# Practice work №9
## Working with LD (Ladder Diagram) and FBD languages. Solving of the combined tasks.

**Task 1.** Create the program for switching on the "lamp", when the "button" is pressed in LD language.

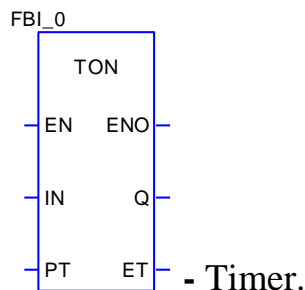For solving this task use the following components:

⊣⊢ - normally opened contact;

⊣( )⊢ - coil.

**Task 2.** Create the following program. When the "button" is pressed start to working TIMER (TON), after 5 seconds the "lamp" will switched on. Use the LD and FBD languages.

For solving this task use the following components:

⊣⊢ - normally opened contact;

⊣( )⊢ - coil;

FBI_0

```
        TON
  ─┤ EN    ENO ├─
  ─┤ IN      Q ├─
  ─┤ PT     ET ├─
```
**- Timer.**

**Task 3.** Create the program for demonstration of the 3 multiply blocks working. They incremented the values of the variables with the different input conditions.
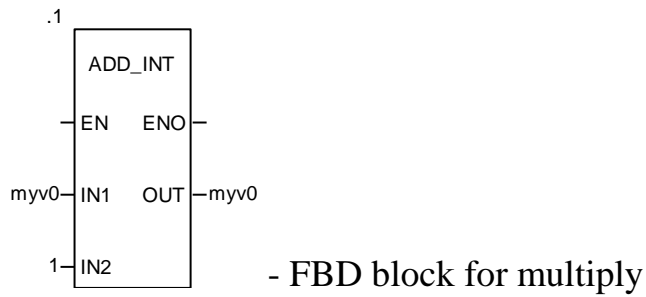
For solving this task use the following components:

**%S -** system bit for normally opened contact;

**%M0** - variable in memory PLC;

**myv0, myv1, myv2** - integer variable;

**mybit1** - ebool (address %M20);

⊣(P)⊢ - positive transition session coil;

.1

ADD_INT

EN  ENO

myv0 — IN1  OUT — myv0

1 — IN2

- FBD block for multiply

It is possible to working with physical address in case of working with the system bits.
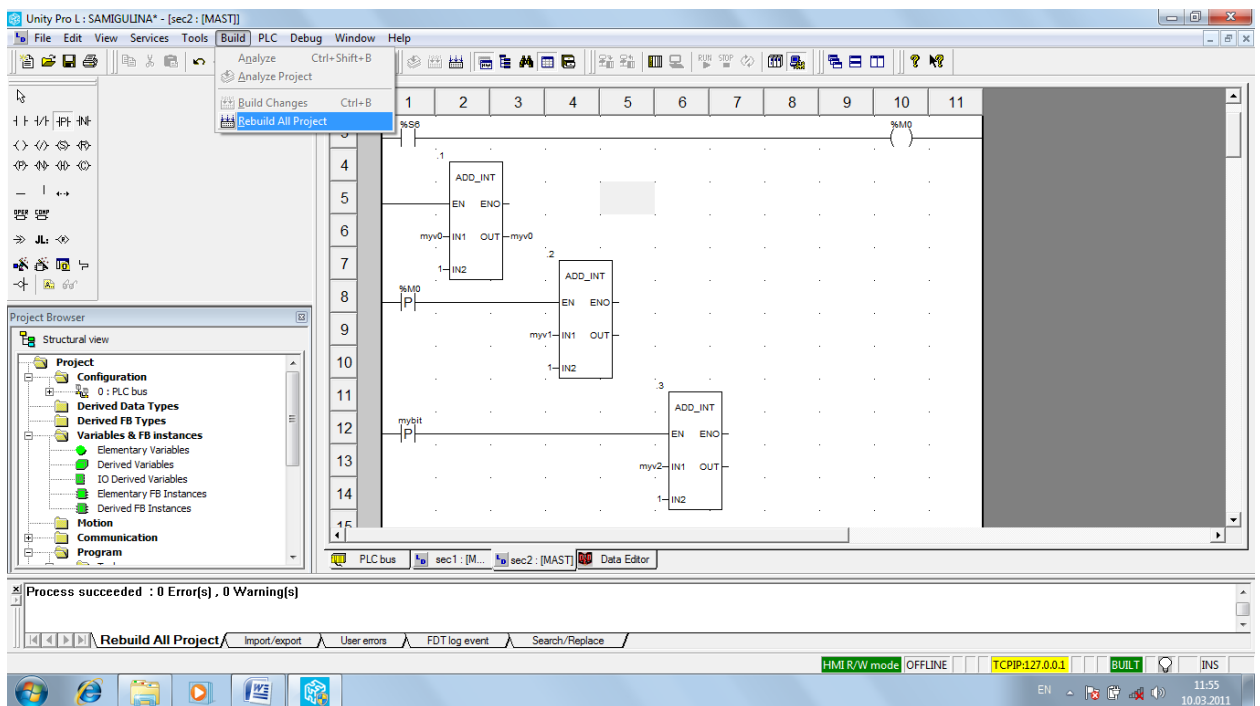


Figure 1 - Unity Pro realization

Animation tables results presented below.



| Name | Value | Type |
|------|-------|------|
| myv0 | 1280 | INT |
| myv1 | 0 | INT |
| myv2 | 0 | INT |
| %S6 | 0 | BOOL |
| %M0 | 0 | EBOOL |
| mybit | 0 | EBOOL |

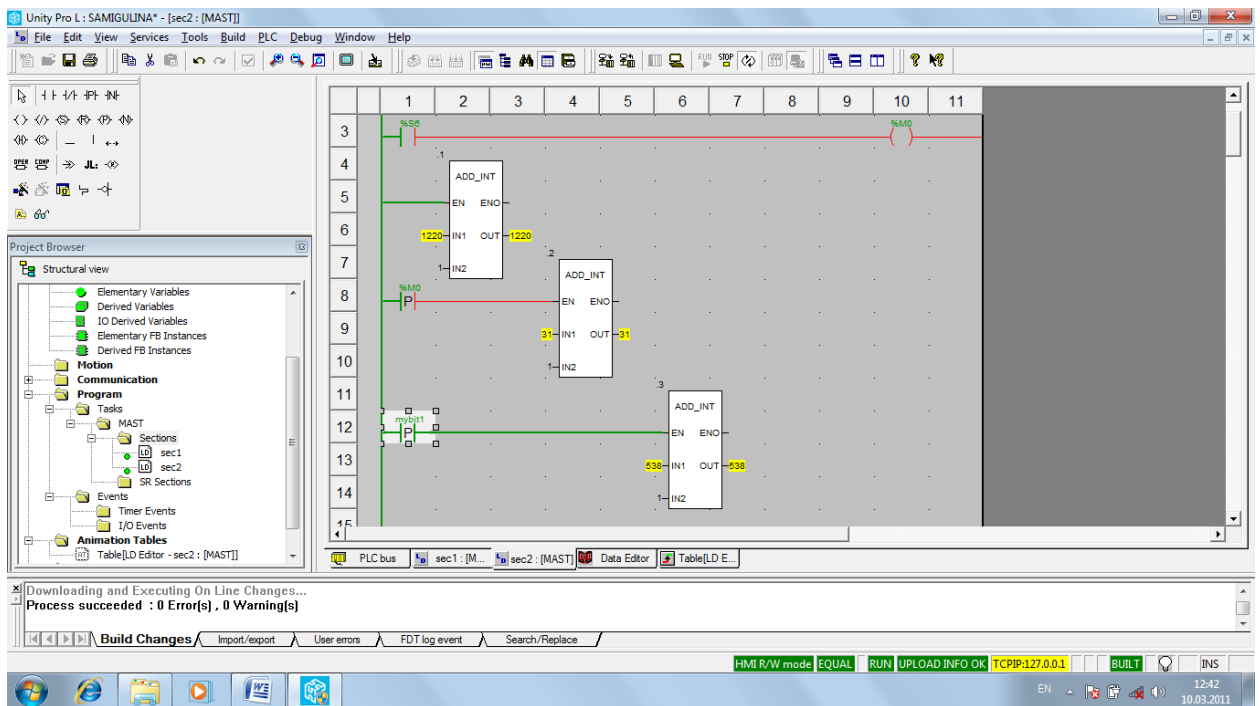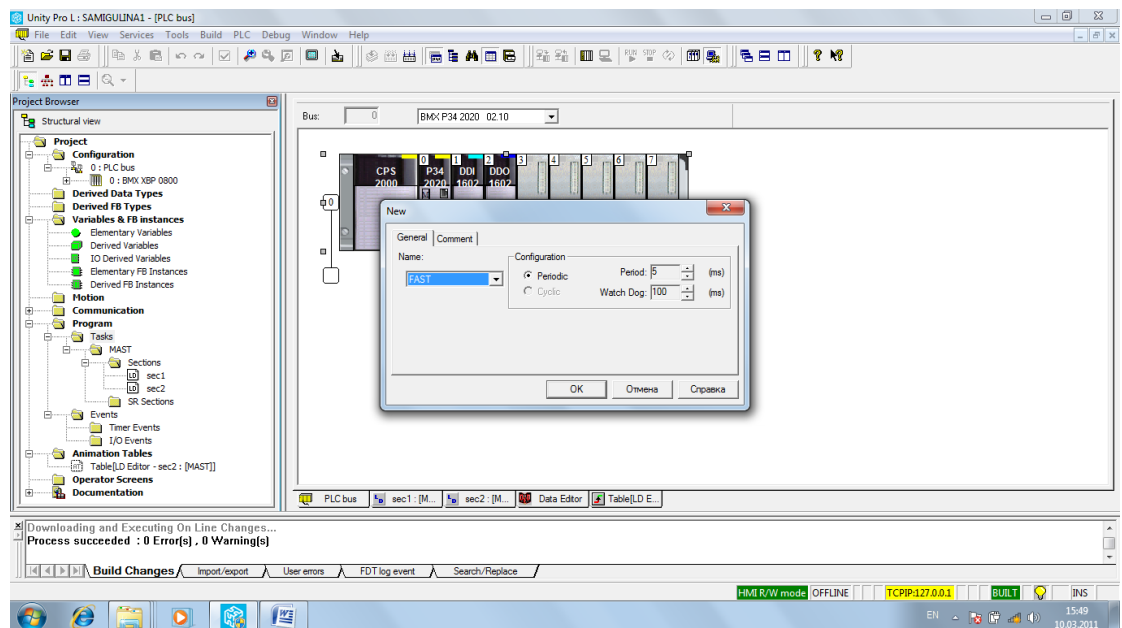Figure 2 show the final working of the program.

Figure 2 - Unity Pro realization

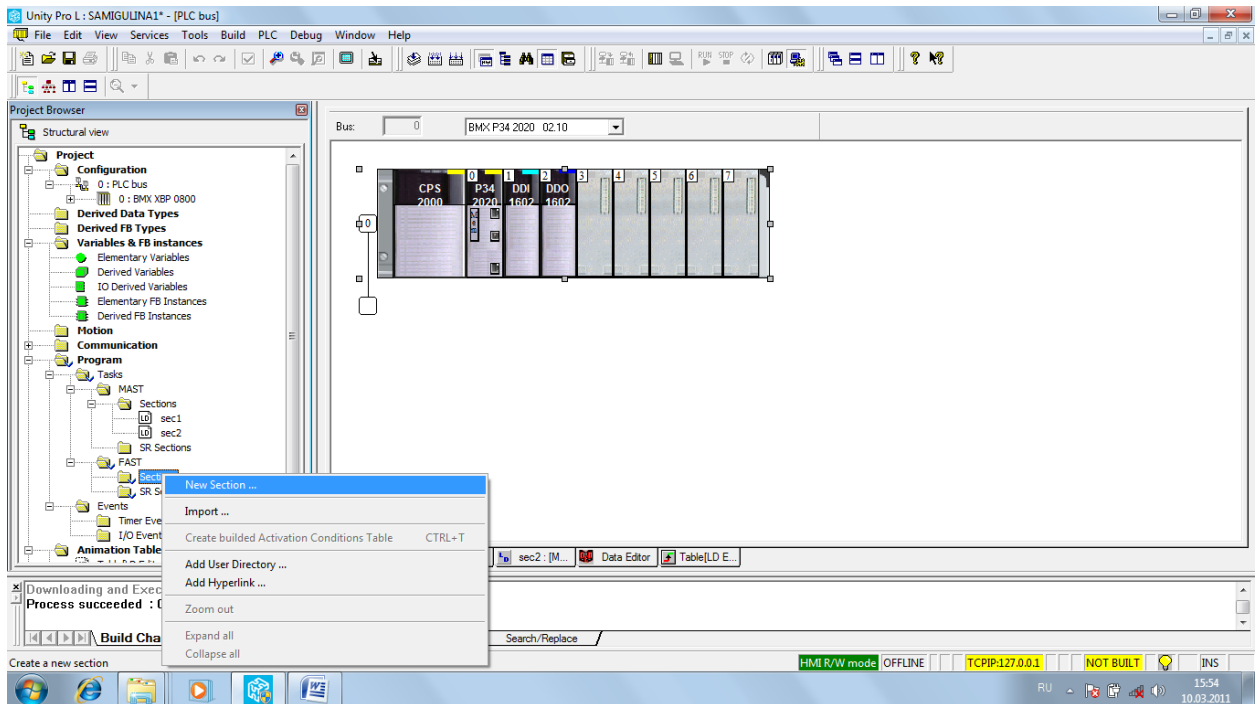**Task 4.** Configuring FAST task, which implements the addition operation.

**Please create the program usage the following steps.**

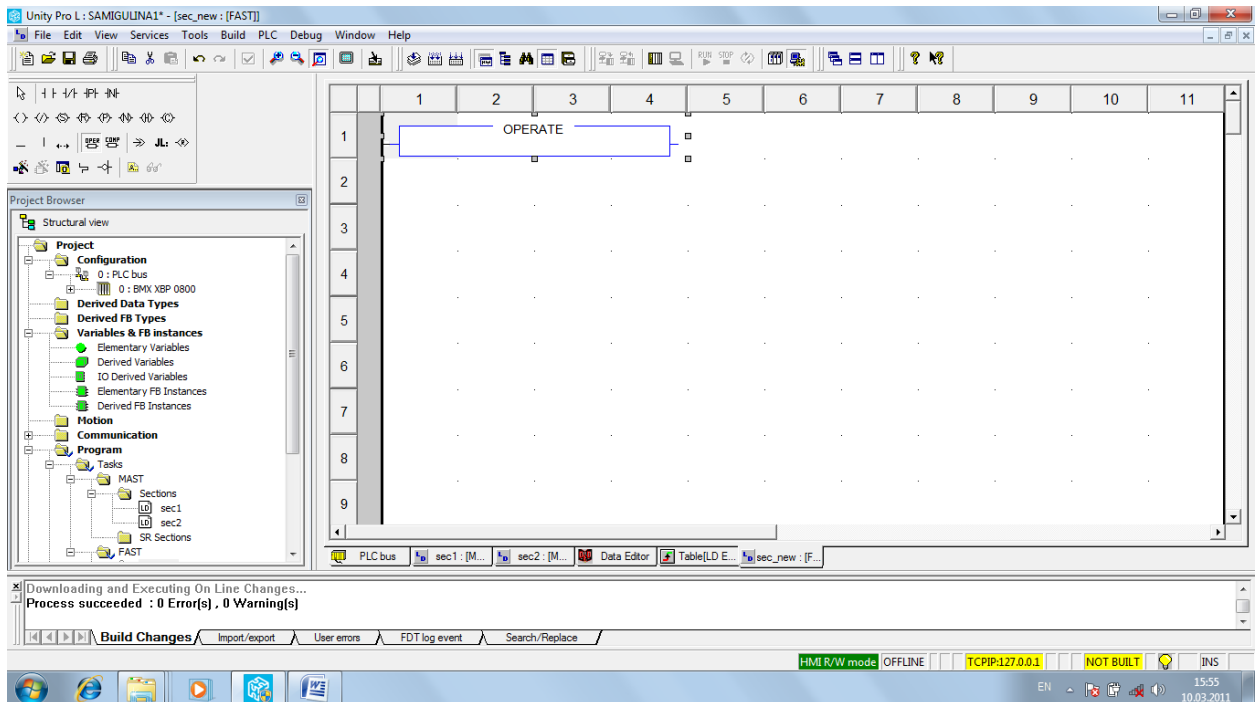STEP 1. Creation the new FAST task in the TASK section. Specified period of time.



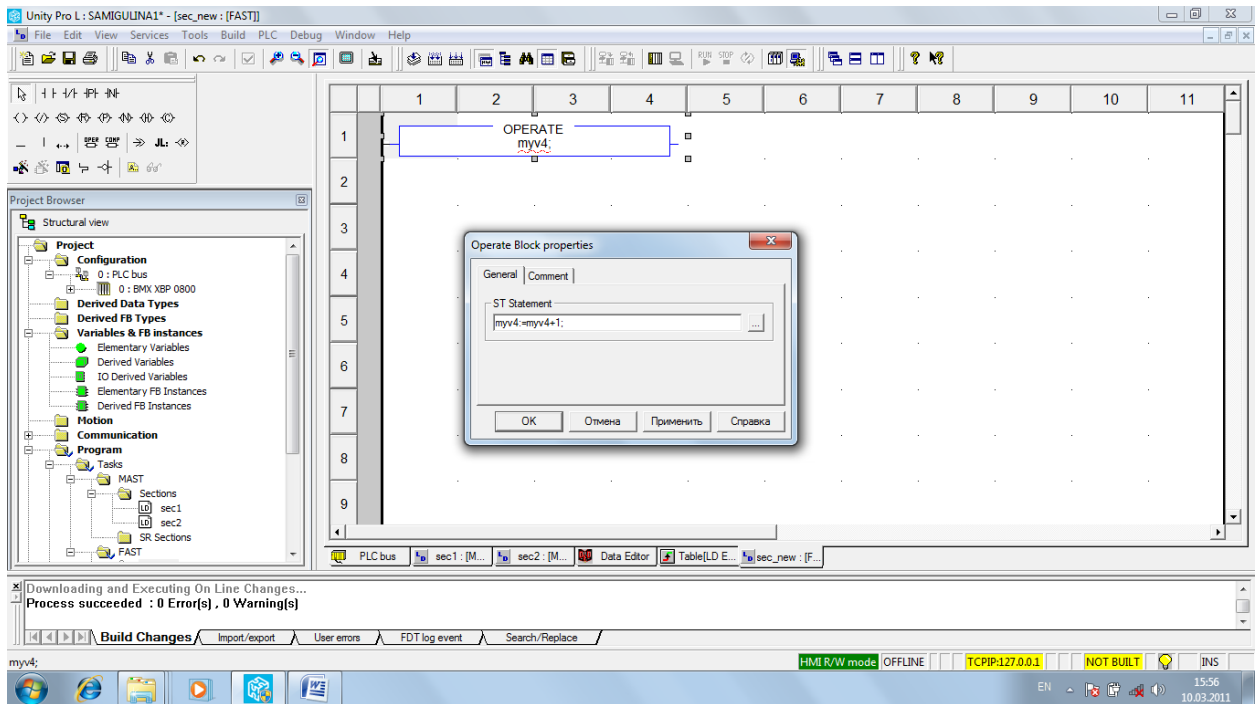STEP 2. Looking at the properties of the FAST task. The period of 20 ms is set manually.

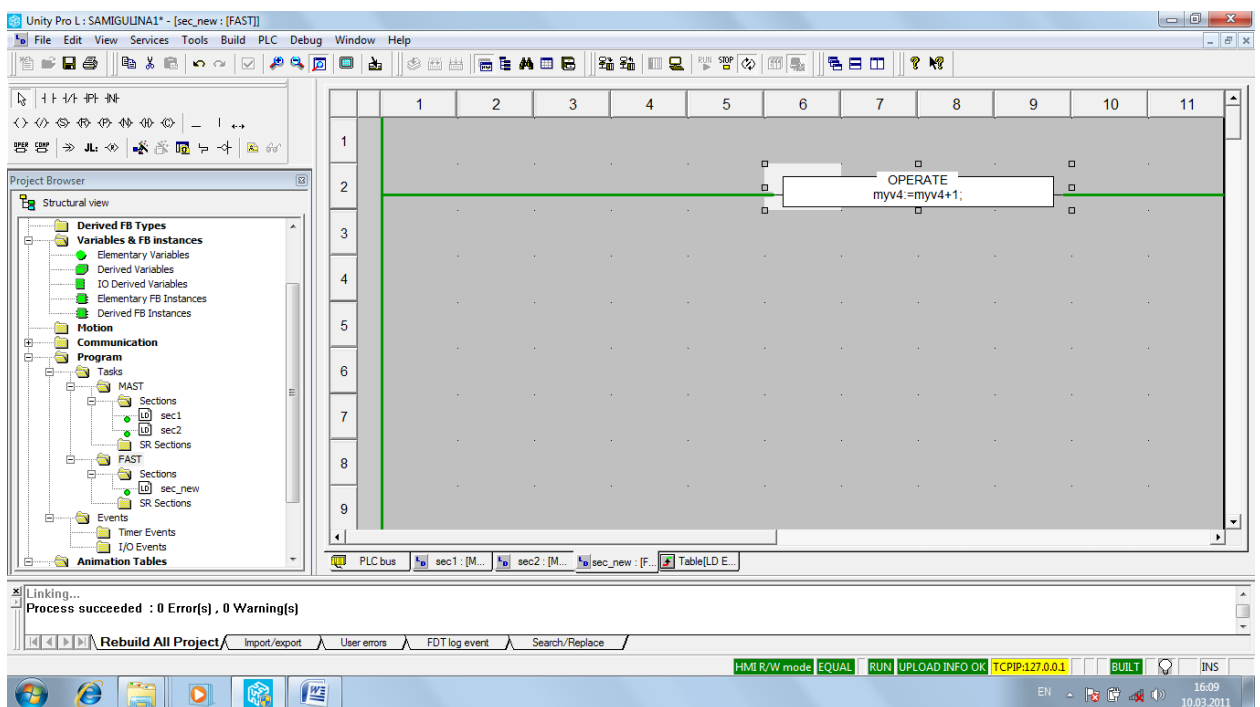STEP 3. Creation the new Section in the FAST task.



STEP 4. Creating a window fast program. Replace the block OPERATE in the workspace of LD editor.



STEP 5. Into the block write an expression. Pre-creating usage variables in the data editor.

STEP 6. Start the program. Perform quick tasks in the animation table. Task is created with a period of 20ms.



STEP 7. In the configuration of PLC, open the properties of the CPU. Tab ANIMATION. In this tab possible to stop and start the task and as a results in the animation table will stop or start the task.
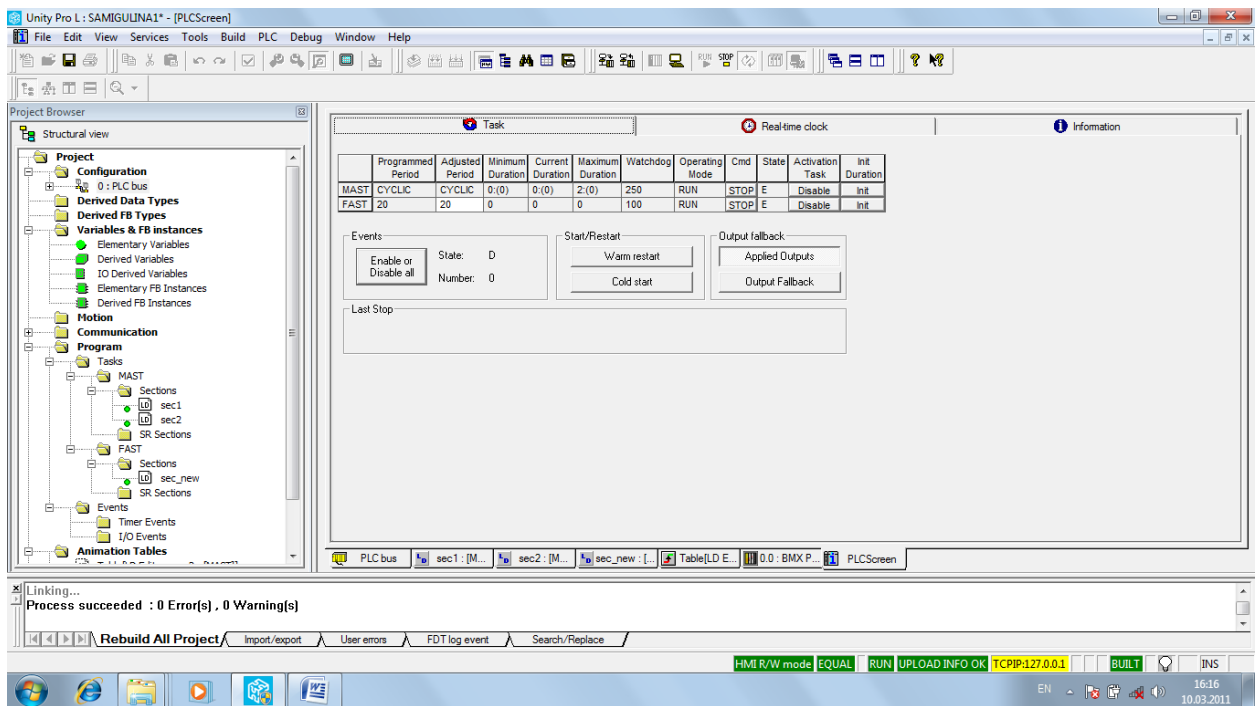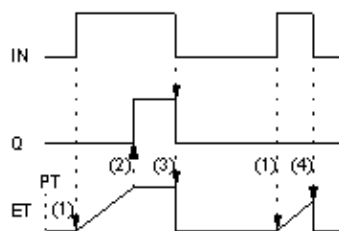
It is possible to change the display format of data results by changing the properties of the display format.


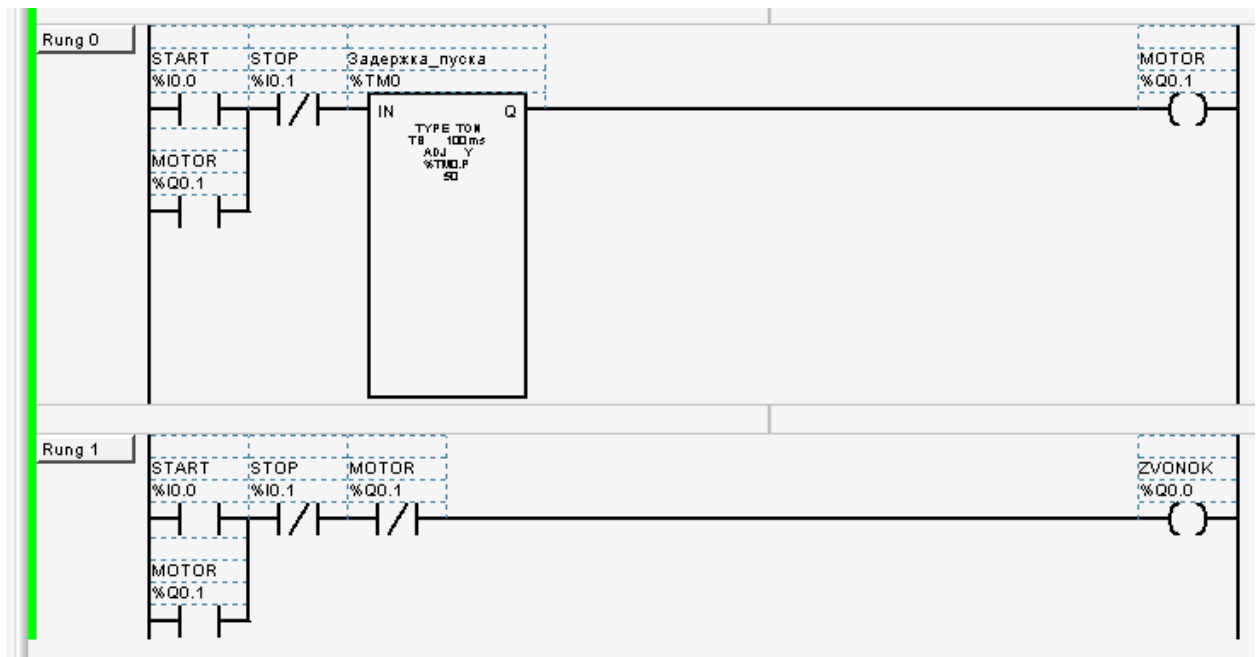**Task 5.** Example of the program for control the starting and stopping the engine.
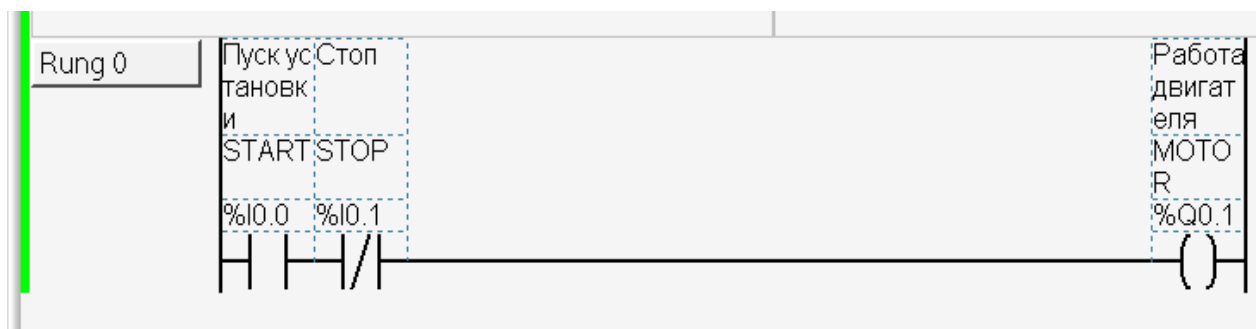


**Task 6.** Example of the delay for starting the motor working.

Representation of the ON delay TON:



**(1)** If IN becomes "1", the internal time (ET) starts.
**(2)** If the internal time reaches the value of PT, Q becomes "1".
**(3)** If IN becomes "0", Q becomes "0" and the internal time is stopped/reset.
**(4)** If IN becomes "0" before the internal time has reached the value of PT, the internal time stops/resets without Q going to "1".

**Task 7.** Example of the impulse generation.
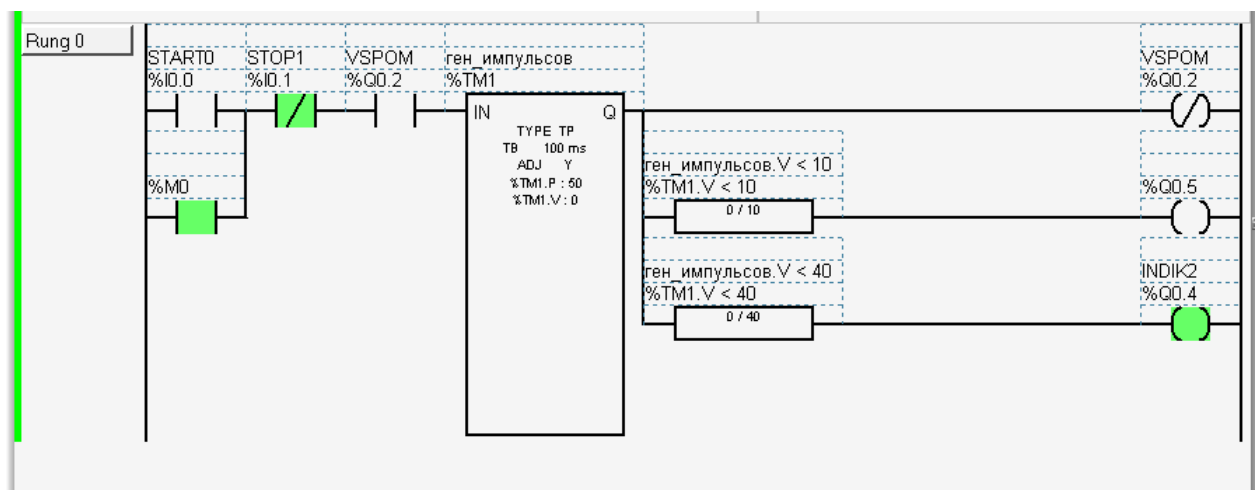


**Task 8.** Develop the project pump working.

**1 part.** Create a program to control the pump system, the liquid is poured from the vessel. Flow of fluid into the container is independent of the control system. Control object - Capacity - has discrete sensor **NU** lower level and upper level sensor **VU** (sensor is in the closed position when the fluid exceeds the sensor level). Command of the control system carries out by relay pump motor startup Motor.
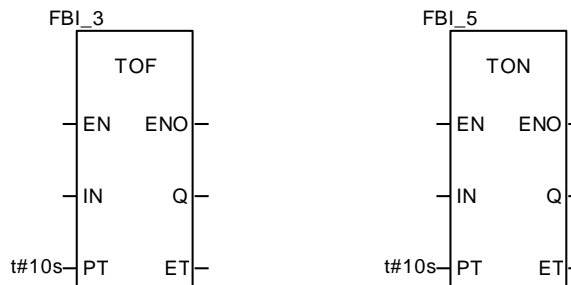
**2 part.** It is necessary to activate the pump with the time delay 10 s after the upper sensor will be 1, and deactivate the pump, when the liquid will be below of the low-level.

**REMARK in Russian:**

1 часть. Составить программу для системы управления насосом, выливающим жидкость из емкости. Поступление жидкости в емкость происходит независимо от системы управления. Объект управления – емкость – имеет дискретные датчик нижнего уровня NU и датчик верхнего уровня VU (датчик находится в замкнутом состоянии, когда жидкость превышает уровень датчика). Команду системы управления выполняет реле запуска двигателя насоса Motor.

2 часть. Требуется включить. насос с задержкой 10с после того, как сработал датчик верхнего уровня, и выключить его, как только жидкость будет находиться ниже уровня датчика нижнего уровня.

**For solve this task use the TON and TOF timers. Explain the differences.**