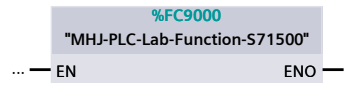
# Main [OB1]

| Main Properties | | | | | | | |
|---|---|---|---|---|---|---|---|
| **General** | | | | | | | |
| **Name** | Main | **Number** | 1 | **Type** | OB | **Language** | FBD |
| **Numbering** | Automatic | | | | | | |
| **Information** | | | | | | | |
| **Title** | "Main Program Sweep (Cycle)" | **Author** | | **Comment** | | **Family** | |
| **Version** | 0.1 | **User-defined ID** | | | | | |

| Name | Data type | Default value | Comment |
|---|---|---|---|
| ▼ Input | | | |
| Initial_Call | Bool | | Initial call of this OB |
| Remanence | Bool | | =True, if remanent data are available |
| Temp | | | |
| Constant | | | |

## Network 1: Import FactoryIO handler




## Network 2: Import Tank Level Controller

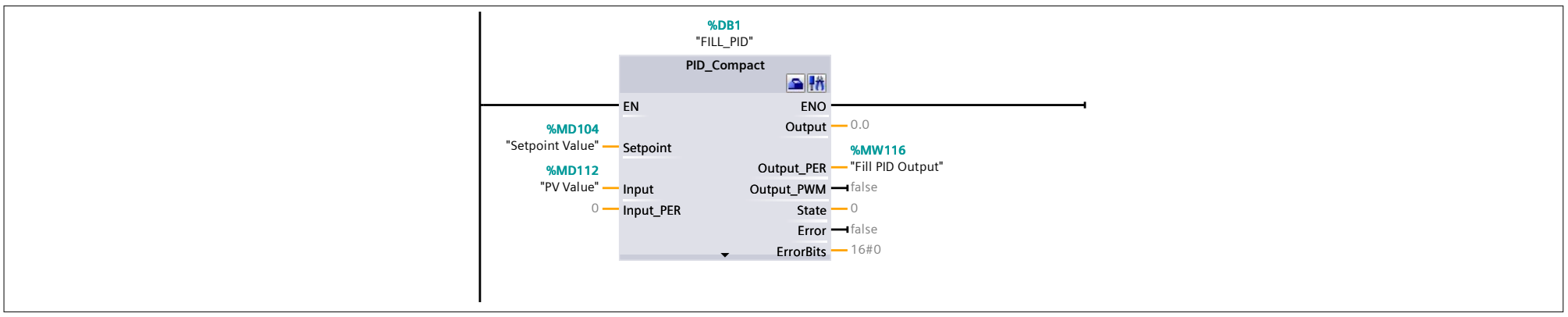
# PID Controllers [OB30]

| PID Controllers Properties | | | | | | | |
|---|---|---|---|---|---|---|---|
| **General** | | | | | | | |
| **Name** | PID Controllers | **Number** | 30 | **Type** | OB | **Language** | LAD |
| **Numbering** | Automatic | | | | | | |
| **Information** | | | | | | | |
| **Title** | PID Block | **Author** | | **Comment** | | **Family** | |
| **Version** | 0.1 | **User-defined ID** | | | | | |

| Name | Data type | Default value | Comment |
|---|---|---|---|
| Input | | | |
| Initial_Call | Bool | | Initial call of this OB |
| Event_Count | Int | | Events discarded |
| Temp | | | |
| Constant | | | |

## Network 1: PID to fill tank according to setpoint

NOTE: We modified several settings for this PID to work. Namely:
Controller type set to "Length", "Cm", and "Automatic"
Input changed from "Input_PER" to "Input"
Process value upper limit changed to 300.0cm
Integral action time changed from 20.0s to 0.0s
PID -> PI (we don't really need the derivative in this case)

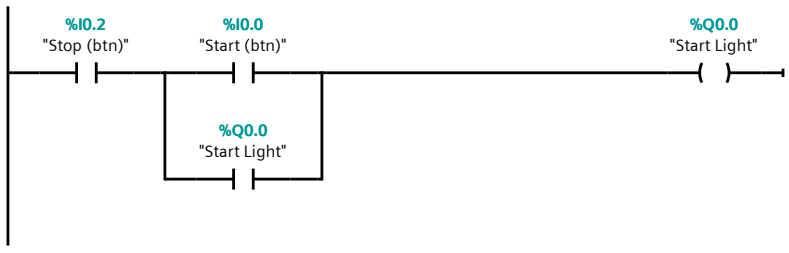


# Tank_Level_Control [FC1]

| Tank_Level_Control Properties | | | | | | | |
|---|---|---|---|---|---|---|---|
| **General** | | | | | | | |
| **Name** | Tank_Level_Control | **Number** | 1 | **Type** | FC | **Language** | LAD |
| **Numbering** | Automatic | | | | | | |
| **Information** | | | | | | | |
| **Title** | | **Author** | | **Comment** | Networks 1-6 handle starting, stopping and resetting the process.<br>Networks 7-9 manages our set point value and process variable value, which interact with a PID to handle how much voltage is sent to the fill valve. | **Family** | |
| **Version** | 0.1 | **User-defined ID** | | | | | |

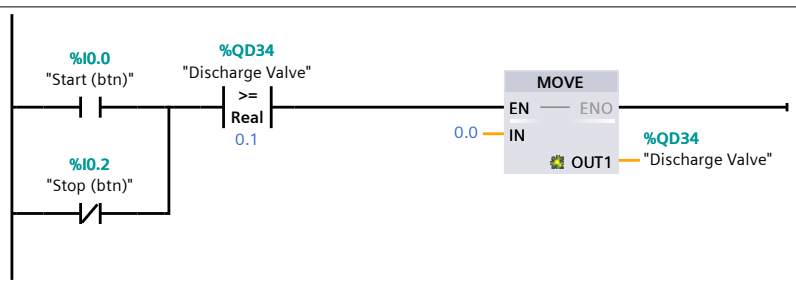
| Name | Data type | Default value | Comment |
|---|---|---|---|
| Input | | | |
| Output | | | |
| InOut | | | |
| Temp | | | |
| Constant | | | |
| ▼ Return | | | |
| Tank_Level_Control | Void | | |

## Network 1: Start process

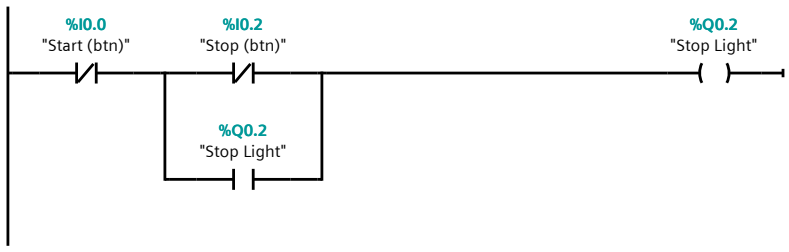



## Network 2: Turn off discharge/drain valve

We'd be wasting water/chemicals if the discharge valve was on when starting the process. Additionally, we want to stop draining if the stop button is pressed.

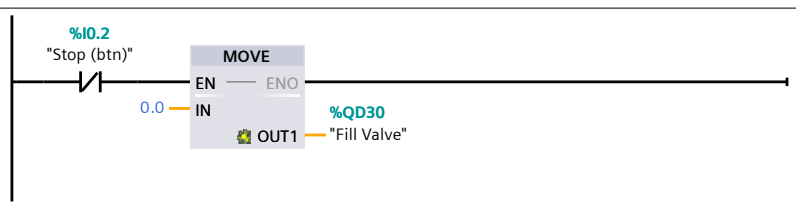



## Network 3: Stop process



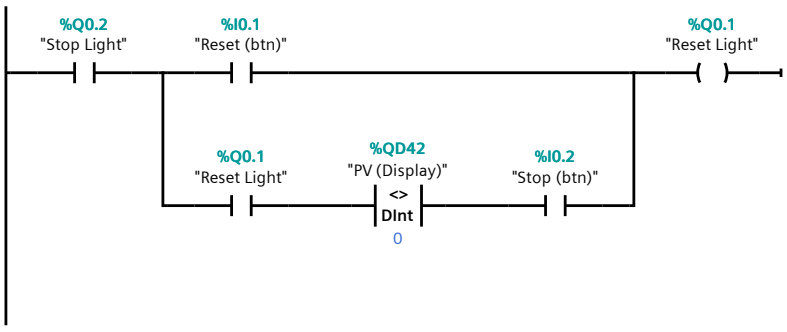

## Network 4: Turn off fill valve

We want to immediately stop filling given operator intervention



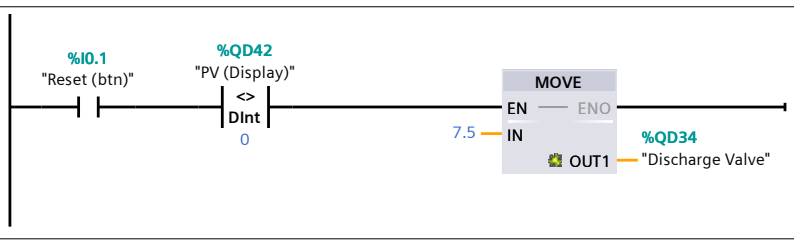

## Network 5: Reset process

<> 0 so the reset light turns off once the tank is fully drained, or the stop button is pressed



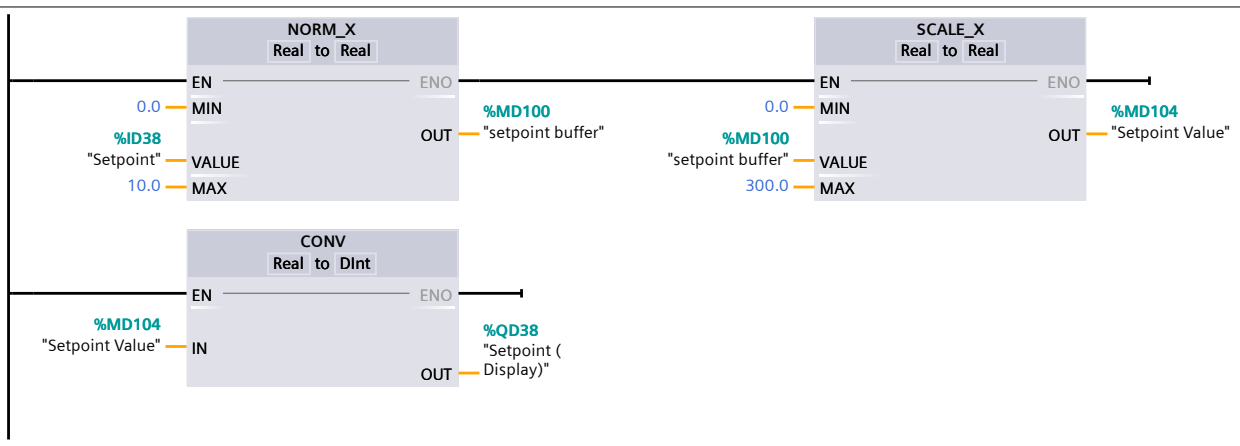

### Network 6: Turn on discharge/drain valve

In the real world, we'd send in a raw integer value for the analog signal (0-27648 for SIMATIC PLCs, meaning 20736 in this case), but FactoryIO direct, 0-10V values only



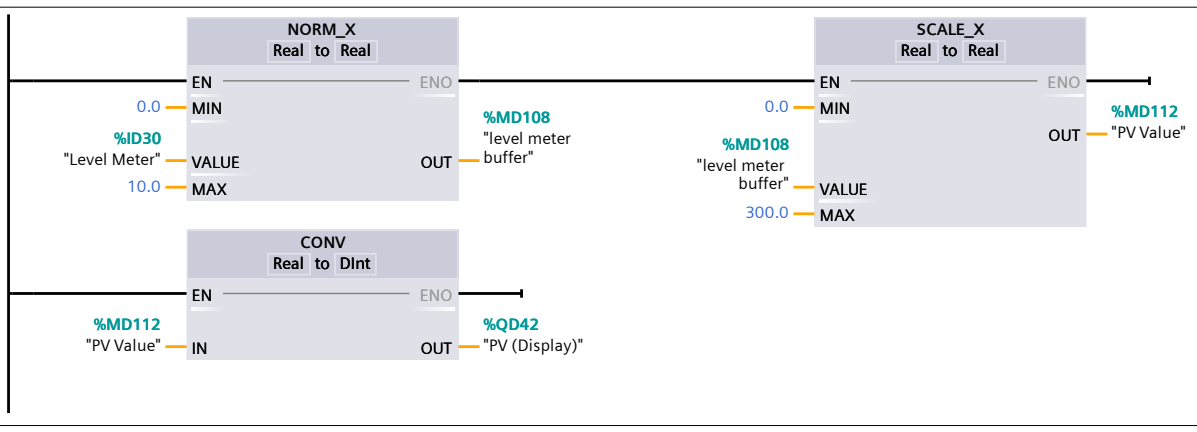

### Network 7: Transfers Setpoint Potentiometer value to Setpoint Display on OIT

NORM_X: Potentiometer is analog and goes from [0.0V, 10.0V]
SCALE_X: Tank level is from [0.0cm, 300.0cm]. (Setpoint Value is also used within our PID)
CONV: Converts setpoint value from REAL to DINT for the Setpoint display on OIT




### Network 8: Transfers Level Meter value to PV Display on OIT

NORM_X: Level Meter is analog and goes from [0.0V, 10.0V]
SCALE_X: Tank level is (again) from [0.0cm, 300.0cm], (PV Value is also used within our PID)
CONV: Converts PV (process variable, or basically tank level value) from REAL to DINT for the PV display on OIT




### Network 9: Transfers PID output to Fill Valve

NORM_X: PID output goes from [0.0,27648.0]
MAX is 27648 because that's the maximum raw integer conversion for analog output for SIMATIC systems (which corresponds to 10V)
SCALE_X: In the real world the valve would be able to take a [0.0,27648.0] value, but in FactoryIO it requires the output to be to 0-10V.
We only want this to happen (i.e., the fill valve to start) if the process has been started by the operator.