Excess copy detection Counter project

AIM – To detect the copy difference between mail room net copies and stacker copies. Copy difference is caused due to misalignment of copies in stacker infeed stream flow. Our idea is create a warning if the difference goes beyond 100 copies.

IDEA – Mail room net counter will be counted. Stacker and tensioning station copies will be counted. The difference can be obtained as follows,

DIFFERENCE = Mail room net copies – Stacker 1 copies – stacker 2 copies – tensioning copies – line

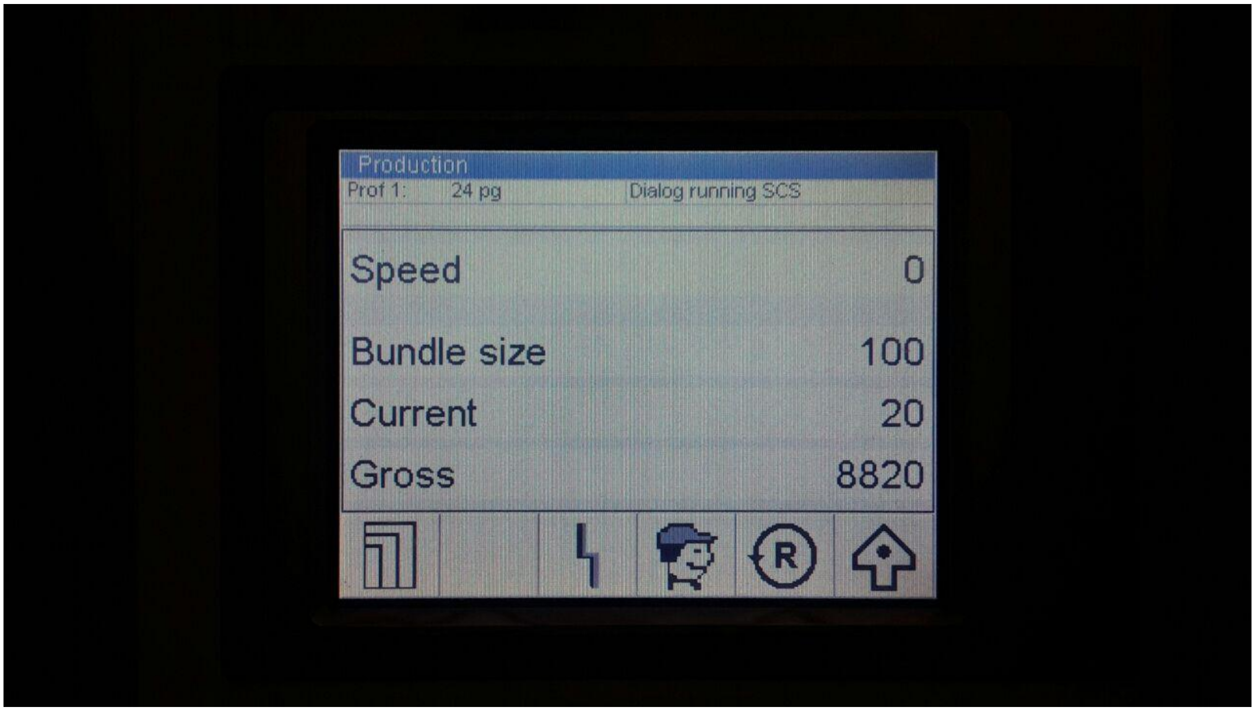
Copies (between pick up to stacker 1) **For single delivery**

DIFFERENCE = Mail room net copies – Stacker 1 copies – tensioning copies – line copies
(between pick up to stacker 1) **For double delivery**

PLC SELECTION

- Initially it was tested using B and R CP474 PLC. Programming was done using B and R Automation studio. While checking it in online, it was found the copies counted in PLC were in mismatch with stacker readings.

Stacker reading image



Production

Prof 1: 24 pg Dialog running SCS

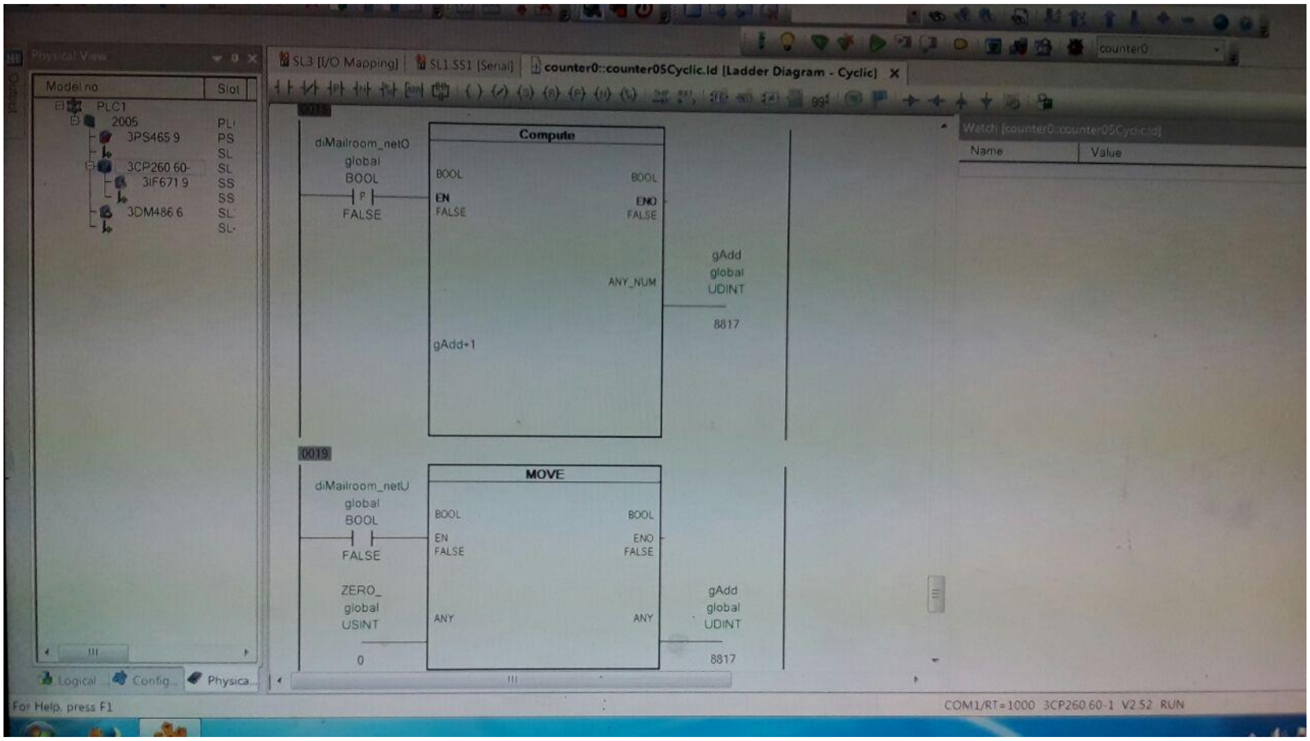
Speed 0

Bundle size 100

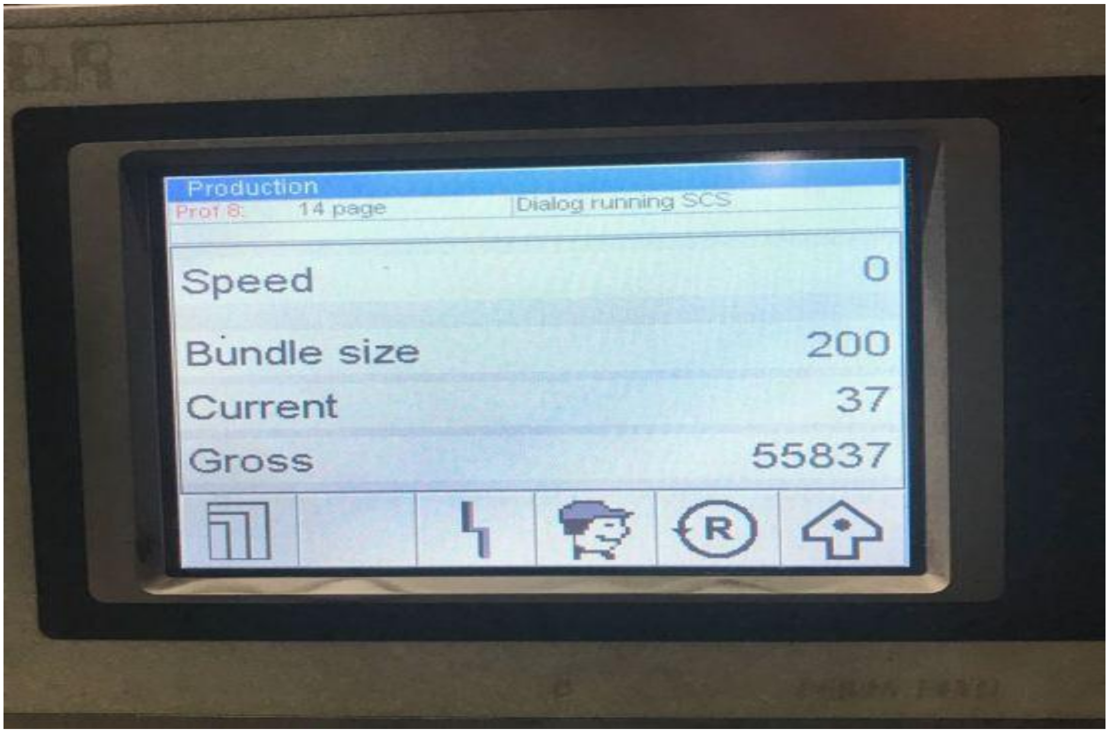
Current 20

Gross 8820

CP 474 Counter image



- Mismatch was found to be in counting. Hence it was tried with CP260 PLC and the problem was found to be persisting. After analysis, it was found that the pulses were missed because the PLC was connected in online mode. So, it was tested without monitoring and found no mismatch in both CP 476 and CP260 PLC. Hence, both can be used for this project.


Production

Prot 8: 14 page Dialog running SCS

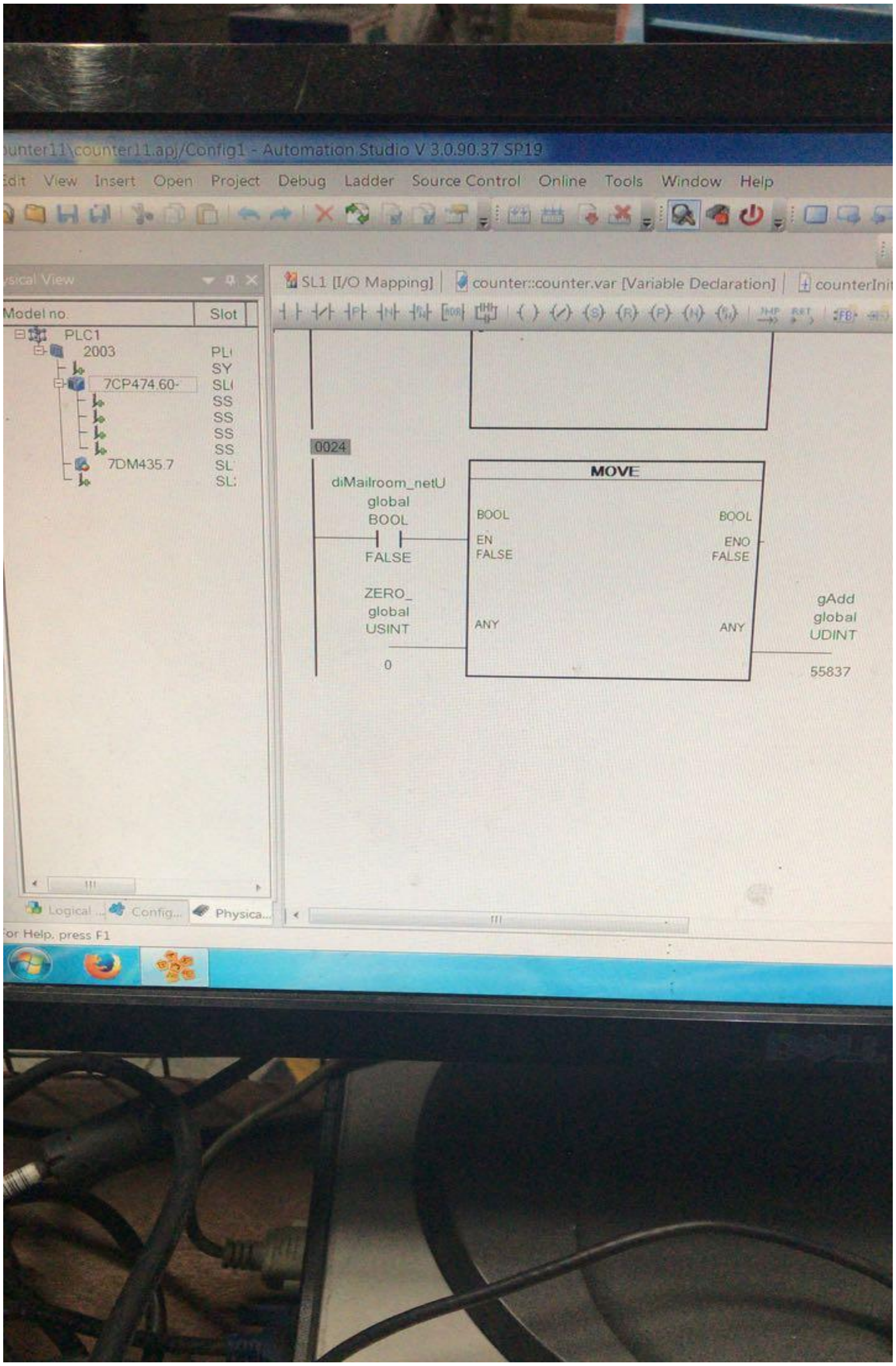
Speed 0

Bundle size 200

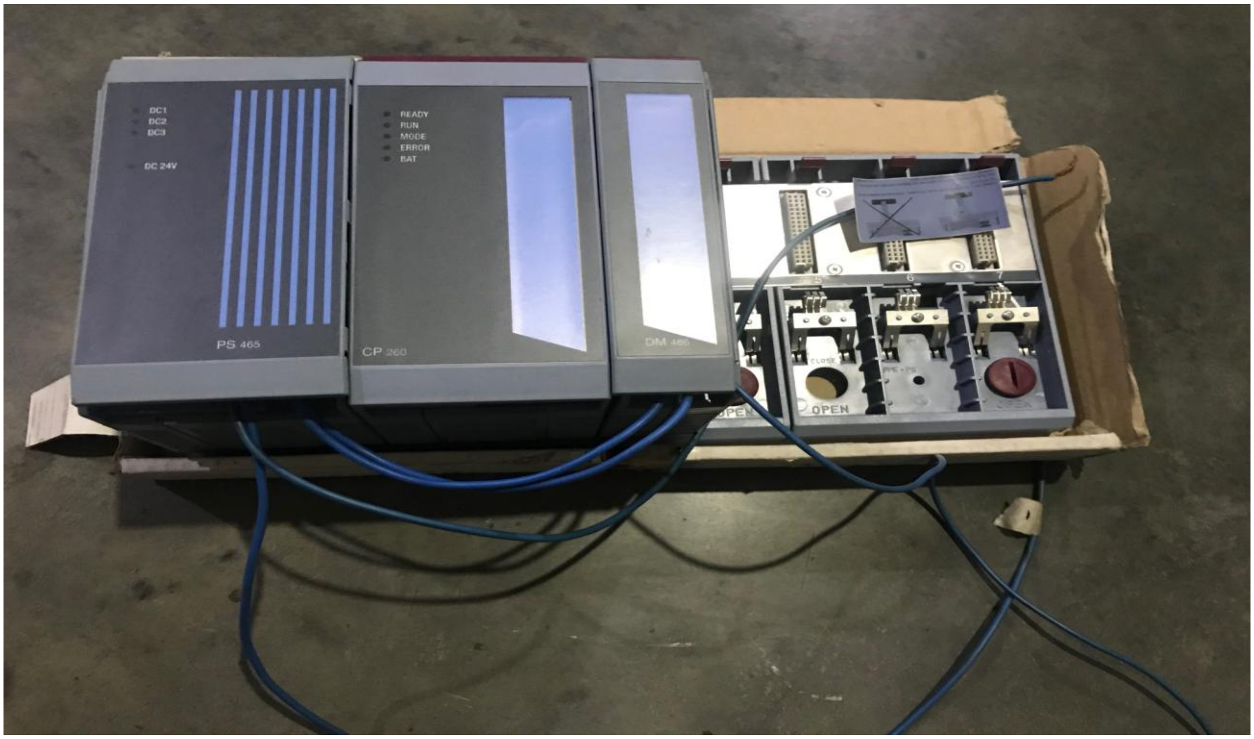
Current 37

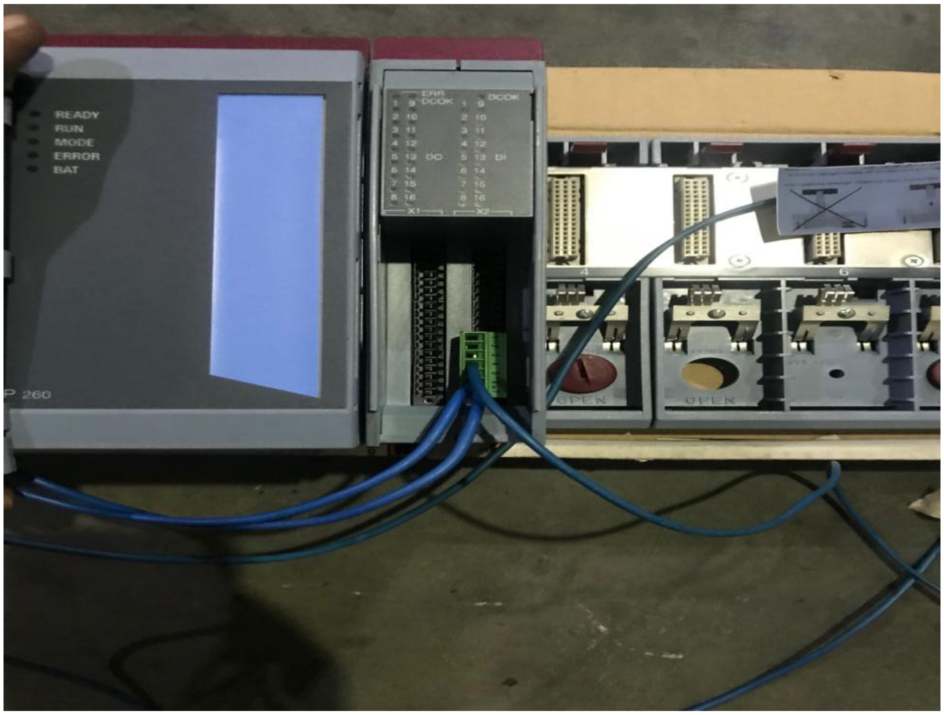
Gross 55837

CP 474 counter value without monitoring

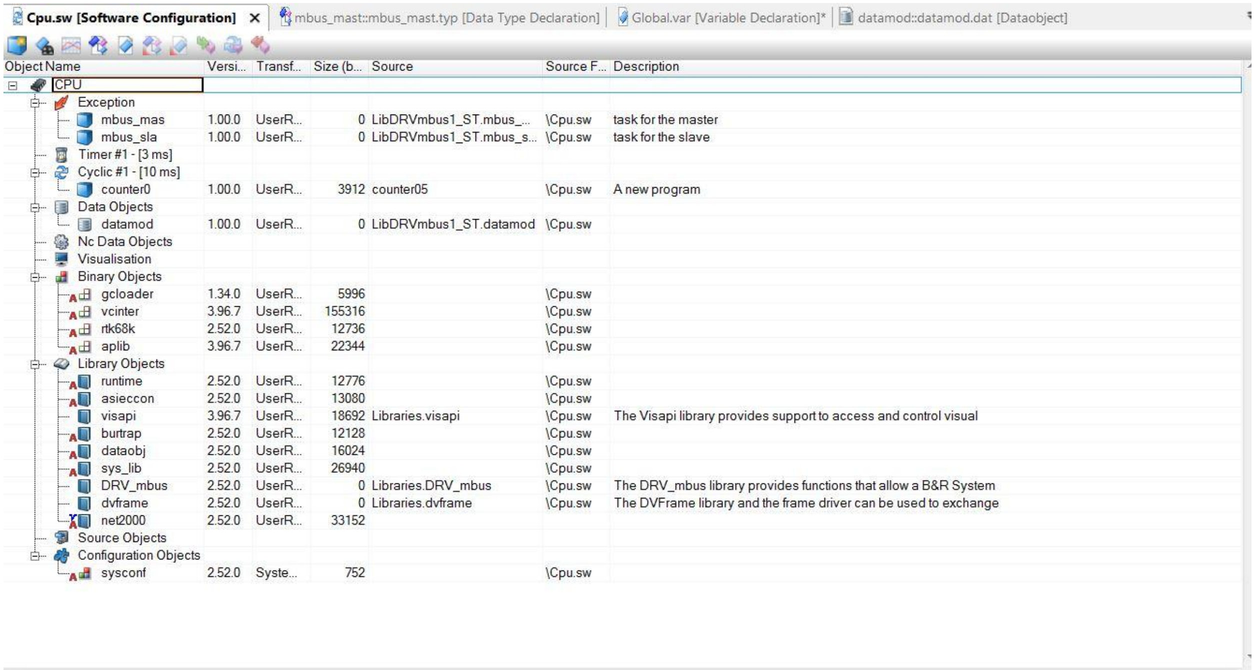


CP 260 PLC assembly



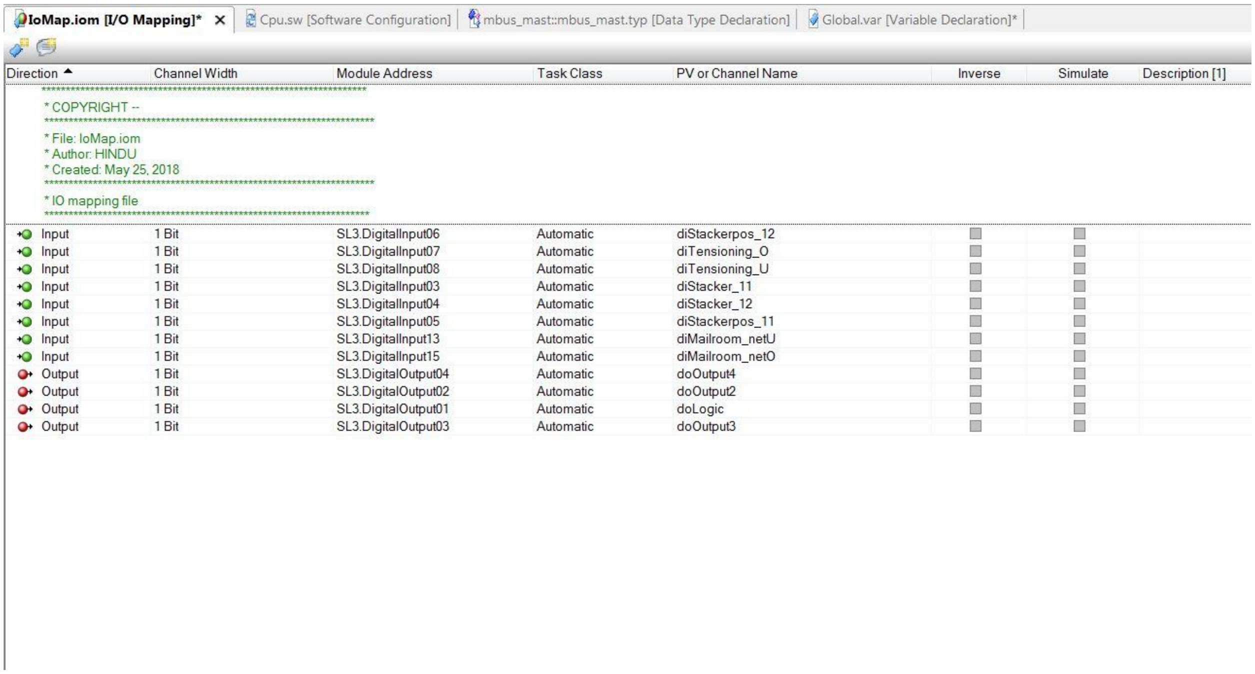


- **PLC logic**
  - CPU was configured first using B and R automation studio


Cpu.sw [Software Configuration]
mbus_mast::mbus_mast.typ [Data Type Declaration]
Global.var [Variable Declaration]*
datamod::datamod.dat [Dataobject]

Object Name	Versi...	Transf...	Size (b...	Source	Source F...	Description
CPU						
Exception						
mbus_mas	1.00.0	UserR...	0	LibDRVmbus1_ST.mbus_...	\Cpu.sw	task for the master
mbus_sla	1.00.0	UserR...	0	LibDRVmbus1_ST.mbus_s...	\Cpu.sw	task for the slave
Timer #1 - [3 ms]						
Cyclic #1 - [10 ms]						
counter0	1.00.0	UserR...	3912	counter05	\Cpu.sw	A new program
Data Objects						
datamod	1.00.0	UserR...	0	LibDRVmbus1_ST.datamod	\Cpu.sw	
Nc Data Objects						
Visualisation						
Binary Objects						
gcloader	1.34.0	UserR...	5996		\Cpu.sw	
vcinter	3.96.7	UserR...	155316		\Cpu.sw	
rtk68k	2.52.0	UserR...	12736		\Cpu.sw	
aplib	3.96.7	UserR...	22344		\Cpu.sw	
Library Objects						
runtime	2.52.0	UserR...	12776		\Cpu.sw	
asieccon	2.52.0	UserR...	13080		\Cpu.sw	
visapi	3.96.7	UserR...	18692	Libraries.visapi	\Cpu.sw	The Visapi library provides support to access and control visual
burtrap	2.52.0	UserR...	12128		\Cpu.sw	
dataobj	2.52.0	UserR...	16024		\Cpu.sw	
sys_lib	2.52.0	UserR...	26940		\Cpu.sw	
DRV_mbus	2.52.0	UserR...	0	Libraries.DRV_mbus	\Cpu.sw	The DRV_mbus library provides functions that allow a B&R System
dvframe	2.52.0	UserR...	0	Libraries.dvframe	\Cpu.sw	The DVFrame library and the frame driver can be used to exchange
net2000	2.52.0	UserR...	33152			
Source Objects						
Configuration Objects						
sysconf	2.52.0	Syste...	752		\Cpu.sw	

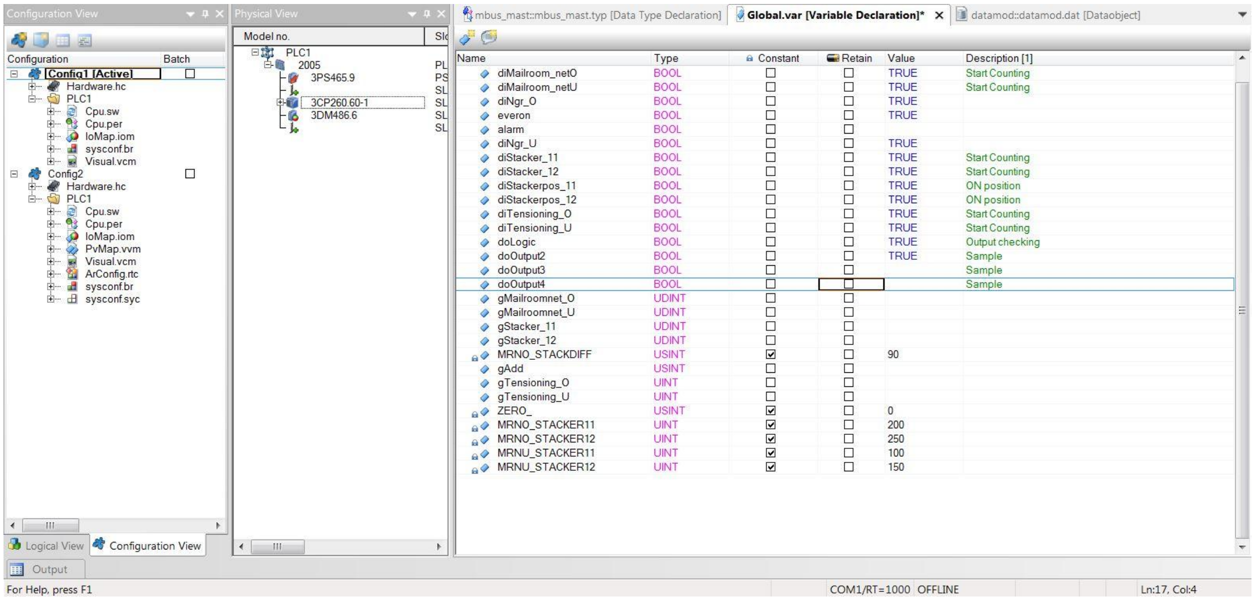
  - I/O mapping was done after adding the corresponding module in configuration view


IoMap.iom [I/O Mapping]*
Cpu.sw [Software Configuration]
mbus_mast::mbus_mast.typ [Data Type Declaration]
Global.var [Variable Declaration]*

```
*******************************************************************
* COPYRIGHT --
*********************************************************************
* File: IoMap.iom
* Author: HINDU
* Created: May 25, 2018
*********************************************************************
* IO mapping file
*******************************************************************
```

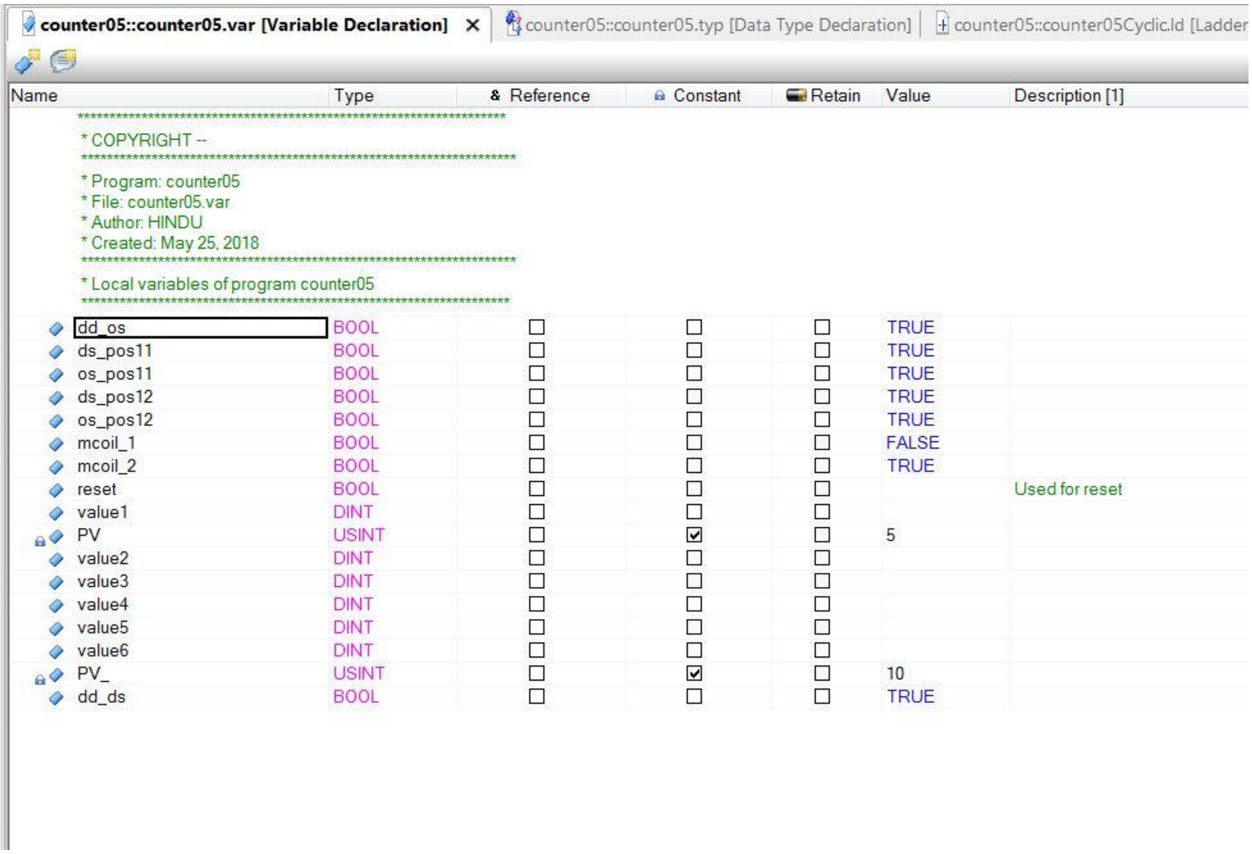
Direction	Channel Width	Module Address	Task Class	PV or Channel Name	Inverse	Simulate	Description [1]
Input	1 Bit	SL3.DigitalInput06	Automatic	diStackerpos_12	☐	☐	
Input	1 Bit	SL3.DigitalInput07	Automatic	diTensioning_O	☐	☐	
Input	1 Bit	SL3.DigitalInput08	Automatic	diTensioning_U	☐	☐	
Input	1 Bit	SL3.DigitalInput03	Automatic	diStacker_11	☐	☐	
Input	1 Bit	SL3.DigitalInput04	Automatic	diStacker_12	☐	☐	
Input	1 Bit	SL3.DigitalInput05	Automatic	diStackerpos_11	☐	☐	
Input	1 Bit	SL3.DigitalInput13	Automatic	diMailroom_netU	☐	☐	
Input	1 Bit	SL3.DigitalInput15	Automatic	diMailroom_netO	☐	☐	
Output	1 Bit	SL3.DigitalOutput04	Automatic	doOutput4	☐	☐	
Output	1 Bit	SL3.DigitalOutput02	Automatic	doOutput2	☐	☐	
Output	1 Bit	SL3.DigitalOutput01	Automatic	doLogic	☐	☐	
Output	1 Bit	SL3.DigitalOutput03	Automatic	doOutput3	☐	☐	

- Global variables are declared based on the datatype. These variables can be used for every program inside the PLC.



Name	Type	Constant	Retain	Value	Description [1]
diMailroom_netO	BOOL	☐	☐	TRUE	Start Counting
diMailroom_netU	BOOL	☐	☐	TRUE	Start Counting
diNgr_O	BOOL	☐	☐	TRUE	
everon	BOOL	☐	☐	TRUE	
alarm	BOOL	☐	☐		
diNgr_U	BOOL	☐	☐	TRUE	
diStacker_11	BOOL	☐	☐	TRUE	Start Counting
diStacker_12	BOOL	☐	☐	TRUE	Start Counting
diStackerpos_11	BOOL	☐	☐	TRUE	ON position
diStackerpos_12	BOOL	☐	☐	TRUE	ON position
diTensioning_O	BOOL	☐	☐	TRUE	Start Counting
diTensioning_U	BOOL	☐	☐	TRUE	Start Counting
doLogic	BOOL	☐	☐	TRUE	Output checking
doOutput2	BOOL	☐	☐	TRUE	Sample
doOutput3	BOOL	☐	☐		Sample
doOutput4	BOOL	☐	☐		Sample
gMailroomnet_O	UDINT	☐	☐		
gMailroomnet_U	UDINT	☐	☐		
gStacker_11	UDINT	☐	☐		
gStacker_12	UDINT	☐	☐		
MRNO_STACKDIFF	USINT	☑	☐	90	
gAdd	USINT	☐	☐		
gTensioning_O	UINT	☐	☐		
gTensioning_U	UINT	☐	☐		
ZERO_	USINT	☑	☐	0	
MRNO_STACKER11	UINT	☑	☐	200	
MRNO_STACKER12	UINT	☑	☐	250	
MRNU_STACKER11	UINT	☑	☐	100	
MRNU_STACKER12	UINT	☑	☐	150	

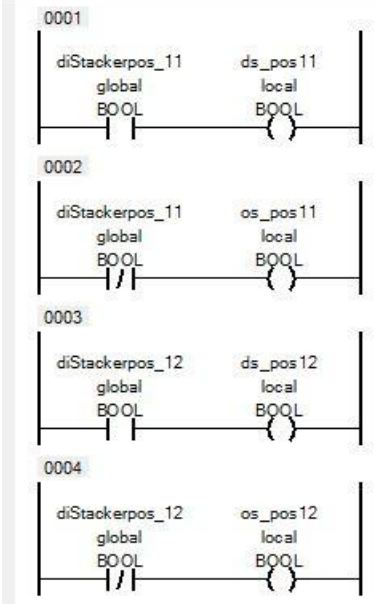
- Local variables are assigned based on the datatype. These variables can be used only for the particular program. So these variables has to be configured only under the particular project name.

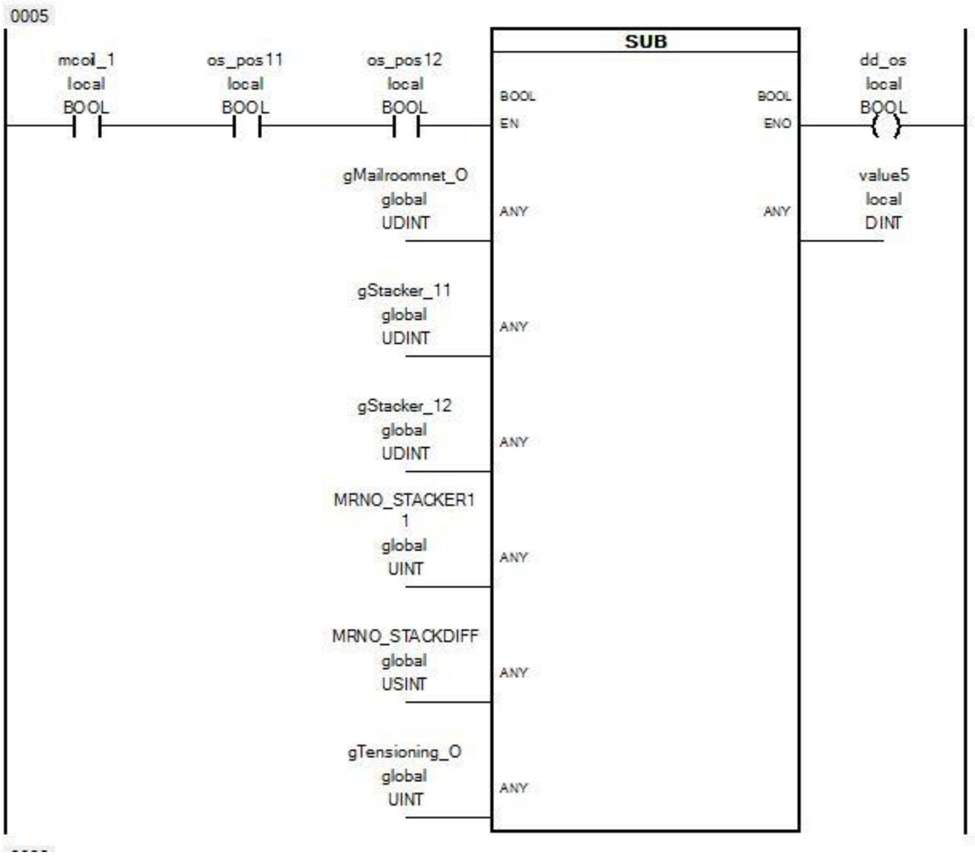

counter05::counter05.var [Variable Declaration]
counter05::counter05.typ [Data Type Declaration]
counter05::counter05Cyclic.ld [Ladder

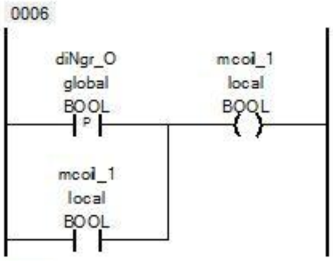
```
********************************************************************
* COPYRIGHT --
********************************************************************
* Program: counter05
* File: counter05.var
* Author: HINDU
* Created: May 25, 2018
********************************************************************
* Local variables of program counter05
********************************************************************
```

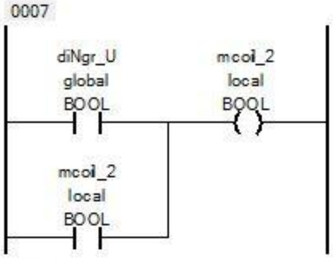
Name	Type	Reference	Constant	Retain	Value	Description [1]
dd_os	BOOL	☐	☐	☐	TRUE	
ds_pos11	BOOL	☐	☐	☐	TRUE	
os_pos11	BOOL	☐	☐	☐	TRUE	
ds_pos12	BOOL	☐	☐	☐	TRUE	
os_pos12	BOOL	☐	☐	☐	TRUE	
mcoil_1	BOOL	☐	☐	☐	FALSE	
mcoil_2	BOOL	☐	☐	☐	TRUE	
reset	BOOL	☐	☐	☐		Used for reset
value1	DINT	☐	☐	☐		
PV	USINT	☐	☑	☐	5	
value2	DINT	☐	☐	☐		
value3	DINT	☐	☐	☐		
value4	DINT	☐	☐	☐		
value5	DINT	☐	☐	☐		
value6	DINT	☐	☐	☐		
PV_	USINT	☐	☑	☐	10	
dd_ds	BOOL	☐	☐	☐	TRUE	

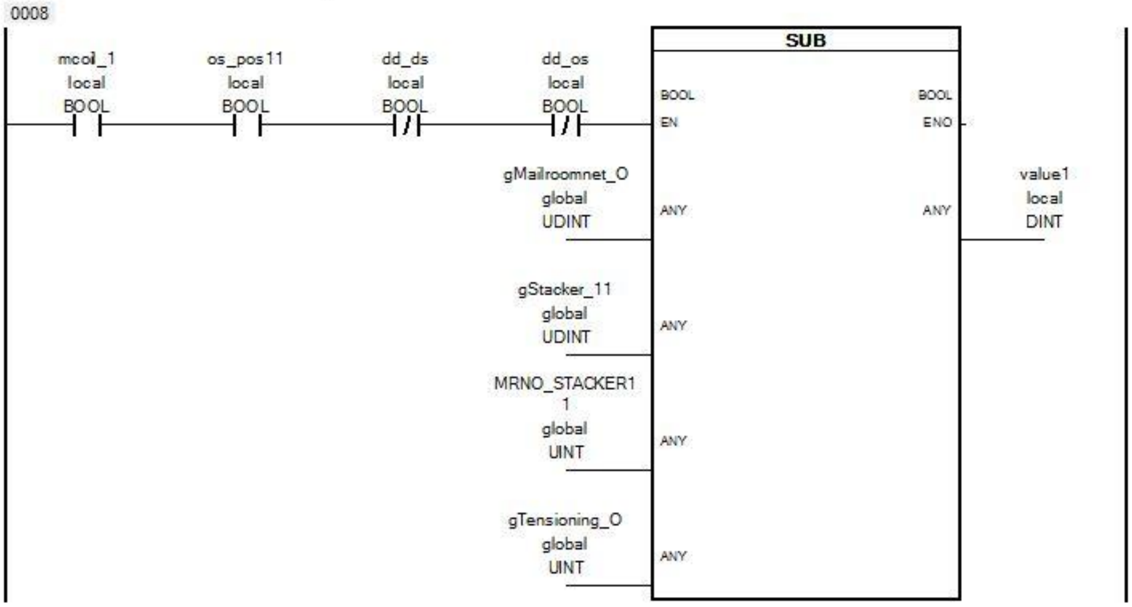
APPENDIX PLC PROGRAM

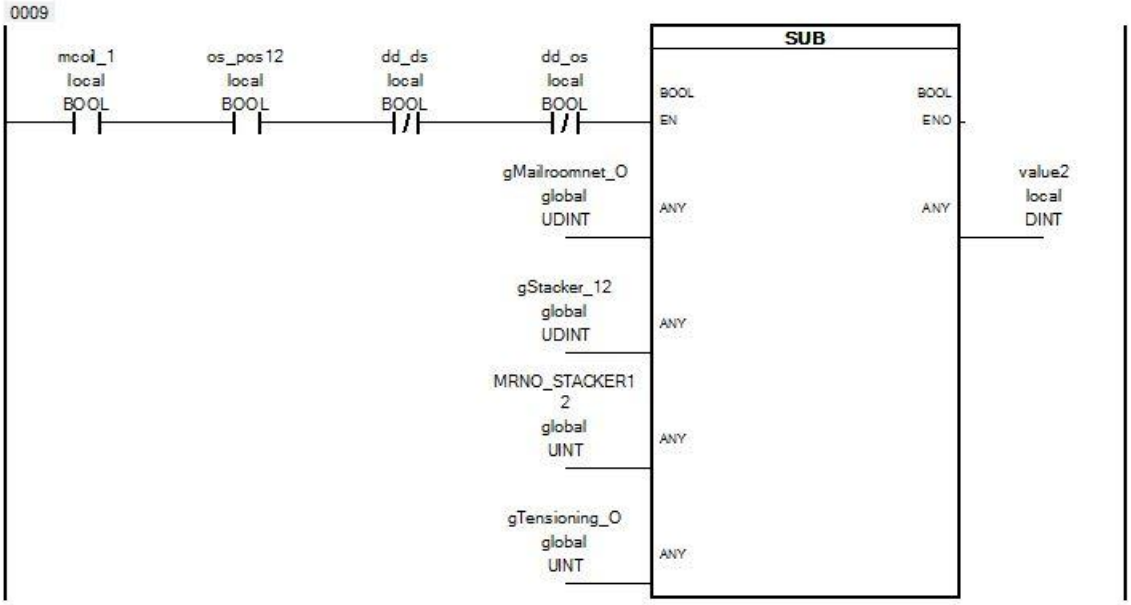


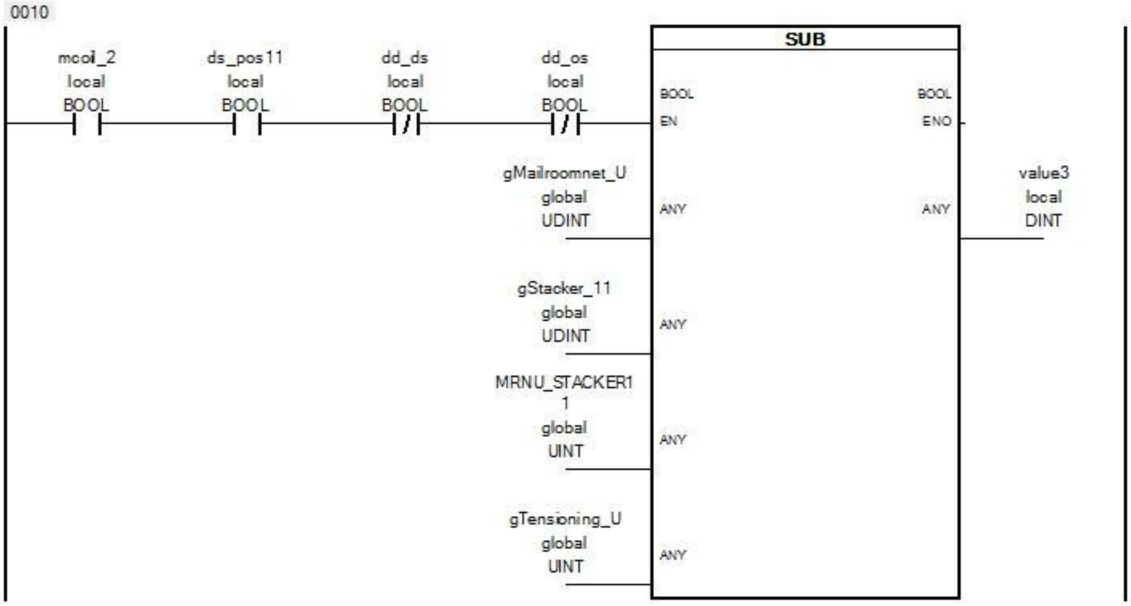


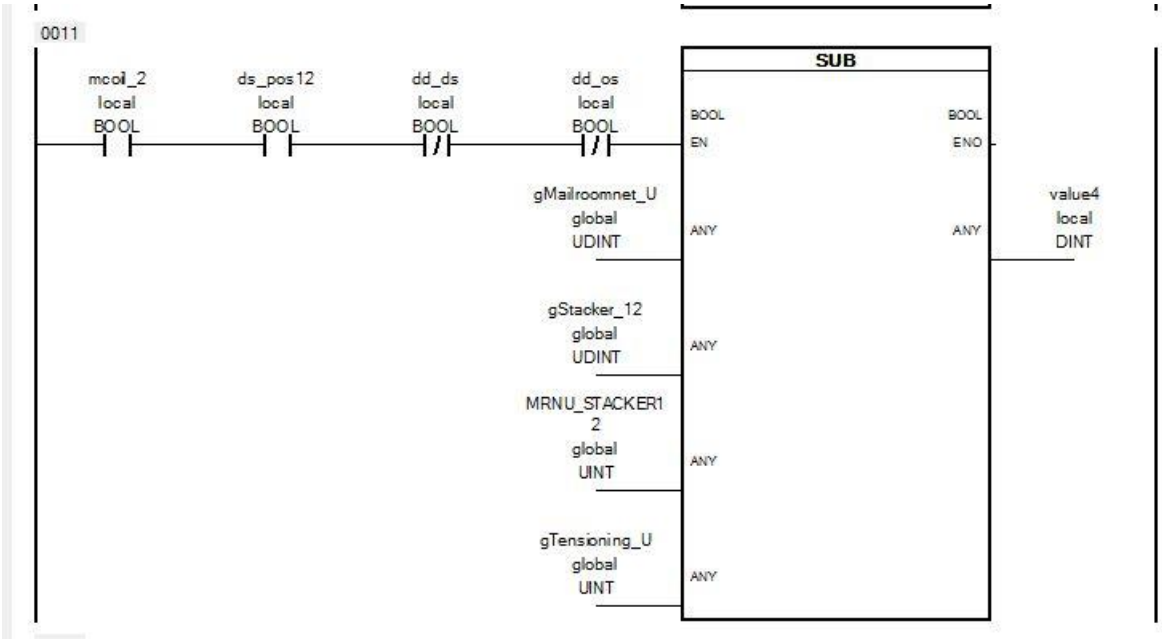

0006
diNgr_O
global
BOOL
P
mcoil_1
local
BOOL
mcoil_1
local
BOOL

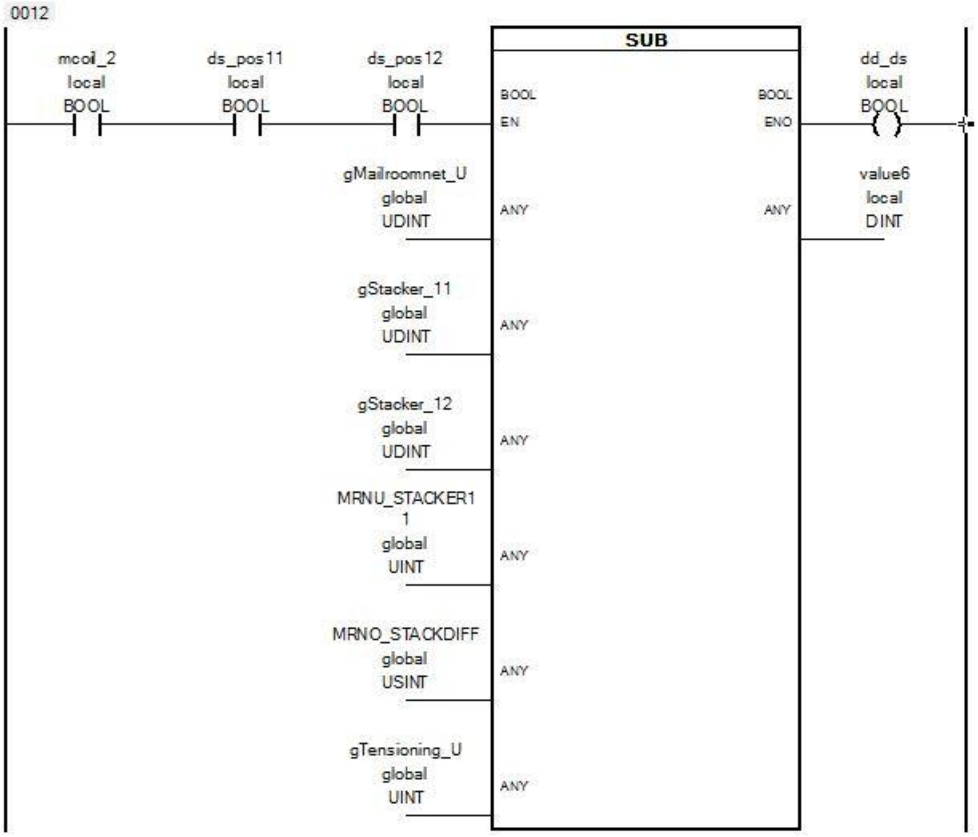

0007
diNgr_U
global
BOOL
mcoil_2
local
BOOL
mcoil_2
local
BOOL

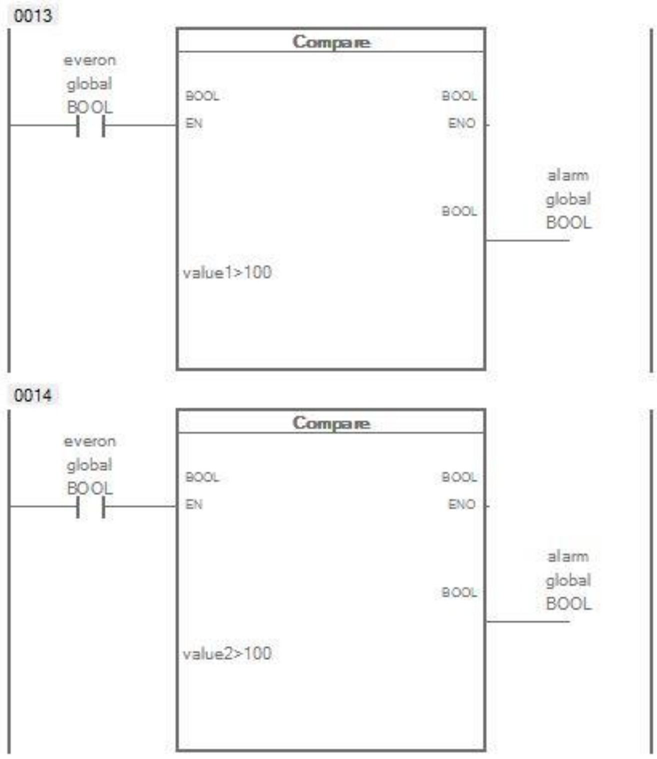

0008
mcoil_1
local
BOOL
os_pos11
local
BOOL
dd_ds
local
BOOL
dd_os
local
BOOL
SUB
BOOL
EN
BOOL
ENO
gMailroomnet_O
global
UDINT
ANY
ANY
value1
local
DINT
gStacker_11
global
UDINT
ANY
MRNO_STACKER1
1
global
UINT
ANY
gTensioning_O
global
UINT
ANY

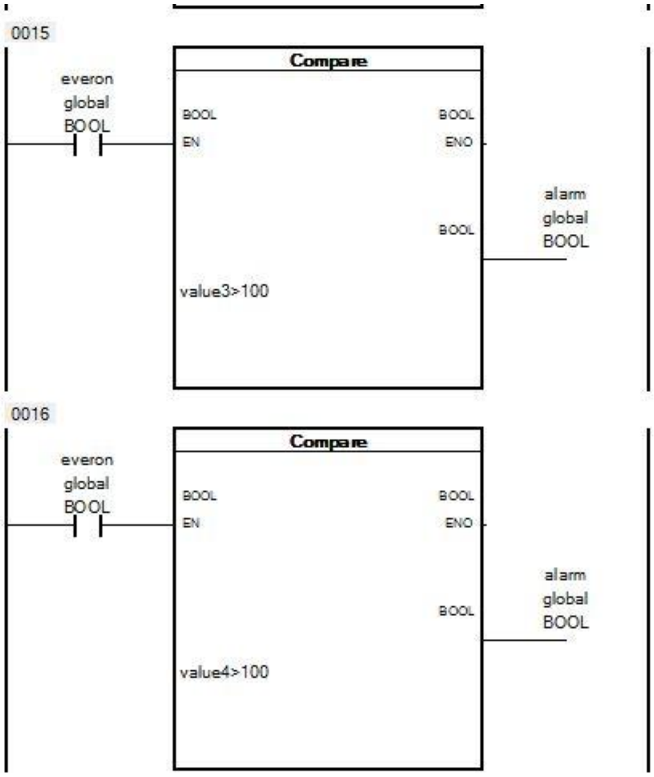

0009
mcoil_1
local
BOOL
os_pos12
local
BOOL
dd_ds
local
BOOL
dd_os
local
BOOL
SUB
BOOL
EN
BOOL
ENO
gMailroomnet_O
global
UDINT
ANY
ANY
value2
local
DINT
gStacker_12
global
UDINT
ANY
MRNO_STACKER1
2
global
UINT
ANY
gTensioning_O
global
UINT
ANY

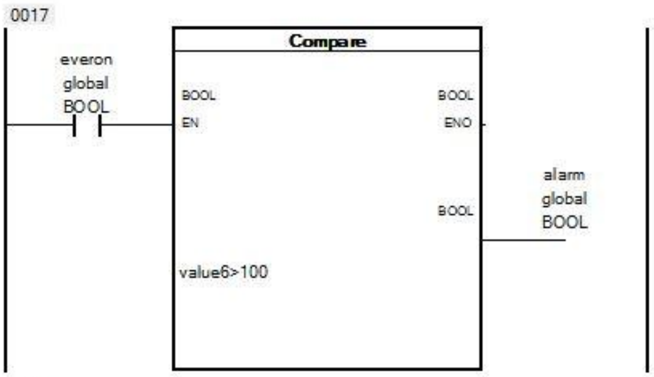

0010
mcoil_2
local
BOOL
ds_pos11
local
BOOL
dd_ds
local
BOOL
dd_os
local
BOOL
SUB
BOOL
EN
BOOL
ENO
gMailroomnet_U
global
UDINT
ANY
ANY
value3
local
DINT
gStacker_11
global
UDINT
ANY
MRNU_STACKER1
1
global
UINT
ANY
gTensioning_U
global
UINT
ANY

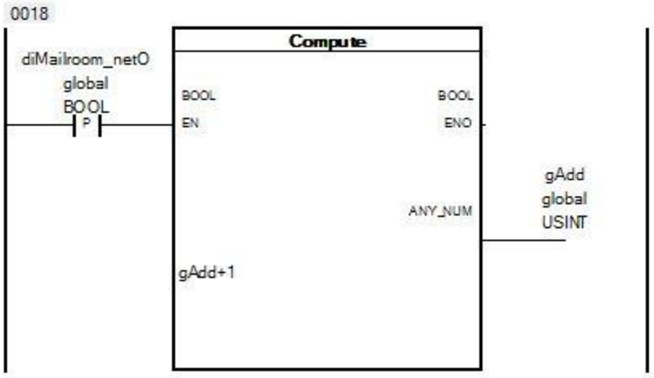

0011
mcoil_2
local
BOOL
ds_pos12
local
BOOL
dd_ds
local
BOOL
dd_os
local
BOOL
SUB
BOOL
EN
BOOL
ENO
gMailroomnet_U
global
UDINT
ANY
ANY
value4
local
DINT
gStacker_12
global
UDINT
ANY
MRNU_STACKER12
global
UINT
ANY
gTensioning_U
global
UINT
ANY

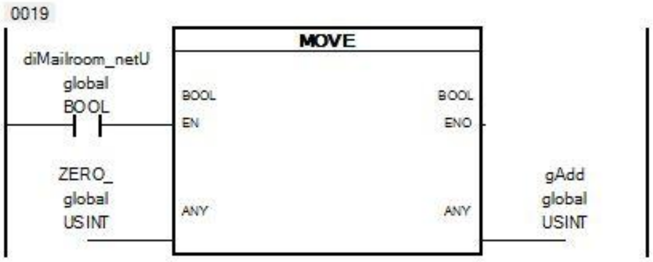

0012
mcoil_2
local
BOOL
ds_pos11
local
BOOL
ds_pos12
local
BOOL
SUB
BOOL
EN
BOOL
ENO
dd_ds
local
BOOL
gMailroomnet_U
global
UDINT
ANY
ANY
value6
local
DINT
gStacker_11
global
UDINT
ANY
gStacker_12
global
UDINT
ANY
MRNU_STACKER11
global
UINT
ANY
MRNO_STACKDIFF
global
USINT
ANY
gTensioning_U
global
UINT
ANY


0013
everon
global
BOOL
Compare
BOOL
EN
BOOL
ENO
BOOL
alarm
global
BOOL
value1>100
0014
everon
global
BOOL
Compare
BOOL
EN
BOOL
ENO
BOOL
alarm
global
BOOL
value2>100


0015
everon
global
BOOL
Compare
BOOL
EN
BOOL
ENO
BOOL
alarm
global
BOOL
value3>100
0016
everon
global
BOOL
Compare
BOOL
EN
BOOL
ENO
BOOL
alarm
global
BOOL
value4>100

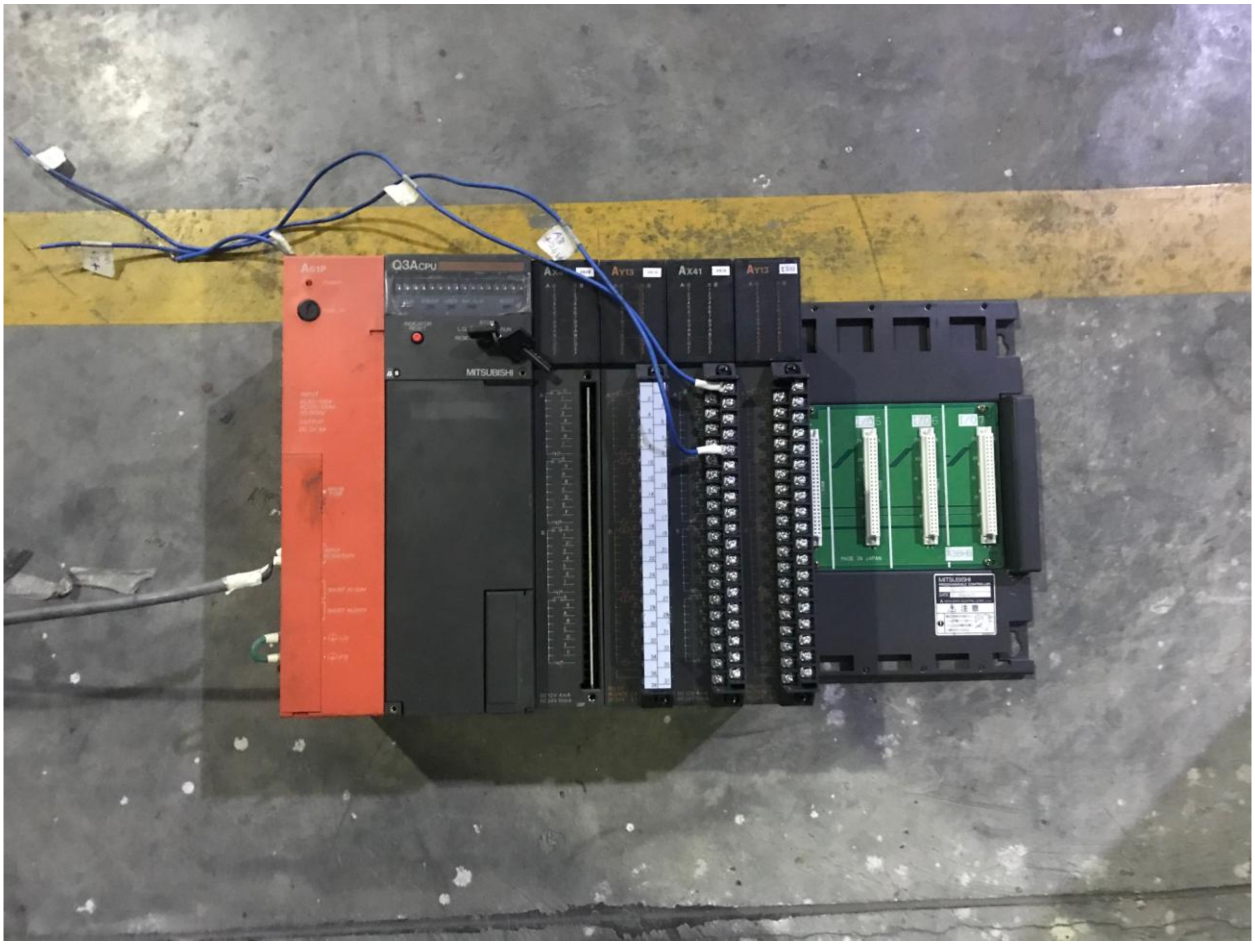






- **Touch screen program**
  - Touch program modification was tried using B and R touch screen
  - We were able to design and add numeric display to touch screen.
  - We tried sending data from PLC to Touch screen by modbus communication
  - We were not able to receive the data in touch screen
  - Studying of modbus communication under progress
  - We tried to use MPC embedded RMC PC, but Automation studio software not supported

- **Experiment with QnA series**
    - Due to touch screen interface problem, we tried to write the program with QnA series PLC. QnA series can be connected to V6/V7 series touch screen. Optocouplers were purchased as QnA PLC fetches only negative input. So we need to convert PNP output pulse into NPN input.



The modules used are

- A61P (Power supply module)
- Q3A (CPU)
- AX41- (32 input NPN input module)
- AY13- (32 PNP output module)
- AJ71QC24N-R4 (serial communication module – to be made ready)

- Programming and configuration is under progress with QnA PLC.