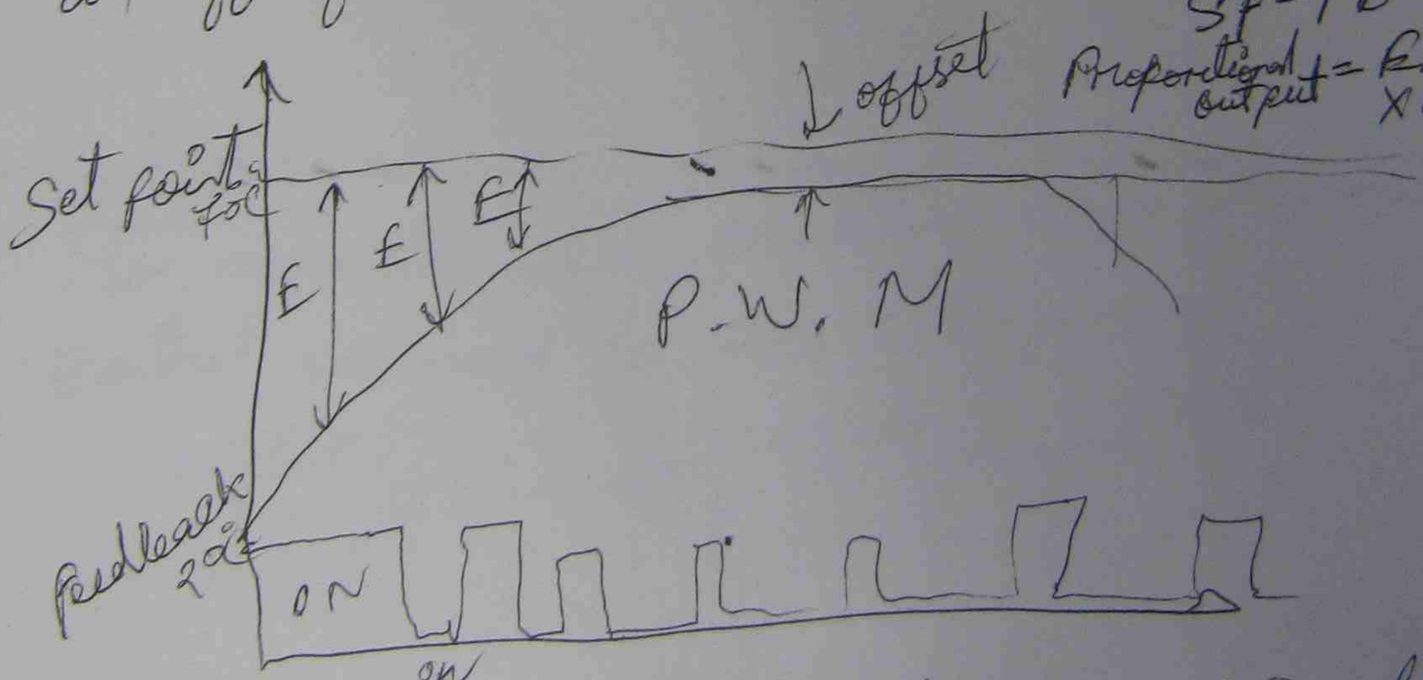
Data Recording:

Need to add a data logging System where the temperature can be recorded in a data block over a period of time.



Proportional Control:

Proportional controls are designed to eliminate the cycling associated with on-off control. A proportional controller decreases the average power supplied to the heater as the temperature approaches set point. This has the effect of slowing down the heater so that it will not overshoot the set point. But will approach the set point and maintain a stable temperature. This proportional action can be accomplished by turning the output on and off for short time intervals

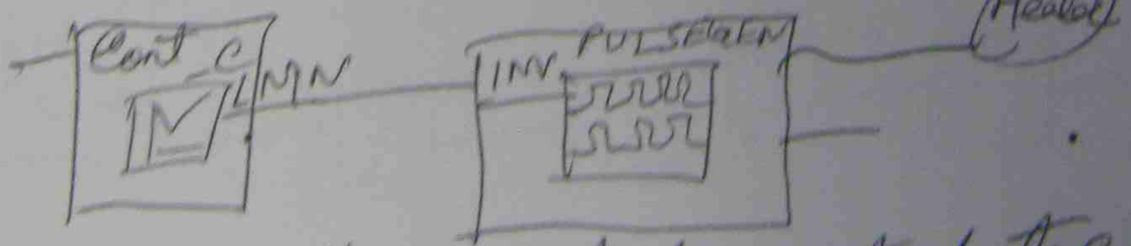


This time proportioning varies the ratio of "on" time to "off time" to control the temperature. Outside this band the controller function is as on-off unit, with

the output either fully on (below the band) or fully off (above the band). However within the band, the output is turned on and off in the ration of the measurement difference from the setpoint. If the temperature is further from the set point, the on and off times vary in proportion to the temperature difference. If the temperature is below setpoint the output will be on longer and if the temperature is higher the output will be off longer.

P.I.D Control:-

To make the output smoother using proportional control we need to use Pulsegen

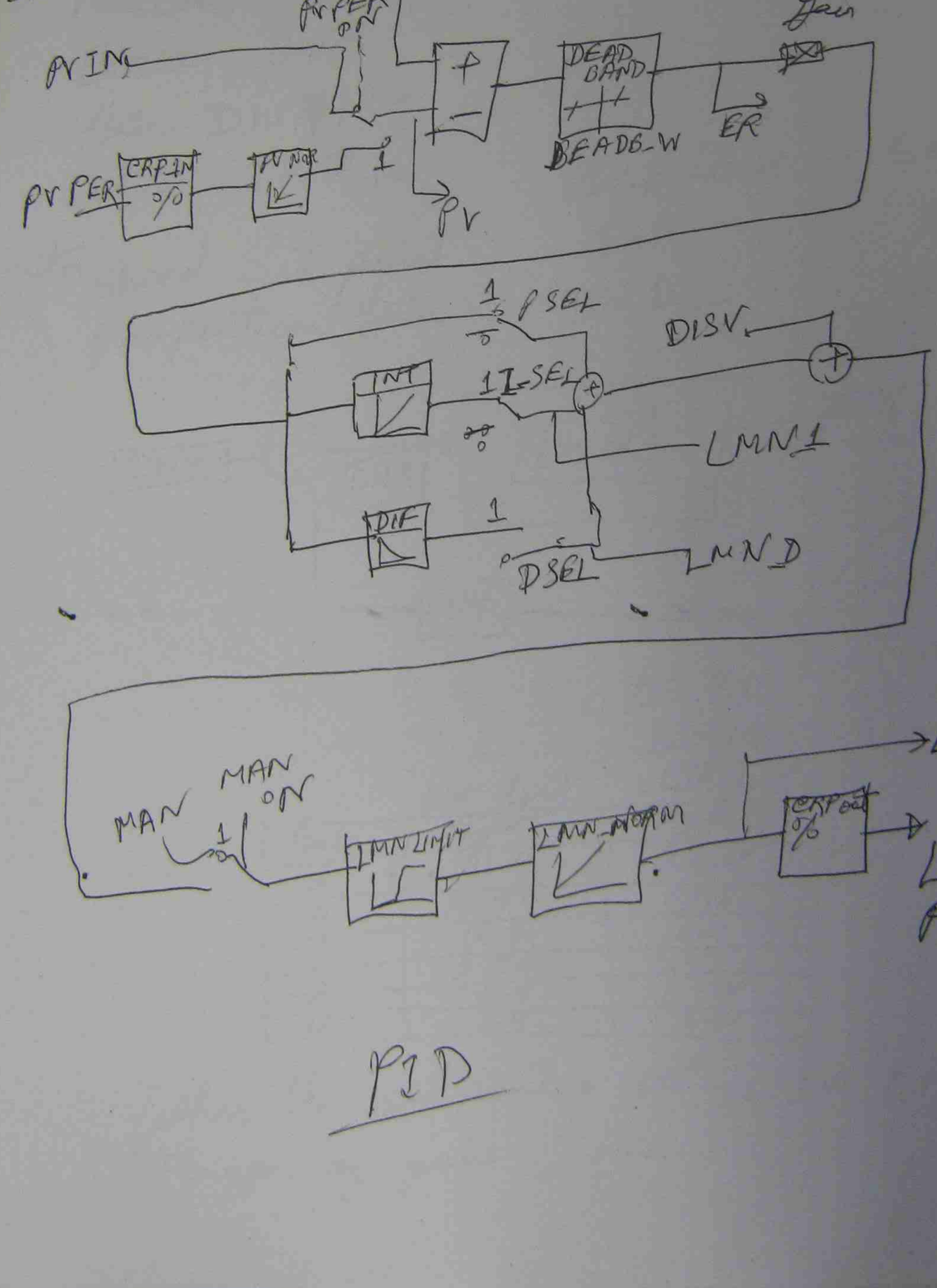


FB "Cont C" is used to control technical process with continuous input and output variables.

"PULSEGEN" (pulse generator) is used to structure a PID controller with pulse output

for proportional actuators. The electronic manual is found to

Block diagram



PID

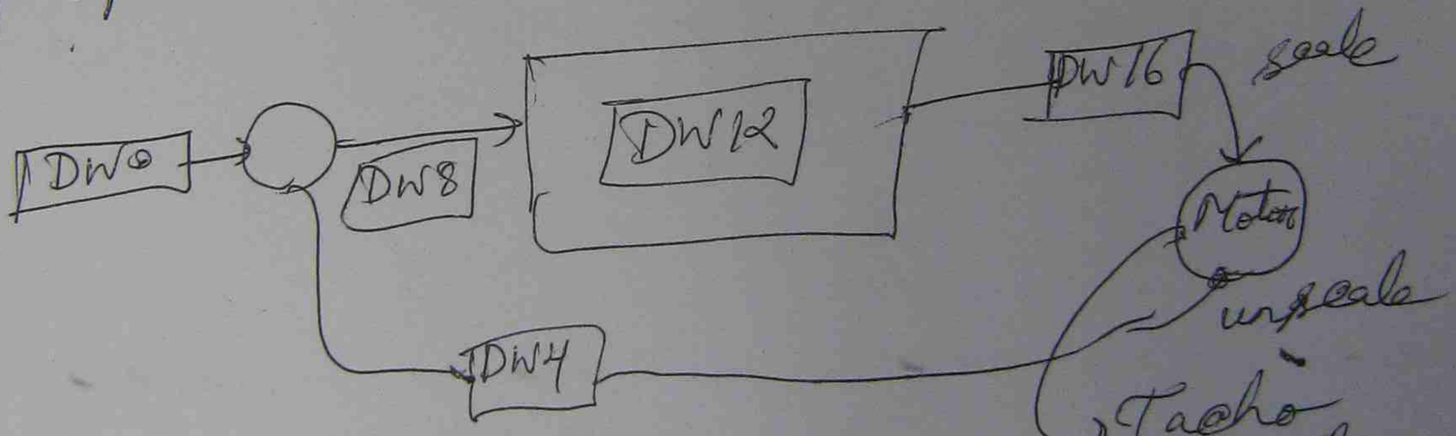
(M)

DC Motor Speed Controller

Proportional Control
Need to use Data Block 10 for storing all settings.

Set point DW0
Feedback DW4
Error DW8
Gain DW12
Output DW16

	PLC Address	Set by Digest Shot
Motor Speed Set point	DW0	I 126-0
Proportional Gain	DW12	I 126-1

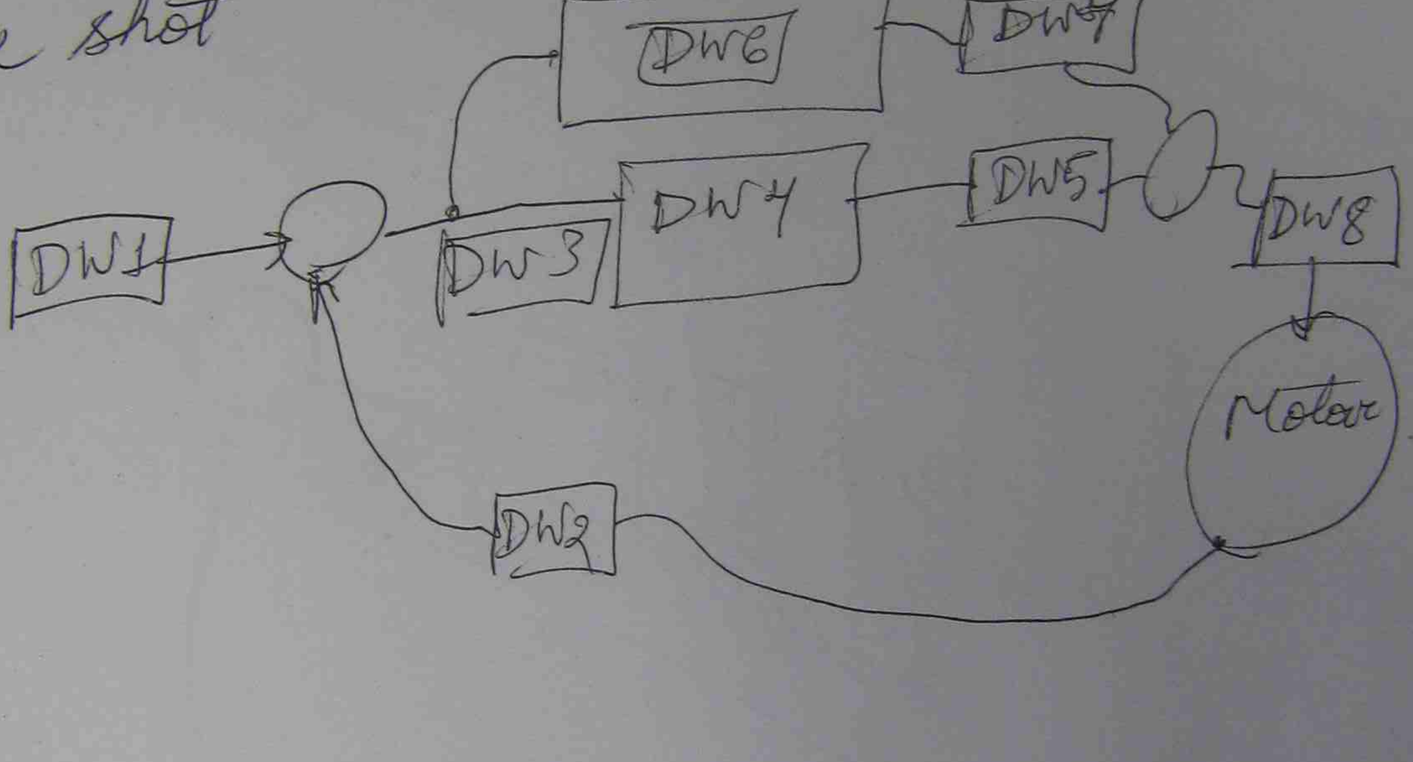


Gain	No load offset	With load offset
2	31.4	37.7
4	18.75	23.6
6	12.5	16.4
8	9.722	13.4
10	7.4	10.6
12	6.4	9.4

When the set point is set to 100 RPM with a range of gains.

Proportional + Integral action:

The integral action will remove the offset, ~~with use of~~
The integral action rate should be adjustable via the thumbwheel switch and a one shot



1

SCADA – Major Project.

LUIS CARO

Bottling Plant Assignment

*Your job is to design a SCADA project for the Simulated Bottling control system with the following specifications. You are encouraged to experiment and add **further features** to your project for full marks.*

Part A 25%

Menu Page (5Marks)
Should include project title and designed by etc
Login and shutdown and page navigation

Main page (10 Marks)
Display the Bottling Plant and levels of each hopper, setpoints etc.
Pump and Valve status
Master Control
Remote Start , stop and reset
Any other feature that you think would be a good addition to the project. (DOCUMENT).

Tank Level setting page (10 Marks)
Slides for tank level settings
Key Entry for tank level settings

?

Part B 30%

Alarms Pages (5 Marks)
Hardware alarm page
Analog alarms for tank levels
Digital alarms for some other features of your choice.

Security (10 Marks)
Set security levels for access tank level settings and remote starts.

?

Trends (5 Marks)
Display trends of tank levels
Have a popup trend on your main page.

* NOTE: YOU MUST FULLY "DOCUMENT" ALL FEATURES FOR PART B ON A SEPERATE PAGE. EXPLAIN ALL FEATURES AND PROCEDURES ETC

***further features*(For advanced students)**

Accumulators (5 Marks)
Display Pump starts and runtime on main page.

Events and/or Reports (5Marks)
Add an event or generate a report for your project. You are free to design something useful for your project.

Add any extra features that you would like to such as reports
Use at least one Genie in your project.

BOTTLING PLANT

VAT

FILL TANK VALVE + RUN.

M10.7

F10.7

F10.7

RUN

BOTTLE FULL = F10.5.

BEER DW0 TANK.

SETPOINT DW20

STOP BOTTLE FILL when full tank on.

SETPOINT DW1 LEVEL DW6

FILL VALVE (F10.2)

FILL STATION

Bottle caps

FILL CAPPER F13.0

MOTOR

CAPS.

DW2

CAPS

SETPOINT DW21

CAPPER

F11.0

F13.2

Add labels

SETPOINT DW22

DW3

LABLER

F12.0

Add more Labels

I2.2 (F1.2)

RESET

TOTAL PASSES = DW5

STATION #'S

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

20.7 20.5 21.7 21.4

MAIN — CONVEYOR (FW20 – DW4)

CONVEYOR MOTOR F10.6

CONVEYOR 2 to PACKAGING SECTION

F11.7

F0.0 MASTER CONTROL LIGHT.

GO

START STOP

I2.0 I2.1

F1.0 (F1.1)

(REMOTE START STOP FROM SCADA)

ARO

	PLC Symbol	Notes	S5 Tag Address	S7 Tag Address	Type	Range	Your Tag
1	Master	Master conrol flag	D010:009.08	M 0.0	Digital		
2	Fillbtle	Open Valve and fill bottle beer	D010:007.10	M 10.2	Digital		
3	Morebeer	Hopper needs more beer	D010:007.15	M 10.7	Digital		
4	Capper	Put Cap on Bottle	D010:007.00	M 11.0	Digital		
5	Conveyor2	Conveyor 2 take bottle to packaging	D010:007.07	M 11.7	Digital		
6	Labeler	Puts Label on bottle	D010:008.08	M 12.0	Digital		
7	station7		D010:004.08	M 20.0	Digital		
8	station6		D010:004.09	M 20.1	Digital		
9	station5		D010:004.10	M 20.2	Digital		
10	station4		D010:004.11	M 20.3	Digital		
11	station3		D010:004.12	M 20.4	Digital		
12	station2	Bottle at Filling station 2	D010:004.13	M 20.5	Digital		
13	station1		D010:004.14	M 20.6	Digital		
14	station0		D010:004.15	M 20.7	Digital		
15	station8	Bottle at Capper station 8	D010:004.07	M 21.7	Digital		
16	station9		D010:004.06	M 21.6	Digital		
17	station10		D010:004.05	M 21.5	Digital		
18	station11	Bottle at Labling station 11	D010:004.04	M 21.4	Digital		
19	station12		D010:004.03	M 21.3	Digital		
20	station13		D010:004.02	M 21.2	Digital		
21	station14		D010:004.01	M 21.1	Digital		
22	station15		D010:004.00	M 21.0	Digital		
23	Beer	Beer Hopper	D010:000	DB10,0	INT	0 to 1000	
24	Btle stpnt	Bottle fill level setpoint	D010:001	DB10,2	INT	0 to 375	
25	Cap Hopr	Caps Hopper	D010:002	DB10,4	INT	0 to 50	
26	Labl Hopr	Labels Hopper	D010:003	DB10,6	INT	0 to 50	
27	Conveyor	Bottling Conveyor stations	D010:004	DB10,8	INT		
28	Total	Total Parts through Plant	D010:005	DB10,10	INT	0 to 100	
29	Botle Level	Actual Bottle Level	D010:006	DB10,12	INT	0 to 375	
30	rem strt	scada start	D010:012.00	M39.0	Digital		
31	rem stop	scada stop	D010:012.01	M39.1	Digital		
32	reset	reset total parts count	D010:012.02	M39.2	Digital		
33	Add Label	Adds more labels to hopper	D010:008.02	M13.2	Digital		
34	Bottle Full	Bottle has been filled	D010:007.13	M10.5	Digital		
35	Fill Caps	Fill Caps Hopper	D010:008.00	M13.0	Digital		
36	Btle Convr	Main Bottling line conveyor	D010:007.14	M10.6	Digital		
37	Beer SP	Beer Hopper Setpoint	D010:020	DB10,40	INT	0 to 2000	
38	Caps SP	Caps Hopper Setpoint	D010:021	DB10,42	INT	0 to 100	
39	Labels SP	Labels Hopper Setpoint	D010:022	DB10,44	INT	0 to 100	
40	AccData1		D010:023	DB10,46	INT	0 to 1000	
41	AccData2		D010:024	DB10,48	INT	0 to 1000	

Remember to have no spcaes in your tag names

Hopper

Connecting Citect SCADA to a siemens S7 PLC via the MPI cable.

Follow the steps below to connect to the PLC.
Check that correct drivers are installed for the connection , ask your instructor.
You might need to install PSdirect front and backend drivers.

1) Create a new project
2) Go to the communications setup in Citect Explorer
3) Create a Server called S7serial
4) Do not create a boards object
5) Add a Port and call it "PS_PORT" (set address to 0 and all other fields blank , including the board)
6) Add an I/O device and call it "S7PLC" connect it to the port "PS_PORT"
7) Set the I/O device address to "S7;MPI" for serial communication
8) Set the I/O device protocol the "PSDIRECT1"

Then you are done, time to test communications

Create a tag with the device"S7PLC" and the address "M0" data type to INT
Create a test page and add your tag to the test page.
Run the siemens serial configuration software, check com port is correct etc. See back of this page for setup.
Run your project and verify that communication is working.

Any problems ask Keith !

Connecting to an S5 PLC via the serial port.

Use the Express Communications Wizard

1. Express Communications Wizard - Server selection – leave as default
2. Express Communications Wizard - Device selection – leave as default
3. External I/O Device
4. Select Siemens S5 95U plc AS 511 protocol.

Any problems ask Keith !

SCADA MAIN BOTTLING PLANT PROJECT

Content of this project
Main Page=Beer
Analogue Alarm
Digital Alarm
Hardware Page
Security
Singletrend
TANK PAGE
In the main page you find
Display the Bottling Plant Project
Pop up Trend
Master control Start
Master control Stop
Master control reset
Morebeer
Master control Flag
Beer Hopper Setpoint
Cap Hopper Level
Cap Hopper Setpoint
Bottle Fill Level
Bottle Level Setpoint
Label Hopper Level
Label Hopper Set point
Total Part Through Plant
Tank Level Setpoint
Pump ON/OFF
Valve ON/OFF

SECURITY PAGE

Security Access to this page
Usser:
User name: Luis caro (1-3)
Full Name: Luis Caro
Password : Luis caro
Confirm Password Luis caro

User:
User name: Administrator (1-8)
Full Name: Louis Smith
Password: Louis Smith
Confirm Password: Louis smith

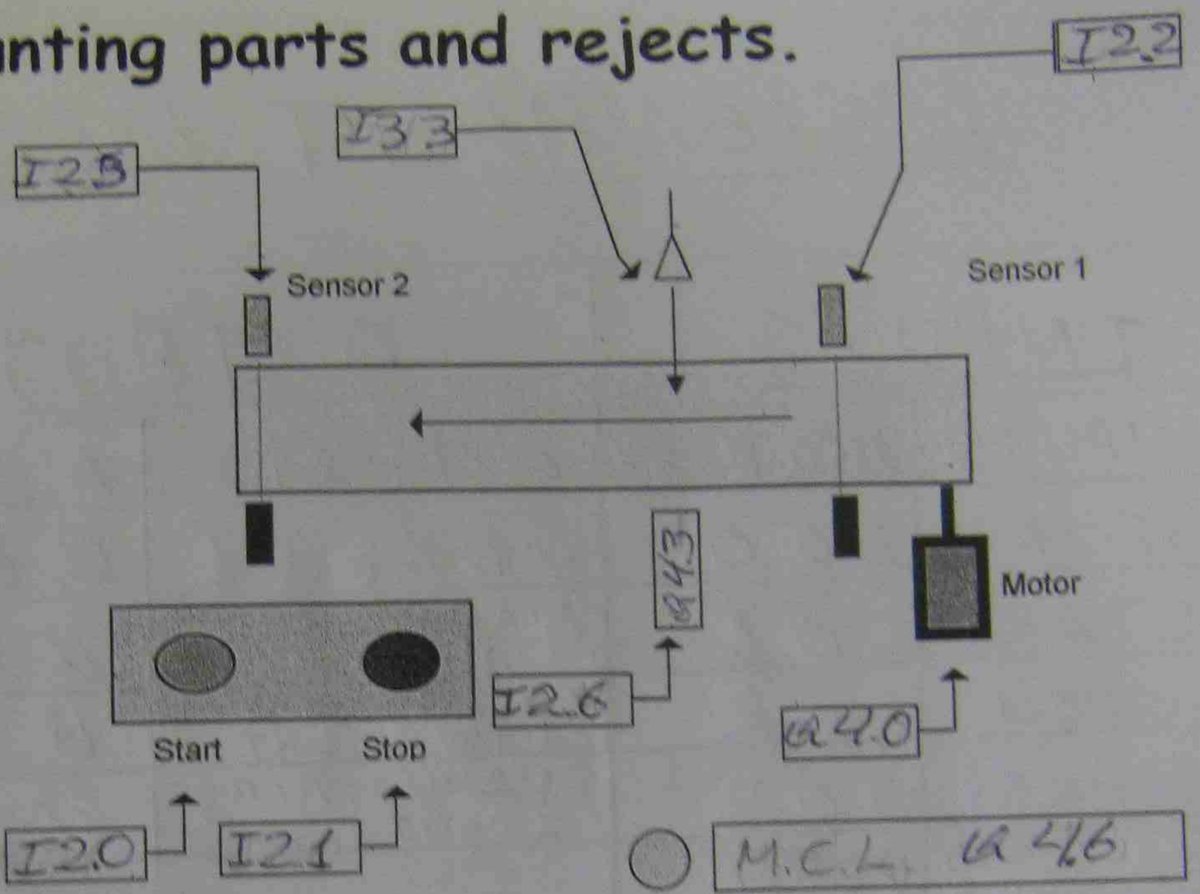
User:
User Name: Manager (3-5)
Full Name: Lisa Carter
Password: Lisa Carter
Confirm Password: Lisa carter

Written By LUIS CARO.

(9) Luis CARO

Count and reject Pieces

Counting parts and rejects.



Sequence of operation (40 Marks)

- Press start and the Master Control light will be illuminated
- The operator will place a part at sensor 1 , the Master control light will flash (0.25 seconds on/off and keep flashing while a part is on the conveyor)
- The conveyor will start
- When the part reaches the inductive sensor the conveyor will stop when the part (30mm dia) has stopped centrally in front of the bin.
- the part will be pushed into the reject bin by the ram . Only short/non-metal parts are allowed to travel along the conveyor.
- Extend the ram for 2 seconds
- If a part reaches sensor 2 the conveyor will stop and the operator picks up the part.
- When 4 parts have successfully traveled along the conveyor to sensor 2 the system will shut down and the master control will be off.
- If the part is left at sensor 2 for 5 seconds , the count will be reset.
- Display the count at QW32
- Stop will stop all operation and no function allowed if the master control is no on.

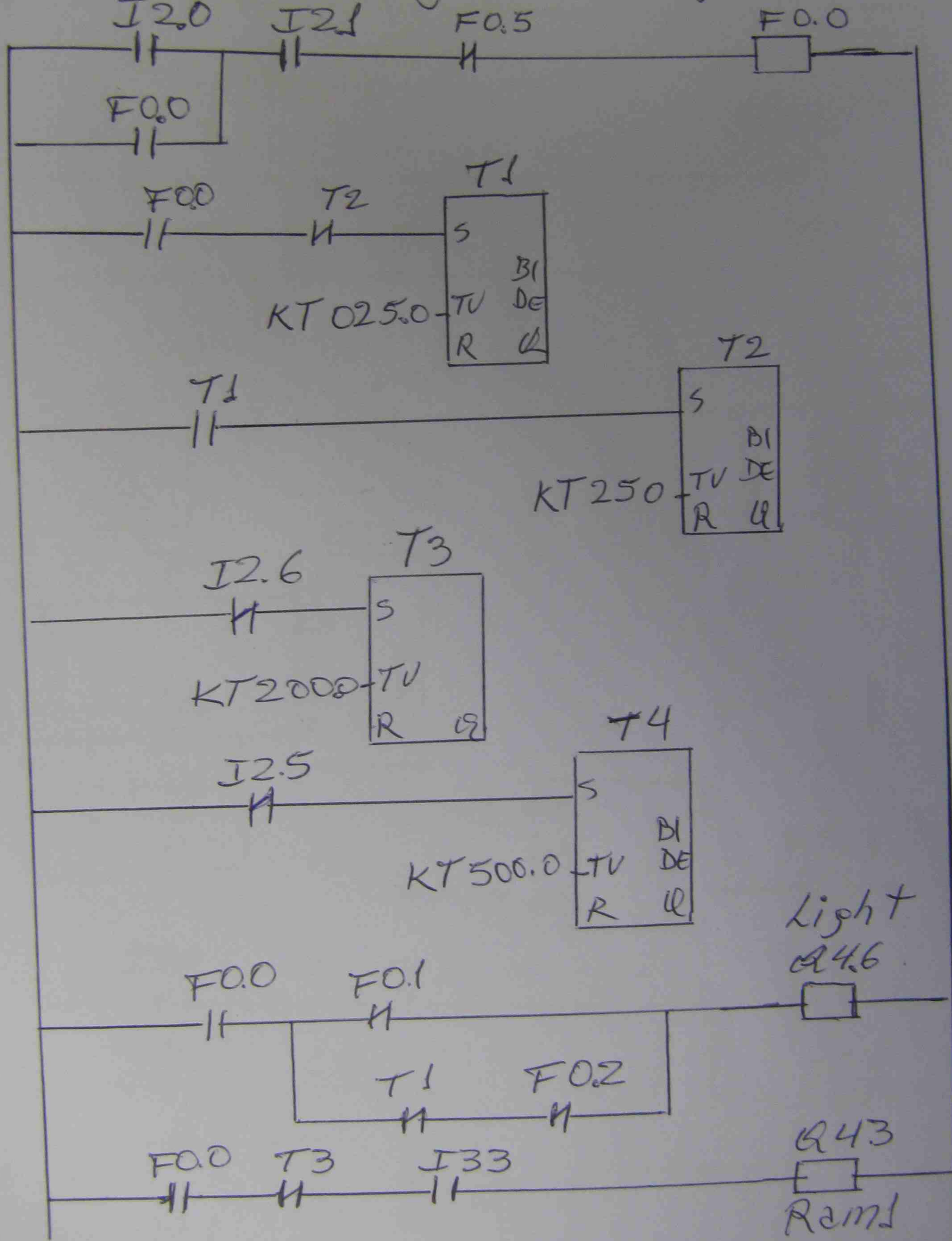
Optional extra (10 marks)

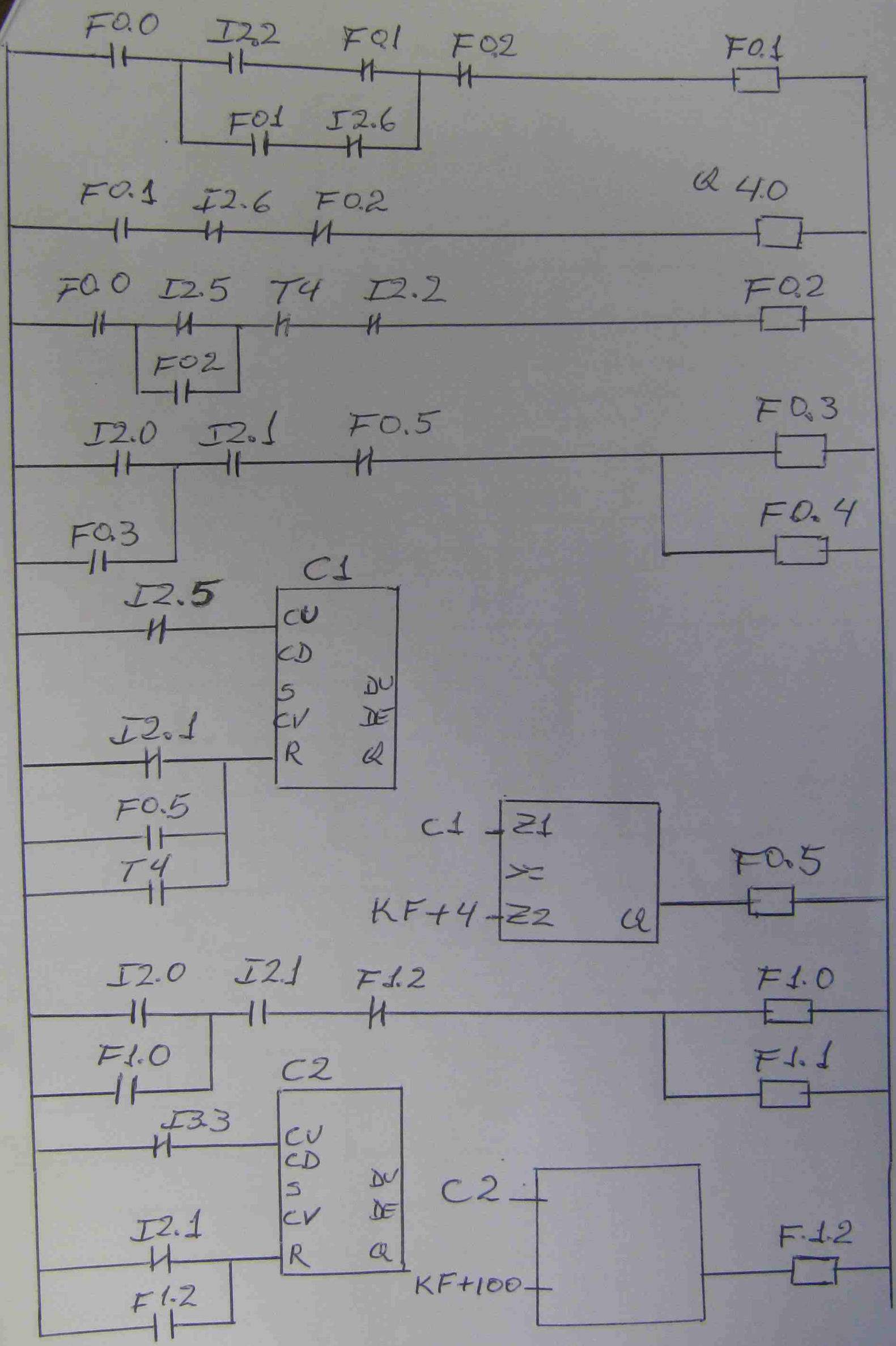
- Display the count of good and bad parts in a picture block.
- The counts are reset by "double clicking" the start button

ASSIGNMENT LIST

INPUTS		OUTPUTS	
INPUTS	ADDRESS	OUTPUTS	ADDRESS
STOP	I 2.0	Conveyor 1	Q 4.0
START	I 2.1	RAM 1	Q 4.3
Sensor	I 2.2	Light	Q 4.6
Sensor	I 2.5		
Inductive Sensor	I 2.6		
Ram 1 Extended	I 3.3		

Counting and Reject




F0.0
I2.2
F0.1
F0.2
F0.1
F0.1
I2.6
F0.2
Q 4.0
F0.0
I2.5
T4
I2.2
F0.2
F0.2
I2.0
I2.1
F0.5
F0.3
F0.4
F0.3
C1
I2.5
CU
CD
S
DU
CV
DE
R
Q
I2.1
F0.5
T4
C1
Z1
>=
KF+4
Z2
Q
F0.5
I2.0
I2.1
F1.2
F1.0
F1.0
F1.1
C2
I33
CU
CD
S
DU
CV
DE
R
Q
I2.1
F1.2
C2
KF+100
F1.2

Symbolic Table

Operand	Symbol
I 2.0	STOP
I 2.1	START
I 2.2	Sensor 1
I 2.5	Sensor 2
I 2.6	Inductive sensor
I 3.3	Ram 1 extended
Q 4.0	Conveyer 1
Q 4.3	Ram 1
Q 4.6	Light
F 0.0	Master Flag
F 0.1	Flag 0.1
F 0.2	Flag 0.2
F 0.3	Flag 0.3
F 0.4	Flag 0.4
F 0.5	Flag 0.5
F 1.0	Flag 1.0
F 1.1	Flag 1.1
F 1.2	Flag 1.2

Operand	Symbol
T1	T1 (0.25 sec. OFF)
T2	T2 (0.25 sec. ON)
T3	T3 (2 sec. ON)
T4	T4 (5 sec ON)
C1	counter 1
C2	counter 2
OB 1	OB1

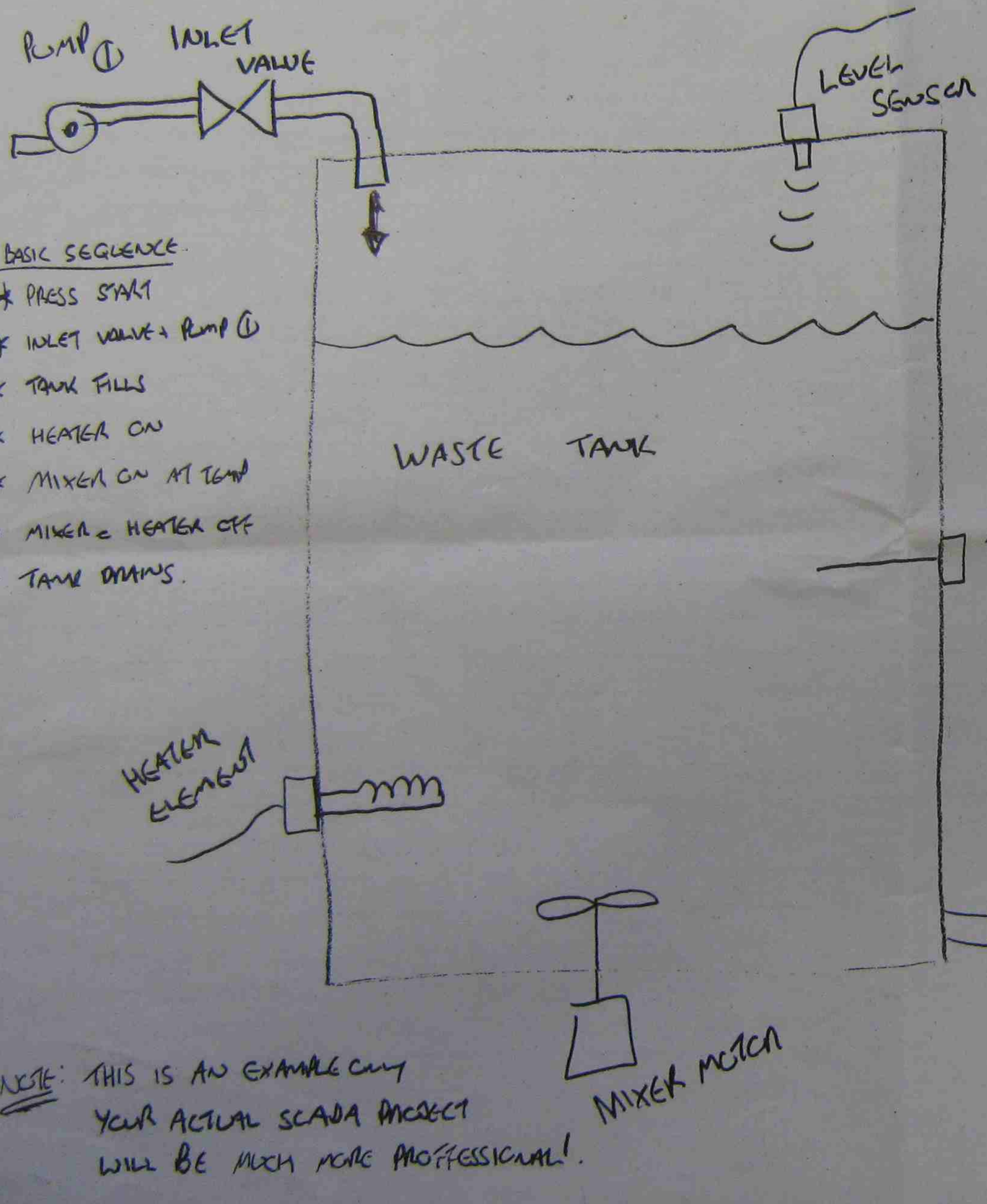
Operand.	Comment
I 2.0	STOP Project
I 2.1	Start project and master control light will be illuminated
I 2.2	Piece at sensor 1 start conveyor and master control flash
I 2.5	If piece reaches sensor 2 conveyor will stop and operator picks the part
I 2.6	Stop conveyor and piece has stop centrally in front of the bin
I 3.3	Sensor that operate output ram Q 4.3
Q 4.0	Motor conveyor 1
Q 4.3	output Ram 1
Q 4.6	signally Light, when stop is ON when flashing the part is in the conveyor
F 0.0	Master Flag operate system ON/OFF
F 0.1	Help to operate indicator Light
F 0.2	Help to operate warning light and Motor conveyor
F 0.3	Control flag of the counter 1
F 0.4	control flag of the counter 1
F 0.5	control flag of the comparator Help to reset System OFF, and counter 1 OFF
F 1.0	Flag of the counter 2.
F 1.1	control flag of counter 2

operand	Comment
F1.2	Control flag of the comparator 2, Help to operate counter 2. OFF
T1	Timer 1 put warning light to flash
T2	Timer 1 put warning light to flash
T3	Timer 3 extend the ram for 2second
T4	If the part is left at sensor 2 for 5 second, the count will be reset to zero
C1	Count the Good Parts
C2	Count the bad Parts
OB1	

Name: SAAMI BIN MOINUDDIN Std ID-3329587382

SCADA PROJECT FOR BODGEY BROTHERS WASTE TREATMENTS.

SCADA SYSTEMS PROJECT ①



BASIC SEQUENCE.

* PRESS START
* INLET VALVE + PUMP ①
* TANK FILLS
* HEATER ON
* MIXER ON AT TEMP
* MIXER & HEATER OFF
* TANK DRAINS.

NOTE: THIS IS A ROUGH LAYOUT FROM THE CUSTOMER.

* REQUIREMENTS.
  - OVERVIEW PAGE
  - TRENDS PAGE
  - ALARMS PAGE
  - LEVEL SETTINGS IF POSSIBLE?
* START
* STOP
* MASTER ON

OPERATOR PANEL.

NOTE: THIS IS AN EXAMPLE ONLY YOUR ACTUAL SCADA PROJECT WILL BE MUCH MORE PROFFESIONAL!

PLC addresses		Citect Tags		
Address	Symbol	S5 adresses	S57 adresses	TAG
I 2.0	Start Cycle	D010:003.00	I126.0	START_CYCLE.
I 2.1	Stop Cycle	D010:003.01	I126.1	
Q 4.0	Master Control Light	D010:004.00	Q125.0	
Q 4.1	Inlet Valve	D010:004.01	Q125.1	
Q 4.2	Inlet Pump	D010:004.02	Q125.2	
Q 4.3	Mixer Motor	D010:004.03	Q125.3	
Q 4.4	Heater Element	D010:004.04	Q125.4	
Q 4.5	Drain Valve	D010:004.05	Q125.5	
F 0.0	Master Control Flag	D010:005.00	M0.0	
F 0.1	Tank at Upper level	D010:005.01	M0.1	
F 0.2	Tank at Temperature	D010:005.02	M0.0	
DW 1	Actual Level	D010:001	DB10,2 0-500	
DW 2	Actual Temperature	D010:002	DB10,4 0-200	
DW 7	LEVEL SETPOINT	D010:007	DB10,14 (0-500)	
DW 8	TEMP SETPOINT	D010:008	DB10,16 (0-200)	

MONITOR ONLY

DIGITAL

3 INT.

SCADA PROJECT (1)

SMALL SCALE WASTE TREATMENT TANK.

SCADA system Project 1

See the attached rough layout , try not to follow the layout exactly , but make your own interpretation of the waste treatment tank.

Set up communications and test first , there are two types of PLC's in the room , be aware of whichPLC you will be connecting to.

Your instructor will help you set up the PLC program which has been written to control the tank system.

You will then be able to setup and test the communications to the PLC , this is the major part of this assessment.

Be as creative as you can with the actual project , just make sure you fufil the basic requirements listed.

/40

NAME: Jamie Waldram

FILE NAME: _____

Advanced PLC's assignment 7

- **Data manipulation – Integral Function Blocks**

IW32 | 1 | 2 | 4 | 9 | → **DW2**

- I2.0 will activated a one shot circuit , after the one shot is activated IW32 (thumbwheel switch) will be converted from BCD to binary and transferred to DW2
- I 2.1 will activate another one shot and IW32 will be converted from BCD to binary and transferred to DW3
- I2.7 will activate another one shot and DW2 will be divided by DW3 and the result will go to DW4 and the remainder will go to DW5.
- I 2.6 will activate another one shot and DW3 will be multiplied by DW2 and the result will got to DW6
- I 2.4 will activate another one shot and DW6 and DW4 will be added and the result will got to DW10.

- Use DB20
- Use a BB (Picture Block) to display your results.

DB20
0
1
2
3
4
5
6
7
8
10
11
12
13
14

Questions:

1. What number system does the PLC USE?
2. Sketch a program that will add decimal +25 to IW32 and display the result at QW32 in BCD.
3. Which data blocks are used by the PLC and what are they used for ?
4. Can you edit an integral function block ?
5. What is the function of the SBCD input to FB240 ?
6. What is the function of FEH on FB243 ?
7. What is the function of Z3=0 on FB 242 ?
8. What is the function of Z31 and Z32 on FB242 ?
9. What format is the answer at Z3 and Z4 for FB243 ?
10. What are formal operands and how do the integral function blocks use them ?

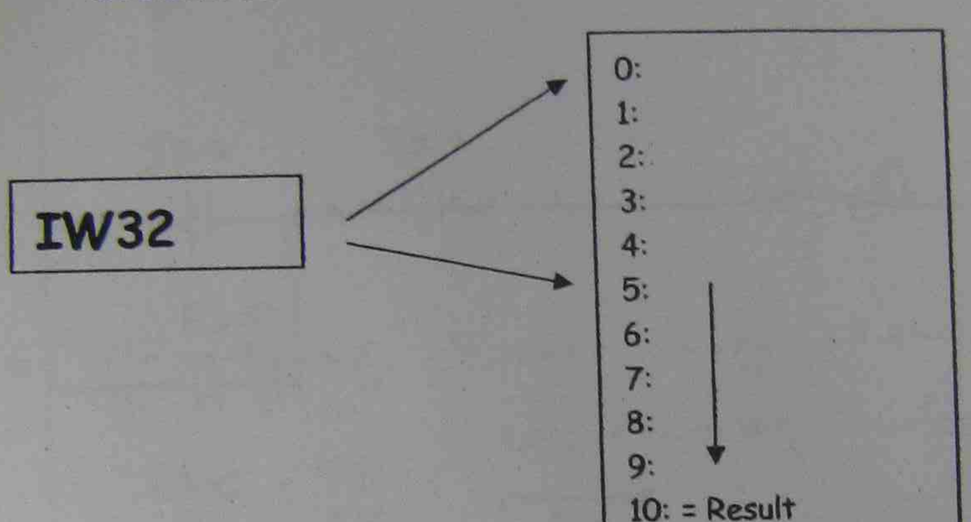
ANSWER THESE QUESTIONS NEATLY!!

Name : Jamie Waldram

Practical 5
Data Blocks

Aim :
to get students to create a data block and monitor it's contents.

- A series of numbers are to be entered into a data block from data word 0 to data word 5 the numbers will then be added together and the result will be displayed at data word 10.



- Use 6 "one shots" to load the values from the thumbwheel switch . take note that the thumbwheel switch's number format is hex.
- Use a one shot to execute the equation
- DW10 = (DW1 + DW0 + DW2) - (DW3 + DW4 + DW5)
- Use a BB (Picture block) to display the contents of your data block .
- Use Data block 40

Questions :

1) What are some of the causes of a PLC going into stop mode ? You should come up with at least 3
2) How can a data block be created automatically in the PLC , give an example , hint : look in the help file of the software for more info.
3) What is the function of DB0 and DB1 ?
4) Explain the purpose of data blocks .
5) Data blocks can only be programmed in STL , true or false , explain your answer.
6) What number format was the result at data word 10 ?
7) What number system does the PLC work in ?
8) What is the function of the two accumulators ?
9) Can we transfer to accumulator 2 ? Explain your answer.
10) Sketch a program that will do the same as this question but it will only add data words 0 to 4 and take away data word 5 and display the result at data word 10.

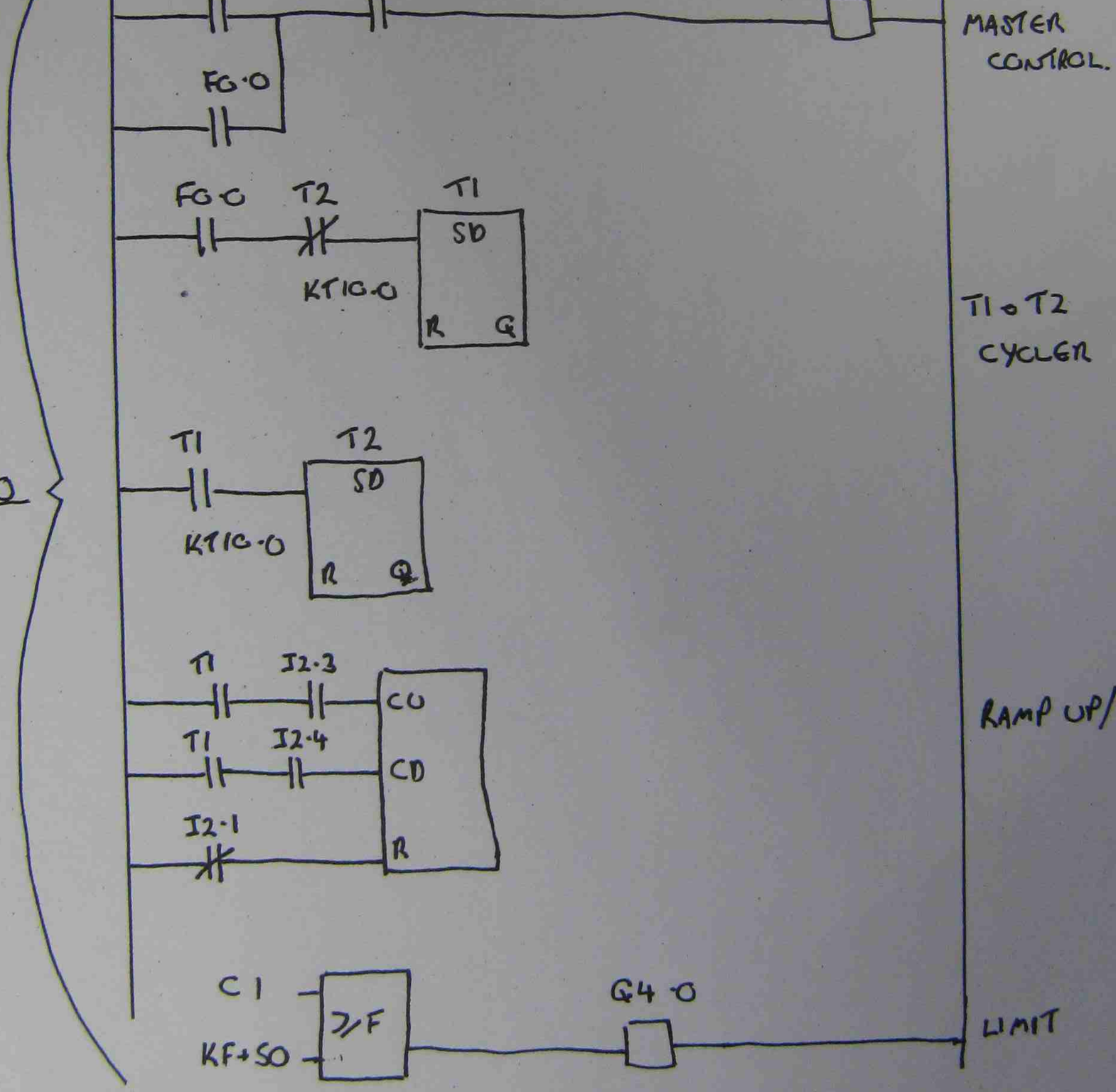
These Questions are to be answered neatly on a separate sheet of paper.

PRAC 6

Name: Jamie Waldram File Name:

Function Block with Formal Operands (Reusable Function Blocks)

Convert the following ladder program into a function block that can be reused many times by converting the program to a function block with variable operands.



TEST THE PROGRAM YOURSELF! HAND IN FOR GRADING.

Name: Mirk Vaw File name:

PLC System Applications Temperature control Assignment

On/Off Control

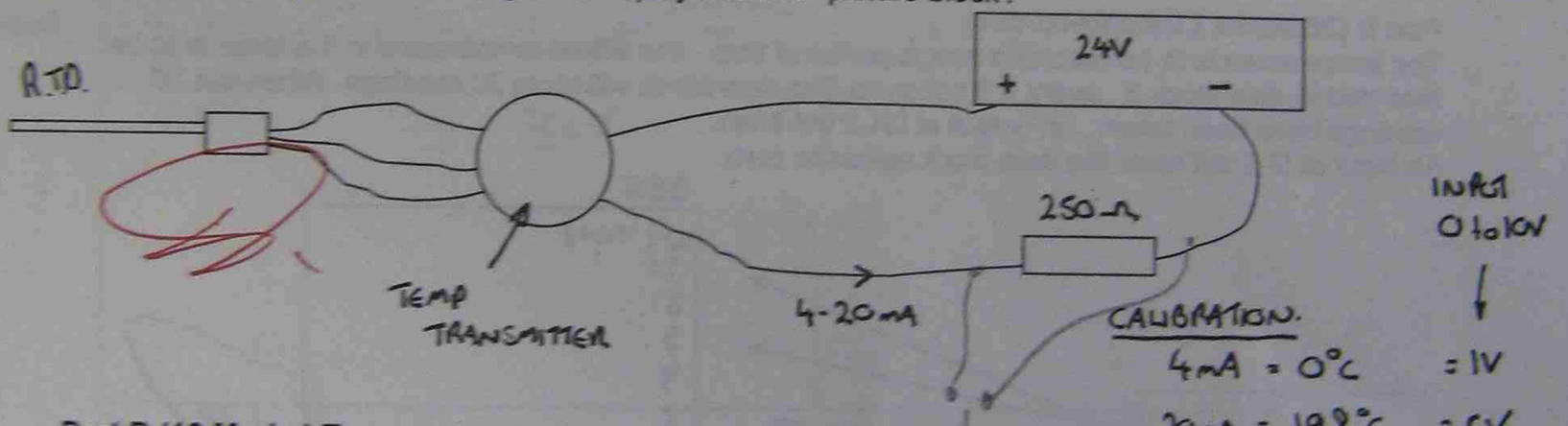
An on-off controller is the simplest form of temperature control device. The output from the device is either on or off, with no middle state. An on-off controller will switch the output only when the temperature crosses the setpoint. For heating control, the output is on when the temperature is below the setpoint, and off above setpoint. Since the temperature crosses the setpoint to change the output state, the process temperature will be cycling continually, going from below setpoint to above, and back below

n cases where this cycling occurs rapidly, and to prevent damage to contactors and valves, an on-off differential, or "hysteresis," is added to the controller operations. This differential requires that the temperature exceed setpoint by a certain amount before the output will turn off or on again. On-off differential prevents the output from "chattering" or making fast, continual switches if the cycling above and below the setpoint occurs very rapidly. On-off control is usually used where a precise control is not necessary, in systems which cannot handle having the energy turned on and off frequently, where the mass of the system is so great that temperatures change extremely slowly, or for a temperature alarm.

Use the analog input to your PLC to perform the following tasks

Part A (10 Marks) Temperature measurement

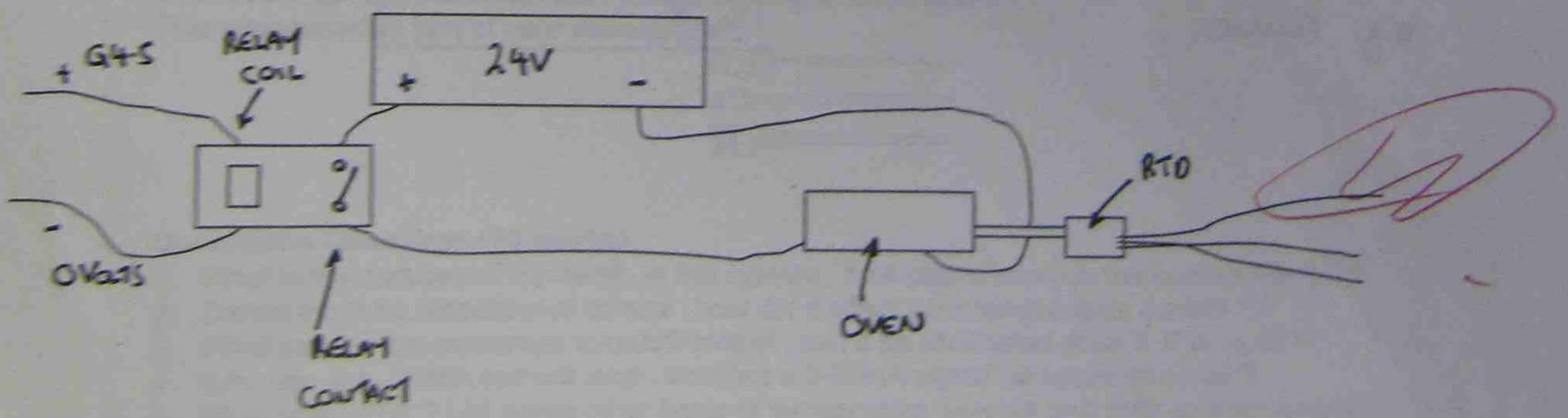
Connect a 4-20mA current loop as shown and measure the temperature in the room. The temperature should be displayed on the 7 segment display and in a "picture block'.



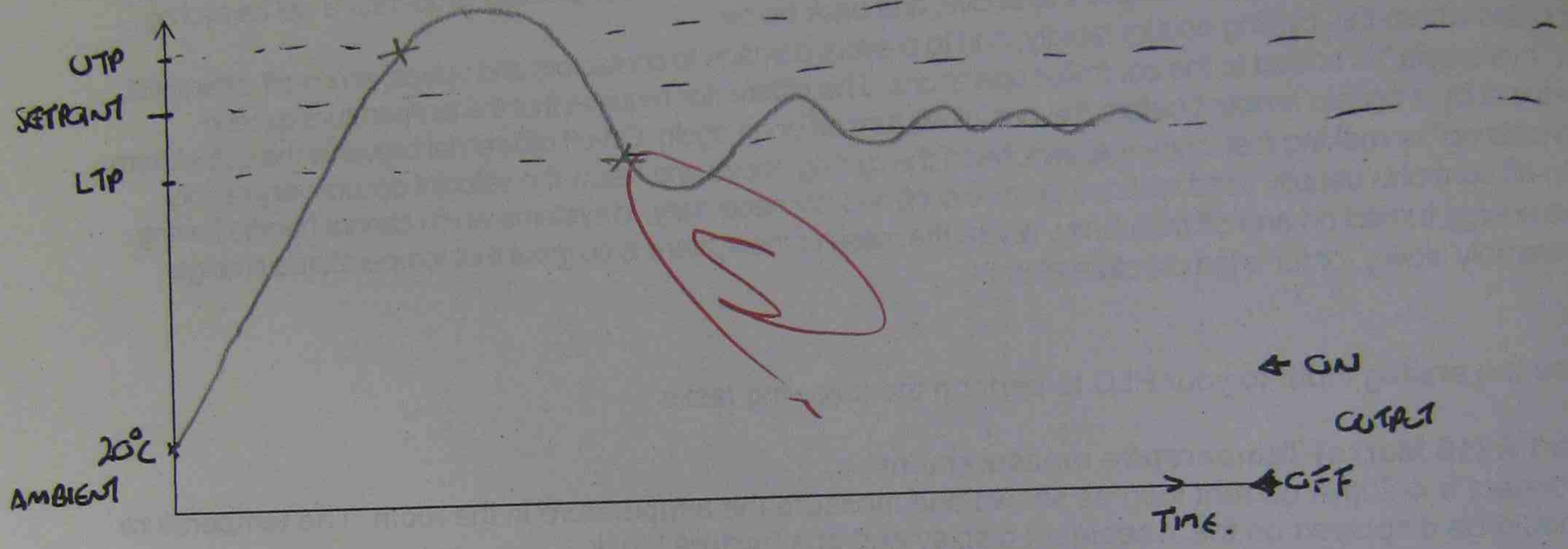
Part B (10 Marks) Temperature control

The temperature in an oven is to be controlled by your PLC , a digital output will control the power to the heater element at Q4.5.

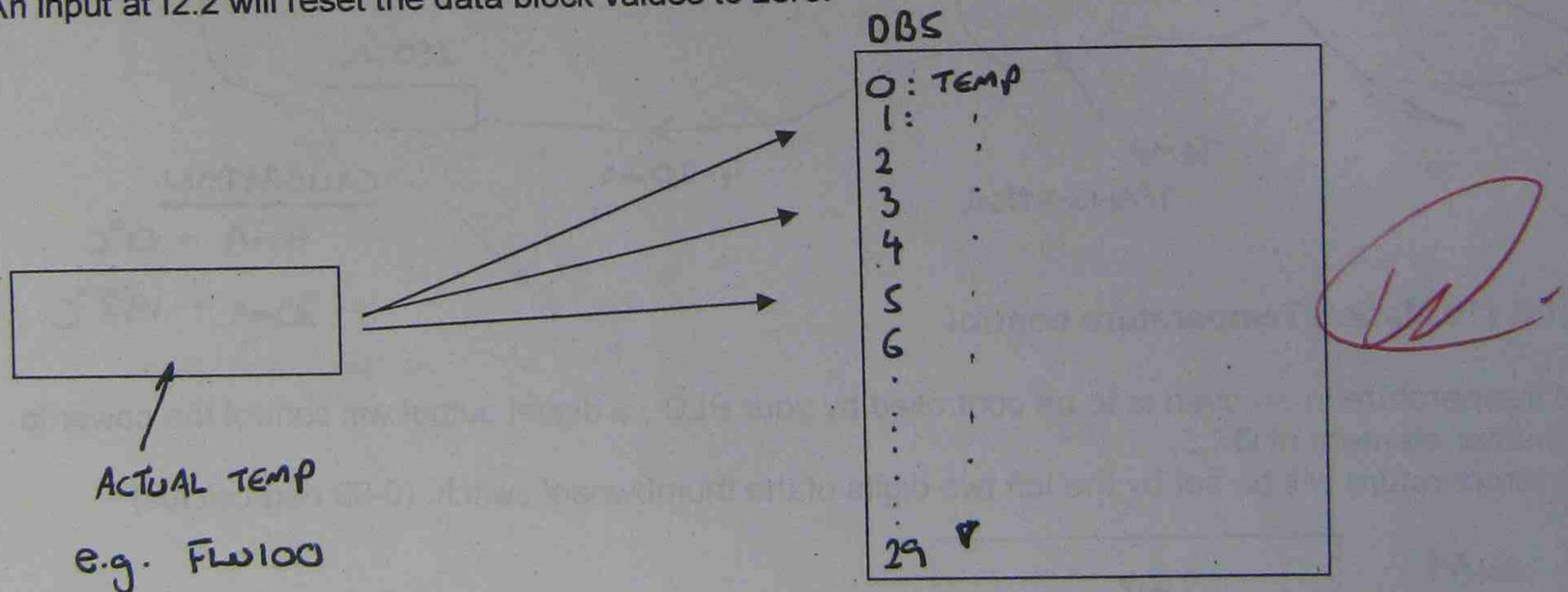
The temperature will be set by the left two digits of the thumbwheel switch. (0-99 deg celcius)



Part C (10 Marks) Hystersis
Add some Hystersis to you your control system , the Hystersis temperature is set by the right two digits of your thumbwheel switch.



Part D (30 Marks) Data Recording
The temperature is to be recorded over a period of time , the actual temperature in the oven is to be recorded in data block 5 , every 0.5 seconds/ The data block will store 30 readings. When the 30 readings have been taken , an output at Q4.2 will flash.
An input at I2.2 will reset the data block values to zero.



Proportional Control

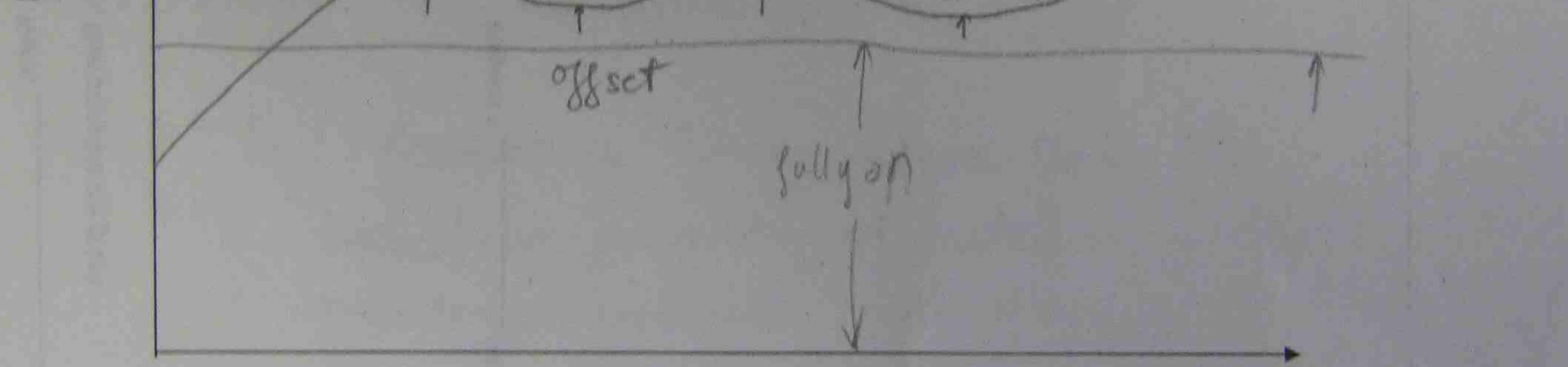
Proportional controls are designed to eliminate the cycling associated with on-off control. A proportional controller decreases the average power supplied to the heater as the temperature approaches setpoint. This has the effect of slowing down the heater so that it will not overshoot the setpoint, but will approach the setpoint and maintain a stable temperature. This proportioning action can be accomplished by turning the output on and off for short time intervals. This "time proportioning" varies the ratio of "on" time to "off" time to control the temperature. The proportioning action occurs within a "proportional band" around the setpoint temperature. Outside this band, the controller functions as an on-off unit, with the output either fully on (below the band) or fully off (above the band). However, within the band, the output is turned on and off in the ratio of the measurement difference from the setpoint. If the temperature is further from the setpoint, the on- and off-times vary in proportion to the temperature difference. If the temperature is below setpoint, the output will be on longer; if the temperature is higher, the output will be off longer.

Part E (30 Marks) Proportional Control.

Remove the Hystersis and On/Off control from your program and design a proportional control system that will average the output using pulse width modulation. Therefore controlling the temperature more accurately.

This is a design question and marks will be awarded for accuracy and simplicity of you system.

Use the two right hand digits to set the gain of you proportional control system.



Notes

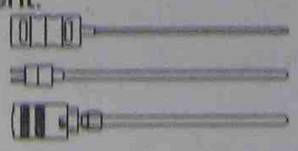
Use one shots for loading your data from the thumbwheel switches.

Document your program with line comments explaining the function of each part of your program.

Do your own work.

You **MUST** hand in this sheet with your assignment! Don't lose it !

This assignment is part of your assessment.



Conclusion Questions (10 marks)

1. What is the purpose of Hystersis in this system , how dies it improve the control if at all ?
2. Define the term proportional control , how did it affect your temperature control ?
3. What causes the overshoot in on/off control , can it be eliminated at all ? If so how ?
4. Why use a 4 - 20mA current loop , wouldn't a 0-20mA signal be easier to scale ?
5. What is an RTD ? List some other types of temperature sensors and their operating ranges.