Design Project I: Traffic Signal Control

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*Abstract: The purpose of this design assignment was to implement a discrete logic controller for traffic control at an intersection of a busy street and an occasionally used side street, using a simulation of a Programmable Logic Controller (PLC). The design was meant to combine sequential logic with ladder logic programming and to be implemented with basic logic functions and timers for sequencing. Further, this simulation was to take place in Automation Direct's Do-More PLC program and specifically to be simulated rather than actually executed with a real PLC.

Key Words: Programmable Logic Controller (PLC), Sequential Logic, Ladder Logic, Timer/Sequencer, Simulation

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**Introduction:(maybe explain design specifications?)

*Procedure:
1. Download Do-More PLC and watch instructional videos.
2. Research ladder logic and timers.
3. Develop an architecture for the traffic controller using the following tools: State Diagram, State Table, Boolean Equation, Timing Diagram.(sean do you want to reference figures for this?)
4. Develop a ladder logic program using ladder diagrams and functional blocks.
5. Simulate solution and verify correctness of design using the Do-More PLC simulator.
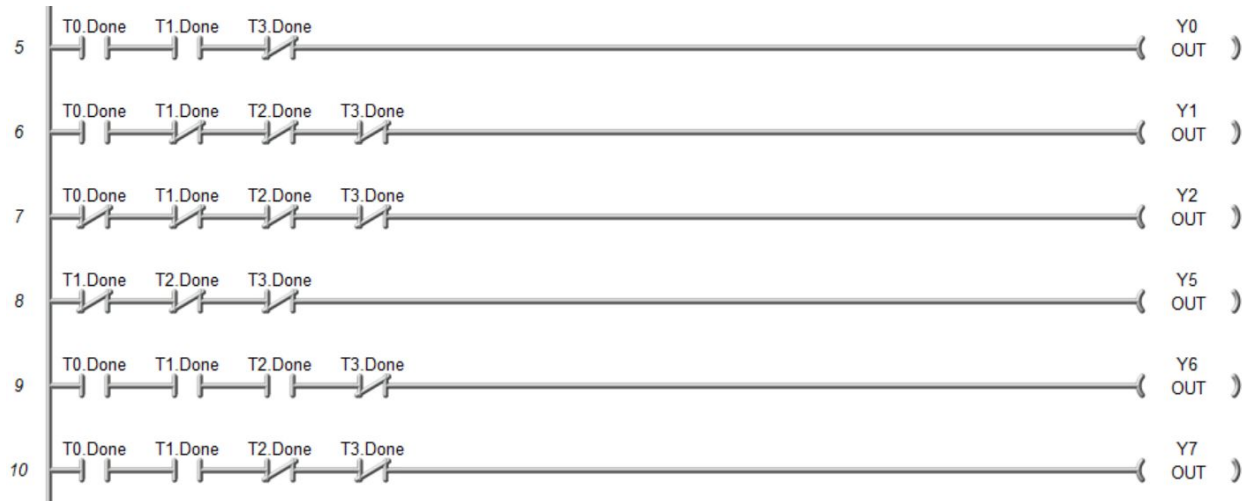
**Results:

Fig XX: Rungs 1-4, Timer Loop
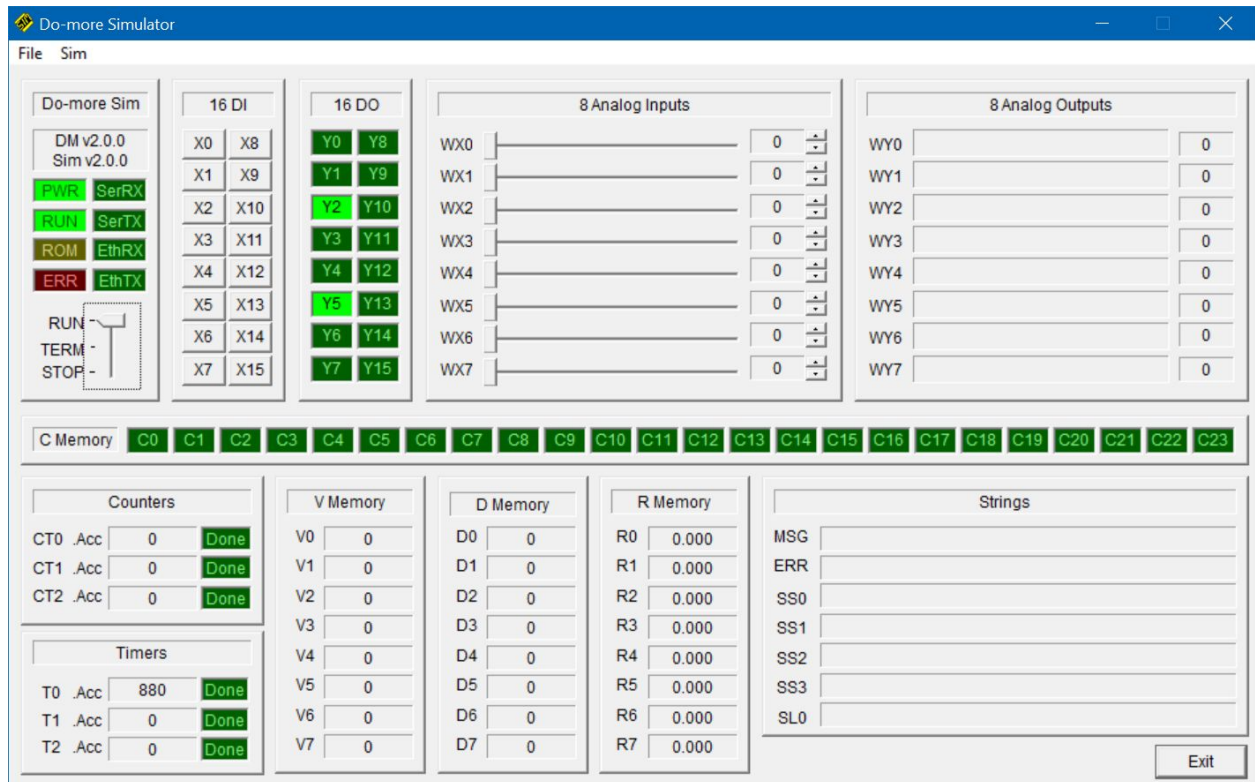

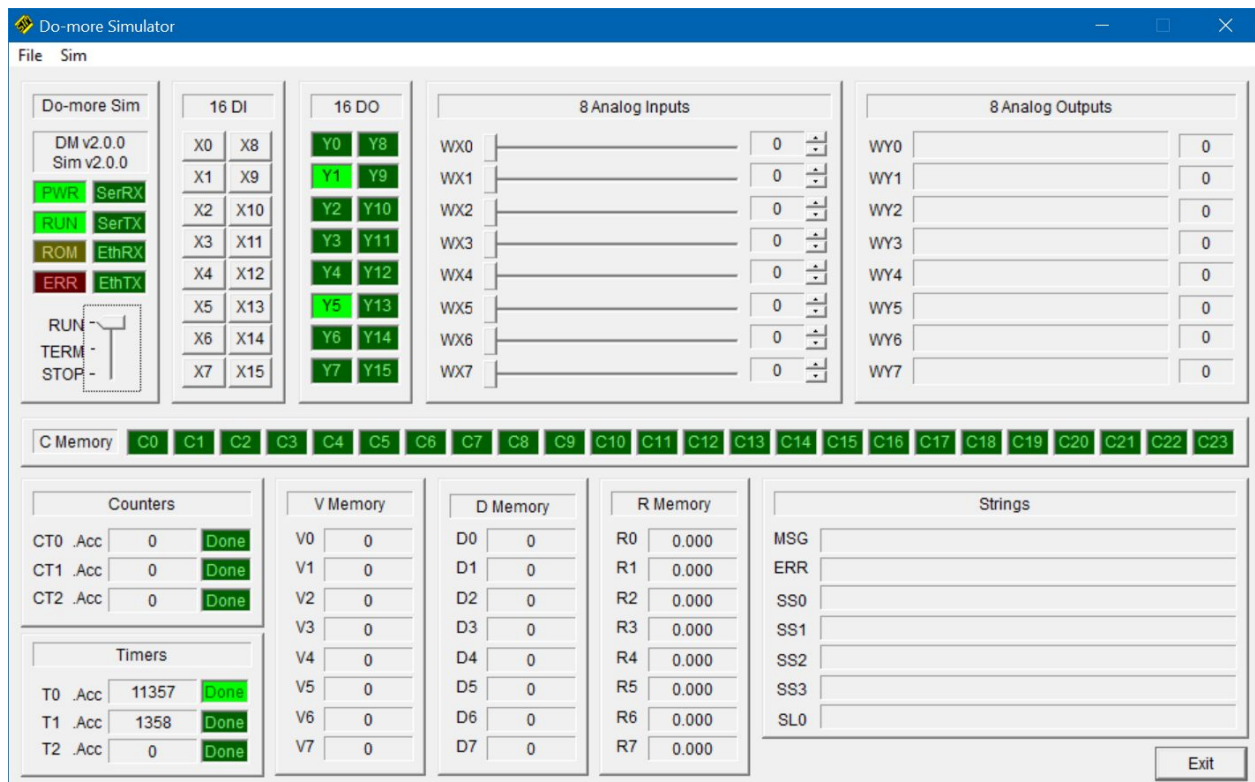Fig XX: Rungs 5-10, Light Outputs and Ladder Logic

Fig XX: Green(1)/Red(2)

Fig XX: Yellow(1)/Red(2)

Figure 1 (top)

Do-more Simulator — File Sim

Do-more Sim
DM v2.0.0
Sim v2.0.0
PWR SerRX
RUN SerTX
ROM EthRX
ERR EthTX
RUN
TERM
STOP

16 DI
X0 X8
X1 X9
X2 X10
X3 X11
X4 X12
X5 X13
X6 X14
X7 X15

16 DO
Y0 Y8
Y1 Y9
Y2 Y10
Y3 Y11
Y4 Y12
Y5 Y13
Y6 Y14
Y7 Y15

8 Analog Inputs
WX0 0
WX1 0
WX2 0
WX3 0
WX4 0
WX5 0
WX6 0
WX7 0

8 Analog Outputs
WY0 0
WY1 0
WY2 0
WY3 0
WY4 0
WY5 0
WY6 0
WY7 0

C Memory C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23

Counters
CT0 .Acc 0 Done
CT1 .Acc 0 Done
CT2 .Acc 0 Done

Timers
T0 .Acc 15409 Done
T1 .Acc 5410 Done
T2 .Acc 1410 Done

V Memory
V0 0
V1 0
V2 0
V3 0
V4 0
V5 0
V6 0
V7 0

D Memory
D0 0
D1 0
D2 0
D3 0
D4 0
D5 0
D6 0
D7 0

R Memory
R0 0.000
R1 0.000
R2 0.000
R3 0.000
R4 0.000
R5 0.000
R6 0.000
R7 0.000

Strings
MSG
ERR
SS0
SS1
SS2
SS3
SL0

Exit

Fig XX: Red(1)/Green(2)

Figure 2 (bottom)

Do-more Simulator — File Sim

Do-more Sim
DM v2.0.0
Sim v2.0.0
PWR SerRX
RUN SerTX
ROM EthRX
ERR EthTX
RUN
TERM
STOP

16 DI
X0 X8
X1 X9
X2 X10
X3 X11
X4 X12
X5 X13
X6 X14
X7 X15

16 DO
Y0 Y8
Y1 Y9
Y2 Y10
Y3 Y11
Y4 Y12
Y5 Y13
Y6 Y14
Y7 Y15

8 Analog Inputs
WX0 0
WX1 0
WX2 0
WX3 0
WX4 0
WX5 0
WX6 0
WX7 0

8 Analog Outputs
WY0 0
WY1 0
WY2 0
WY3 0
WY4 0
WY5 0
WY6 0
WY7 0

C Memory C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23

Counters
CT0 .Acc 0 Done
CT1 .Acc 0 Done
CT2 .Acc 0 Done

Timers
T0 .Acc 24952 Done
T1 .Acc 14953 Done
T2 .Acc 10953 Done

V Memory
V0 0
V1 0
V2 0
V3 0
V4 0
V5 0
V6 0
V7 0

D Memory
D0 0
D1 0
D2 0
D3 0
D4 0
D5 0
D6 0
D7 0

R Memory
R0 0.000
R1 0.000
R2 0.000
R3 0.000
R4 0.000
R5 0.000
R6 0.000
R7 0.000

Strings
MSG
ERR
SS0
SS1
SS2
SS3
SL0

Exit
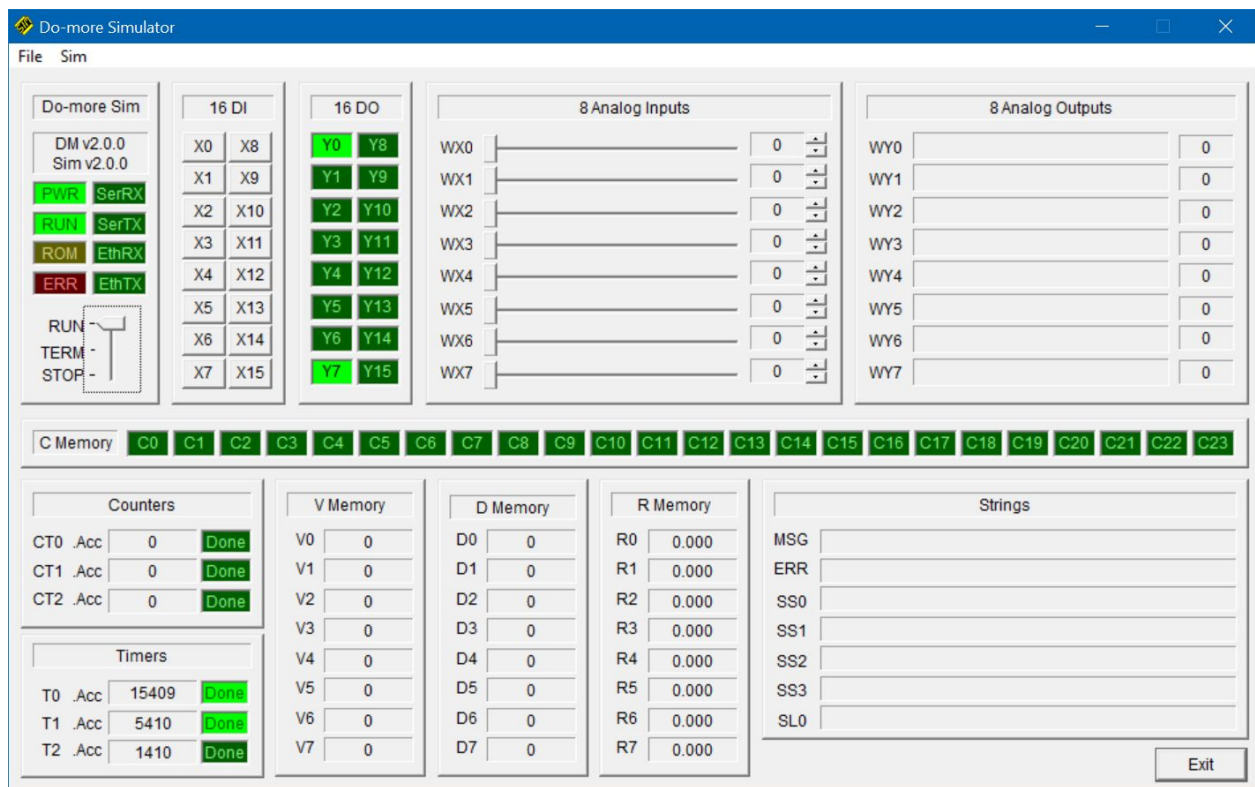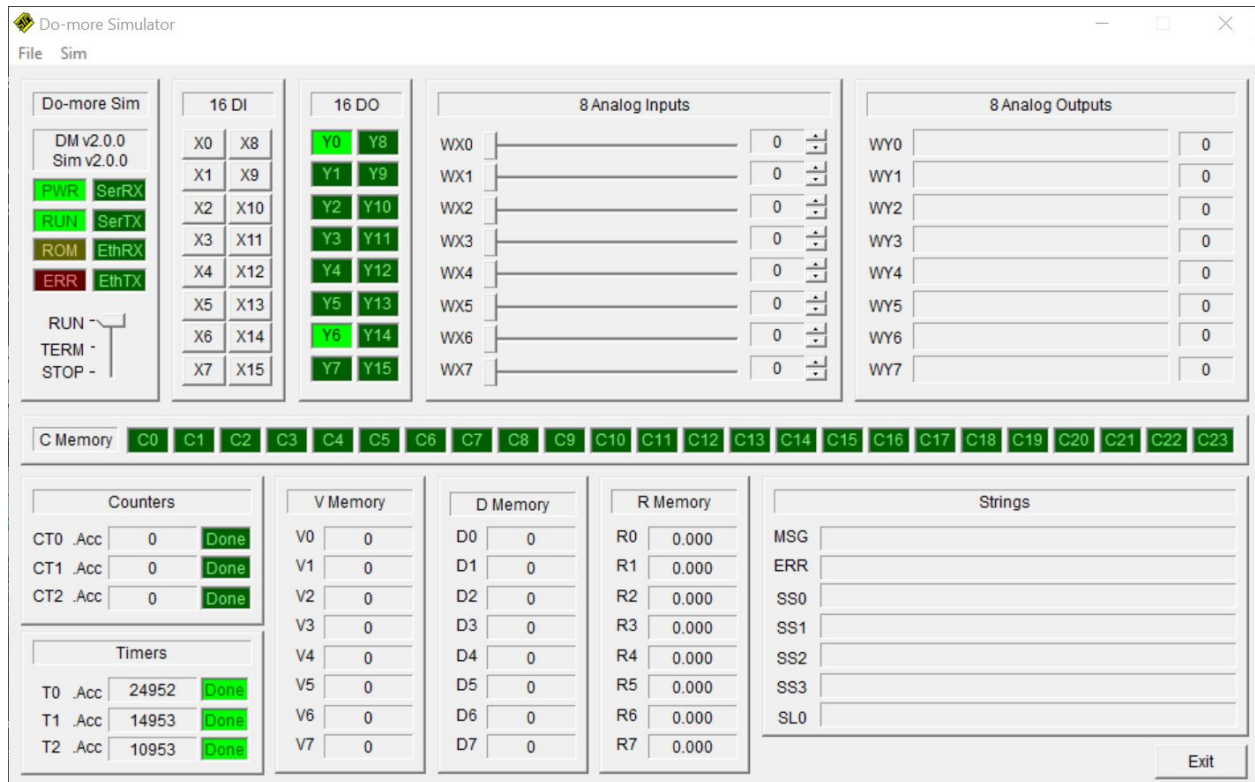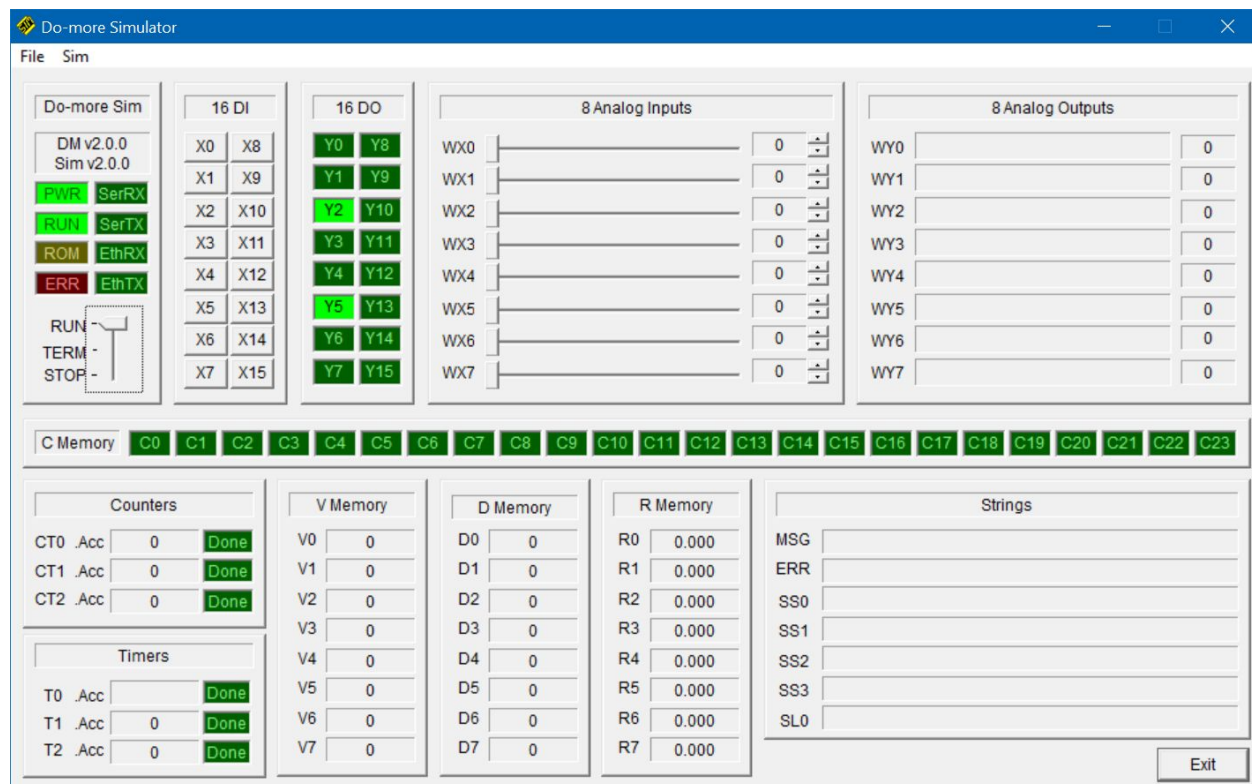
Fig. XX: Red(1)/Yellow(2)

*Conclusion: The goal of this undertaking was to implement a discrete logic controller for traffic control at an intersection of two streets using a Programmable Logic Controller (PLC). This assignment was very important because not only did we gain a useful insight into discrete control systems and ladder logic for this application, but for any application that utilizes a PLC. Further the applications of these principles may someday be used in our work in tandem with continuous variable control systems. Ultimately this assignment served as a crucial stepping stone into the world of industrial control systems.