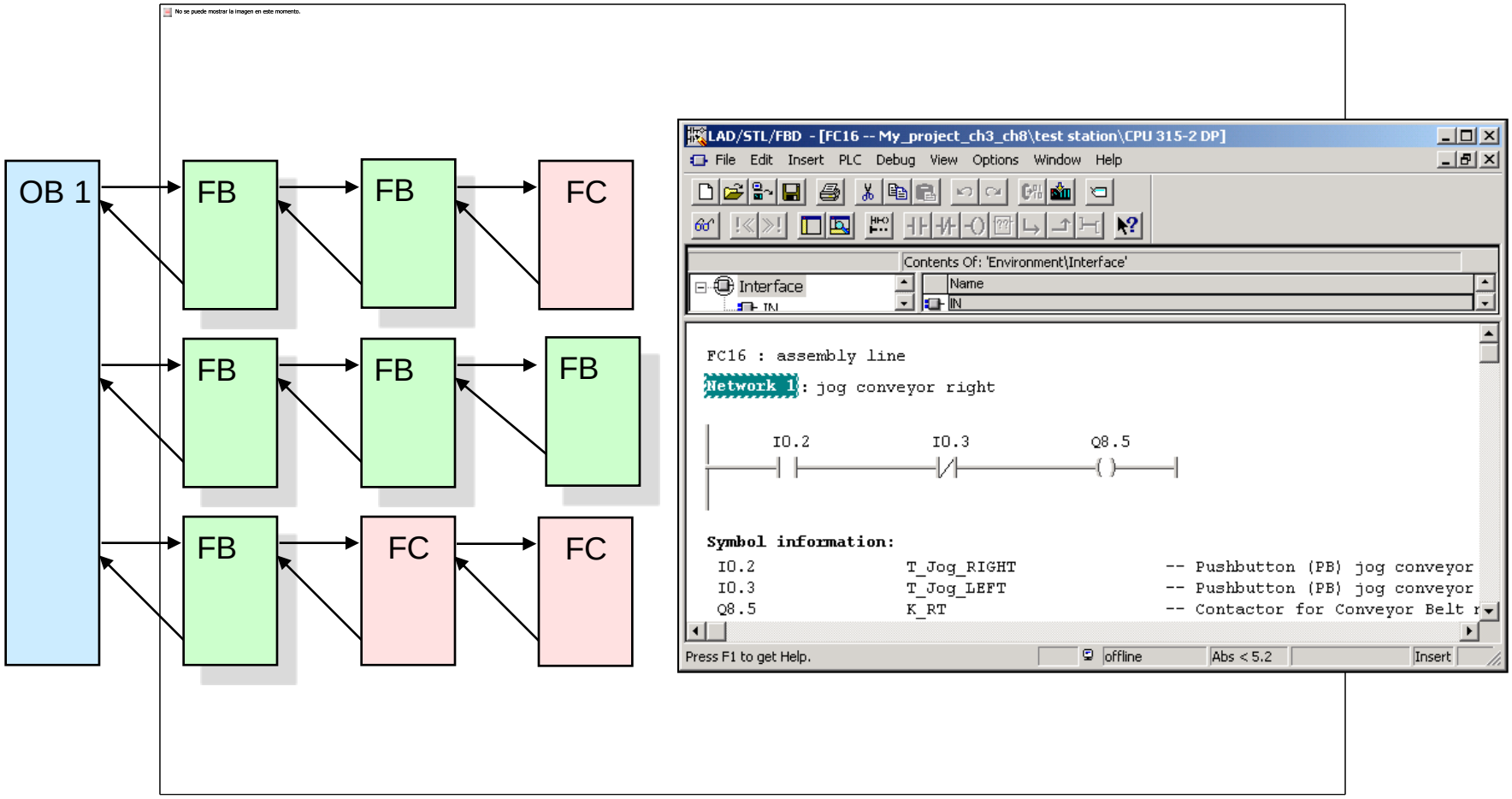
Block Architecture and the LAD / STL / FBD Editor



Objectives

Upon completion of this chapter the participant will ...

... know the different types of S7 blocks

... understand the principle of "structured programming"

... know the meaning of the process images (PII, PIQ)

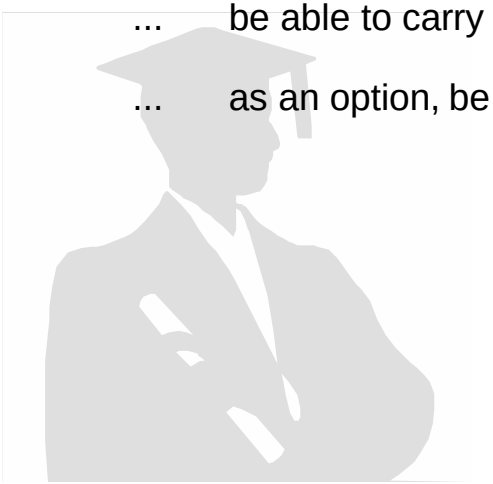
... be able to explain the principle of cyclic program execution

... know and be able to select the LAD, FBD and STL programming languages

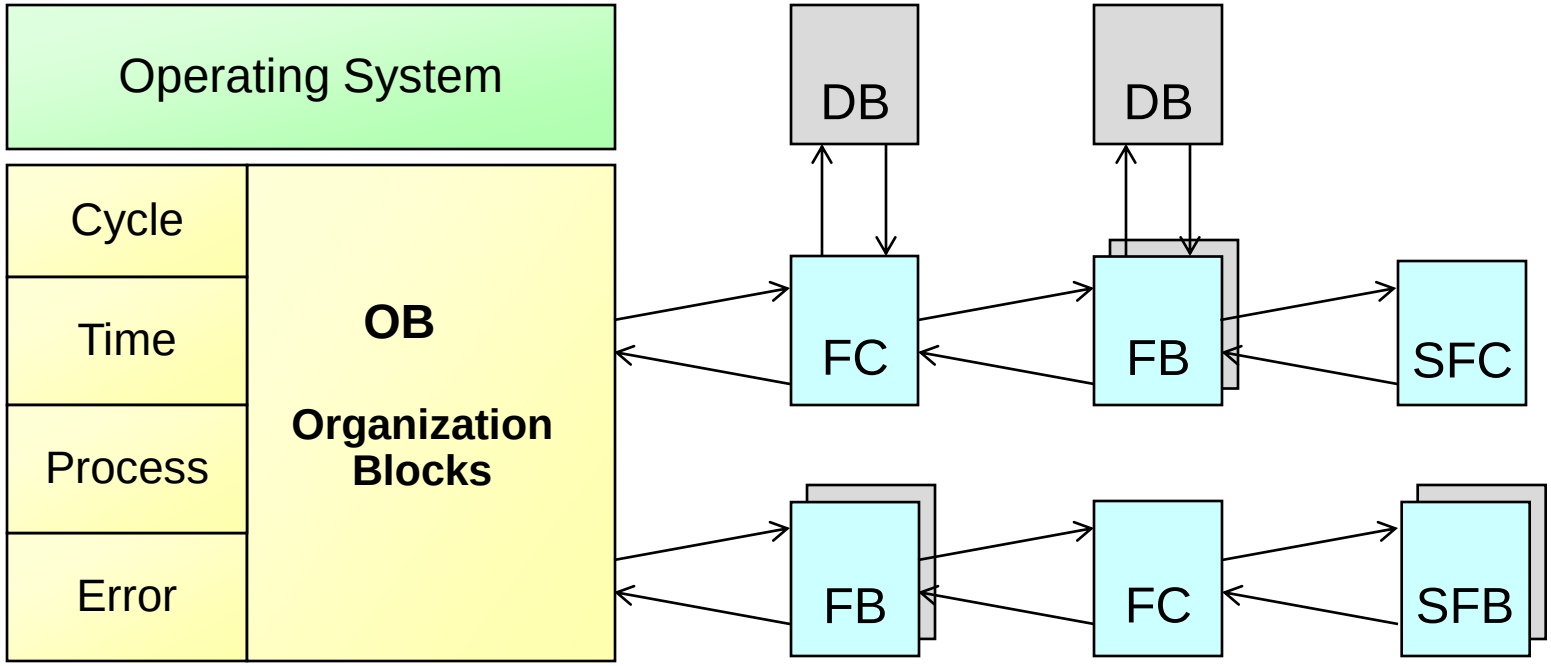
... be able to edit, save and download a block with the LAD/STL/FBD Editor

... be able to carry out a simple program debugging with the "Monitor Block" test function

... as an option, be able to make customizations to the LAD/FBD/STL Editor

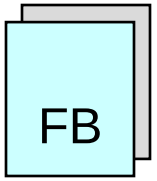


Types of Program Blocks



Legend:

OB = Organization Block
FB = Function Block
FC = Function
SFB = System Function Block
SFC = System Function
DB = Data Block



FB with
Instance DB

Maximum nesting depth:

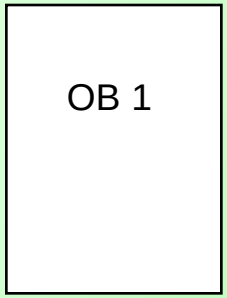
S7-300: 8 (16 for CPU 318)

S7-400: 24

(for each priority class,
2 to 4 additional levels for Error OBs)

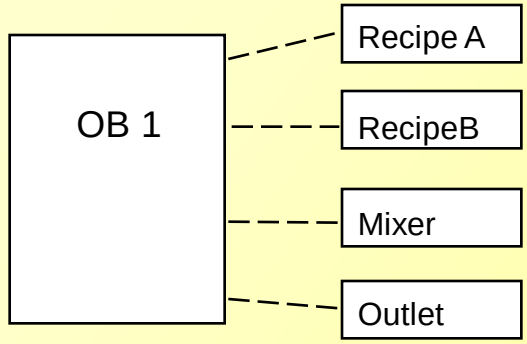
Program Structuring Possibilities

Linear Program



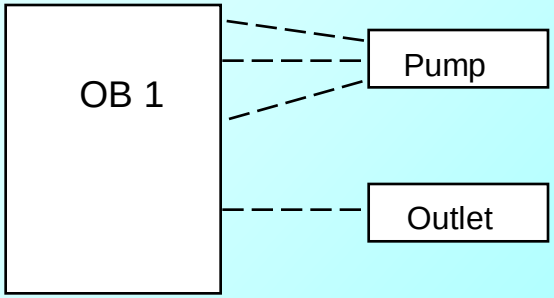
All instructions are found in one block (usually in Organization Block OB 1)

Program Partitioned into Areas



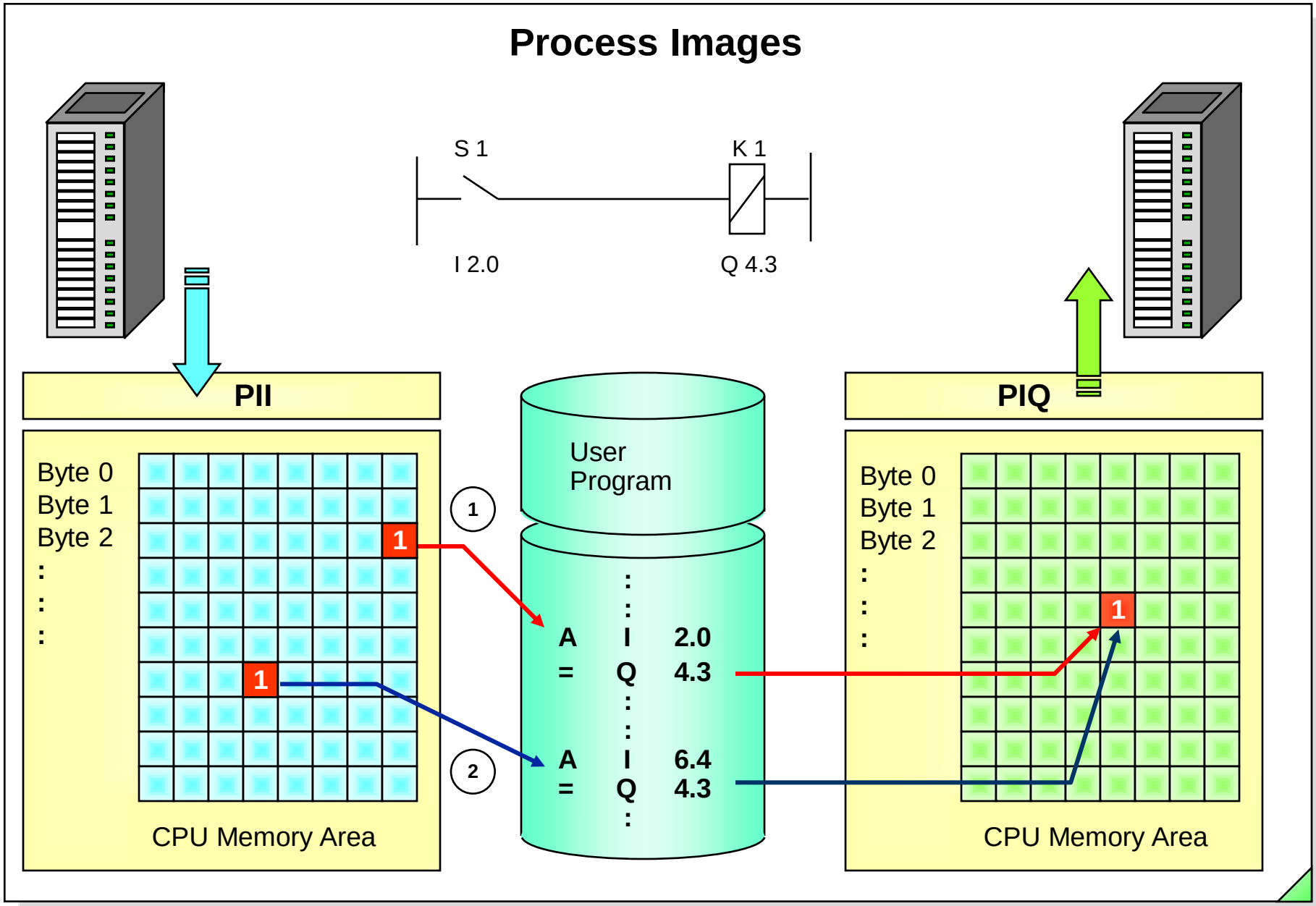
The instructions for the individual functions are found in individual blocks. OB 1 calls the individual blocks one after the other.

Structured Program



Reusable functions are loaded into individual blocks. OB 1 (or other blocks) call these blocks and pass on the pertinent data.

Process Images



Date: 2/3/2012
File: PRO1_06E.5

Cyclic Program Execution

Before October 1998

- Startup program: Call and execution of OB 100 (once, after Power ON, for example)
- Transfer PIQ to the digital output modules

Start of the cycle monitoring time

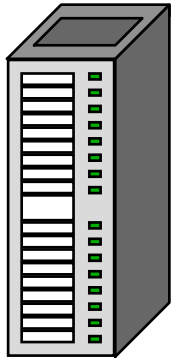
Reading the input states from the digital input modules and saving the states in the process image (PII)

Call and execution of OB1

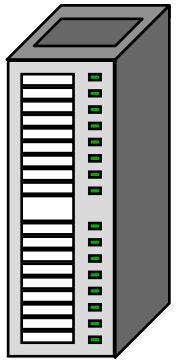
(possible interruption by call of other OBs for events such as time-of-day interrupt, hardware interrupts etc.)

Writing the process-image output table (PIQ) in the digital output modules

CPU Cycle



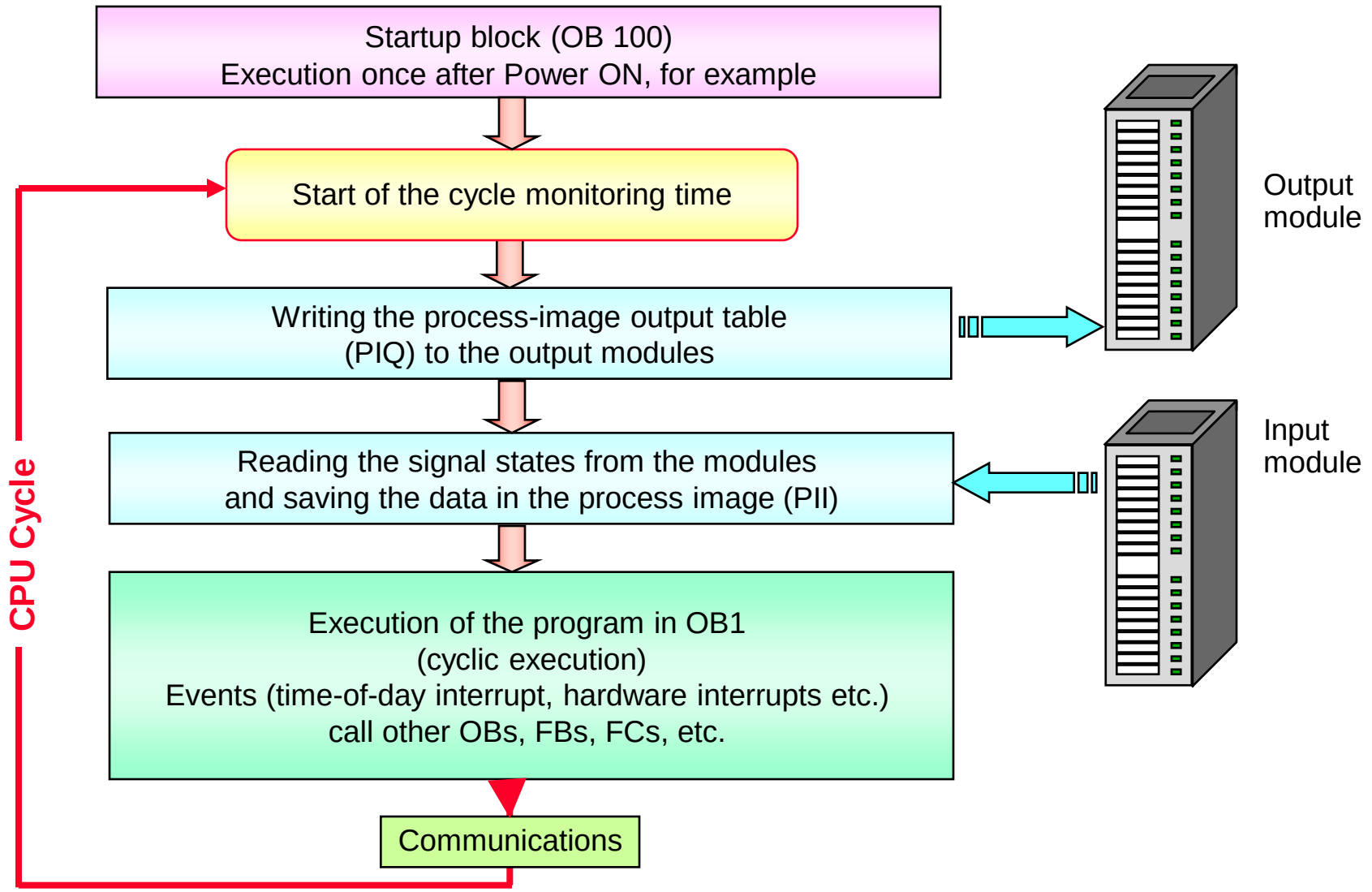
digital input module



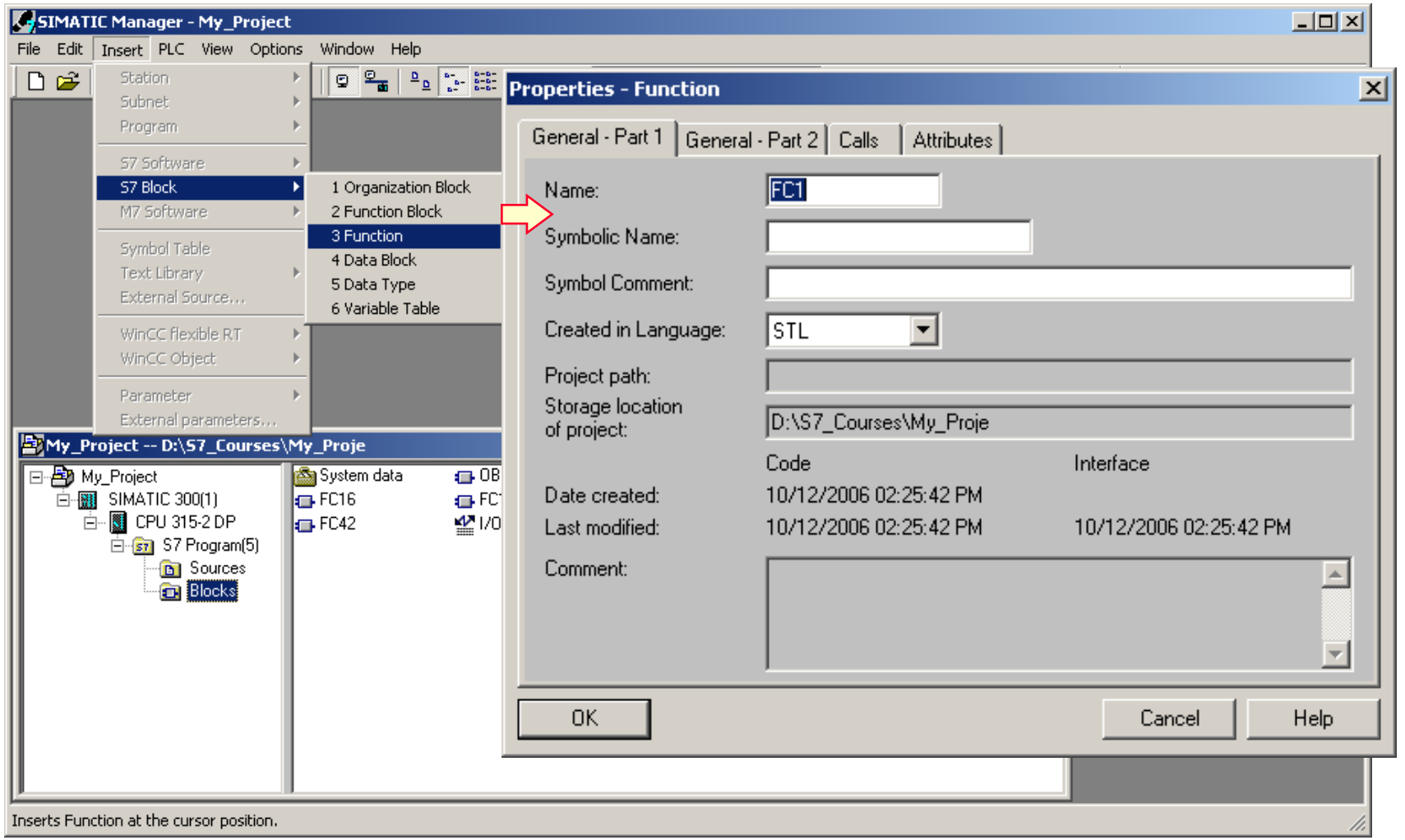
digital output module

Cyclic Program Execution

After October 1998



Inserting an S7 Block

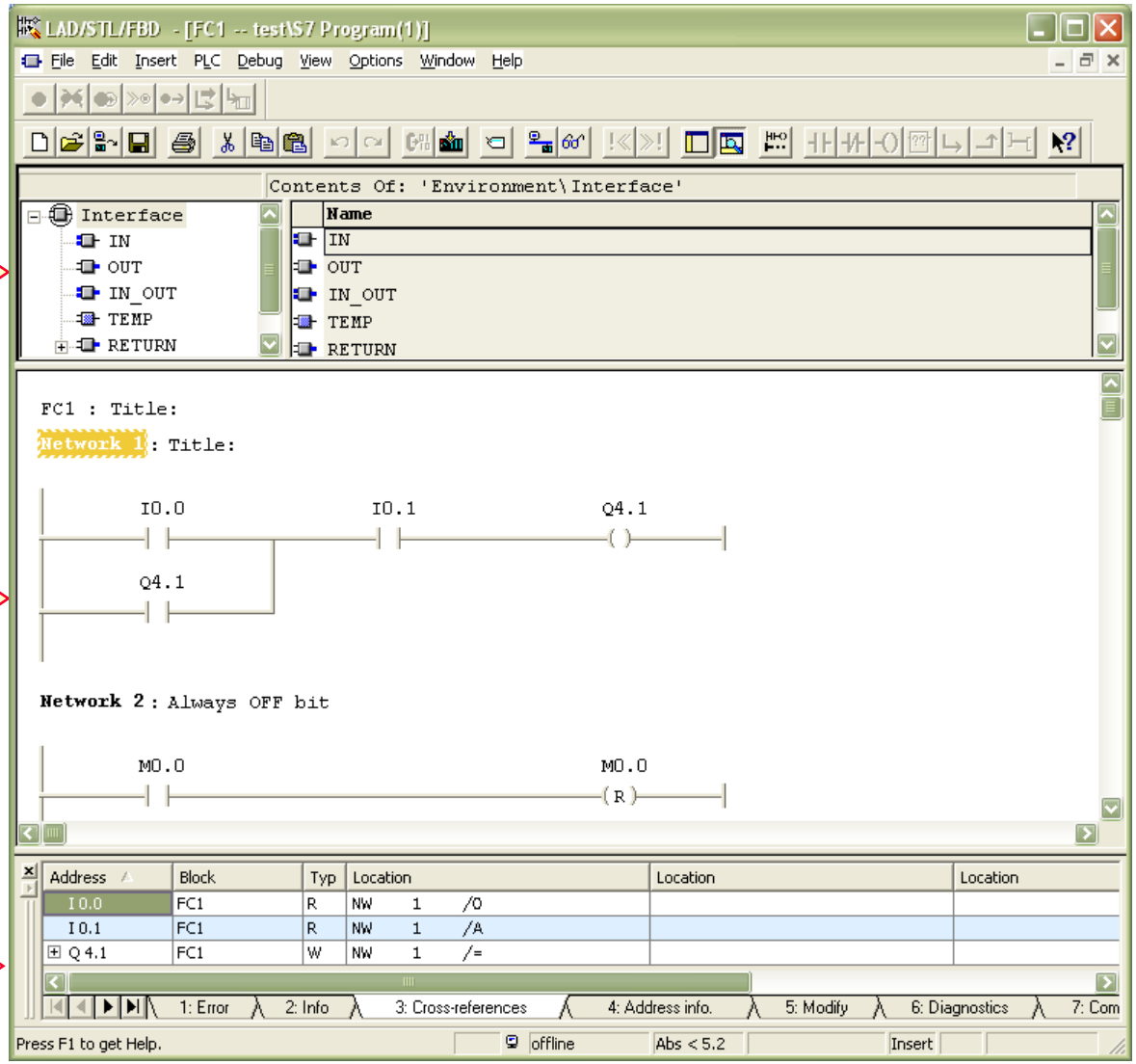


The LAD / STL / FBD Editor

Declaration Table

Code Section

Detail Window

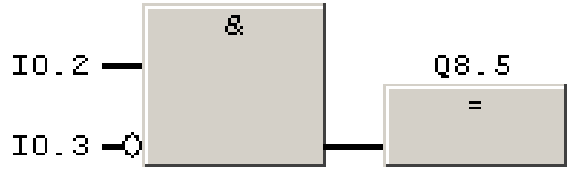


The STEP 7 Programming Languages

Function Block Diagram

FC16 : Conveyor Control

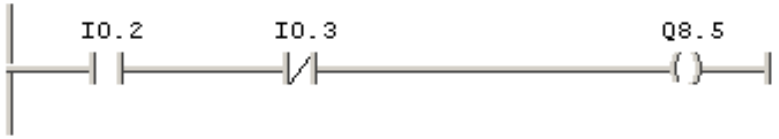
Network 1: Jog Conveyor RIGHT



Ladder Diagram

FC16 : Conveyor Control

Network 1: Jog Conveyor RIGHT



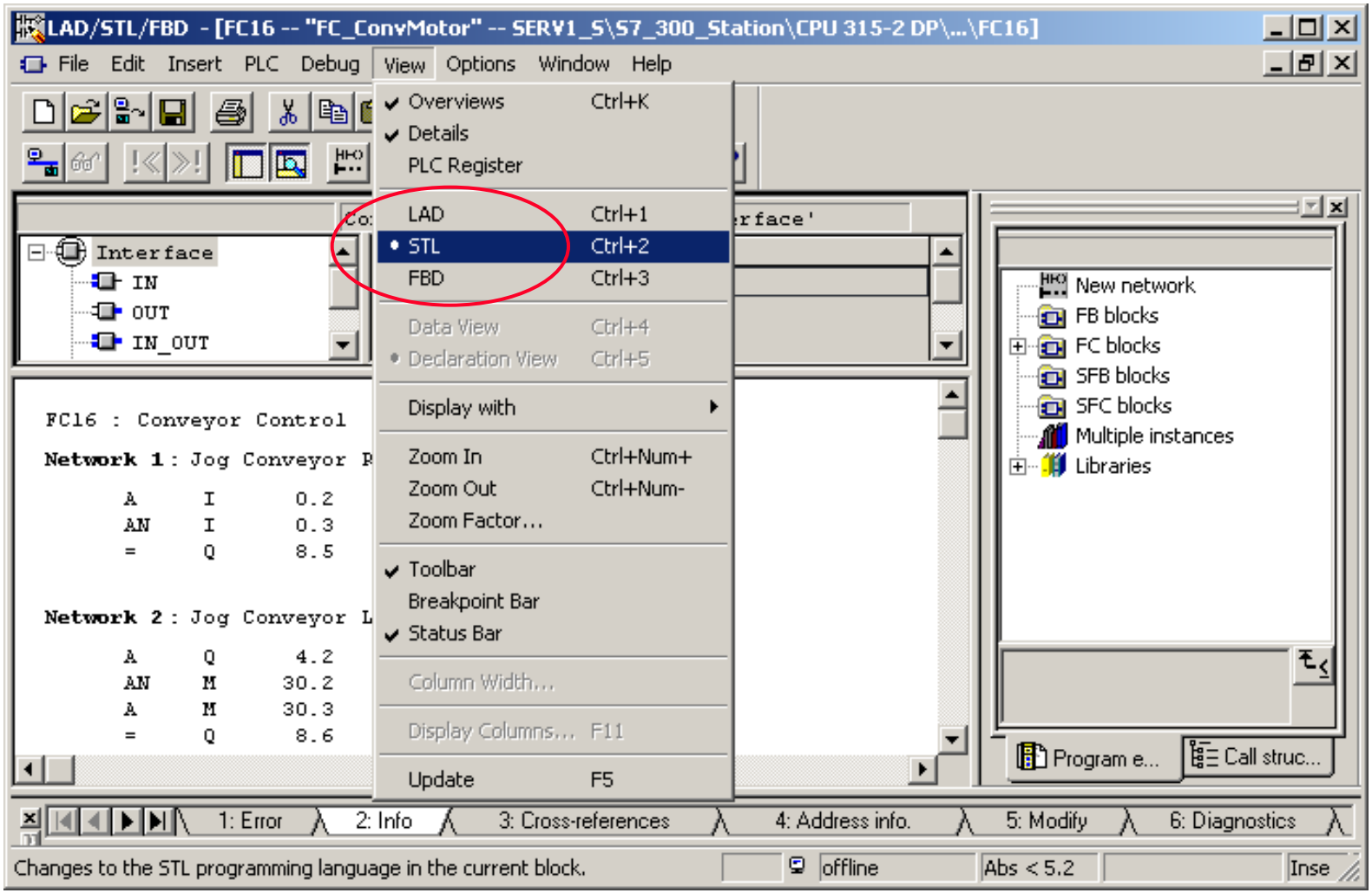
Statement List

FC16 : Conveyor Control

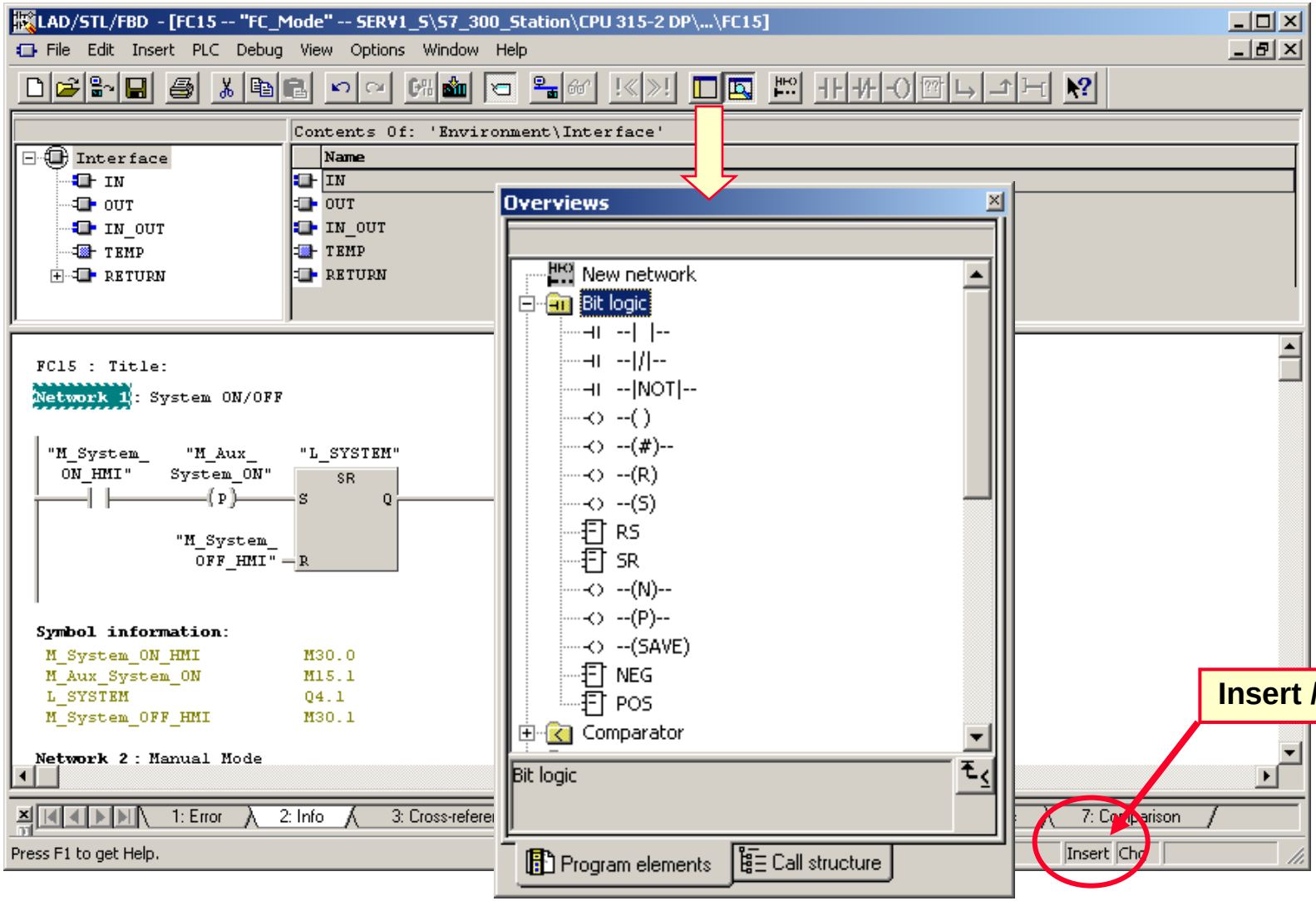
Network 1: Jog Conveyor RIGHT

```
A     I     0.2
AN    I     0.3
=     Q     8.5
```

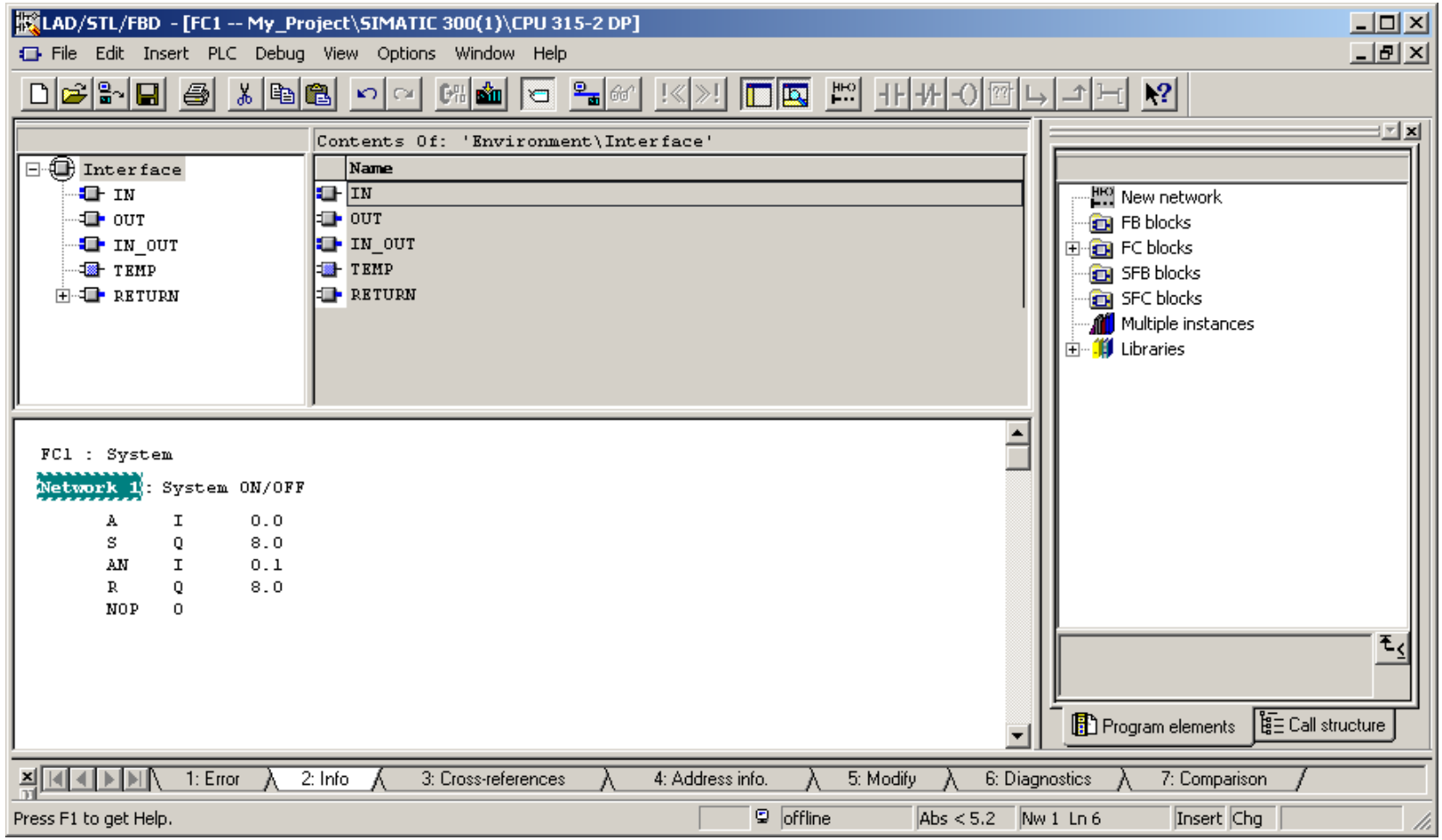
Selecting the Programming Language



Programming in LAD and FBD

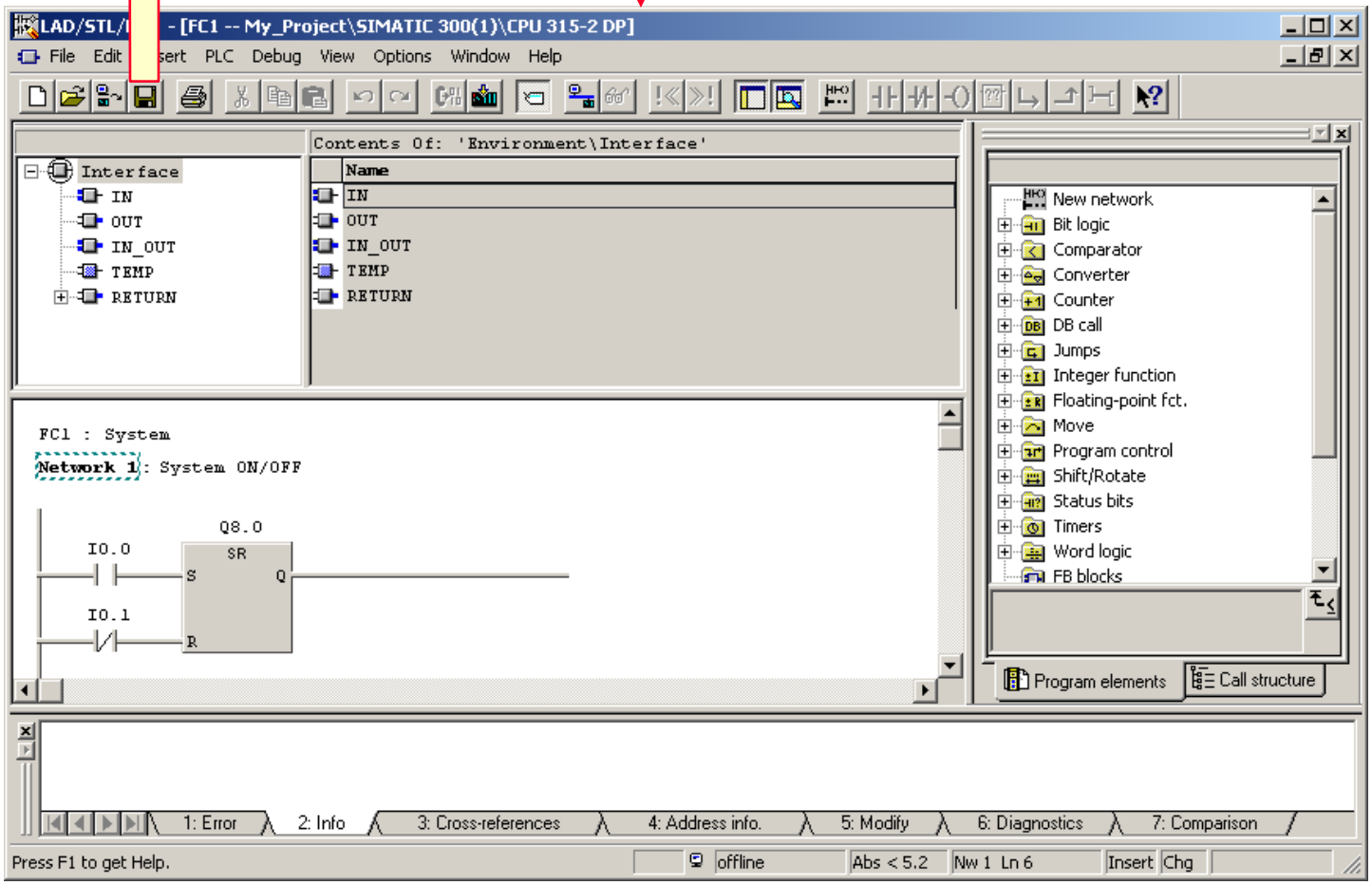


Programming in STL

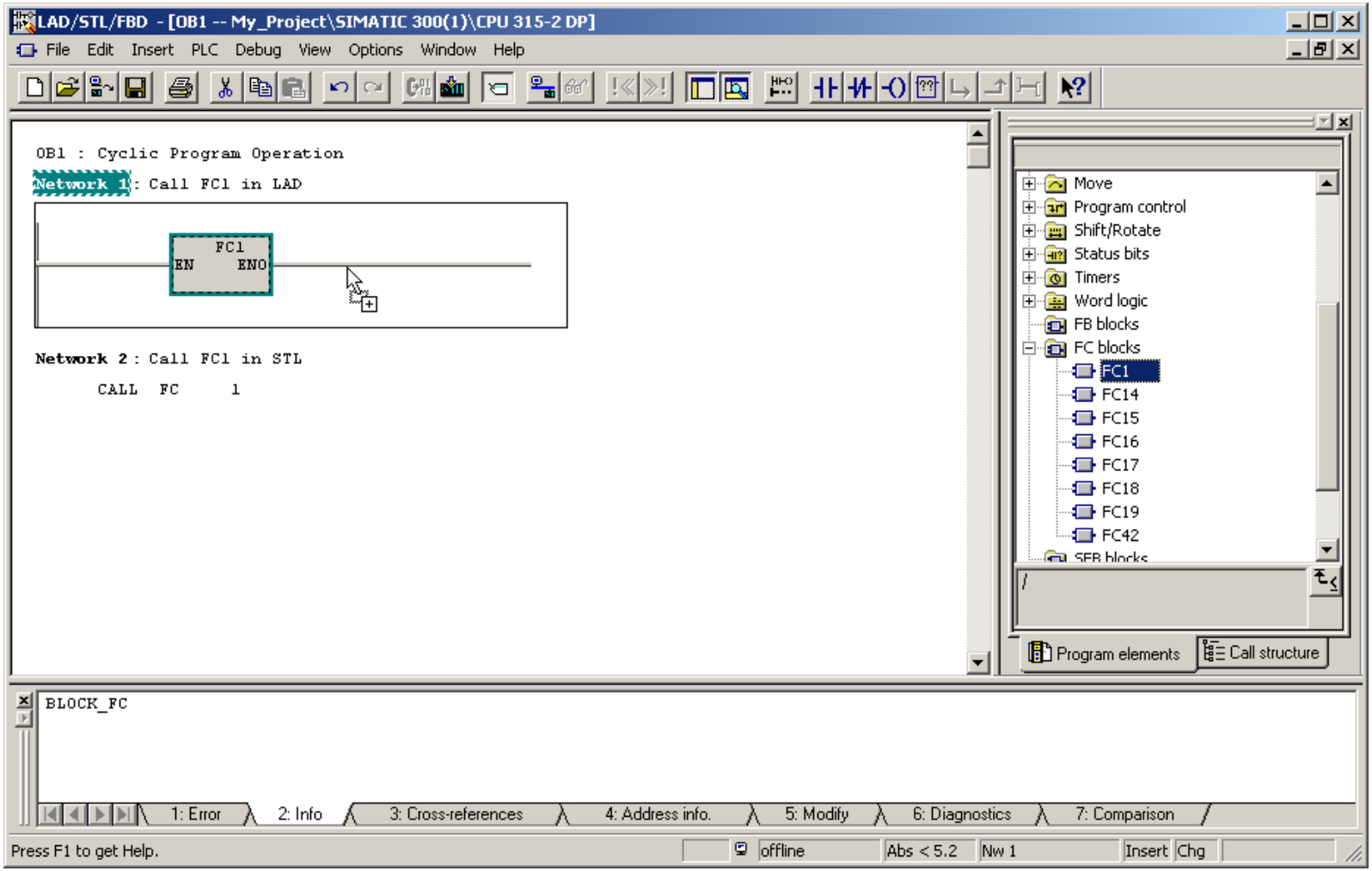


Saving a Block

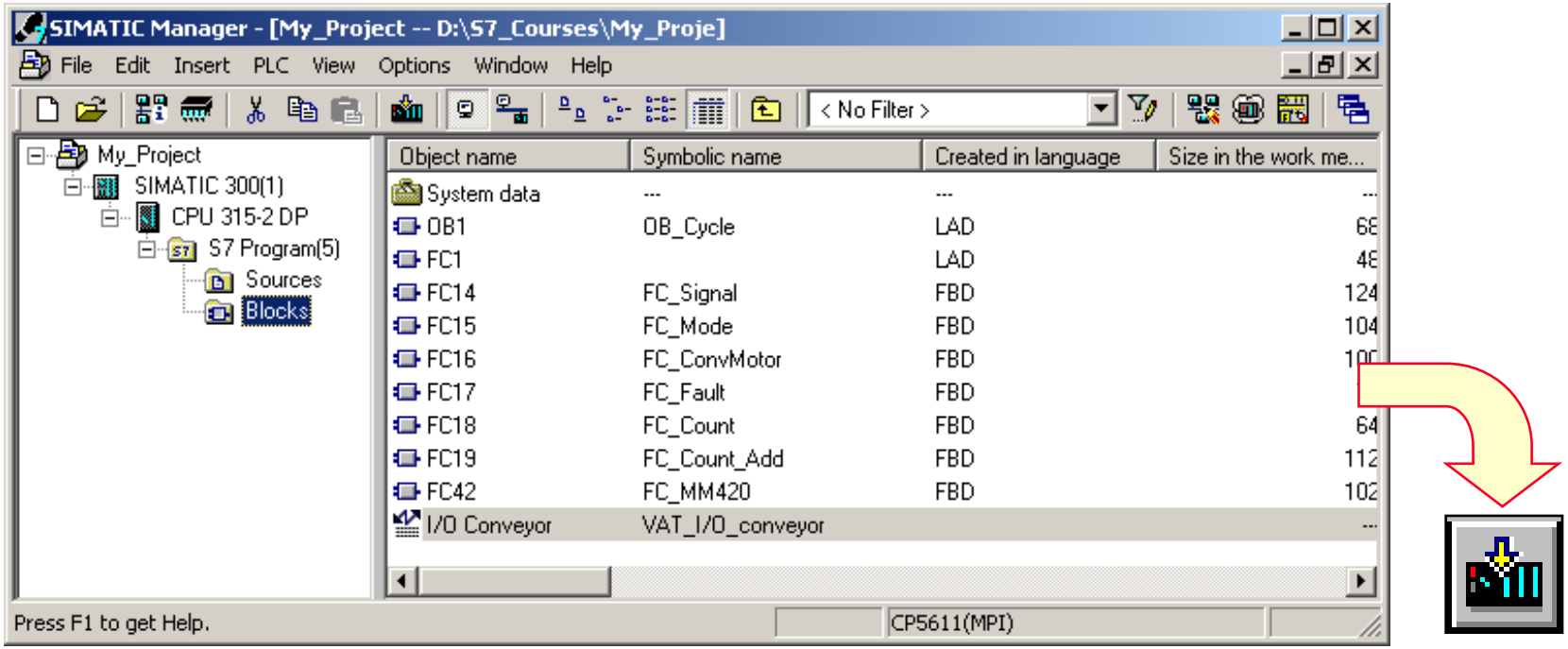
Current project directory with block name



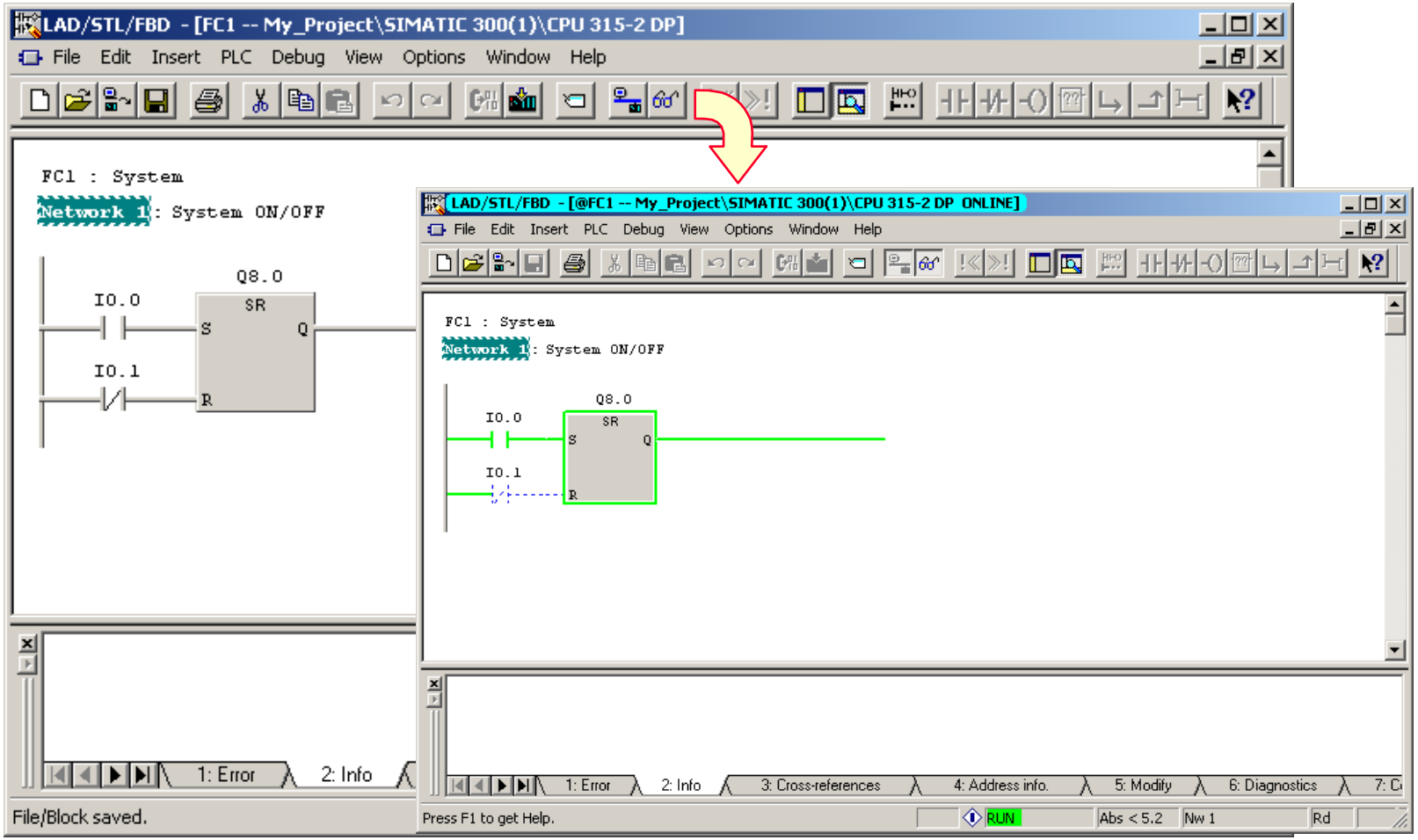
Calling a Block in OB1



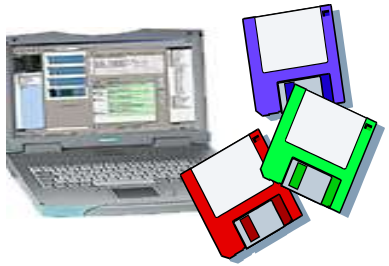
Downloading Blocks into the PLC



Simple Program Debugging

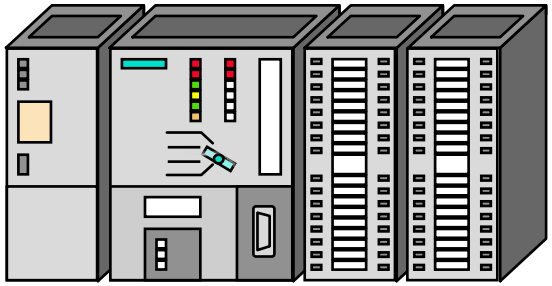


Downloading and Saving Modified Blocks



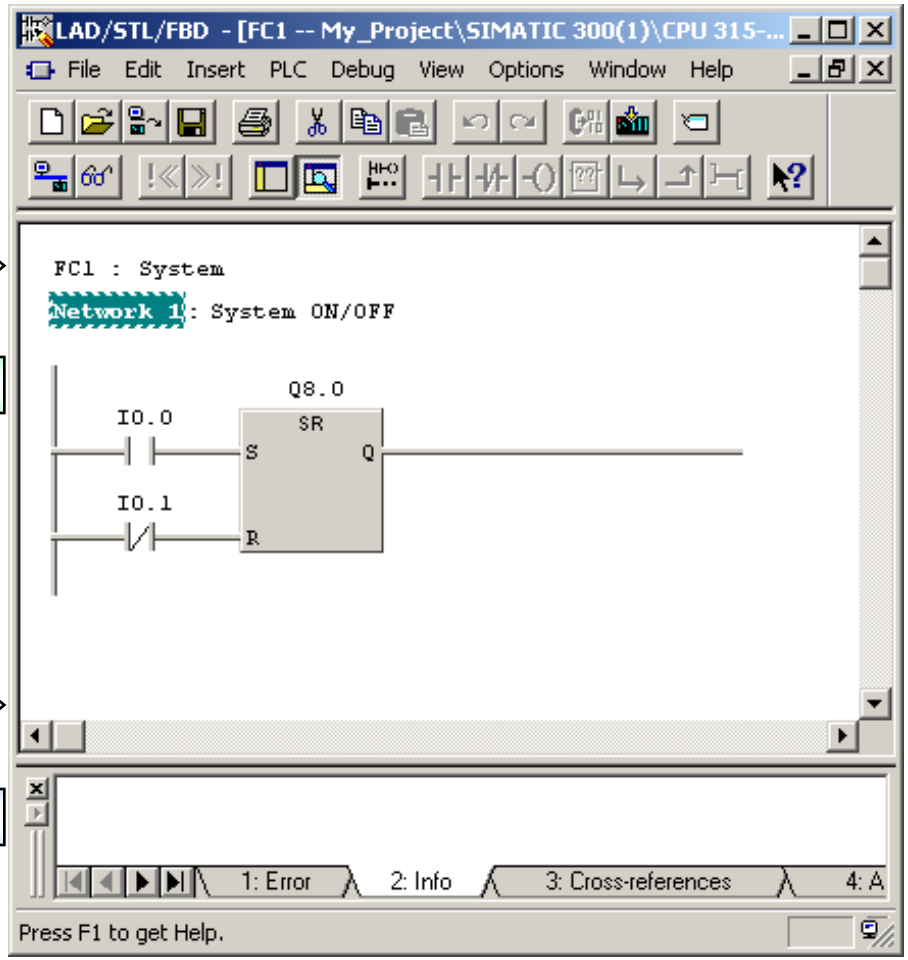
Open offline

Save

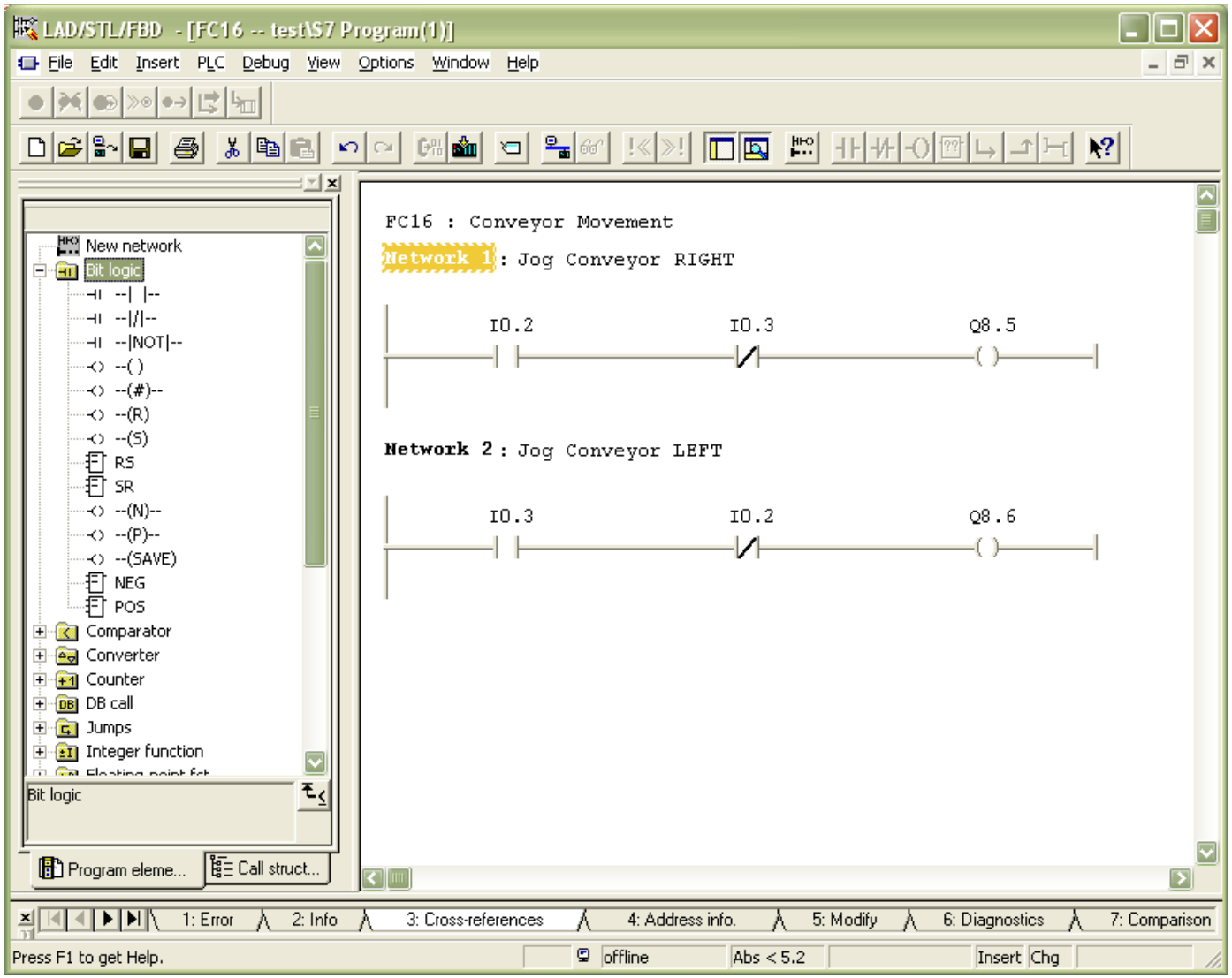


Open online

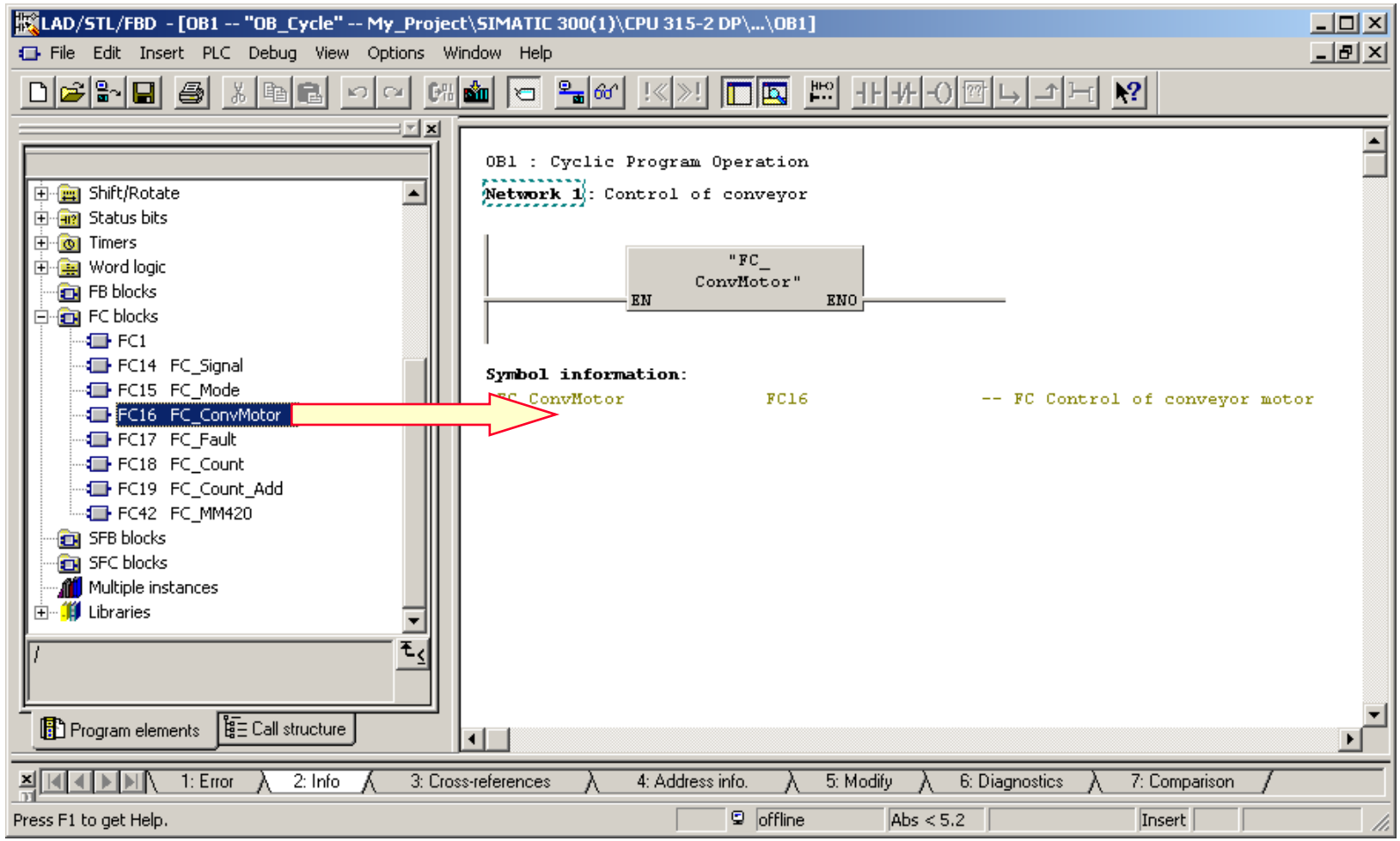
Download



Exercise 1: Jogging the Conveyor Motor (FC 16)

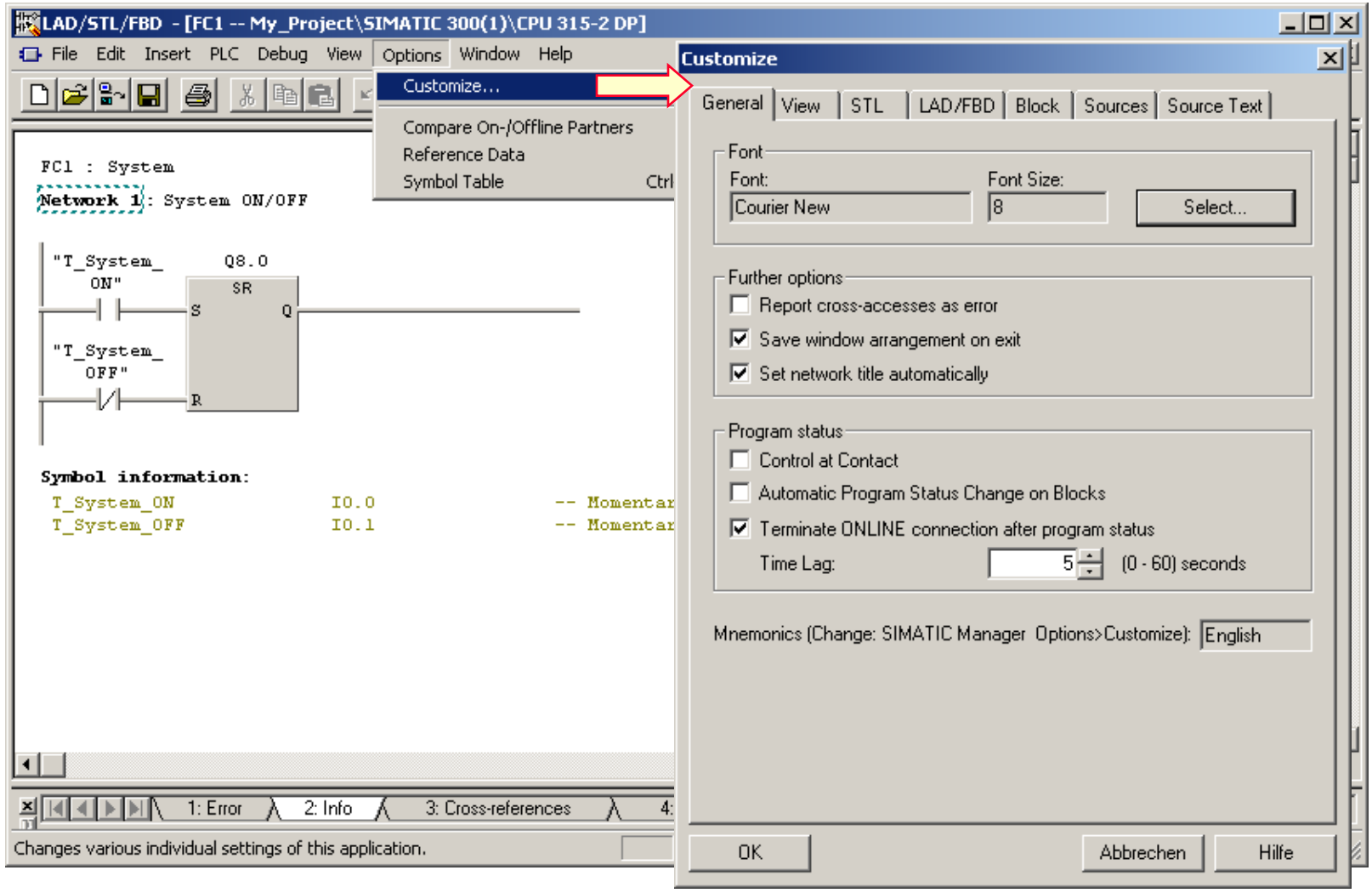


Exercise 2: Calling FC 16 in OB 1

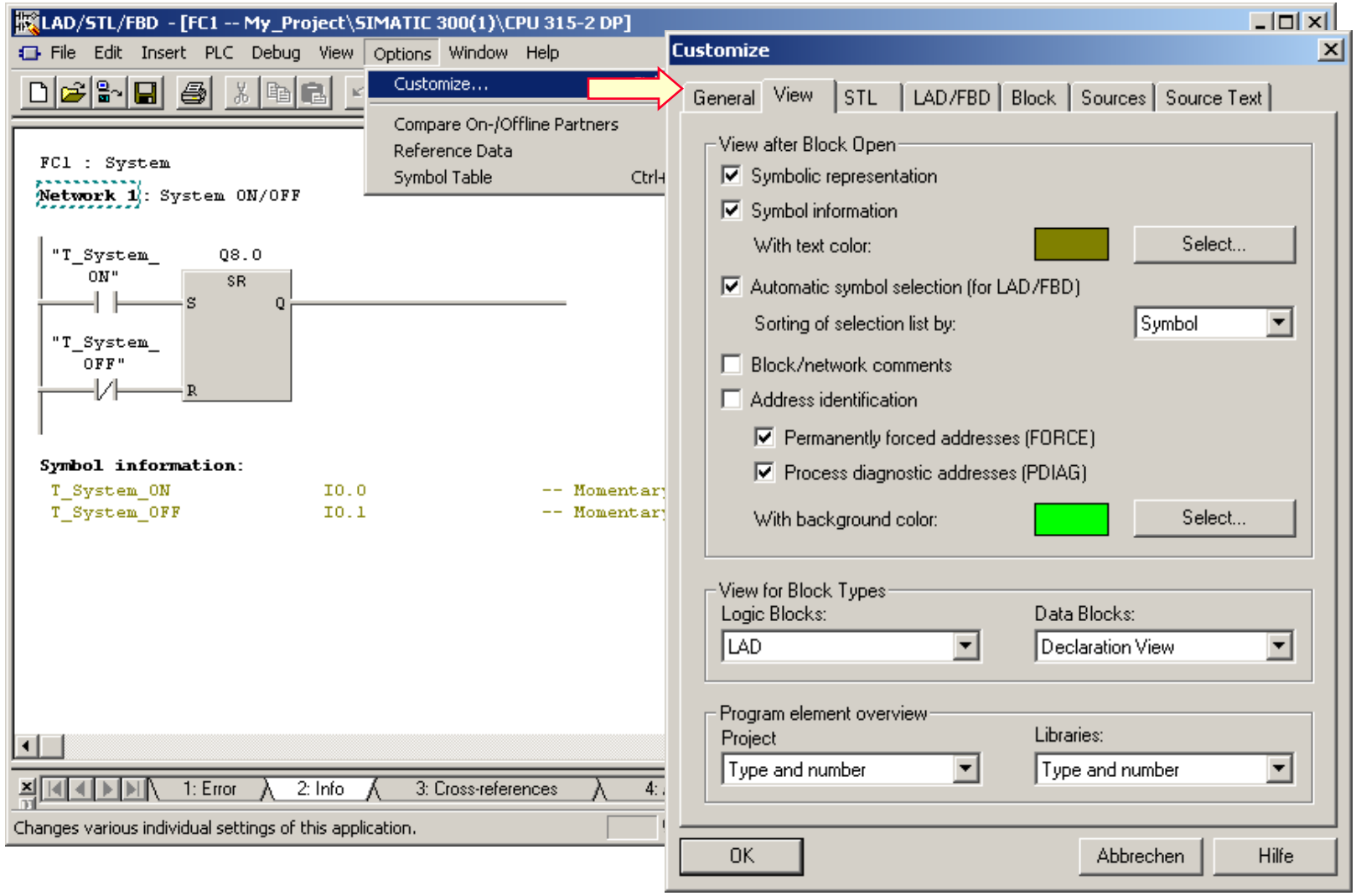


If You Want to Know More

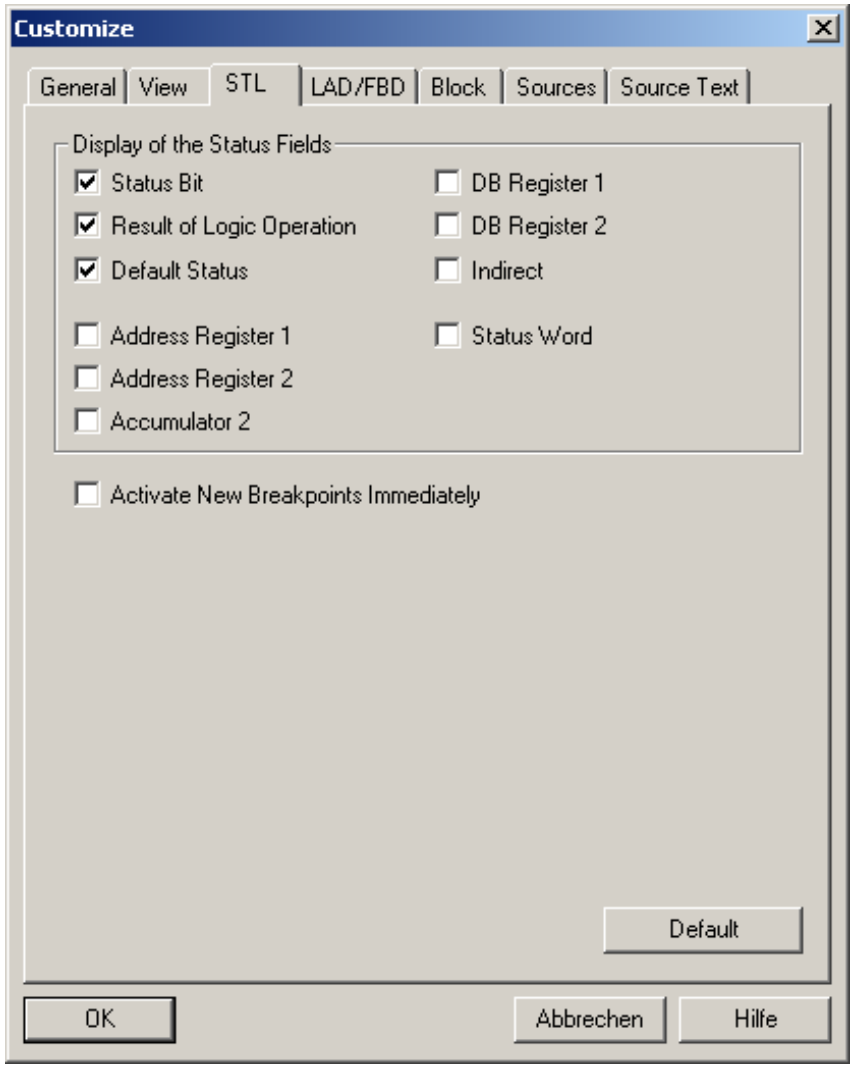
Editor Customization: "General" Tab



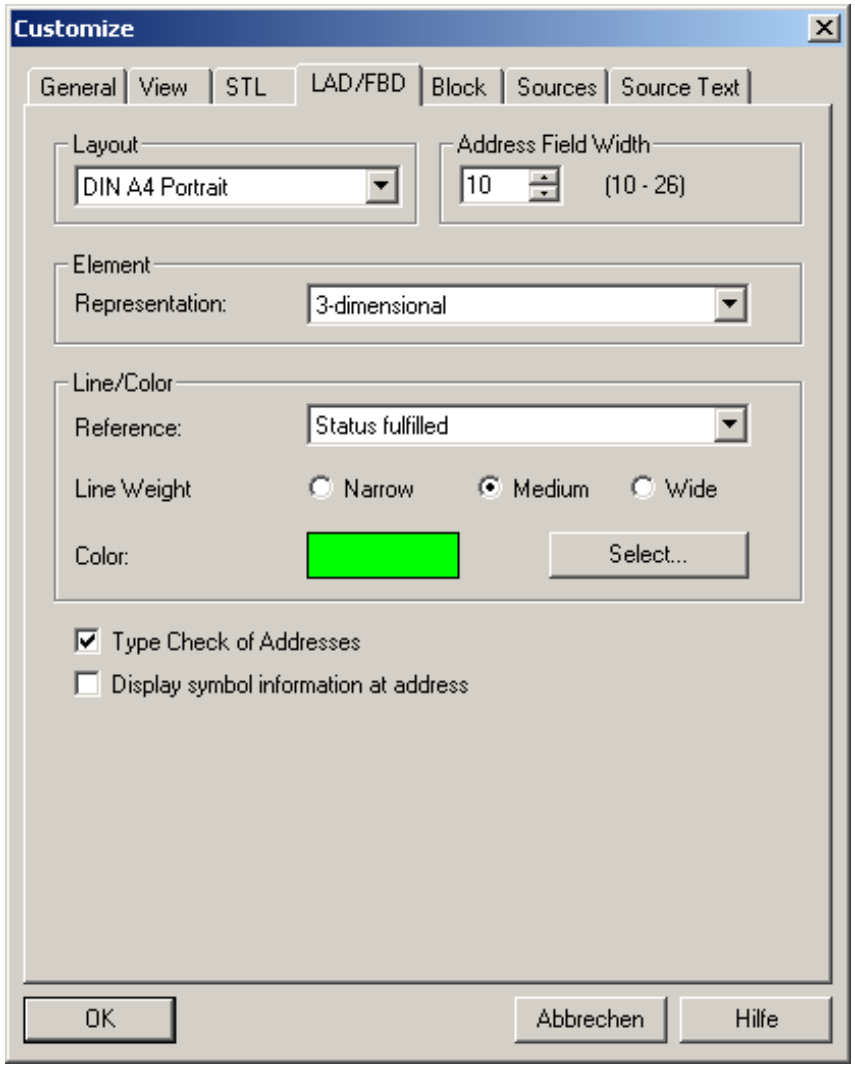
Editor Customization: "View " Tab



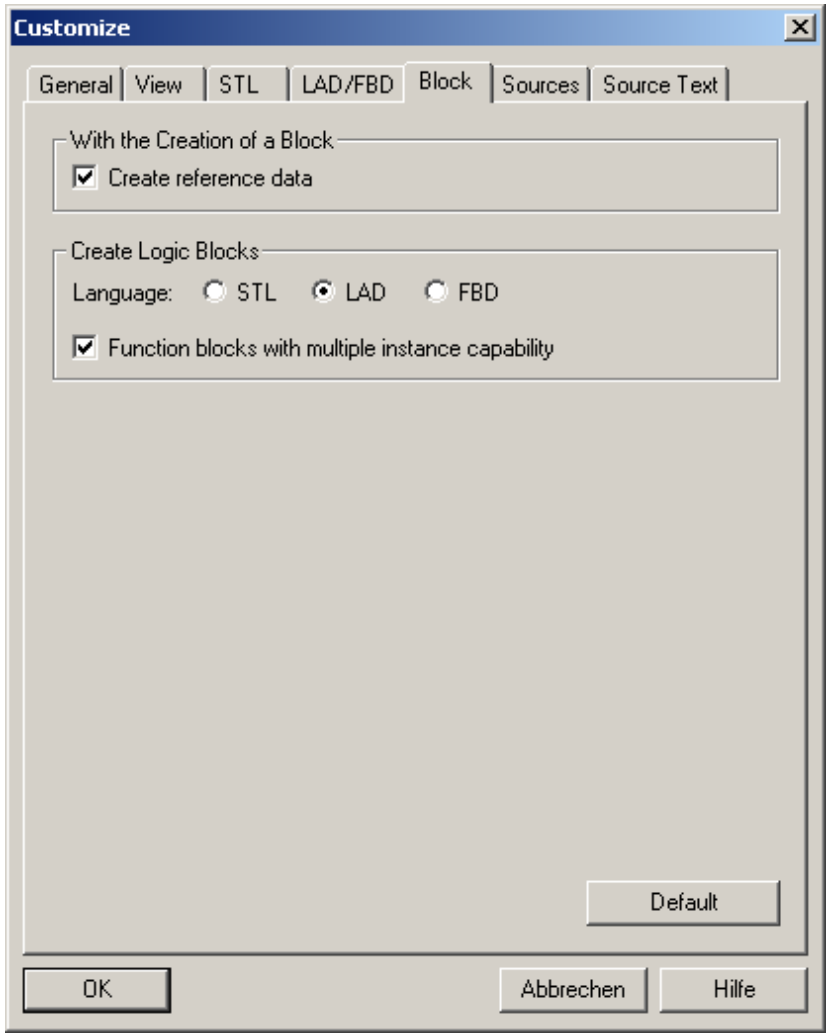
Editor Customization: "STL" Tab

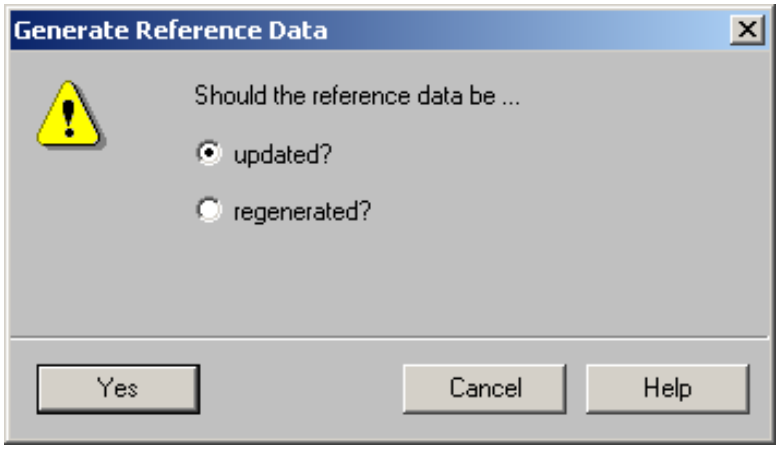


Editor Customization: "LAD/FBD" Tab



Editor Customization: "Block" Tab





Editor Customization: "Sources/Source Text" Tab