DAJO Solutions

Developing and exploiting machine intelligence

CODESYS Beginners Tutorial

Getting started with CODESYS

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Introduction

This tutorial is designed for aspiring programmers who wish to learn more about industrial and physical computing using the open source platform; CODESYS.

More information about CODESYS can be gained from the Smart Software Solutions (3S) website www.codesys.com.

Objectives

In the course of this tutorial you will learn how to:

- Create and save new CODESYS projects
- Implement and control physical elements in a virtual environment
- Run virtual simulations to test your programme
- Have the confidence to further explore the programming environment

Prerequisites

There is no need for previously proven software development skills in order to successfully complete this tutorial. All that is required is a licenced (including a Demo licence) copy of CODESYS version 3.5 or higher, and basic computer literacy.

How to write your first program in XSoft – CODESYS 3

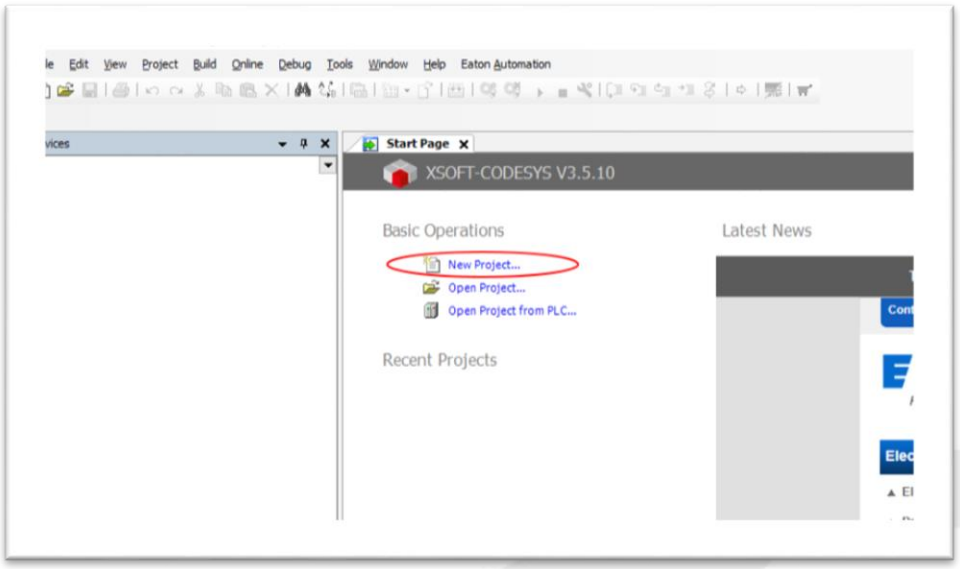
Step 1: Preparing the environment

A) Open the development environment (IDE)

Double click on the XSOFT icon to open the software.

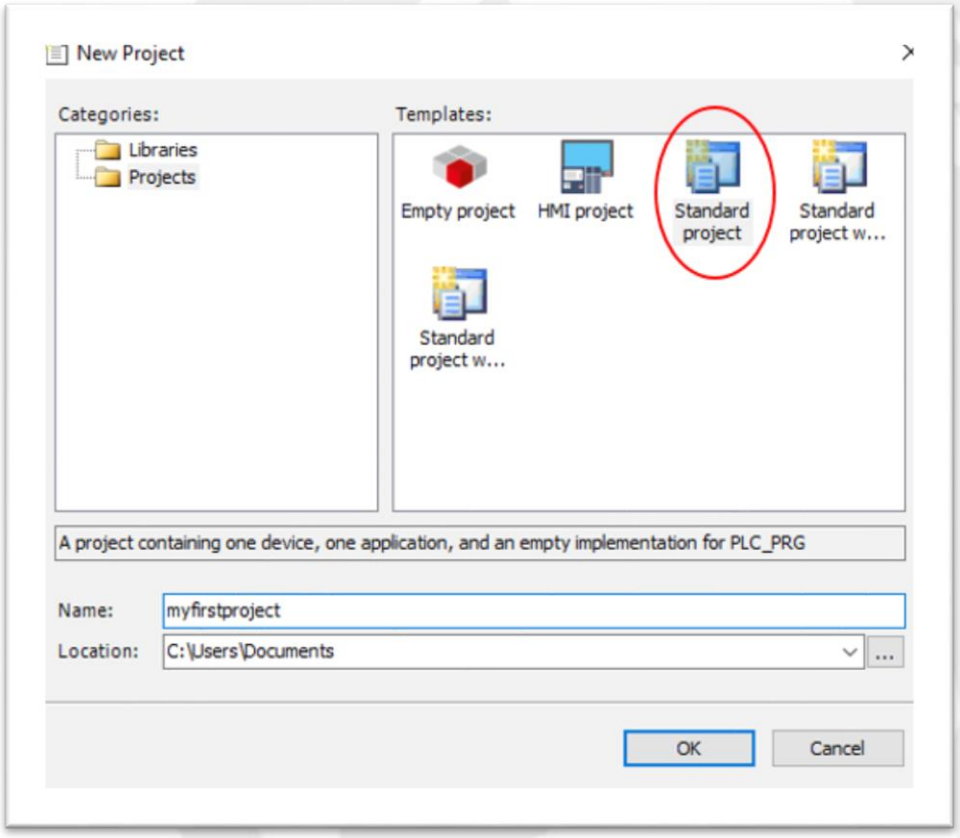
B) Create a new Project

Within the homepage of the application select New Project…



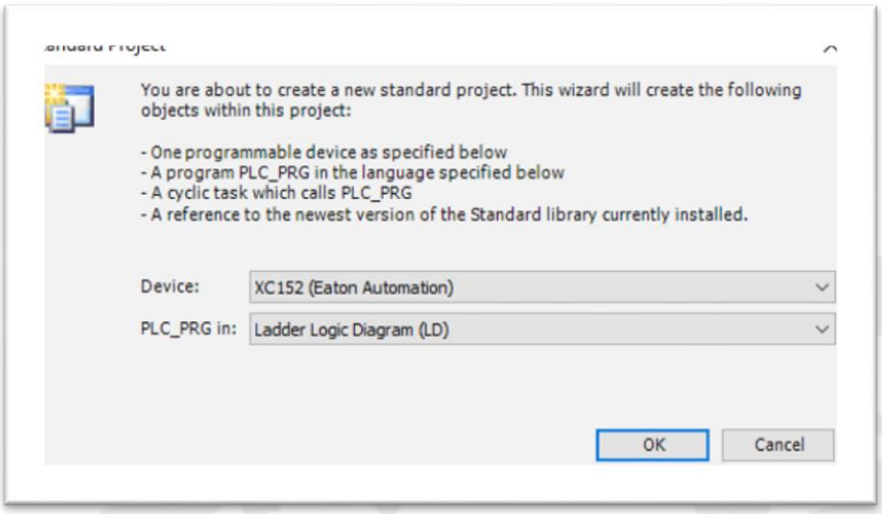
C) Identify the project

In the New Project pop up select 'Standard Project', then an appropriate folder location and finally give your project a name.



D) Set the Project device and language

Next, we need to select the hardware and the programming language to be used in the project. For the purpose of this tutorial we will use an Eaton XC152 PLC and Ladder Diagrams, although in the future thee options may vary depending on the application.

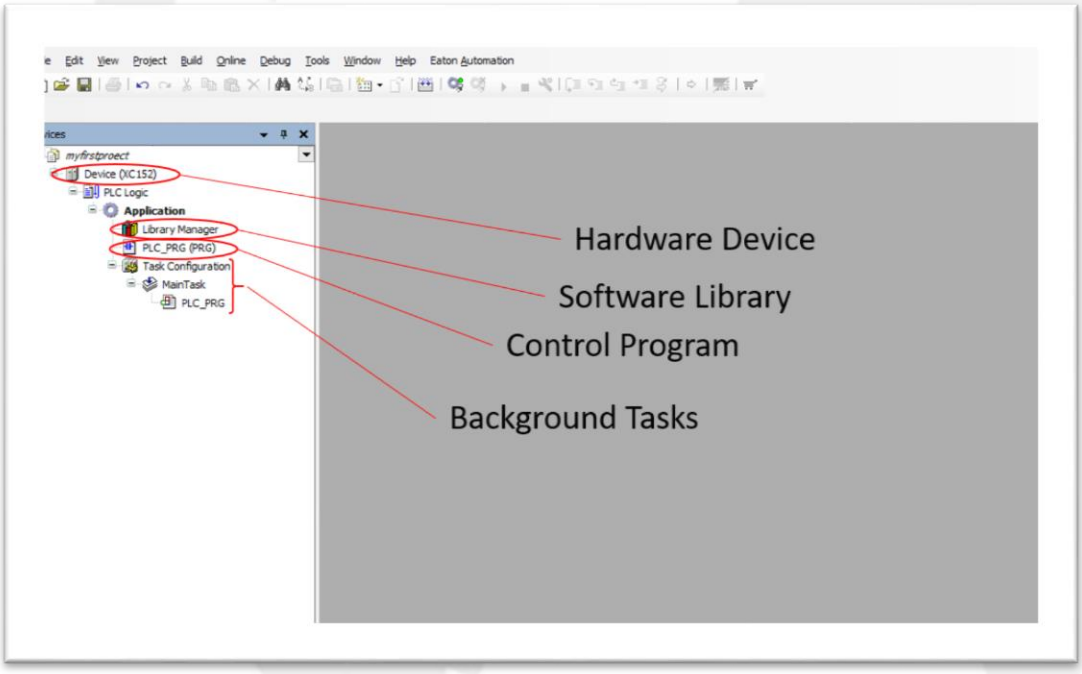


Step 2: Write the program

A) Open the project

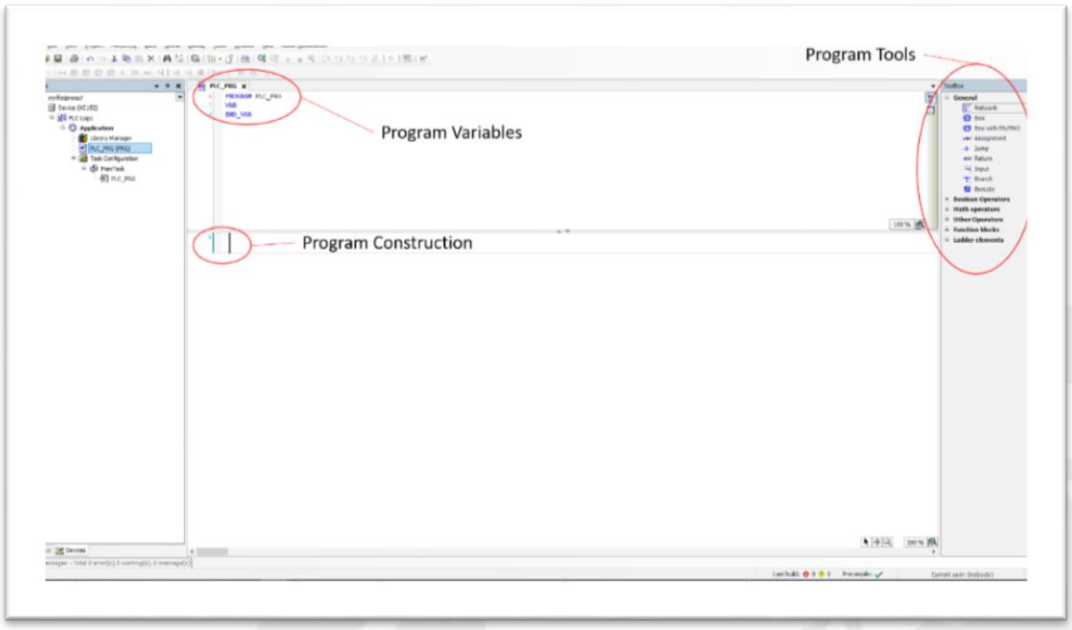
The project will open in an Integrated Development Environment. (IDE)

In this initial screen there are a number of key things to note. The menu bar on the left gives easy access to everything needed to create your program. From your earlier selections in 1D (Select the program device and language) it has remembered your preferences and has listed only the headings appropriate to this application.



B) Select PLC_PRG (PRG)

PLC_PRG(PRG) is the default name for all programs, you can easily update this by right clicking it, and then selecting 'Refactoring'.



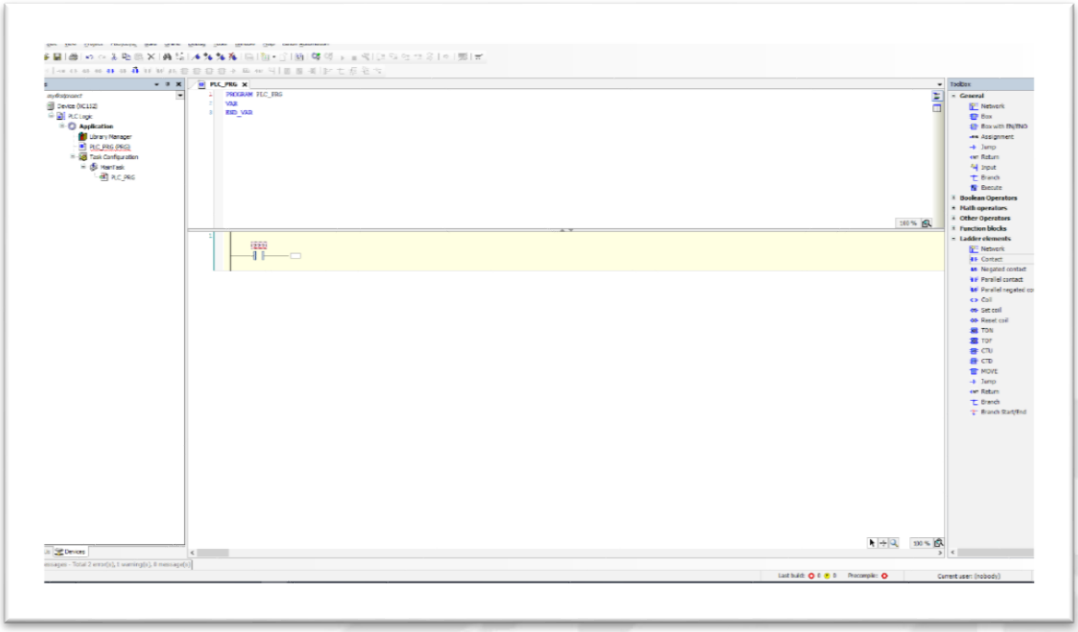
To develop the program there are three important areas. Firstly, the bottom middle section of the page where the program is constructed. Above this there is a section to detail the program variables. Lastly, to the right are the program tools which you will use to write the program.

C) Write the program

We are going to generate a simple program that turns on a light. In order to do this we firstly need a button.

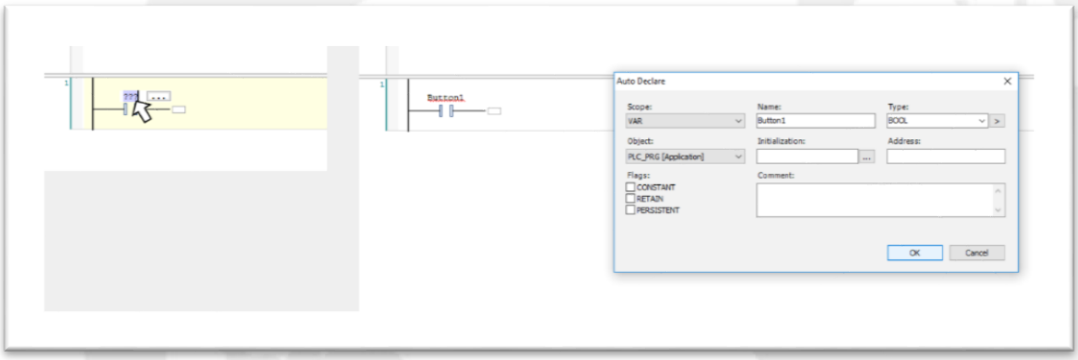
From the toolbox on the right, select 'Ladder Elements' at the bottom of the list, this will open a sub menu of elements. From here drag and drop 'Contact' onto the 'Start Here' icon which will appear in the program construction area once you pick up the 'Contact' element.

Once dropped, you will end up with something that looks like this:

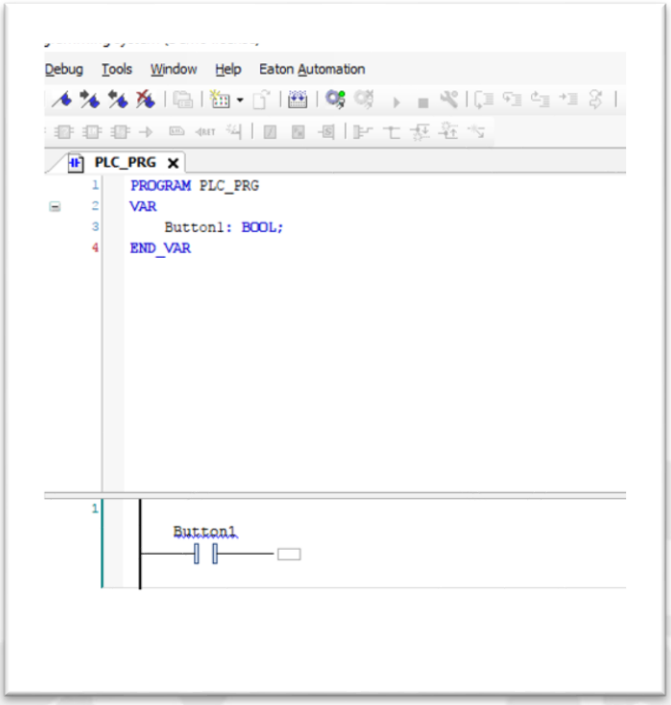


D) Name the Contact

Without a name, CODESYS callsany element '???'. Clicking this will allow you to replace it with something appropriate to the application. When you press return a dialogue box will open with further details of the element. Press OK.

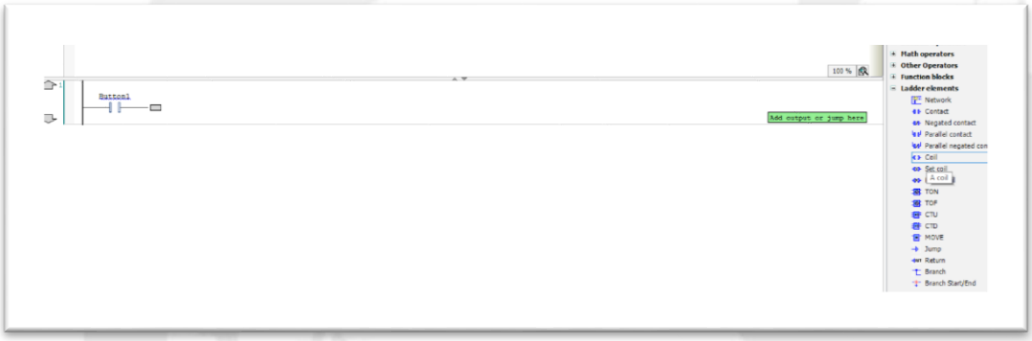


You will also see at this point that the variables for the button have automatically been added to the program variables section.

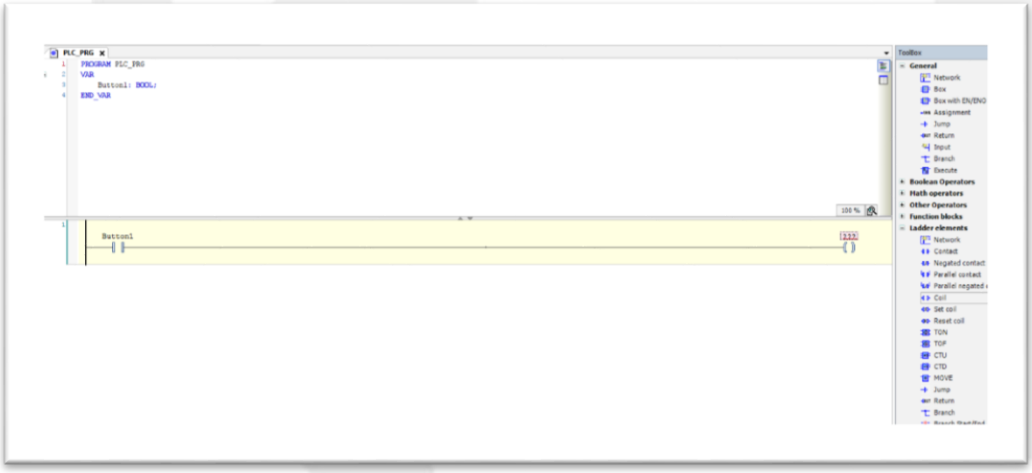


E) Add a coil to the program

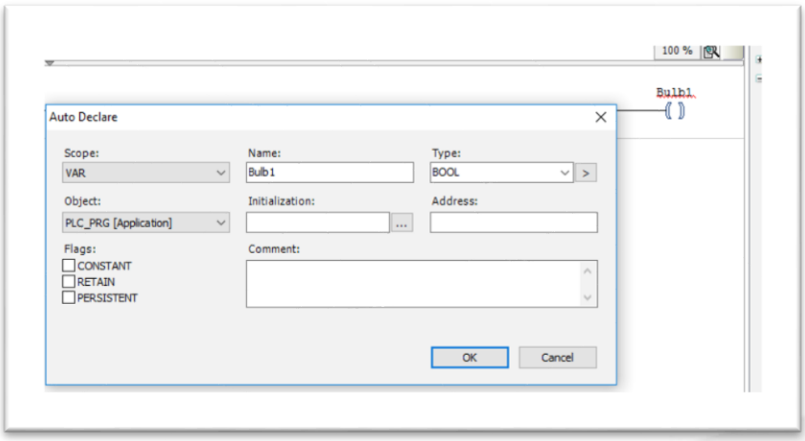
Just as we need an input to activate the program, we need an output to do something once activation has occurred. From the Ladder Elements menu drag and drop a 'Coil' element onto the end of the Contact, 'Button1'. Just like last time, as soon as you pick up the coil the program will react.



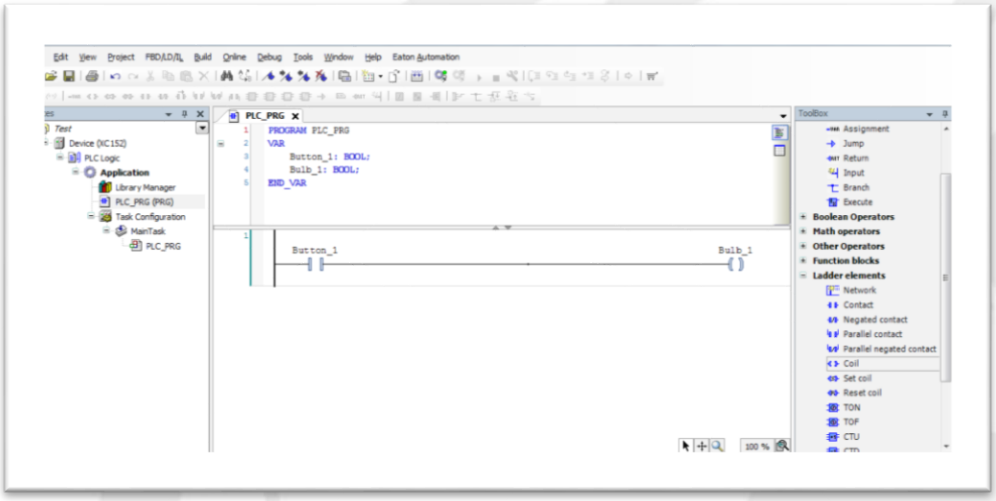
When the coil is dropped into place correctly the program will look like this:



F) Name the coil



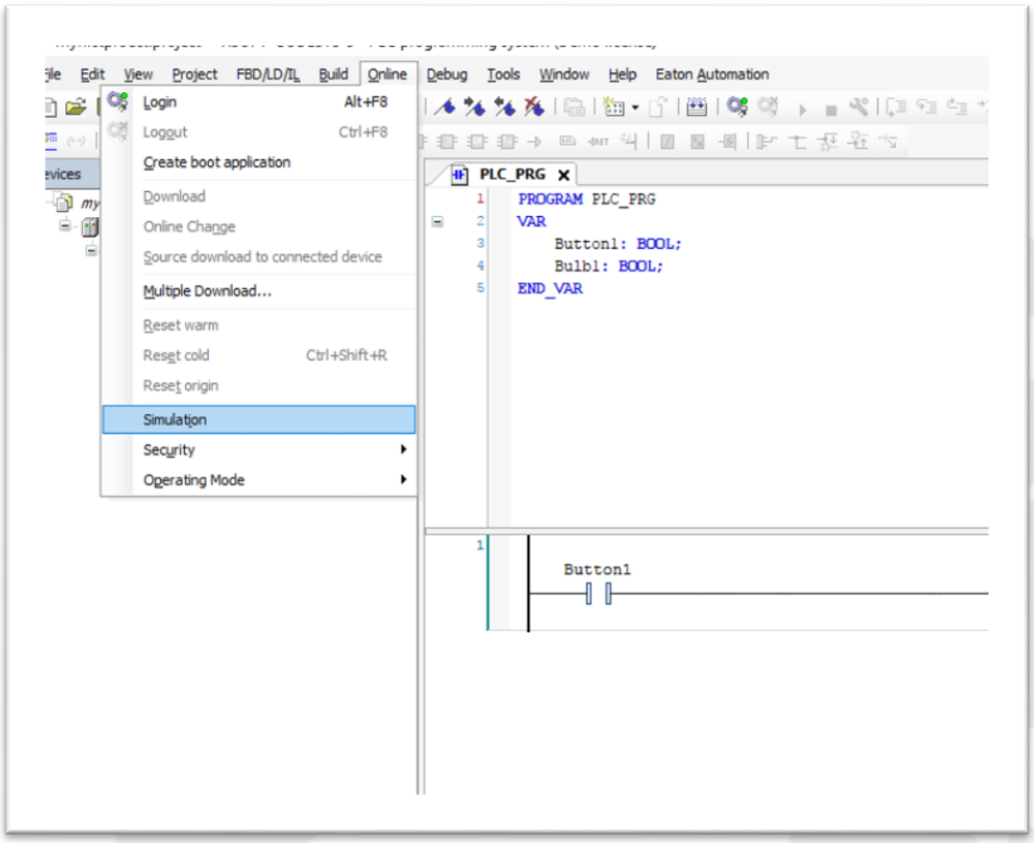
The program will automatically update all the relevant sections and will now look like this:



Step 3: Run this program

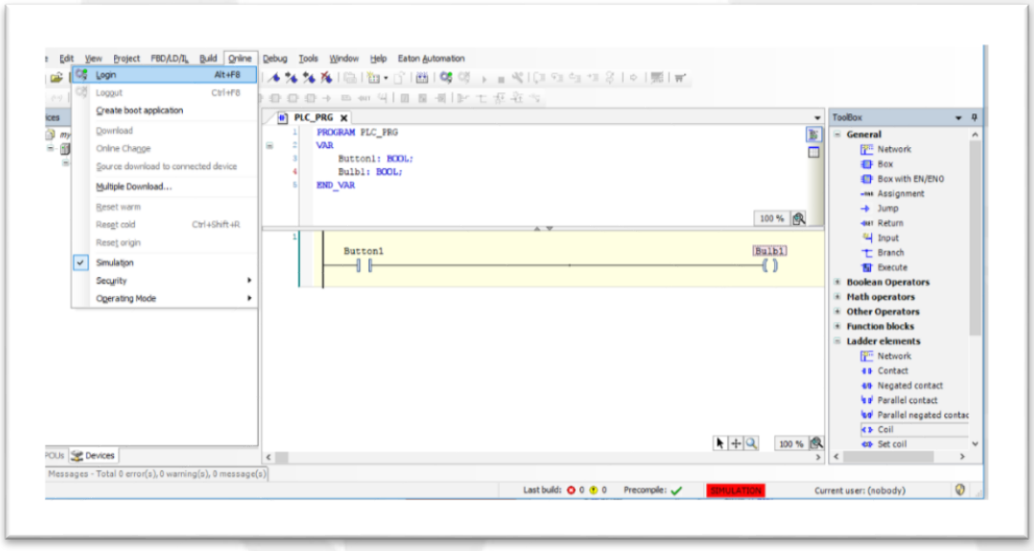
A) Enter Simulation mode

Without a PLC connected, you need to run the program in simulation mode. Click on Online, then Simulation to turn on simulation mode

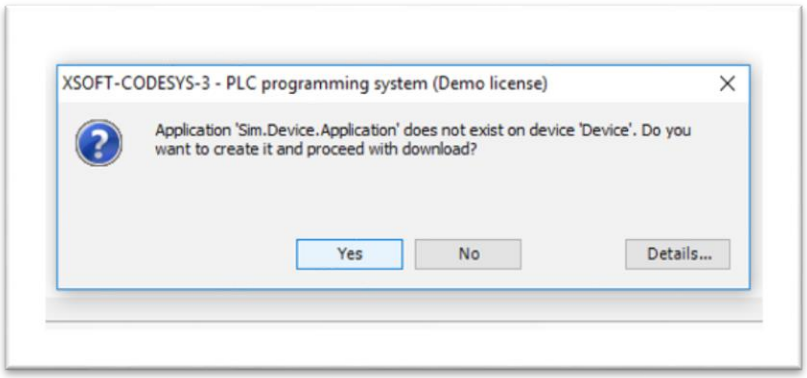


B) Once you are in simulation mode

Ensure that SIMULATION appears with a red highlight in the bottom right hand corner of the page. Then run the program by selecting Online, then Login.



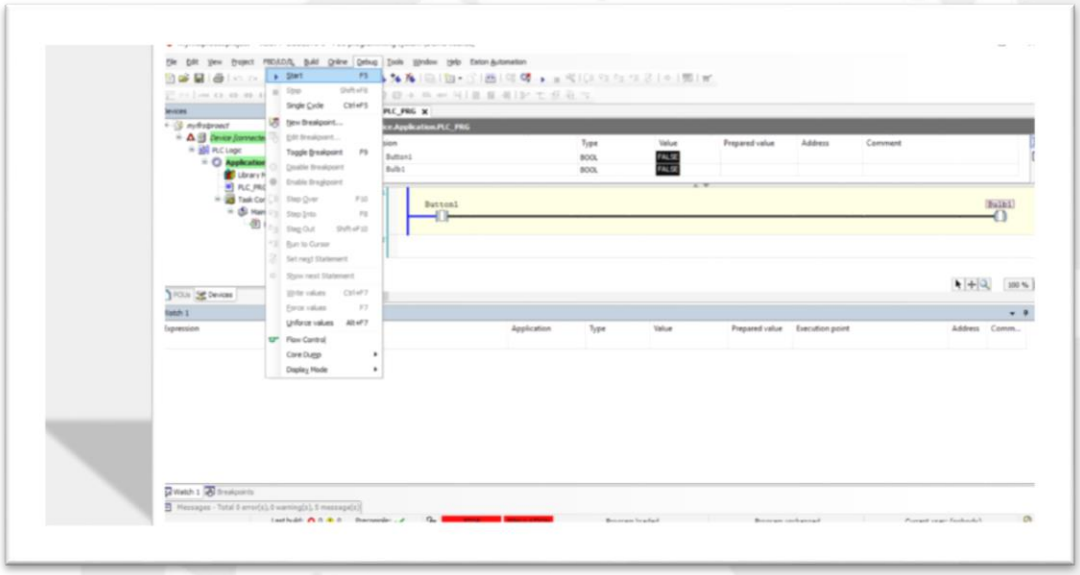
C) Create the application on the device



Download the program to simulation mode by selecting Yes in the dialogue box.

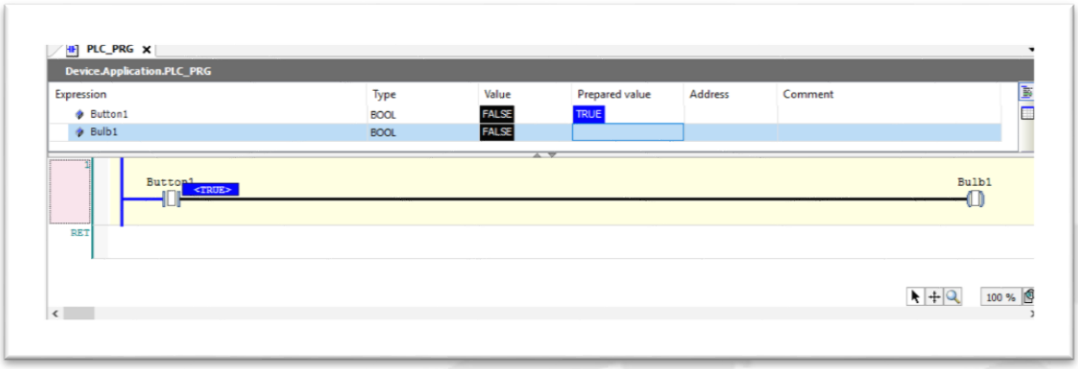
D) Run the simulation.

Click debug, then Start

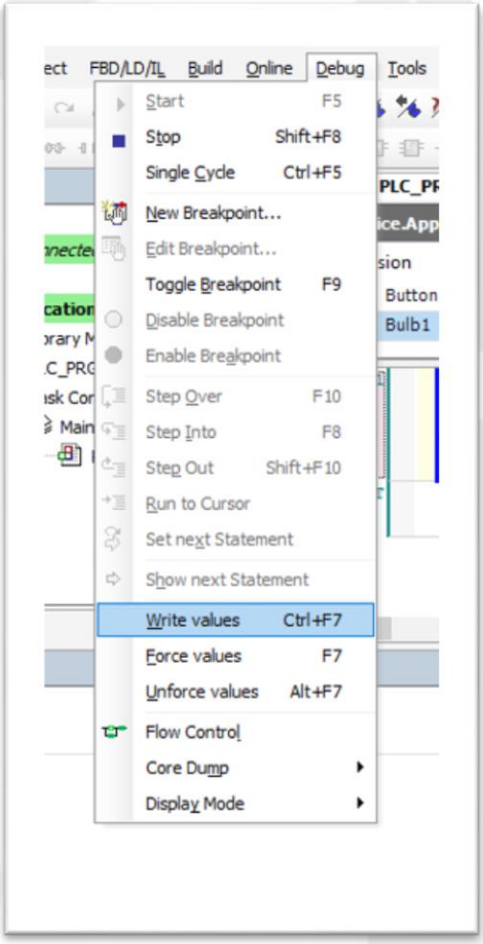


E) Manipulate the values

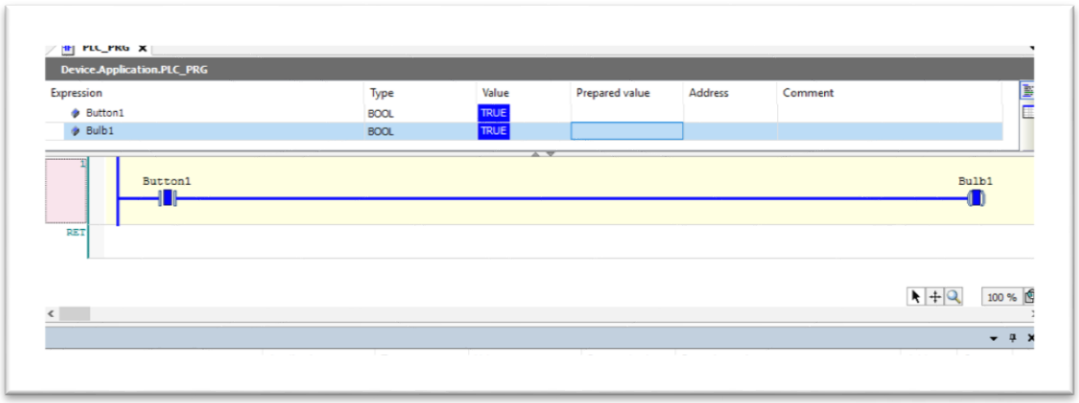
Once the program is running in simulation mode, you can simulate the inputs and outputs. To do this, click on the prepared values cell of the element you want to manipulate. This will toggle it through the possible options for that element. In this case, TRUE, FALSE, or blank.



Try Clicking in the “prepared value” column in front of the “Button_1” tag. this will change the value to “TRUE”. Now write the value by using menu Debug, then Write Value.



F) See how Button1 effects Bulb1



Turning Button1 on or off will have a corresponding effect on Bulb1. However, writing values to Bulb1 has no impact on either the button or the bbulb element. So when the “Button_1” contact is ON, it turns ON the “bulb_1” coil.

Conclusion

Obviously, using a PLC to turn a lightbulb on or off would in many instances be considered to be an over engineered solution. But it does help answer the important question:

> *How many software engineers does it take to change a lightbulb?*

This little project does capture some of the essential elements of developing a PLC program for a physical or even industrial application and we will build on this in our next tutorial: Using COSESYS to program an industrial device.