# 

ASSIGNEMENT 5

**31342 -** Introduction to Programmable Logic Controllers

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# Part 1 – IL XOR

To implement the XOR without using the XOR logic gate, first a truth table must be build:

|  |  |  |
| --- | --- | --- |
| s1 | s3 | o2 |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

This will translate to:

Which is easily converted to the following Instruction List:

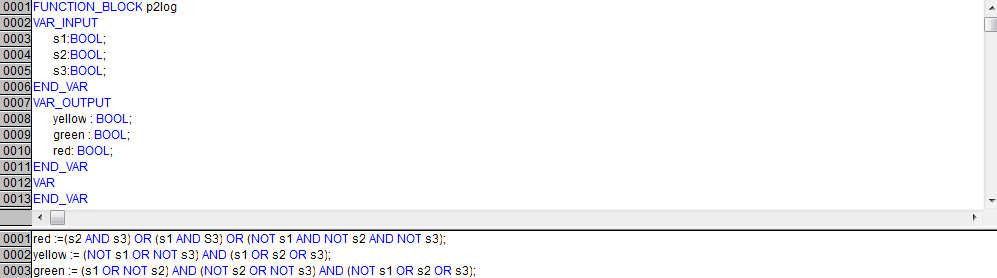


# Part 2 – Logic expression in ST

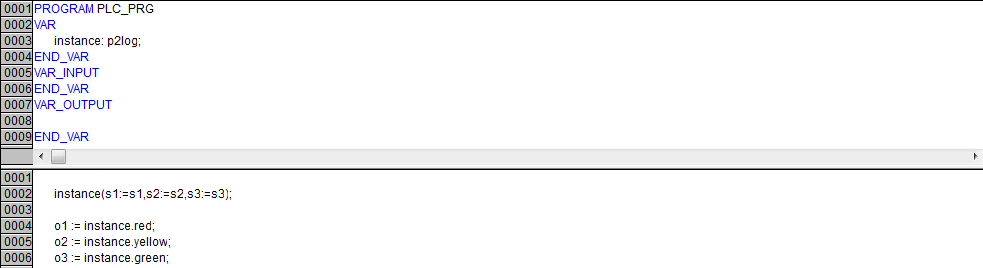
The table shown in the assignment is the same as the one on the last assignment, so the logic expressions will be the same:

After having this, converting it into Structured Text is straight forward.

Since it was asked to make a function, the following function was built:



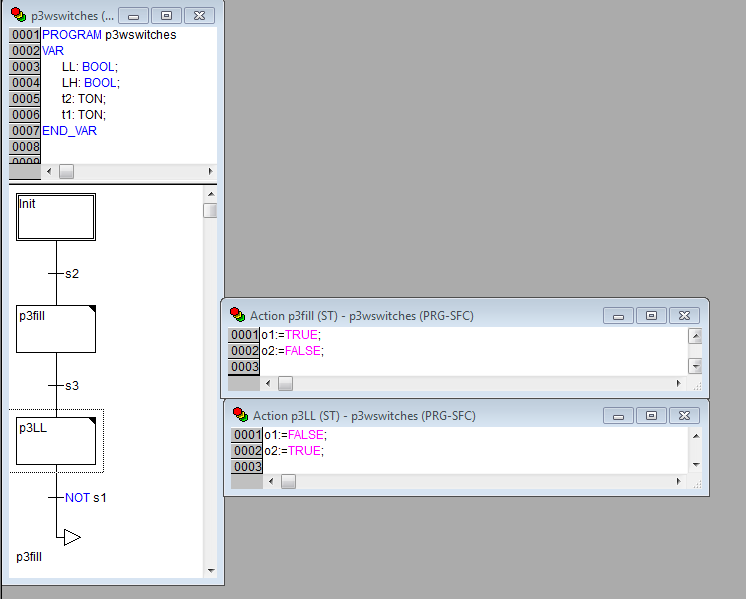
Then the function should be called with the following PLC program:



After this it was verified that the PLC worked correctly.

# Part 3 – Water Tank Sequence

Part 3 was implemented in SFC, and the transitions/states where implemented in structure text.



First there is the *Init* state, where nothing is done until the start button (*s2*) is pressed.

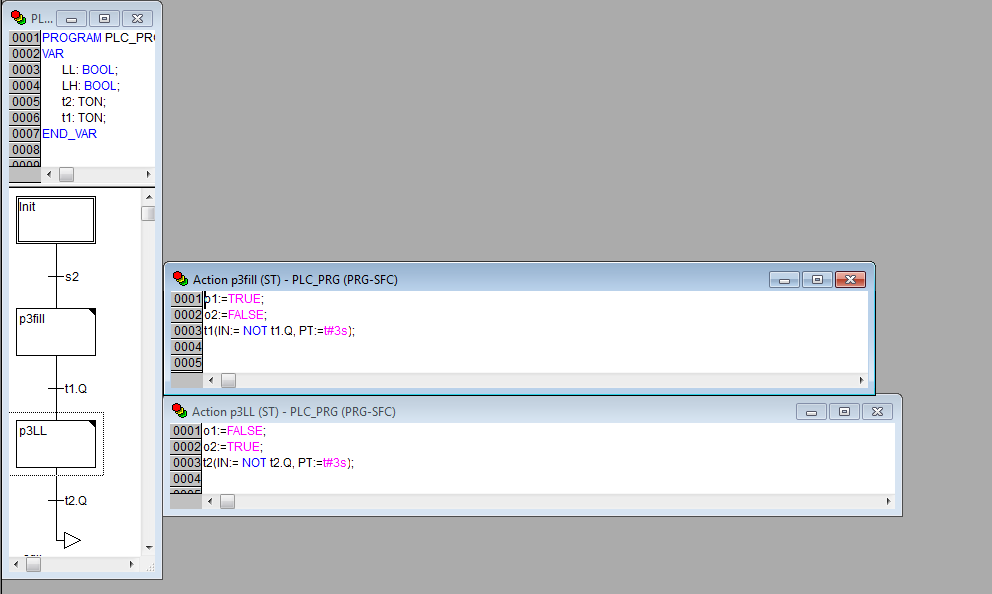
The on state *p3fill* the tank will start to fill (*v3* which corresponds to the *red* light(*o1*) is active). Then s1, which represents *LL* is pressed, followed by s3 which represents *HL*.

When the *High Level* is reached the PLC transitions onto the *P3LL* state where the *v2* opens and *v1* closes. This will happen while the water level is not below the low level (*LL*). When that finally happens, the PLC goes onto state p3fill where *v1* is closed and *v2*, repeating the whole process again.

(See Video in attachment)

# Part 3 Extra – Water Tank Sequence

To implement the same system but with timer, the previous PLC only needed a few changes, that consisted in TON timers that are started when the state is entered. After 3 seconds of filling up (only *v1* open) the PLC empties the tank during 3 seconds (only *v2* open):



A video of this functionality can be seen in attachment.