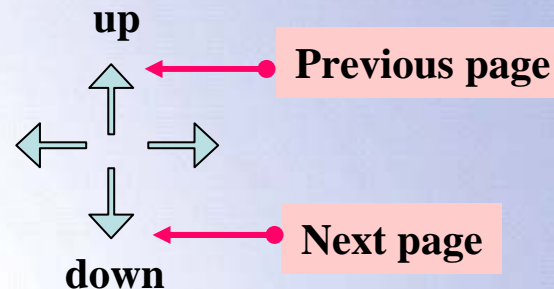


Short explanation about using this tutorial

1. Your PC must be hooked up to a PLC, and Control FPWIN Pro must be running.

2. Press <Alt> + <Tab> to switch back and forth between this presentation and Control FPWIN Pro!

3. Change pages using pagination keys:



4. Press ESC to return to the presentation at any time.

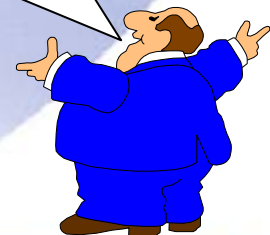
5. A PDF file of the presentation is included on the CD, e.g. to print.

This tutorial provides an overview of:

- handling and programming with Control FPWIN Pro
- conventional programming with FP addresses
- programming according to the IEC 61131-3 standard

Please spend about two hours to take your first, easy steps into
Control FPWIN Pro.

Please stop!
And spend a little while
to learn your
first programming steps.



Why IEC 61131-3?

IEC 61131-3

An internationally accepted standard

- **Unified rules in systems worldwide,
reduces misunderstandings and shortens training**
- **Reuse of ready-made Functions and Function Blocks,
saves time for programming and debugging**
- **Better overview through structure and modularity**
- **Fewer errors through defined data types and encapsulation**
- **Safe investment due to standardisation**

If you want to know more about IEC 61131-3, please refer to the other presentation on your CD-ROM: [IEC61131_3_basics.pdf](#)



Start Control FPWIN Pro

The screenshot shows a Windows XP desktop with a blue background. The Start menu is open, displaying a list of programs. The 'FPWIN Pro 5' application is highlighted, and its sub-menu is visible, showing 'FPWIN Pro 5', 'Lernprogramm Erste Schritte', and 'Online-Hilfe'. The desktop contains various icons such as 'Eigene Dateien', 'Arbeitsplatz', 'Internet Explorer', and 'Microsoft Outlook'. The taskbar at the bottom shows the Start button and several open applications.

Start Control FPWIN Pro
under Windows/Programs.





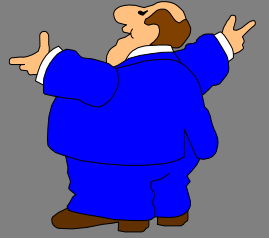
Create a new project with the start-up wizard.

Creates a new or opens an existing project



- Creates a new project
- Opens a project from the PLC
- Restores a backed-up project
- Opens an existing project

Search additional projects...



OK Cancel

Everything is pre-selected in the wizard (but changeable):

File location

Project Path (Location\project name):
C:\Programme\NAiS Control\FPWIN Pro 5\Project\Project1

PLC Type:
[Empty field]

Define one Program (PRG):
Name:
Program_1

Language:
Function Block Diagram (FBD)
Instruction List (IL)
Ladder Diagram (LD)
Sequential Function Chart (SFC)
Structured Text (ST)

Buttons: Path Selection..., Change PLC Type..., Help

Buttons: Create Project, Create Empty Project, Cancel

PLC type

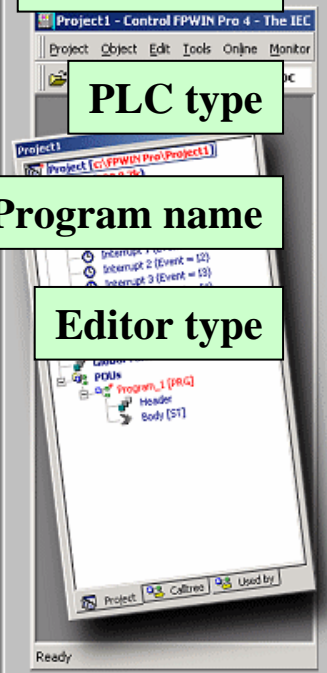
PLC Type

FP-X	FP-SIGMA 12k
FP-e	
FP-SIGMA	
FP0	
FP1	
FP-M	
FP2	
FP2SH	
FP3,FP-C	
FP5	
FP10	
FP10SH	

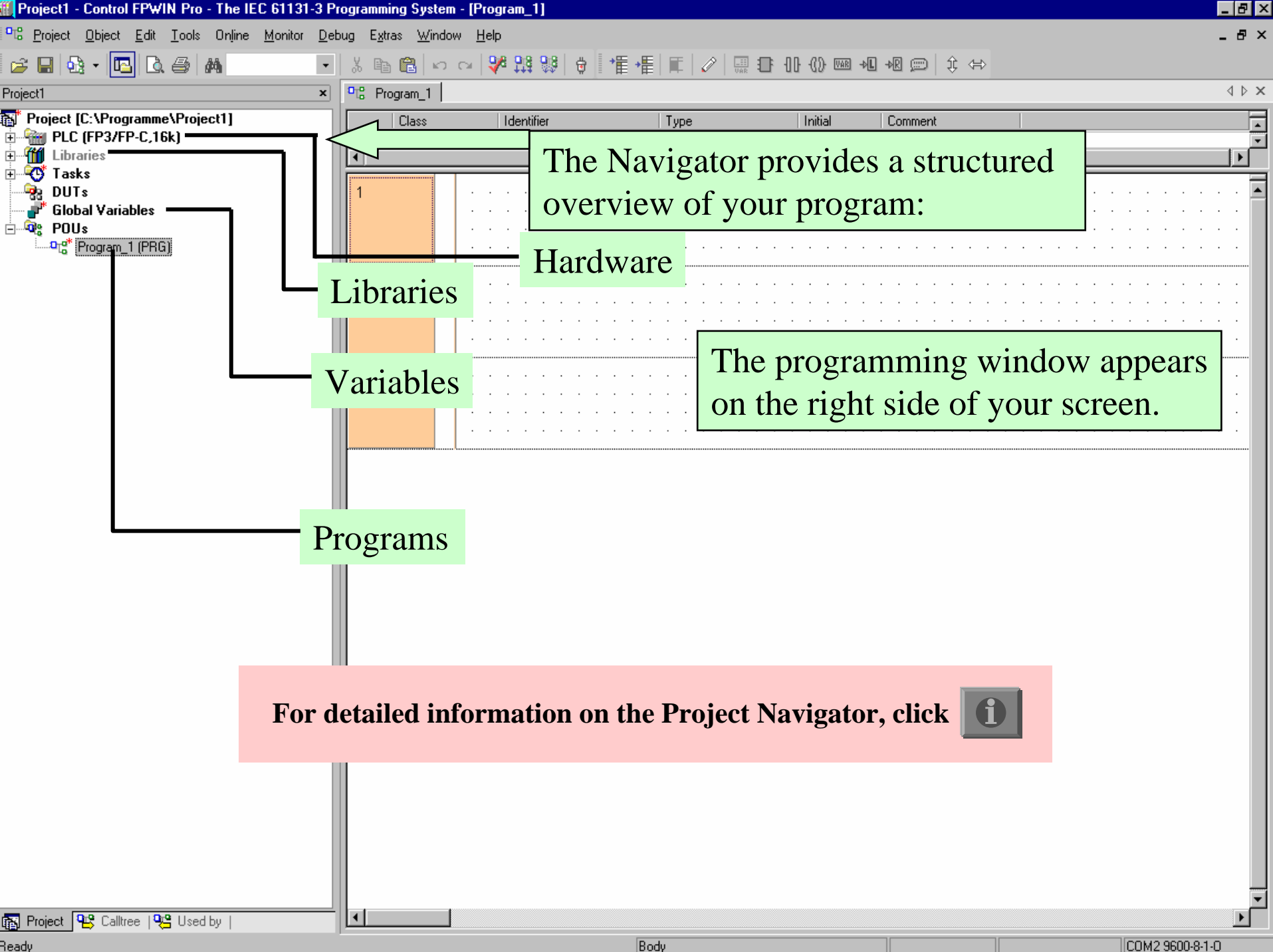
Buttons: OK, Cancel

Program name

Editor type



Click for OK



The Navigator provides a structured overview of your program:

Hardware

Libraries

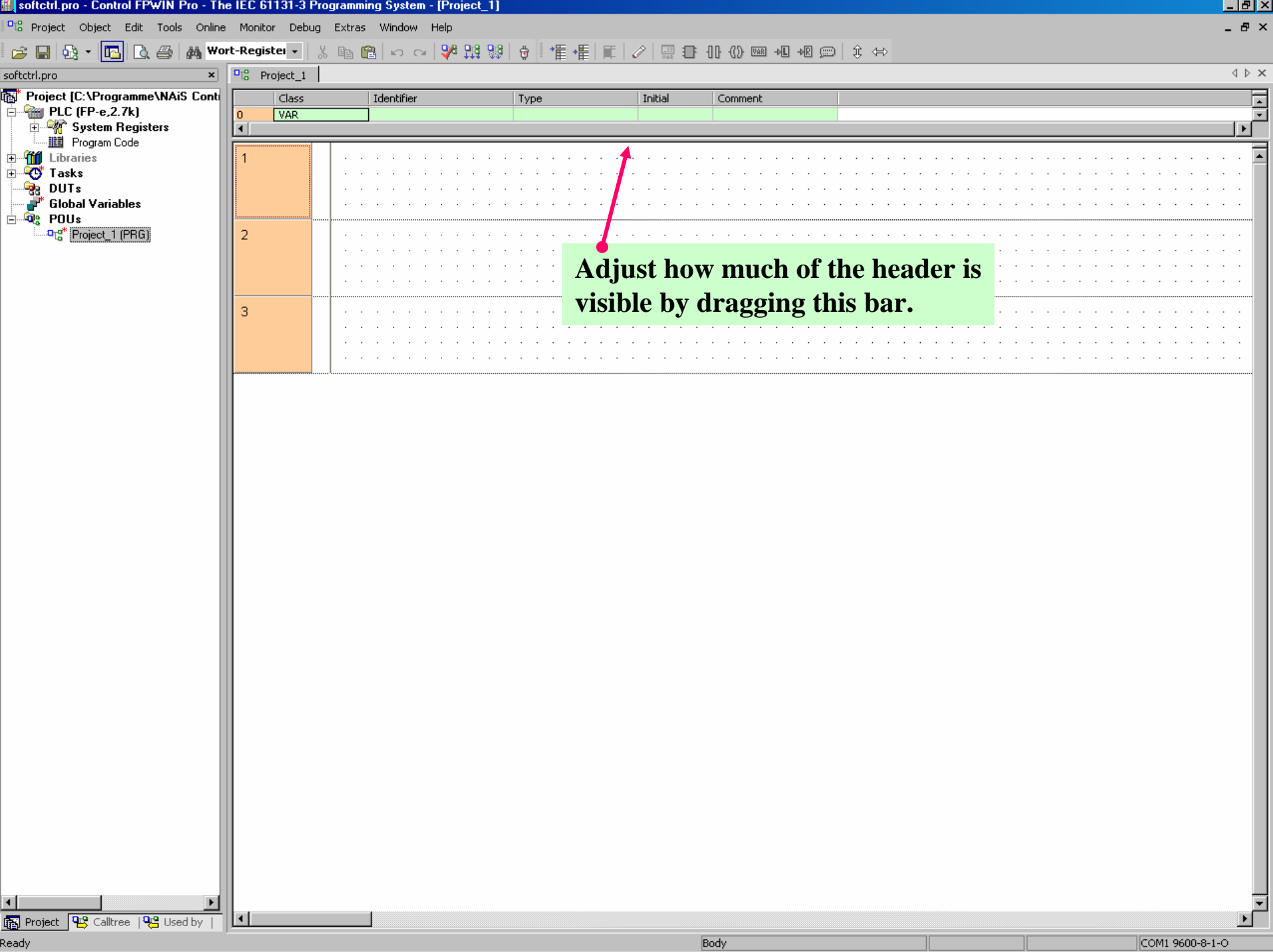
Variables

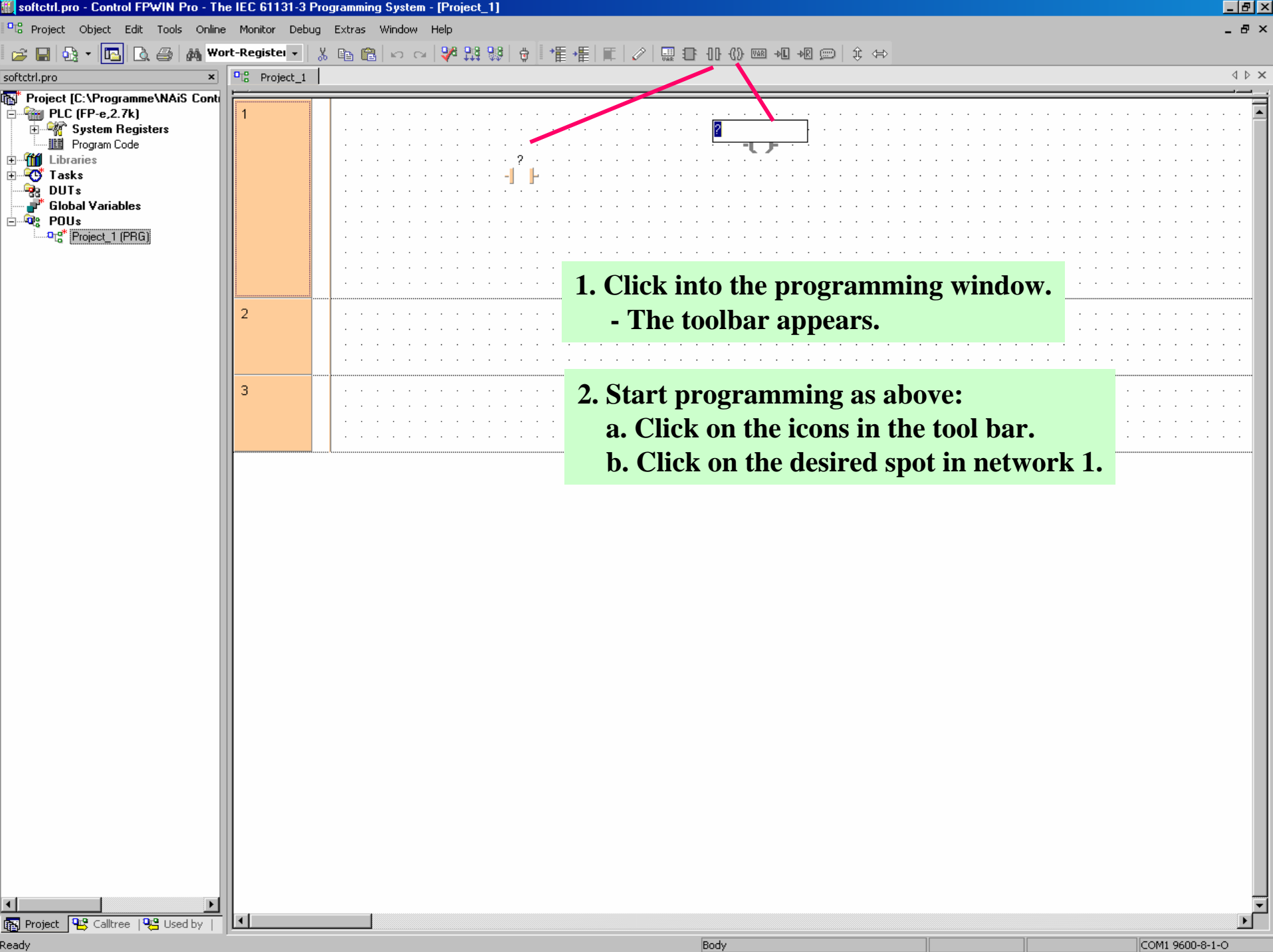
Programs

The programming window appears on the right side of your screen.

For detailed information on the Project Navigator, click

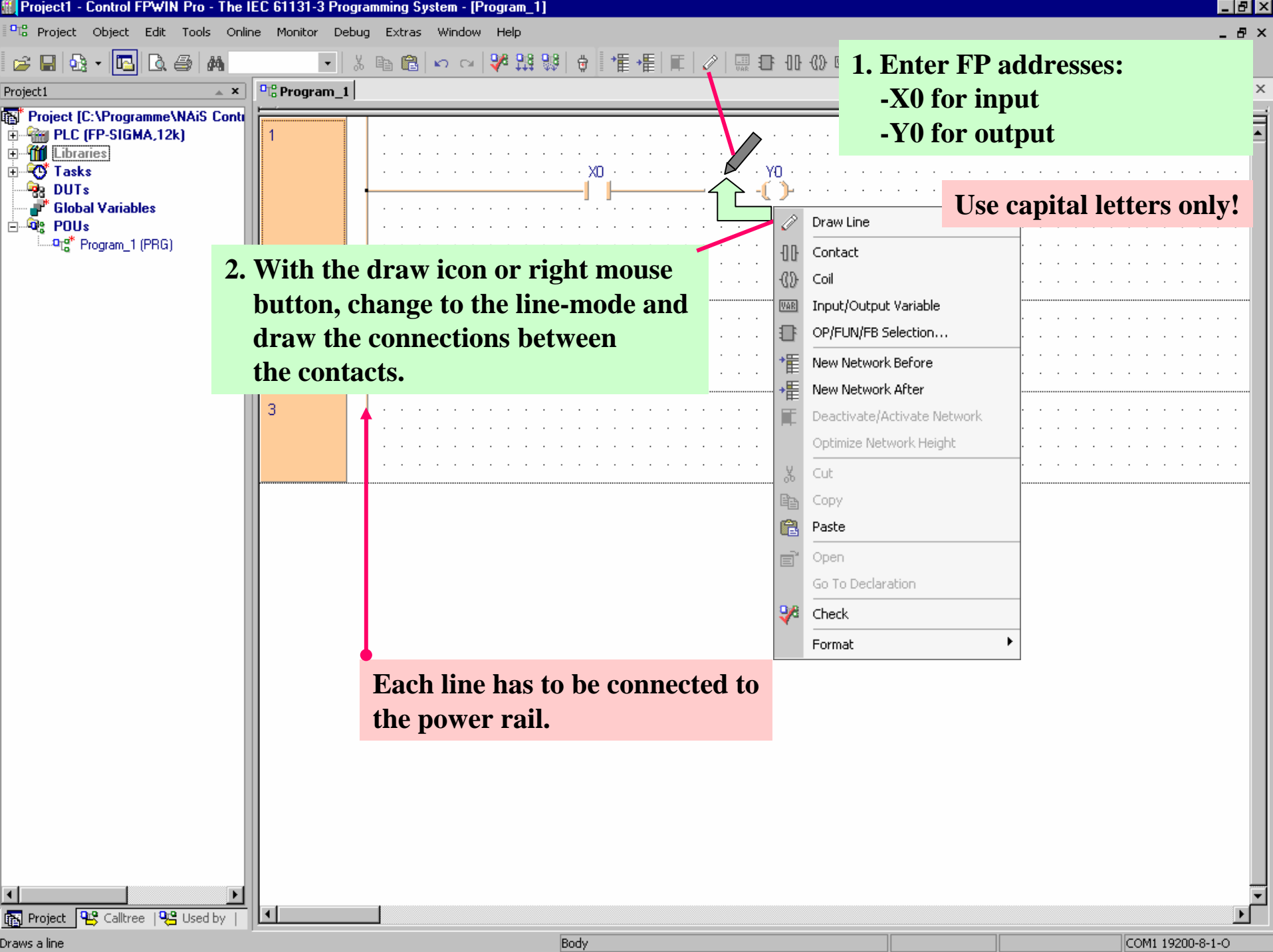






**1. Click into the programming window.
- The toolbar appears.**

**2. Start programming as above:
a. Click on the icons in the tool bar.
b. Click on the desired spot in network 1.**



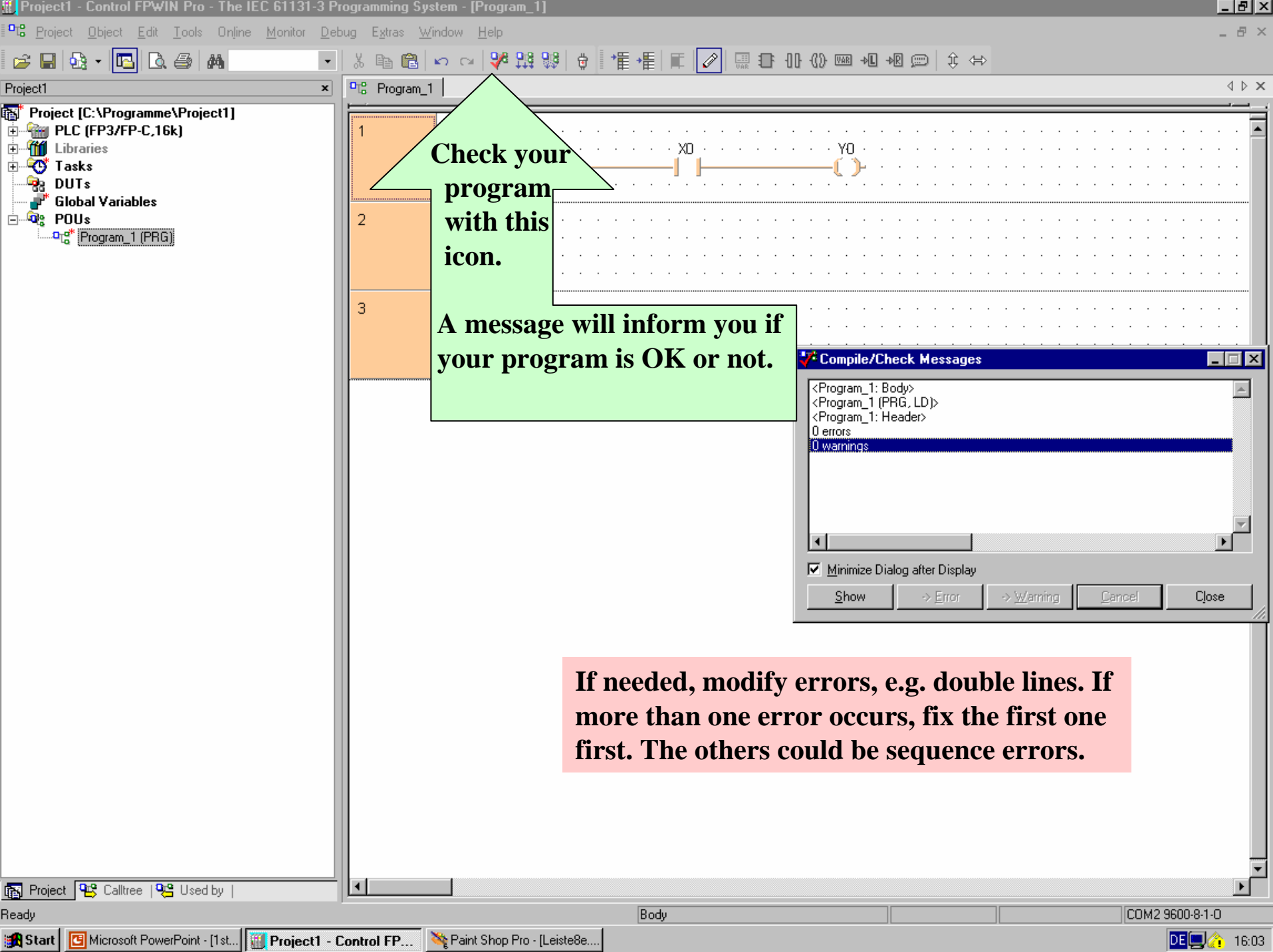
**1. Enter FP addresses:
-X0 for input
-Y0 for output**

2. With the draw icon or right mouse button, change to the line-mode and draw the connections between the contacts.

Use capital letters only!

Each line has to be connected to the power rail.

- Draw Line
- Contact
- Coil
- Input/Output Variable
- OP/FUN/FB Selection...
- New Network Before
- New Network After
- Deactivate/Activate Network
- Optimize Network Height
- Cut
- Copy
- Paste
- Open
- Go To Declaration
- Check
- Format



Check your program with this icon.

A message will inform you if your program is OK or not.

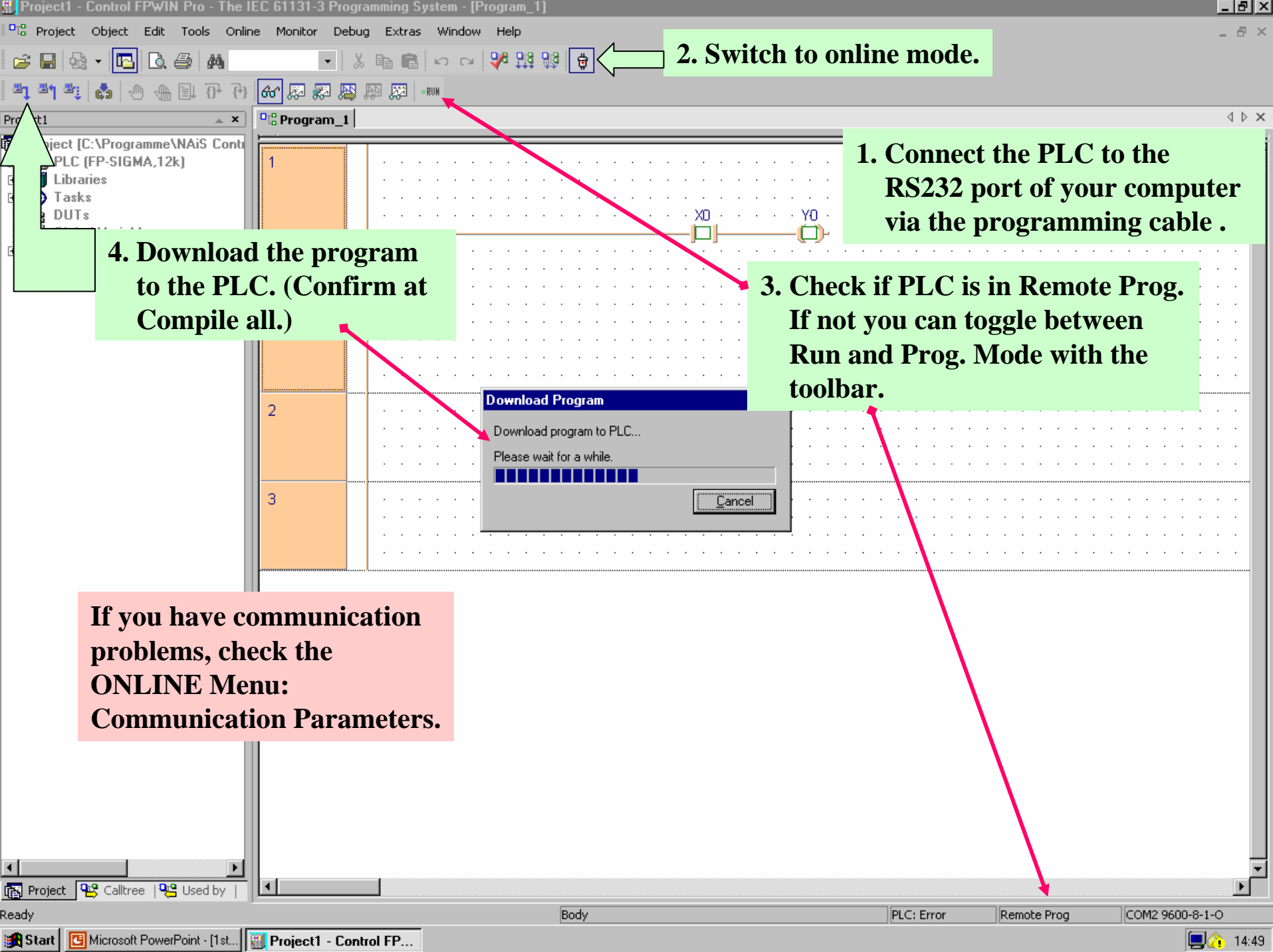
Compile/Check Messages

<Program_1: Body>
<Program_1 (PRG, LD)>
<Program_1: Header>
0 errors
0 warnings

Minimize Dialog after Display

Show > Error > Warning Cancel Close

If needed, modify errors, e.g. double lines. If more than one error occurs, fix the first one first. The others could be sequence errors.



2. Switch to online mode.

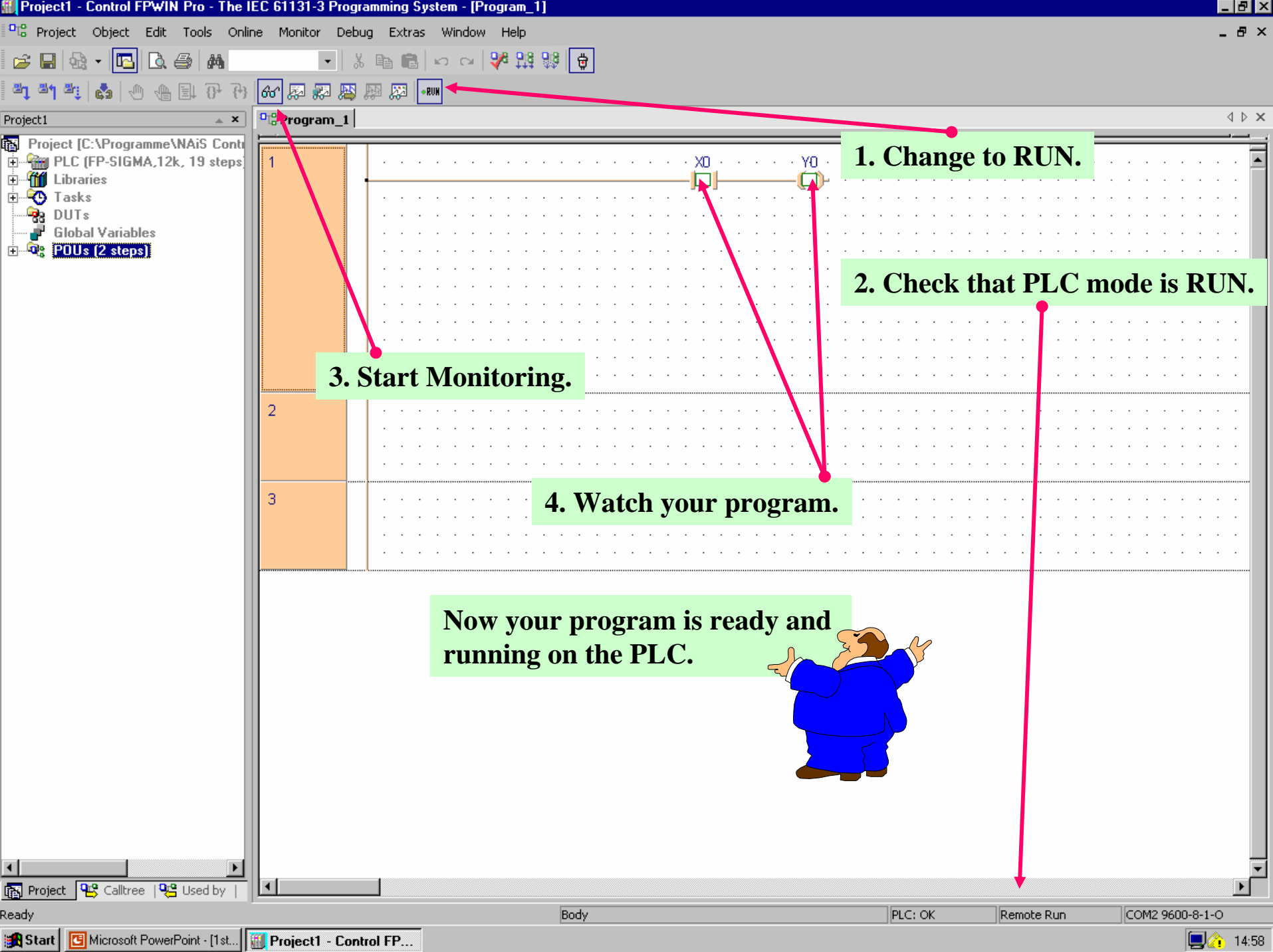
1. Connect the PLC to the RS232 port of your computer via the programming cable .

3. Check if PLC is in Remote Prog. If not you can toggle between Run and Prog. Mode with the toolbar.

4. Download the program to the PLC. (Confirm at Compile all.)

Download Program
Download program to PLC...
Please wait for a while.
[Progress bar]
[Cancel]

If you have communication problems, check the ONLINE Menu: Communication Parameters.



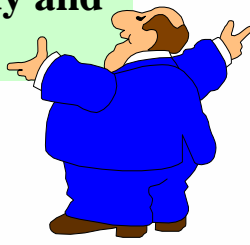
1. Change to RUN.

2. Check that PLC mode is RUN.

3. Start Monitoring.

4. Watch your program.

Now your program is ready and running on the PLC.



Project Object Edit Tools Online Monitor Debug Extras Window Help

New... Ctrl+N
Open... Ctrl+O
Open Project from the PLC...
Close
Save Ctrl+S
Save As...
Compile All...
Compile Incrementally...
Used Memory...
Printer Setup...
Print Preview Ctrl+Q
Print... Ctrl+P
Open Cross-Reference List...
Import Project...
Export Project...
Change Security Level...
Change Passwords...
1 C:\Programme\Projet1
2 C:\Programme\Projet5
3 C:\Programme\Proyecto7
4 C:\Programme\Proyecto3
5 C:\Programme\Proyecto2
6 C:\Programme\Proyecto6
7 C:\Programme\Proyecto5
8 C:\Programme\Proyecto4
9 C:\Programme\Proyecto1
0 C:\Programme\Progetto6
1 C:\Programme\Progetto5
2 C:\Programme\Progetto4
3 C:\Programme\Progetto3
4 C:\Programme\Progetto2
Exit Alt+F4

1
2
3
4

X1 Y1

Close and Save the project.

Project Calltree Used by

1. A small program

Next is a small program.

We will use conventional programming style with FP addresses.

Description:

If 2 of 3 inputs are ON, the output will be switched ON

Please remember the introduction!

Create a new project/program

1. Create a new project with the start-up wizard

2. Click for OK.

Wizard - Create a new project

Project Path (Location/project name): C:\Programme\NAIS Control FFWIN Pro 5\Project\Project3 Path Selection ...

PLC Type: Change PLC Type ...

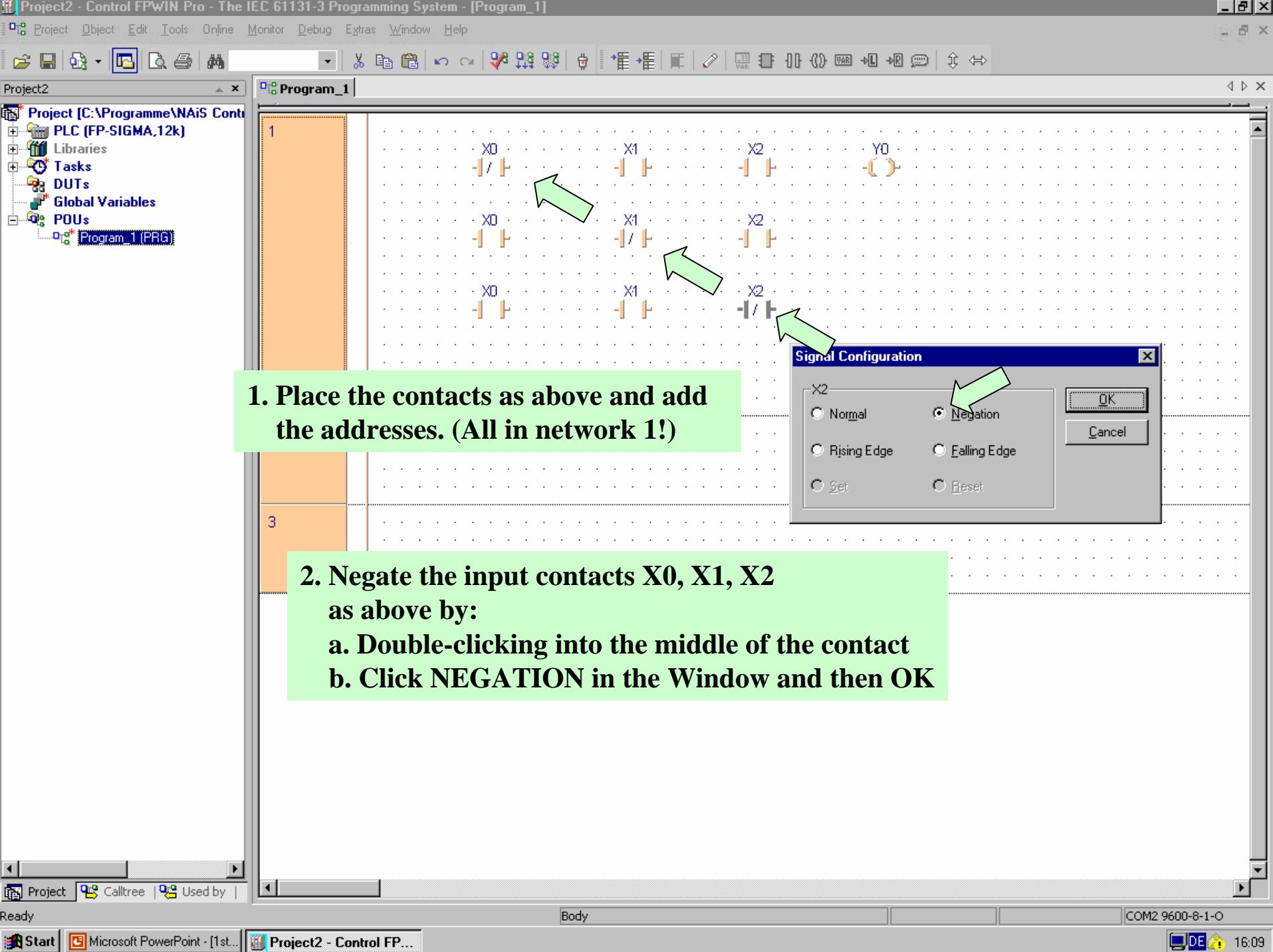
Define one Program (PRG):

Name: Program_1 Help

Language:

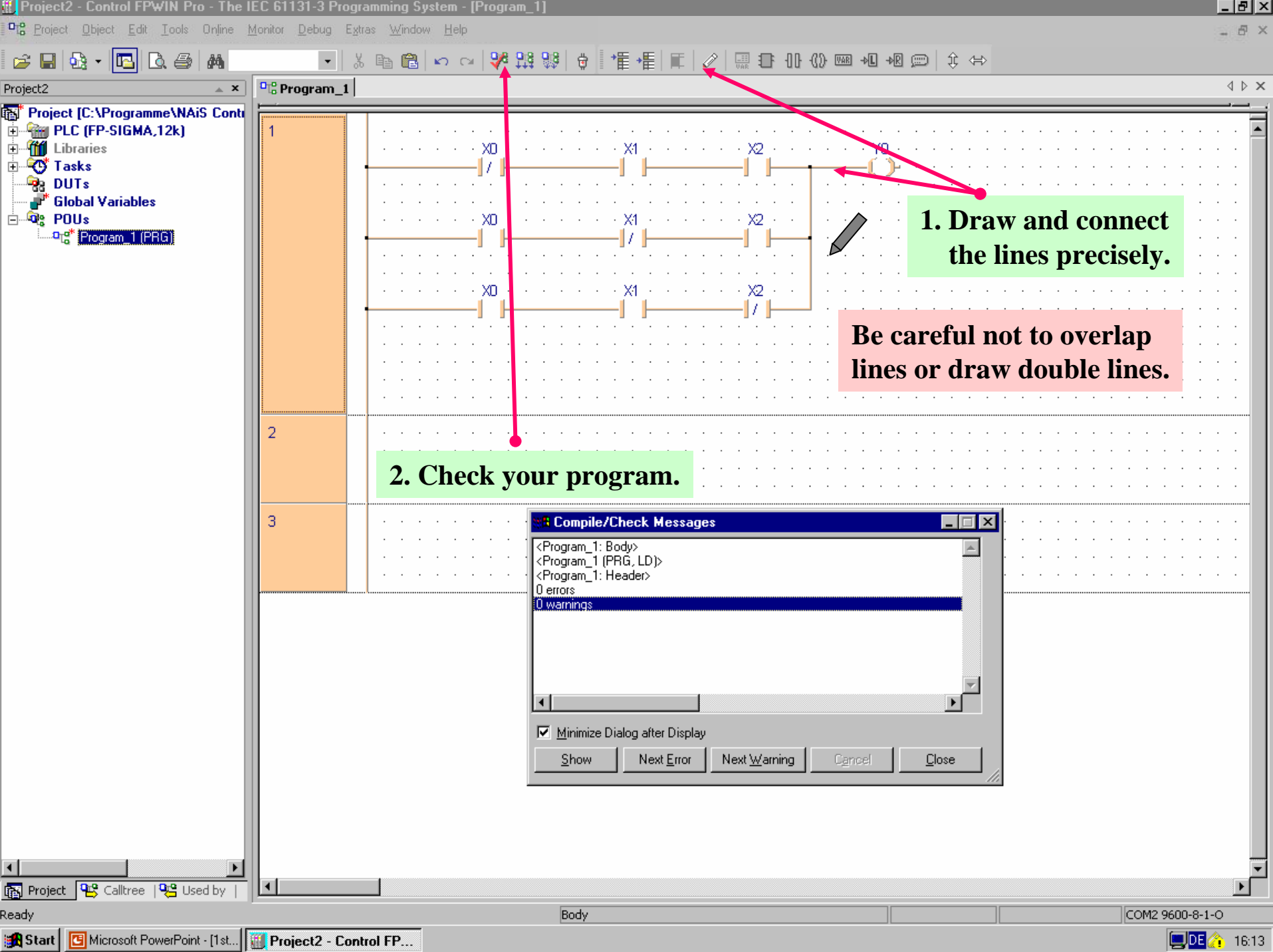
- Function Block Diagram (FBD)
- Instruction List (IL)
- Basic Diagram (L)**
- Sequential Function Chart (SFC)
- Structured Text (ST)

Advanced Dialog << Create Project Create Empty Project Cancel



1. Place the contacts as above and add the addresses. (All in network 1!)

2. Negate the input contacts X0, X1, X2 as above by:
a. Double-clicking into the middle of the contact
b. Click NEGATION in the Window and then OK



1. Draw and connect the lines precisely.

Be careful not to overlap lines or draw double lines.

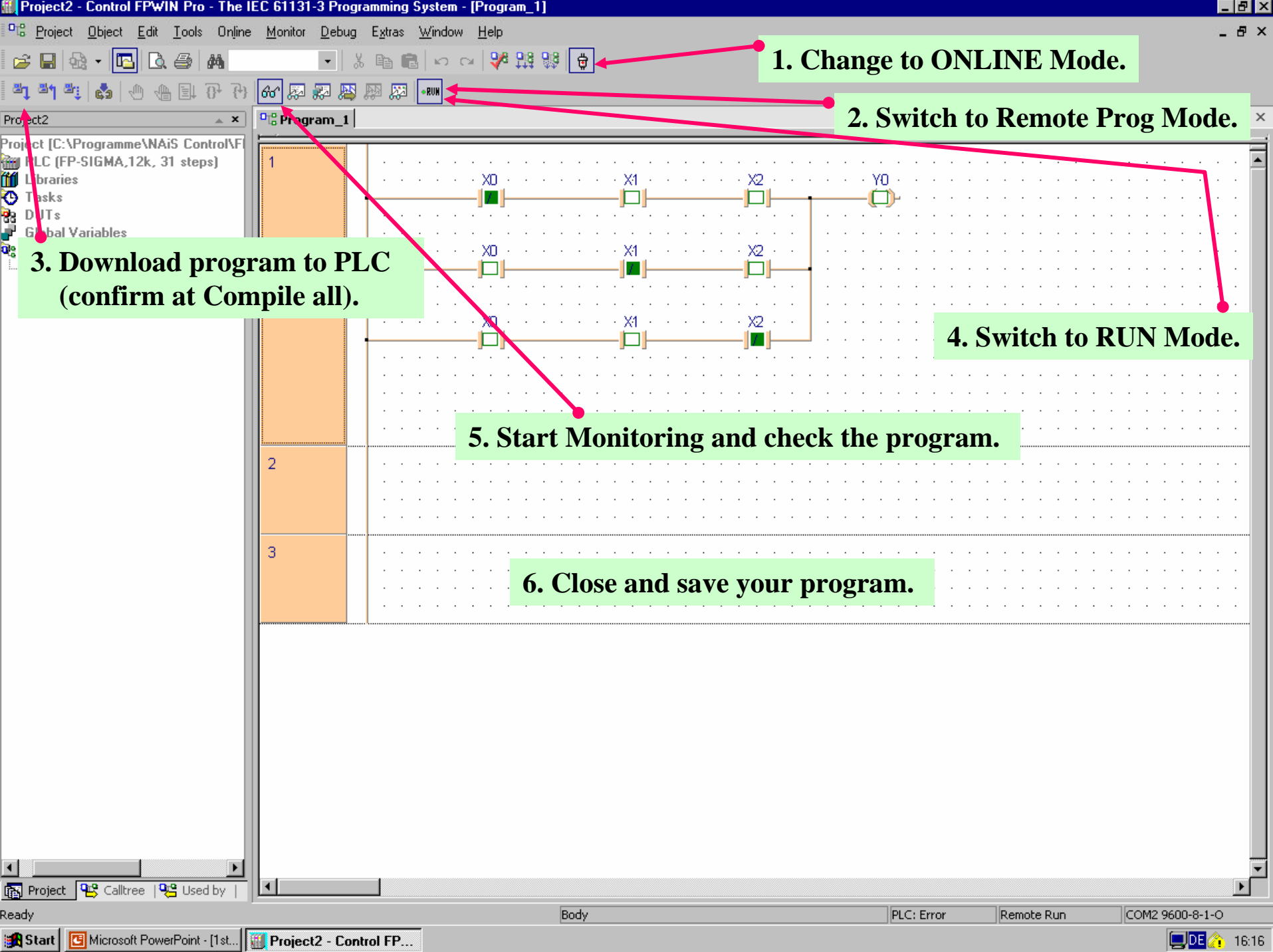
2. Check your program.

Compile/Check Messages

<Program_1: Body>
<Program_1 (PRG, LD)>
<Program_1: Header>
0 errors
0 warnings

Minimize Dialog after Display

Show Next Error Next Warning Cancel Close



1. Change to ONLINE Mode.

2. Switch to Remote Prog Mode.

3. Download program to PLC
(confirm at Compile all).

4. Switch to RUN Mode.

5. Start Monitoring and check the program.

6. Close and save your program.

2. Program with IEC 61131-3 addresses

In the next sample program you will use addresses according to the IEC 61131-3 standard.

We will write the same 2-of-3-inputs program.

With IEC 61131-3 addresses you can see the names of your contacts in the editor field.

Create a new project/program

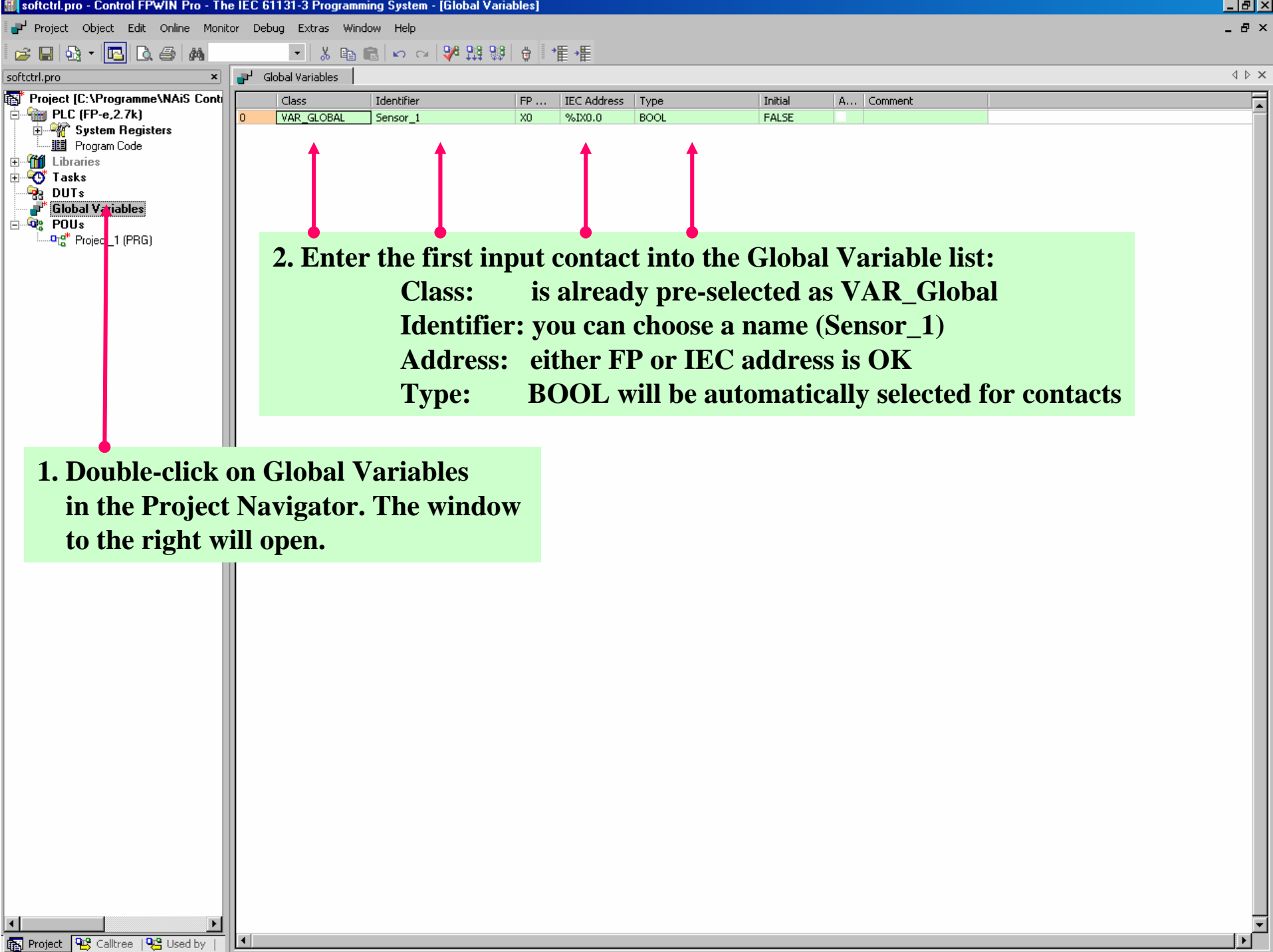
1. Create a new project with the start-up wizard

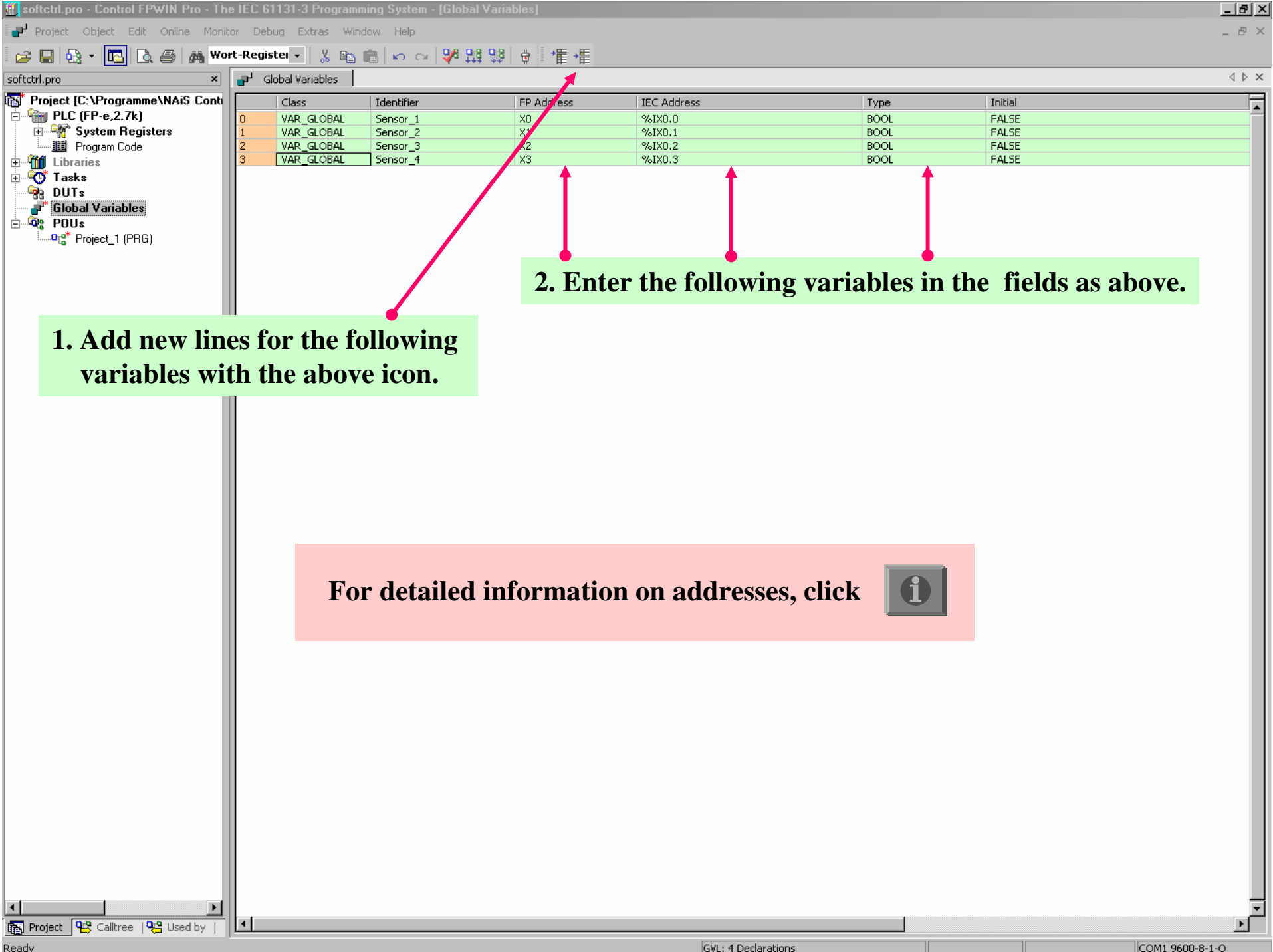
2. Click for OK.

The screenshot displays the 'Control FPWIN Pro - The IEC 61131-3 Programming System' application. The 'Wizard - Create a new project' dialog is open, showing the following fields and options:

- Project Path (Location/project name):** C:\Programme\NAIS Control\FPWIN Pro 5\Project\Project3
- PLC Type:** (Empty)
- Define one Program (PRG):**
 - Name:** Program_1
 - Language:** Ladder Diagram (LD) (Selected)
 - Other options: Function Block Diagram (FBD), Instruction List (IL), Sequential Function Chart (SFC), Structured Text (ST)

Buttons at the bottom of the wizard include: Advanced Dialog, <<, **Create Project**, Create Empty Project, and Cancel.



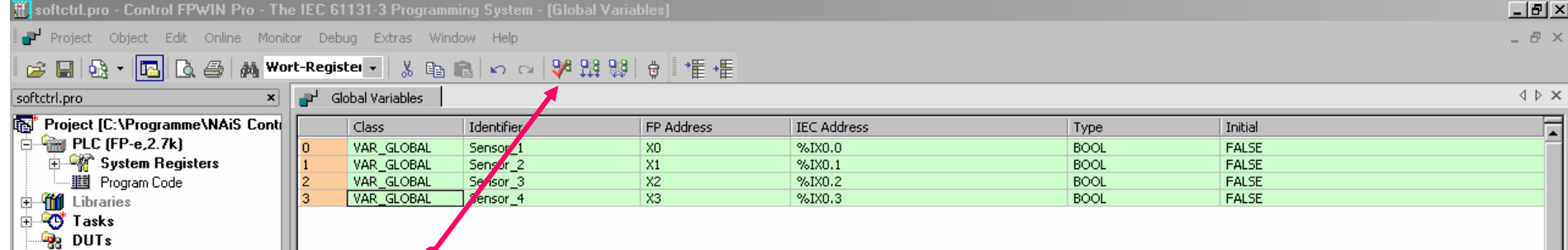


	Class	Identifier	FP Address	IEC Address	Type	Initial
0	VAR_GLOBAL	Sensor_1	X0	%IX0.0	BOOL	FALSE
1	VAR_GLOBAL	Sensor_2	X1	%IX0.1	BOOL	FALSE
2	VAR_GLOBAL	Sensor_3	X2	%IX0.2	BOOL	FALSE
3	VAR_GLOBAL	Sensor_4	X3	%IX0.3	BOOL	FALSE

1. Add new lines for the following variables with the above icon.

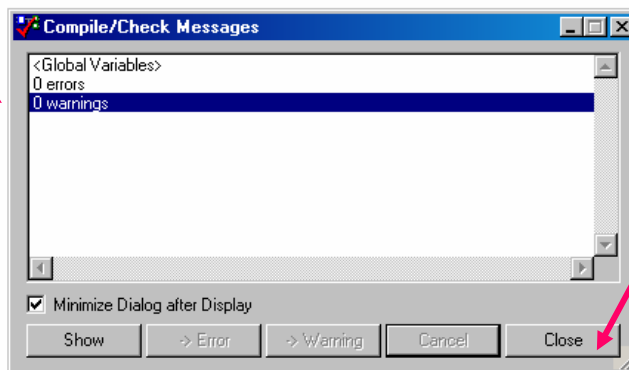
2. Enter the following variables in the fields as above.

For detailed information on addresses, click 

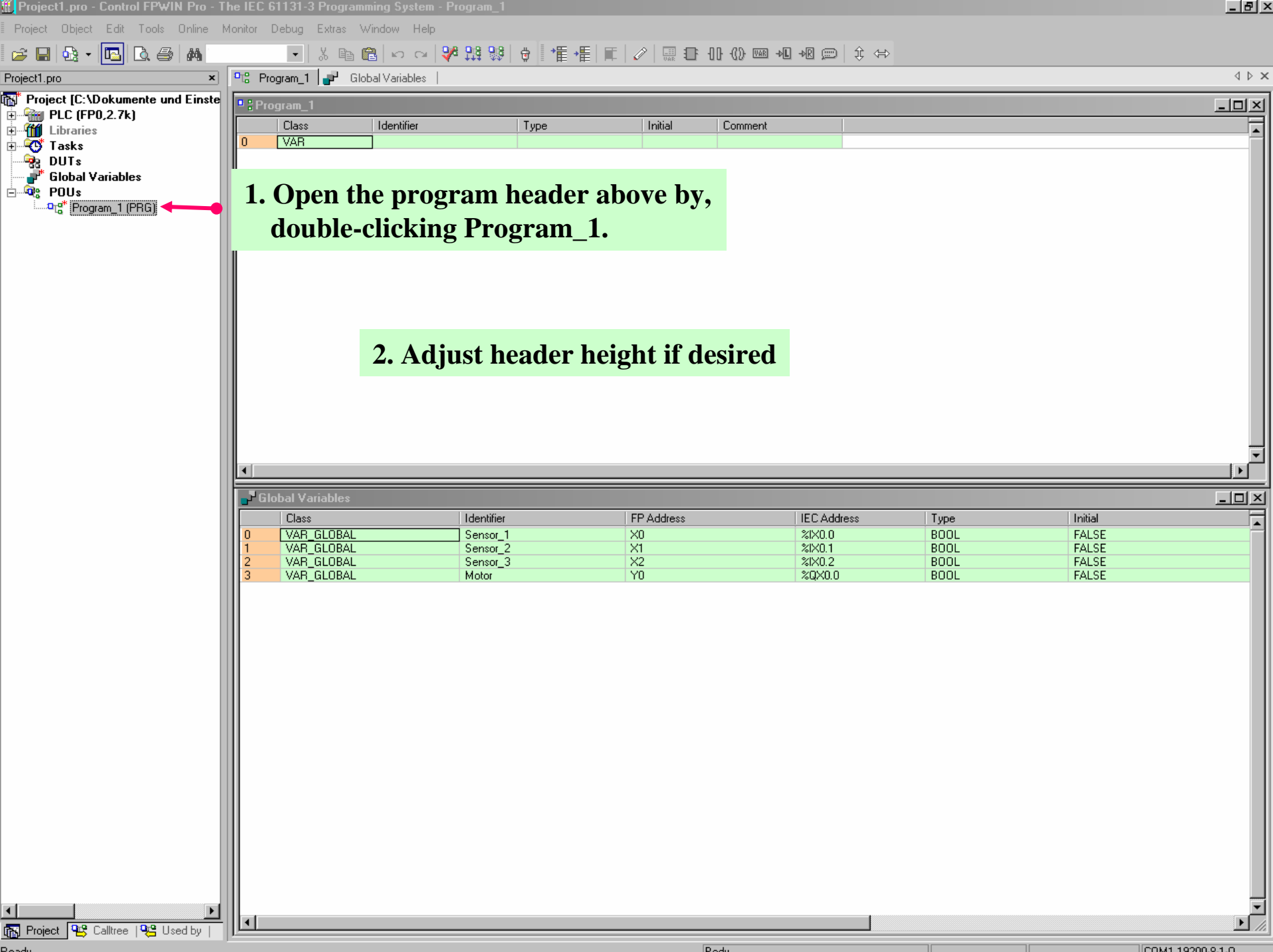


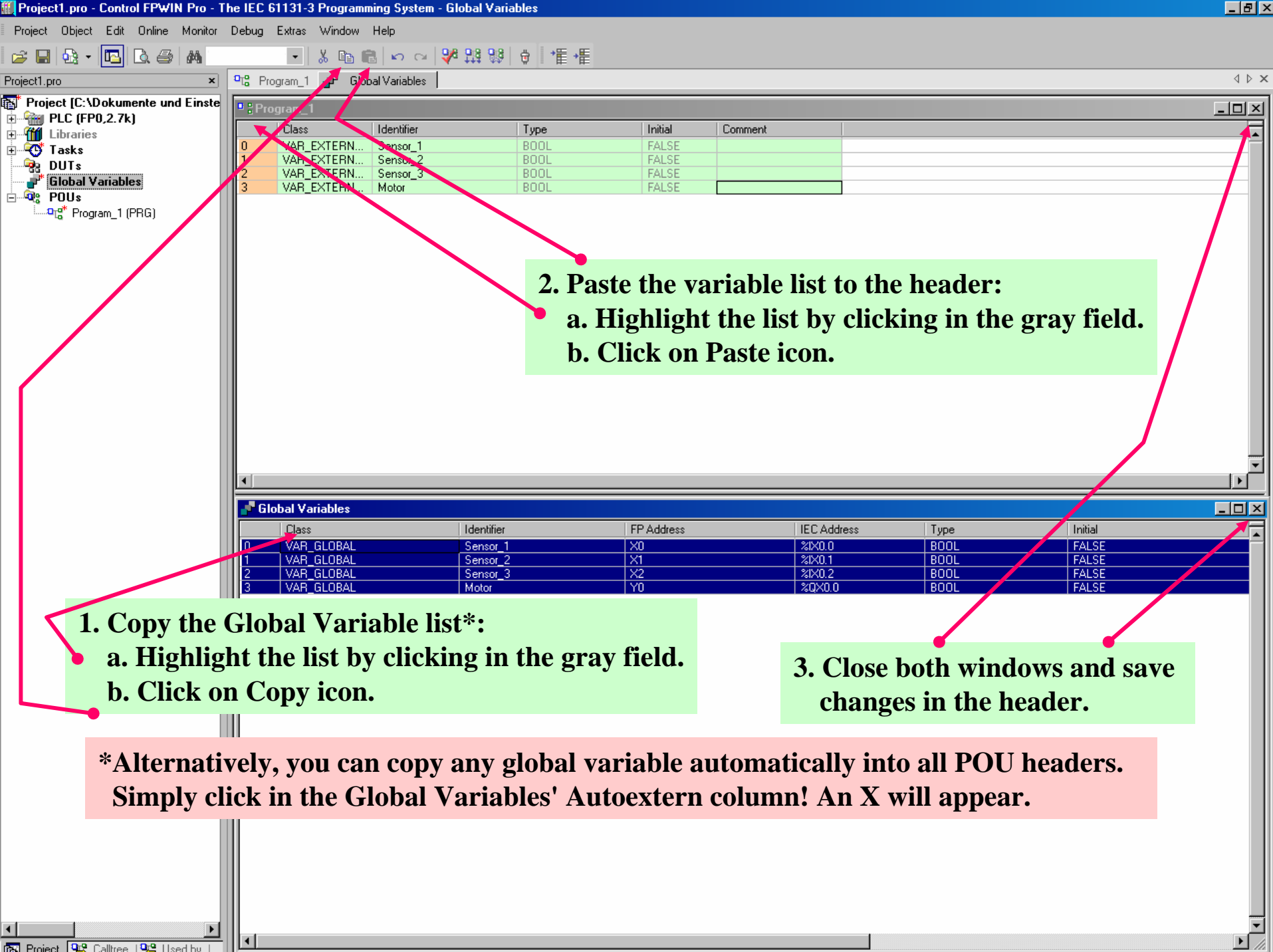
1. Check to see if you entered the variables correctly with above icon. If needed, make corrections.

2. Close the window by clicking here.



Now the global variables are entered and available in the program.



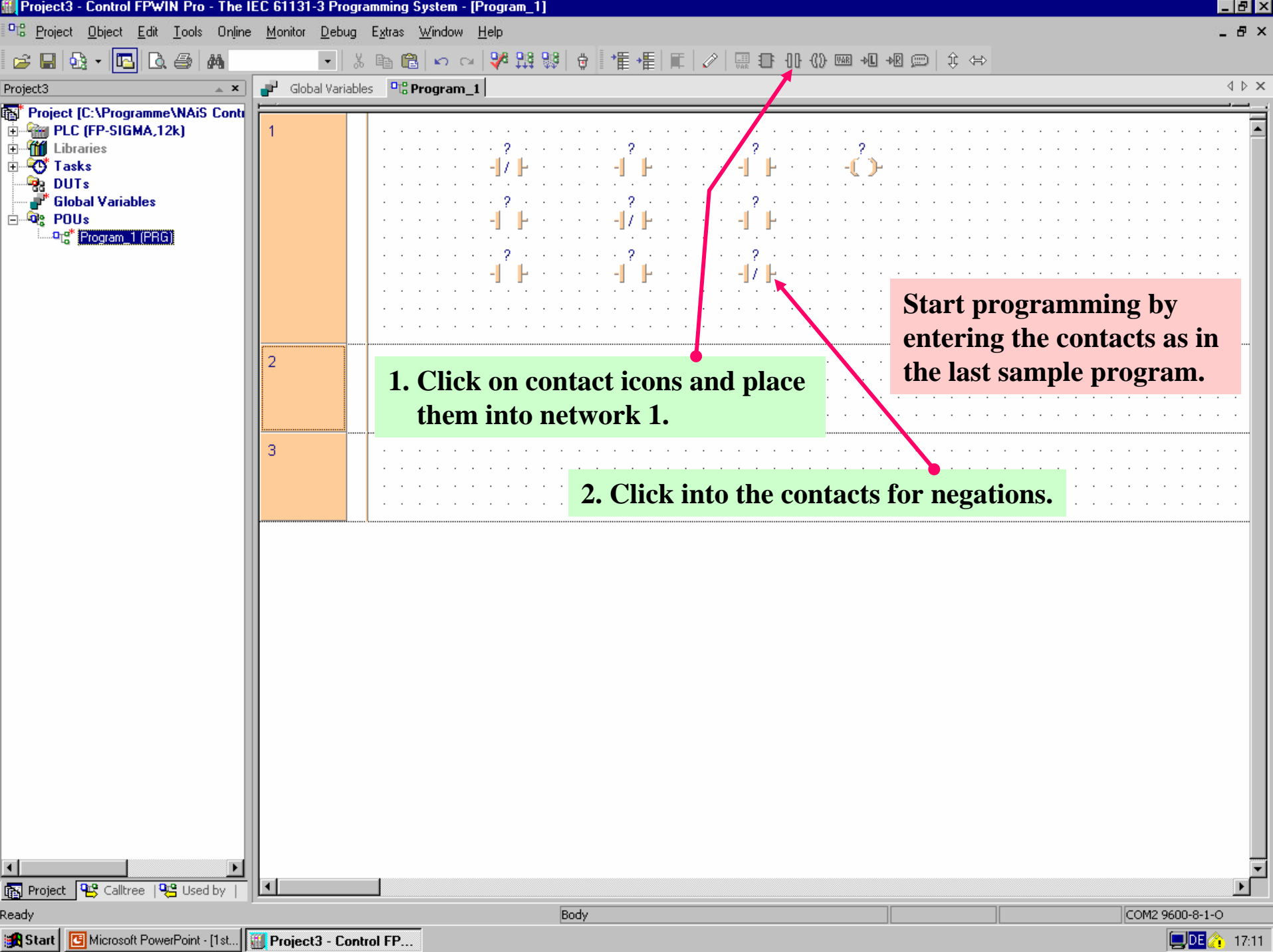


2. Paste the variable list to the header:
a. Highlight the list by clicking in the gray field.
b. Click on Paste icon.

1. Copy the Global Variable list*:
a. Highlight the list by clicking in the gray field.
b. Click on Copy icon.

3. Close both windows and save changes in the header.

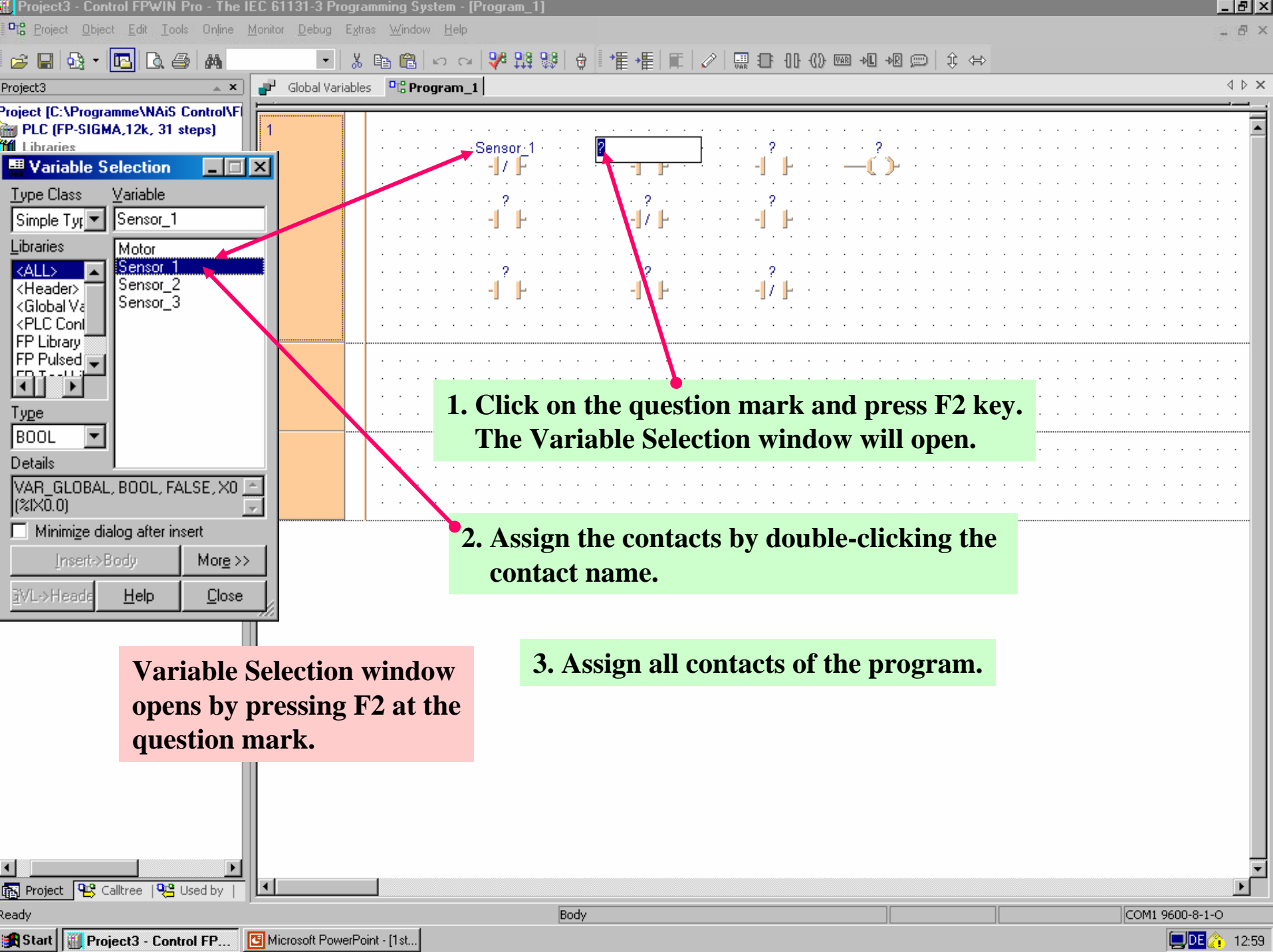
***Alternatively, you can copy any global variable automatically into all POU headers. Simply click in the Global Variables' Autoextern column! An X will appear.**



Start programming by entering the contacts as in the last sample program.

1. Click on contact icons and place them into network 1.

2. Click into the contacts for negations.

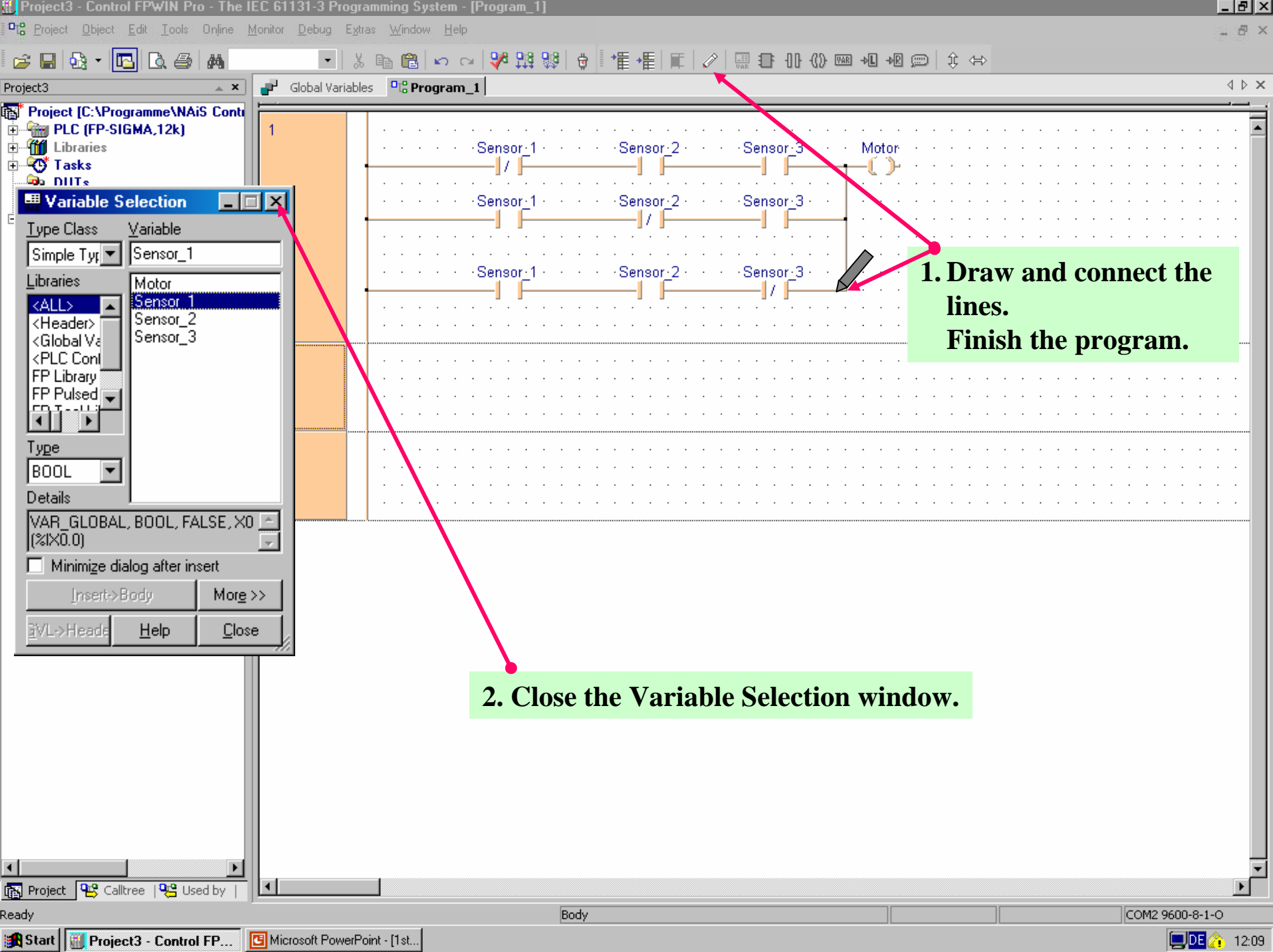


**1. Click on the question mark and press F2 key.
The Variable Selection window will open.**

**2. Assign the contacts by double-clicking the
contact name.**

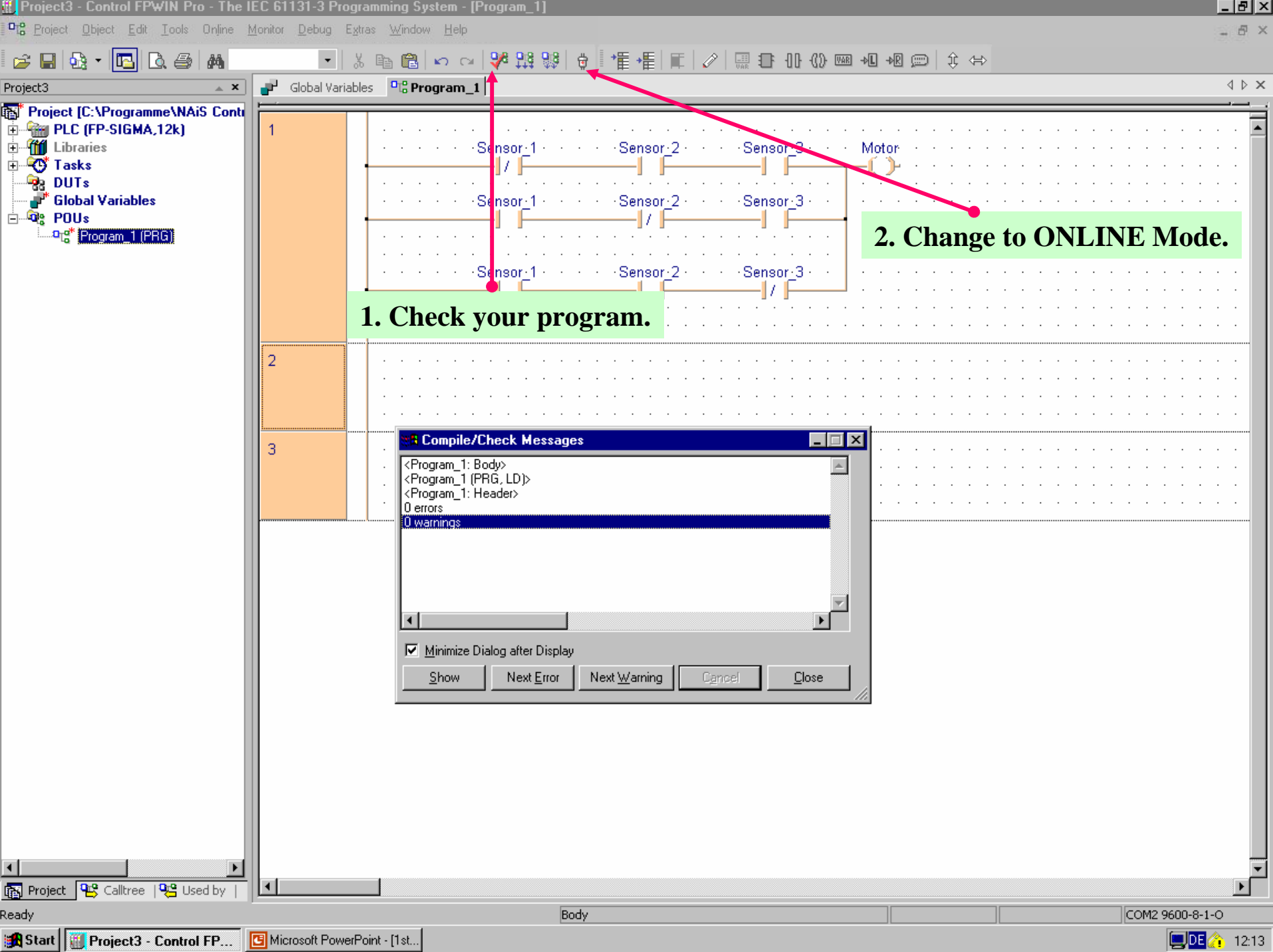
3. Assign all contacts of the program.

**Variable Selection window
opens by pressing F2 at the
question mark.**



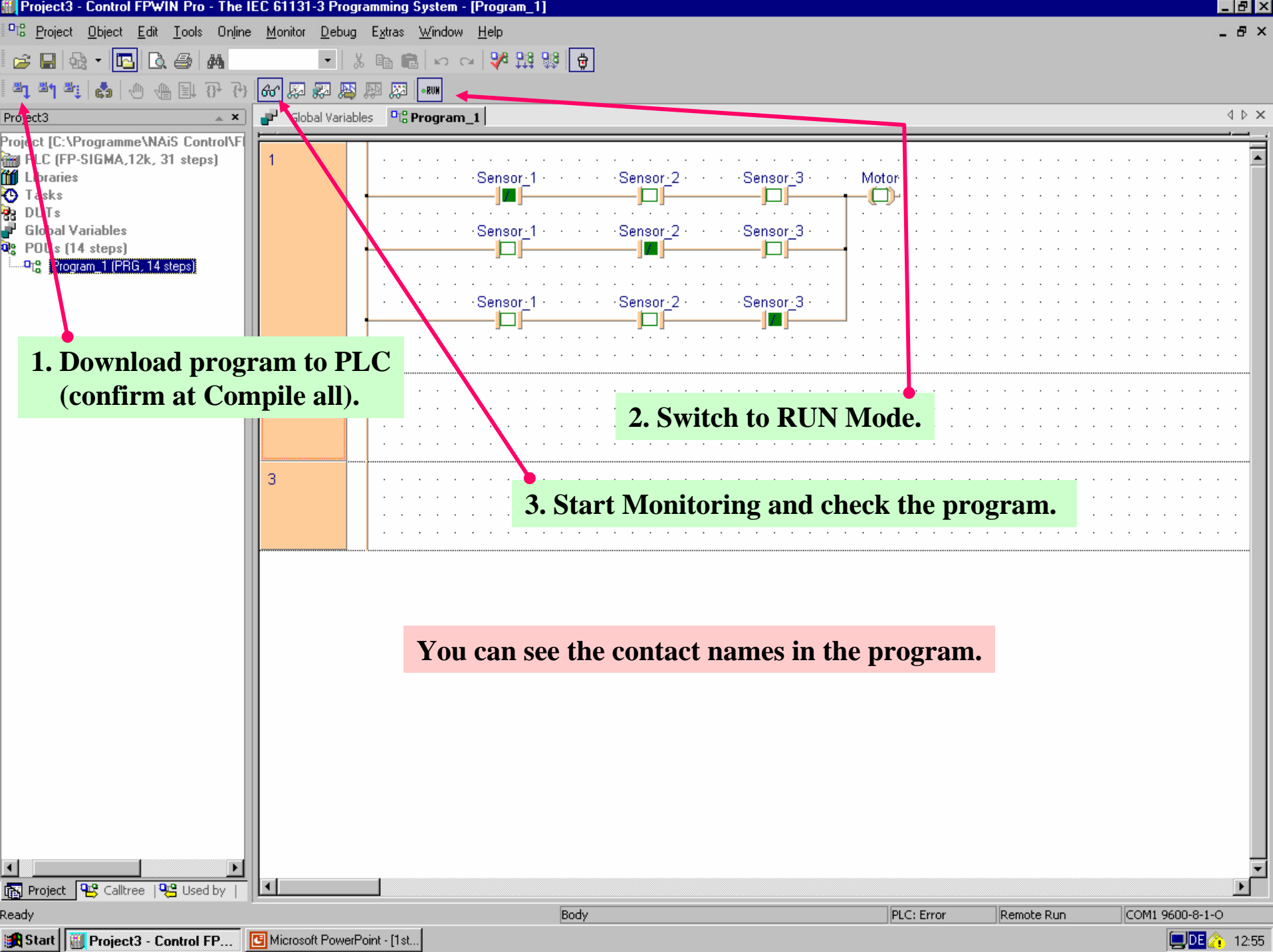
**1. Draw and connect the lines.
Finish the program.**

2. Close the Variable Selection window.



1. Check your program.

2. Change to ONLINE Mode.



**1. Download program to PLC
(confirm at Compile all).**

2. Switch to RUN Mode.

3. Start Monitoring and check the program.

You can see the contact names in the program.

3. Program with Timer and Add Functions

In the next sample program you will use FP addresses.

We will write a program which has a timer and an add function.

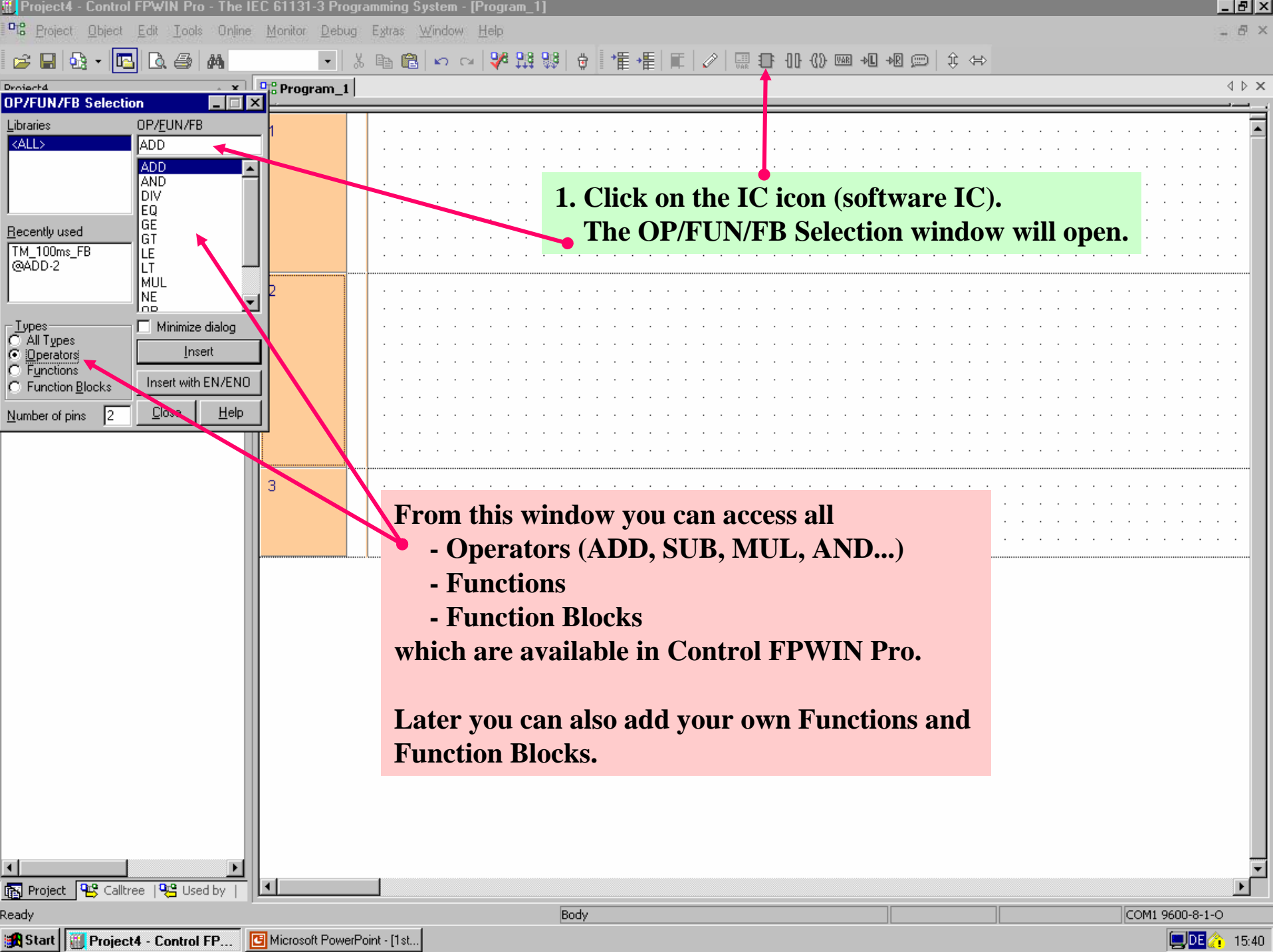
This exercise demonstrates how to utilize functions in the libraries which are pre-installed.

Create a new project/program

1. Create a new project with the start-up wizard

2. Click for OK.

The screenshot displays the 'Control FFWIN Pro - The IEC 61131-3 Programming System' application. The 'Project' menu is open, with 'New...' selected. The 'Wizard - Create a new project' dialog is shown, with the 'Language' list containing 'Function Block Diagram (FBD)', 'Instruction List (IL)', 'Ladder Diagram (LD)', 'Sequential Function Chart (SFC)', and 'Structured Text (ST)'. The 'Create Project' button is highlighted with a green arrow and callout.



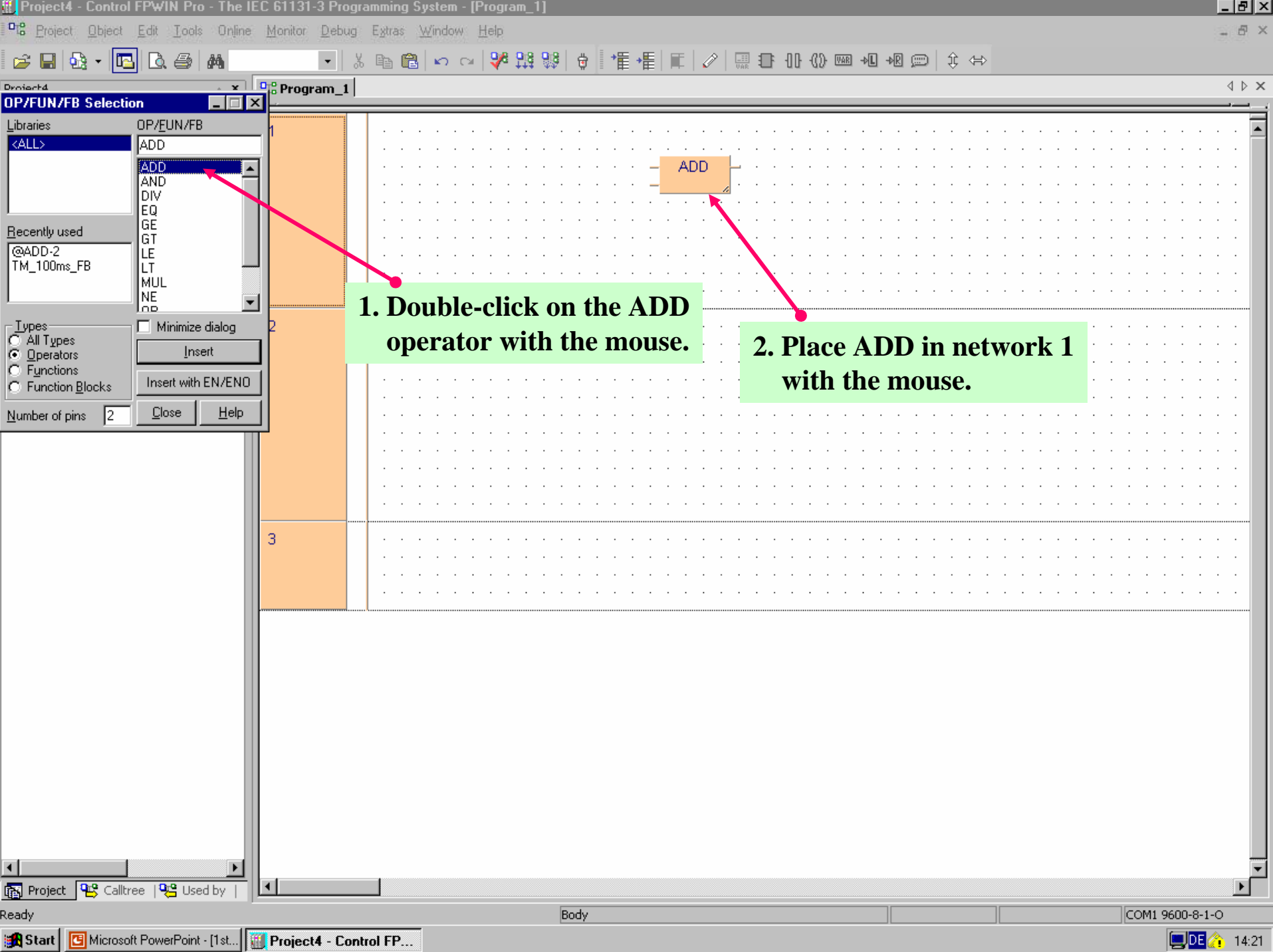
**1. Click on the IC icon (software IC).
The OP/FUN/FB Selection window will open.**

From this window you can access all

- Operators (ADD, SUB, MUL, AND...)**
- Functions**
- Function Blocks**

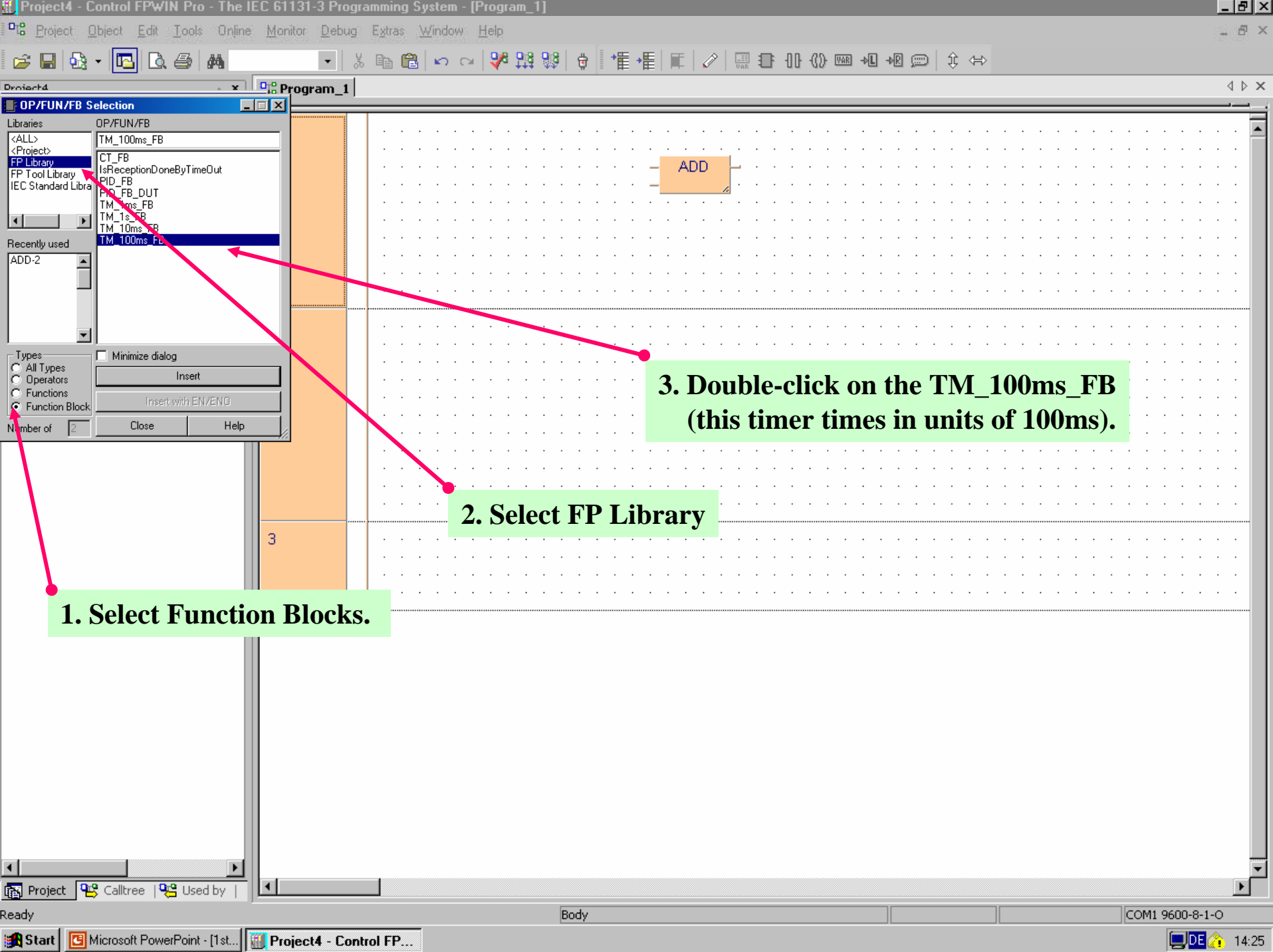
which are available in Control FPWIN Pro.

Later you can also add your own Functions and Function Blocks.



1. Double-click on the ADD operator with the mouse.

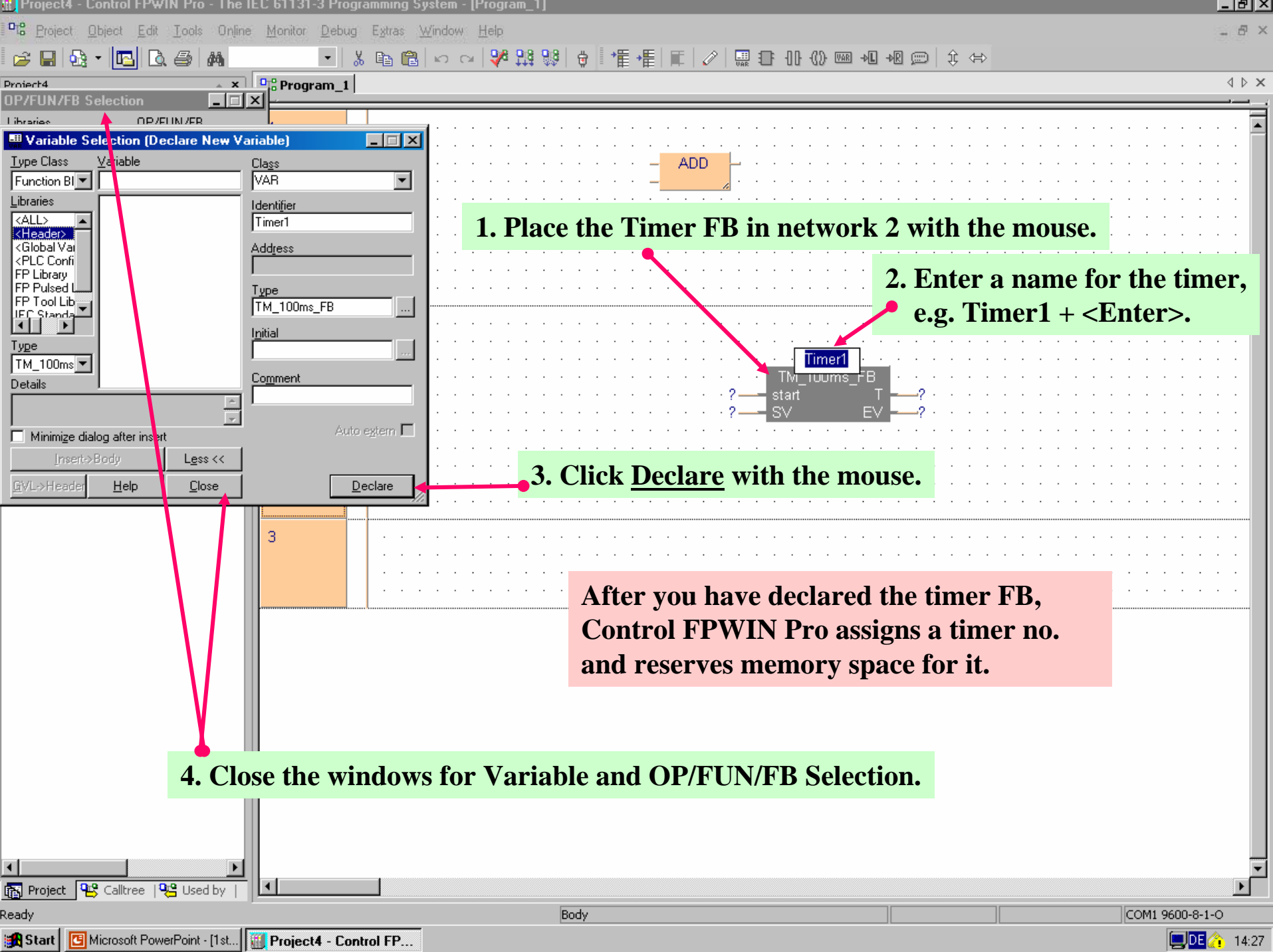
2. Place ADD in network 1 with the mouse.



1. Select Function Blocks.

2. Select FP Library

**3. Double-click on the TM_100ms_FB
(this timer times in units of 100ms).**



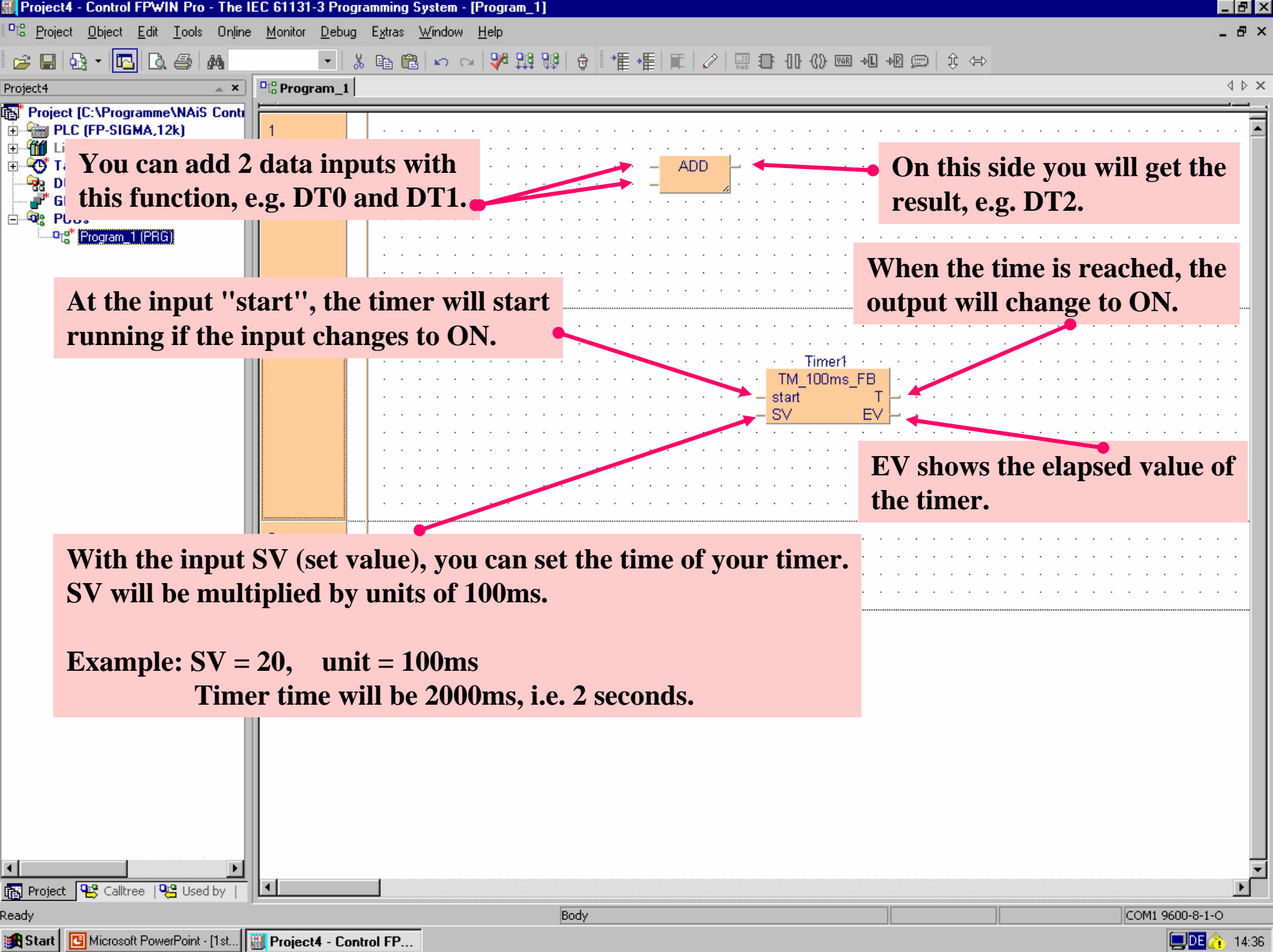
1. Place the Timer FB in network 2 with the mouse.

2. Enter a name for the timer, e.g. Timer1 + <Enter>.

3. Click Declare with the mouse.

4. Close the windows for Variable and OP/FUN/FB Selection.

After you have declared the timer FB, Control FPWIN Pro assigns a timer no. and reserves memory space for it.



You can add 2 data inputs with this function, e.g. DT0 and DT1.

On this side you will get the result, e.g. DT2.

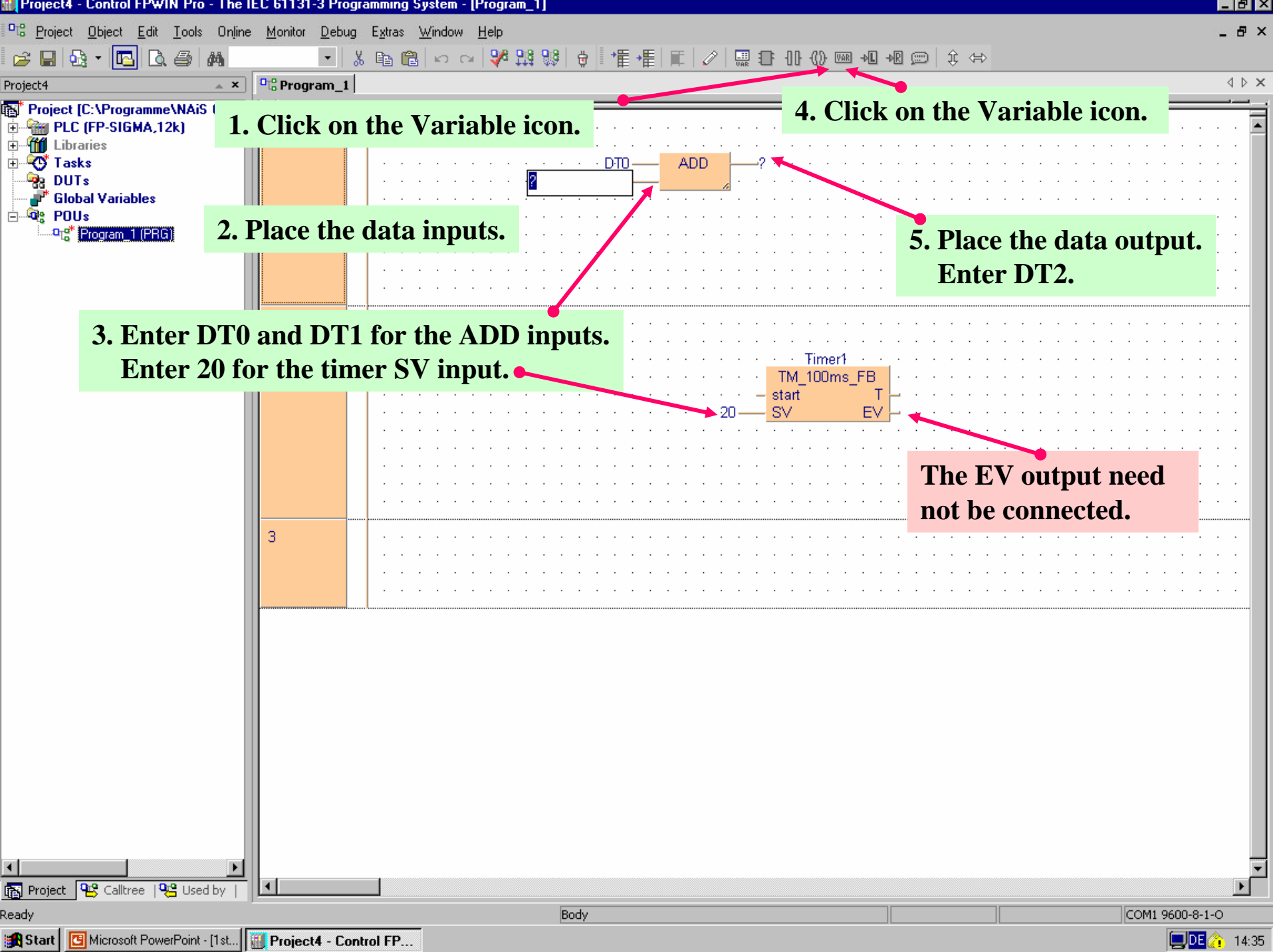
At the input "start", the timer will start running if the input changes to ON.

When the time is reached, the output will change to ON.

With the input SV (set value), you can set the time of your timer. SV will be multiplied by units of 100ms.

EV shows the elapsed value of the timer.

**Example: SV = 20, unit = 100ms
Timer time will be 2000ms, i.e. 2 seconds.**



1. Click on the Variable icon.

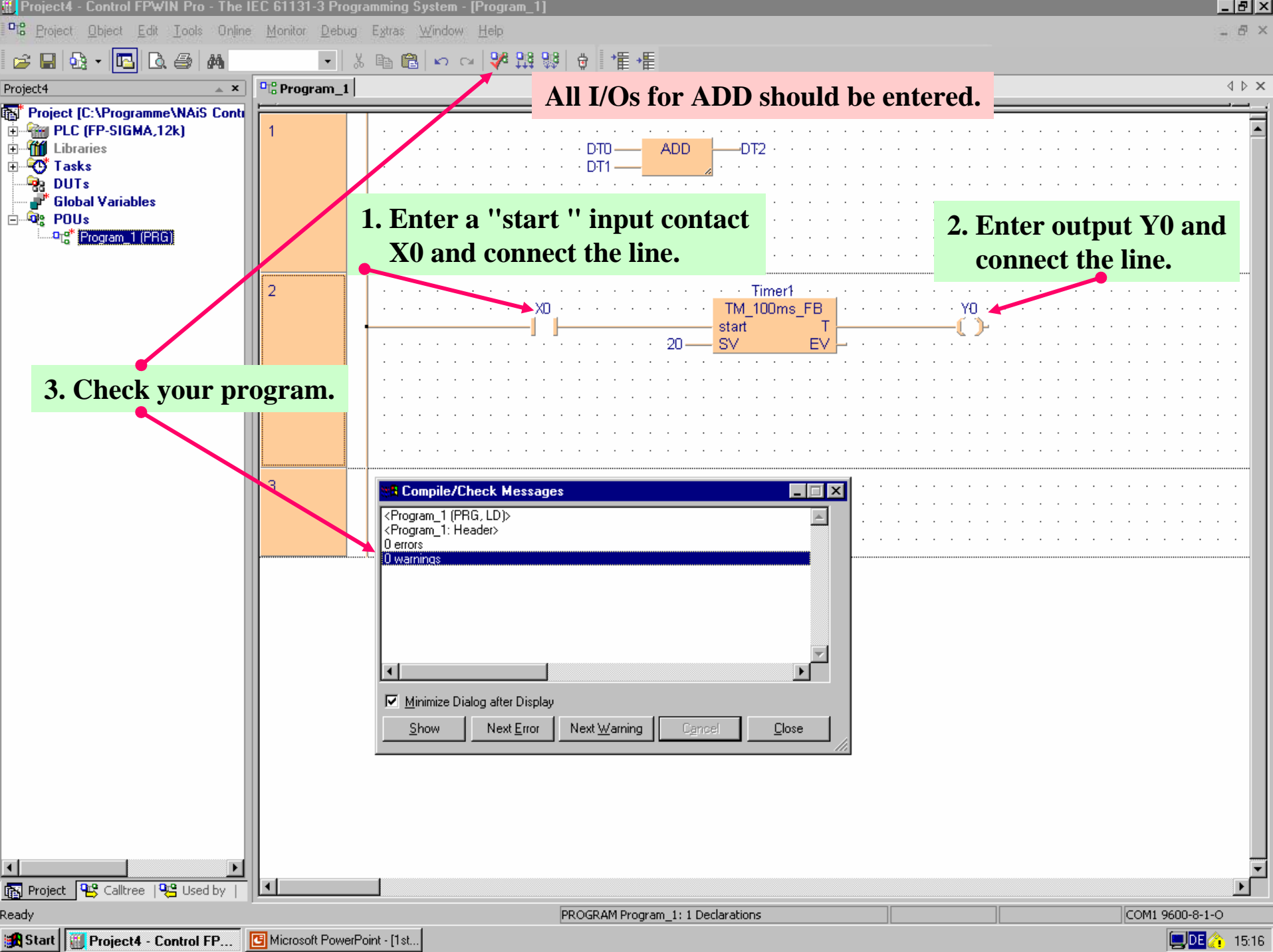
4. Click on the Variable icon.

2. Place the data inputs.

**5. Place the data output.
Enter DT2.**

**3. Enter DT0 and DT1 for the ADD inputs.
Enter 20 for the timer SV input.**

**The EV output need
not be connected.**



All I/Os for ADD should be entered.

1. Enter a "start " input contact X0 and connect the line.

2. Enter output Y0 and connect the line.

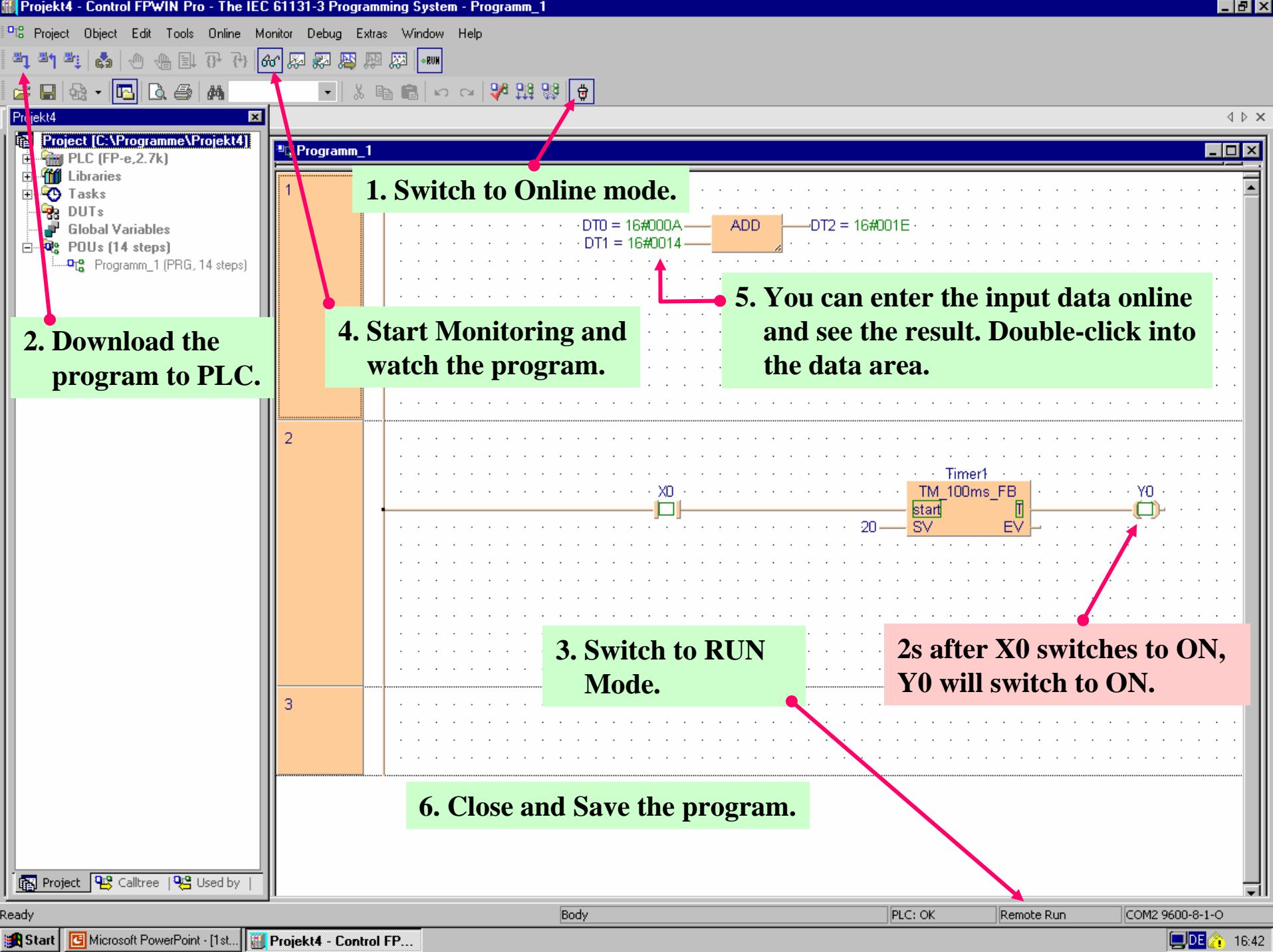
3. Check your program.

Compile/Check Messages

<Program_1 (PRG, LD)>
<Program_1: Header>
0 errors
0 warnings

Minimize Dialog after Display

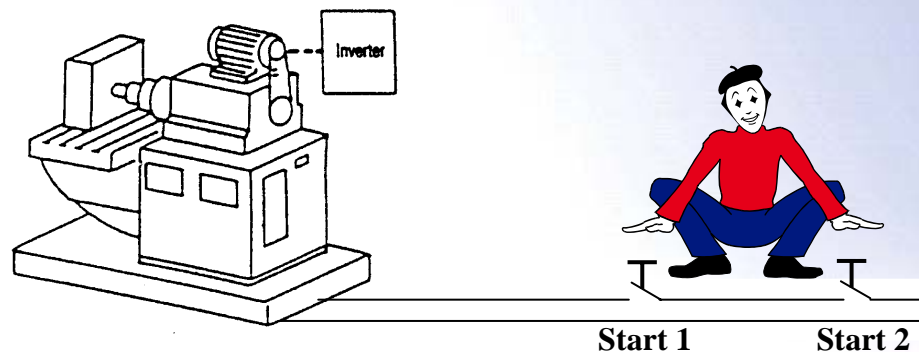
Show Next Error Next Warning Cancel Close



4. Two-Hand Trip Guard

In the next sample program you will use addresses according to the IEC 61131-3 standard. You will write a two-hand trip guard program.

With dangerous machines, two buttons must be pushed to ensure the user's safety. Both buttons have to be pressed within 0.5s of each other.

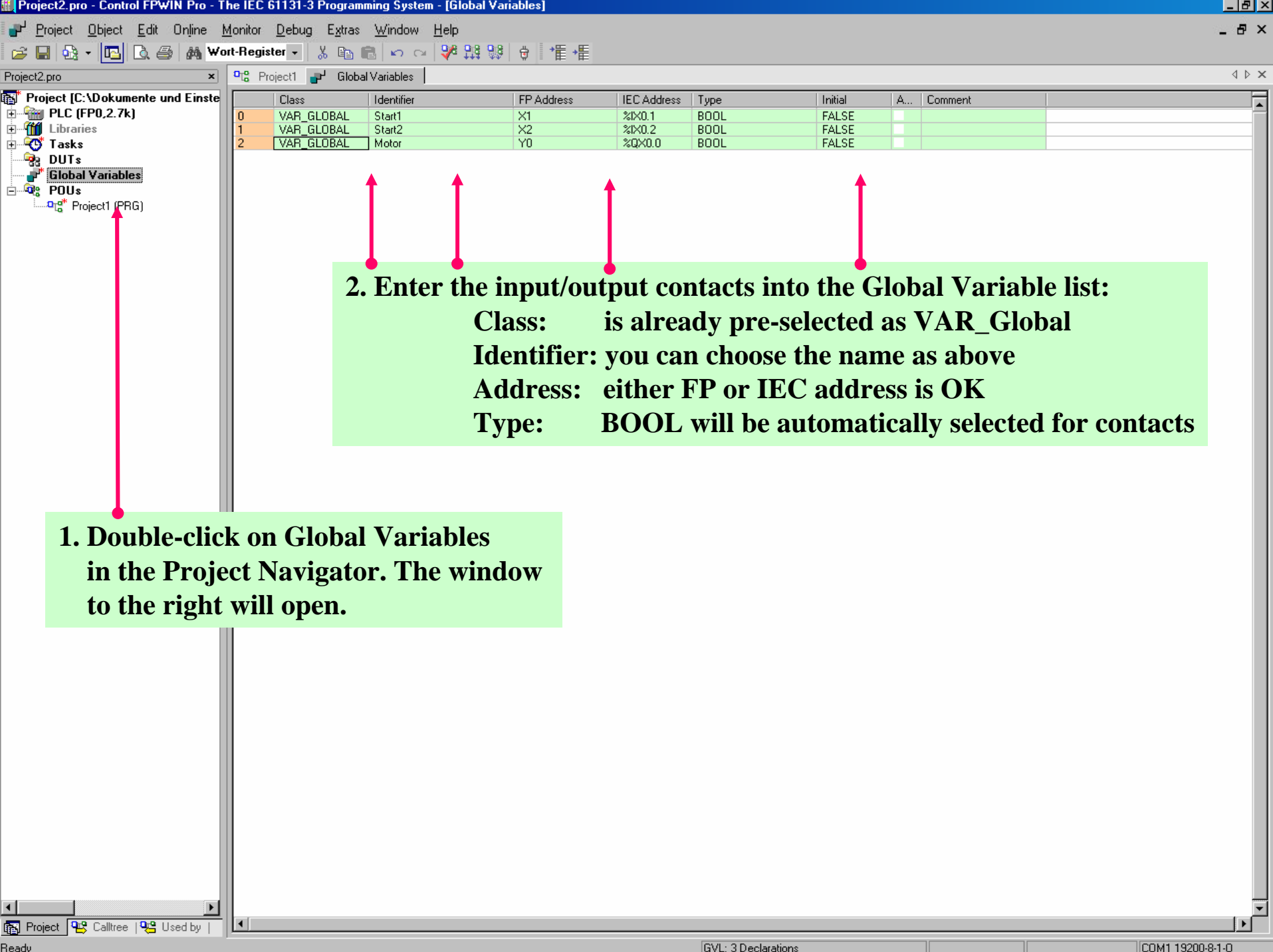


Create a new project/program

The screenshot displays the Control FPWIN Pro software interface. The 'Project' menu is open, showing options like 'New...', 'Open...', 'Save', and 'Exit'. A green callout box with the text '1. Create a new project with the start-up wizard' is overlaid on the main workspace, accompanied by a cartoon wizard character. In the foreground, the 'Wizard - Create a new project' dialog box is shown. It contains fields for 'Project Path', 'PLC Type', and 'Define one Program (PRG)'. The 'Define one Program (PRG)' section has a list of options: 'Function Block Diagram (FBD)', 'Instruction List (IL)', 'Sequential Program (LD)', 'Sequential Function Chart (SFC)', and 'Structured Text (ST)'. A green arrow points from a callout box with the text '2. Click for OK.' to the 'Create Project' button at the bottom of the wizard dialog.

1. Create a new project with the start-up wizard

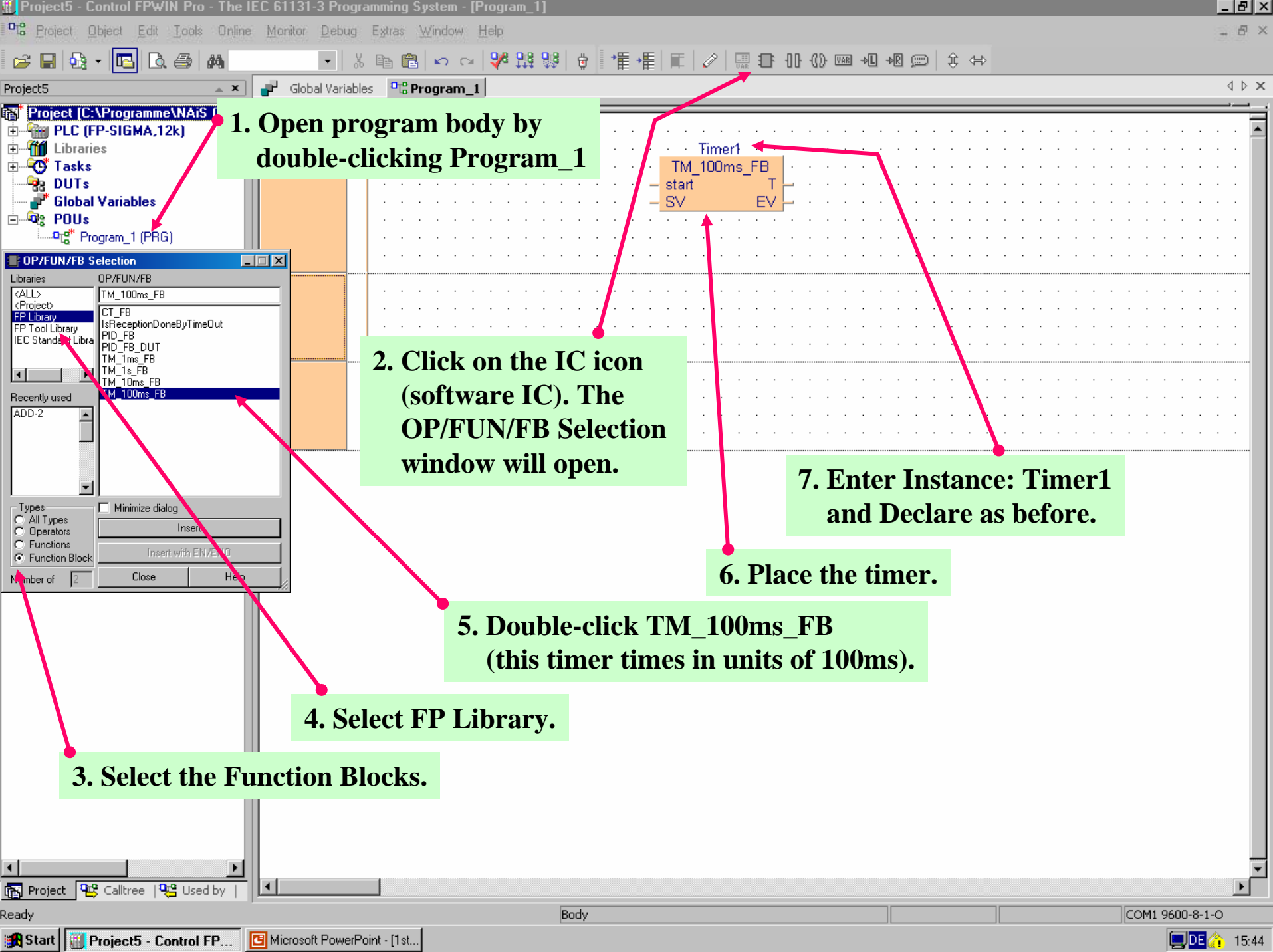
2. Click for OK.



	Class	Identifier	FP Address	IEC Address	Type	Initial	A...	Comment	
0	VAR_GLOBAL	Start1	X1	%IX0.1	BOOL	FALSE	<input type="checkbox"/>		
1	VAR_GLOBAL	Start2	X2	%IX0.2	BOOL	FALSE	<input type="checkbox"/>		
2	VAR_GLOBAL	Motor	Y0	%QX0.0	BOOL	FALSE	<input type="checkbox"/>		

1. Double-click on Global Variables in the Project Navigator. The window to the right will open.

2. Enter the input/output contacts into the Global Variable list:
Class: is already pre-selected as VAR_Global
Identifier: you can choose the name as above
Address: either FP or IEC address is OK
Type: BOOL will be automatically selected for contacts



1. Open program body by double-clicking Program_1

2. Click on the IC icon (software IC). The OP/FUN/FB Selection window will open.

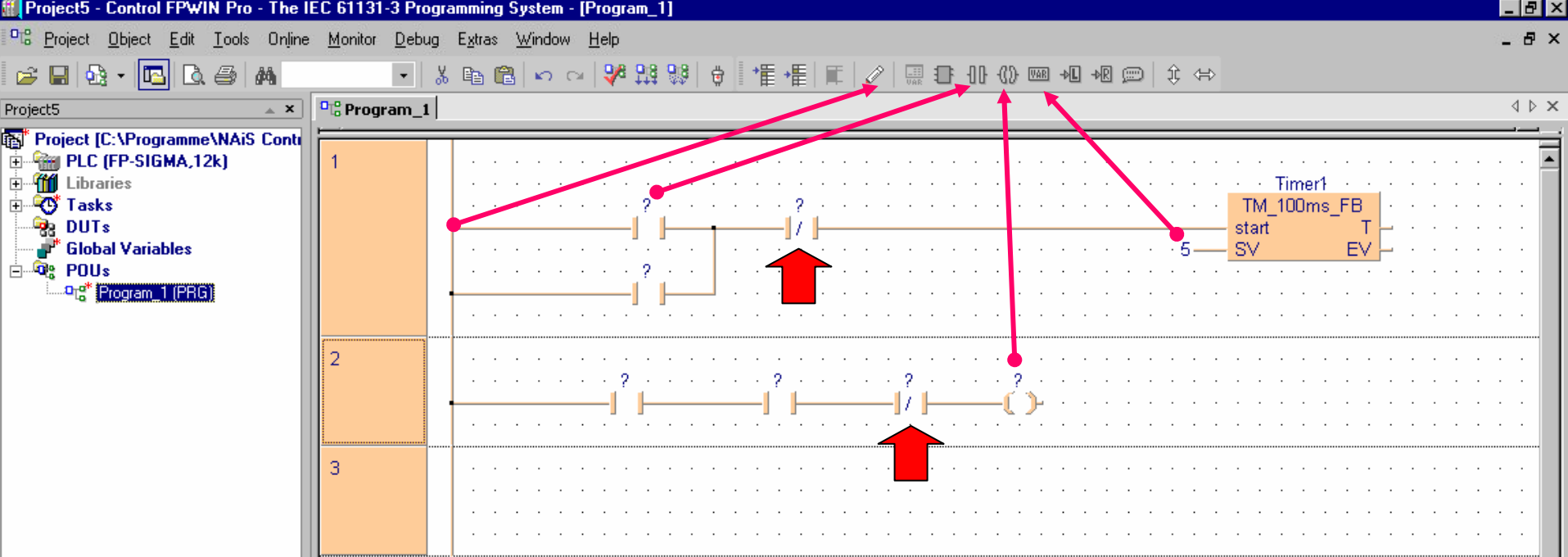
3. Select the Function Blocks.

4. Select FP Library.

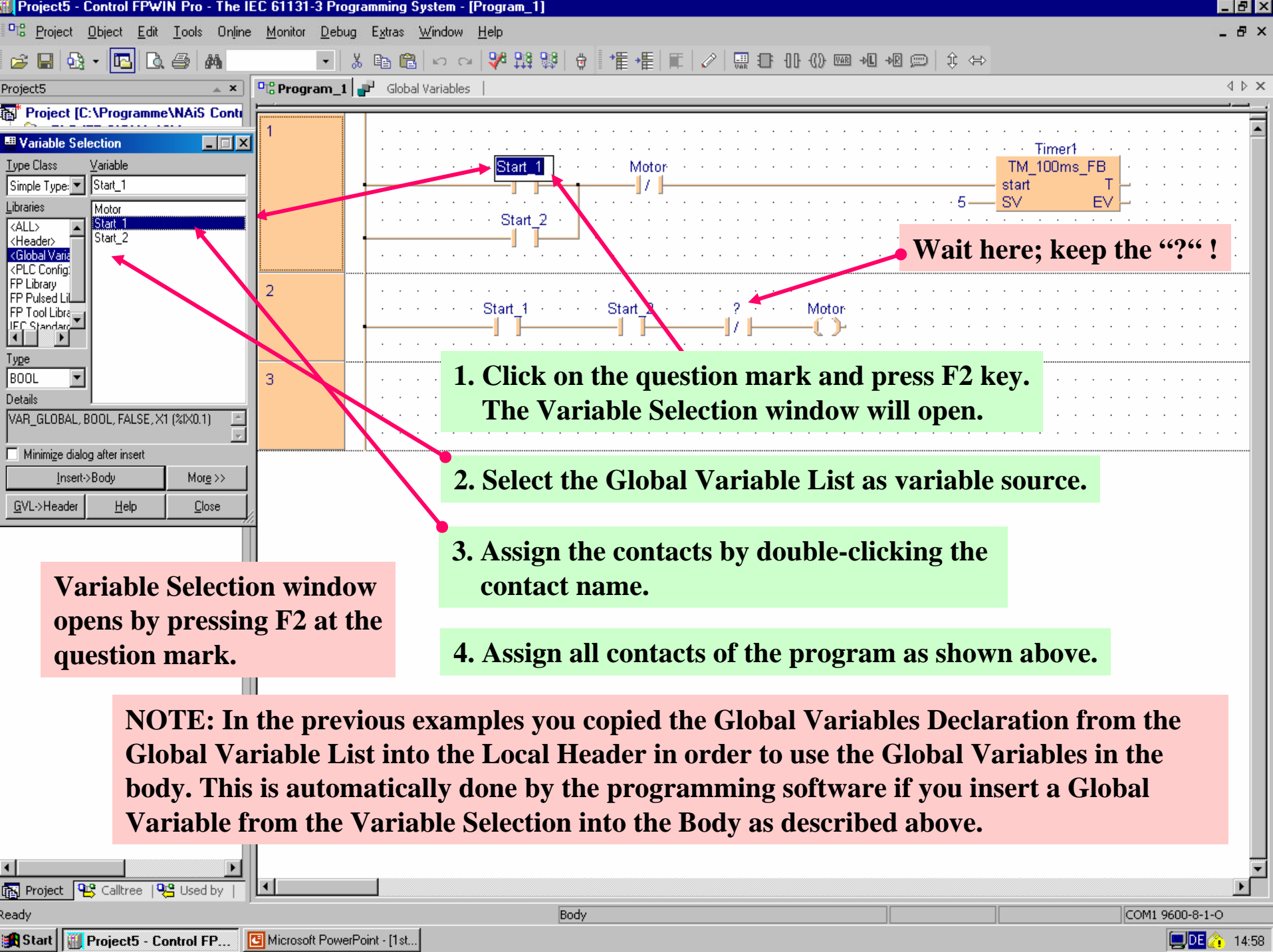
5. Double-click TM_100ms_FB (this timer times in units of 100ms).

6. Place the timer.

7. Enter Instance: Timer1 and Declare as before.



**1. Enter the contacts and draw the lines using the toolbar above.
Do not forget about the 2 negations.**



Wait here; keep the “?” !

1. Click on the question mark and press F2 key. The Variable Selection window will open.

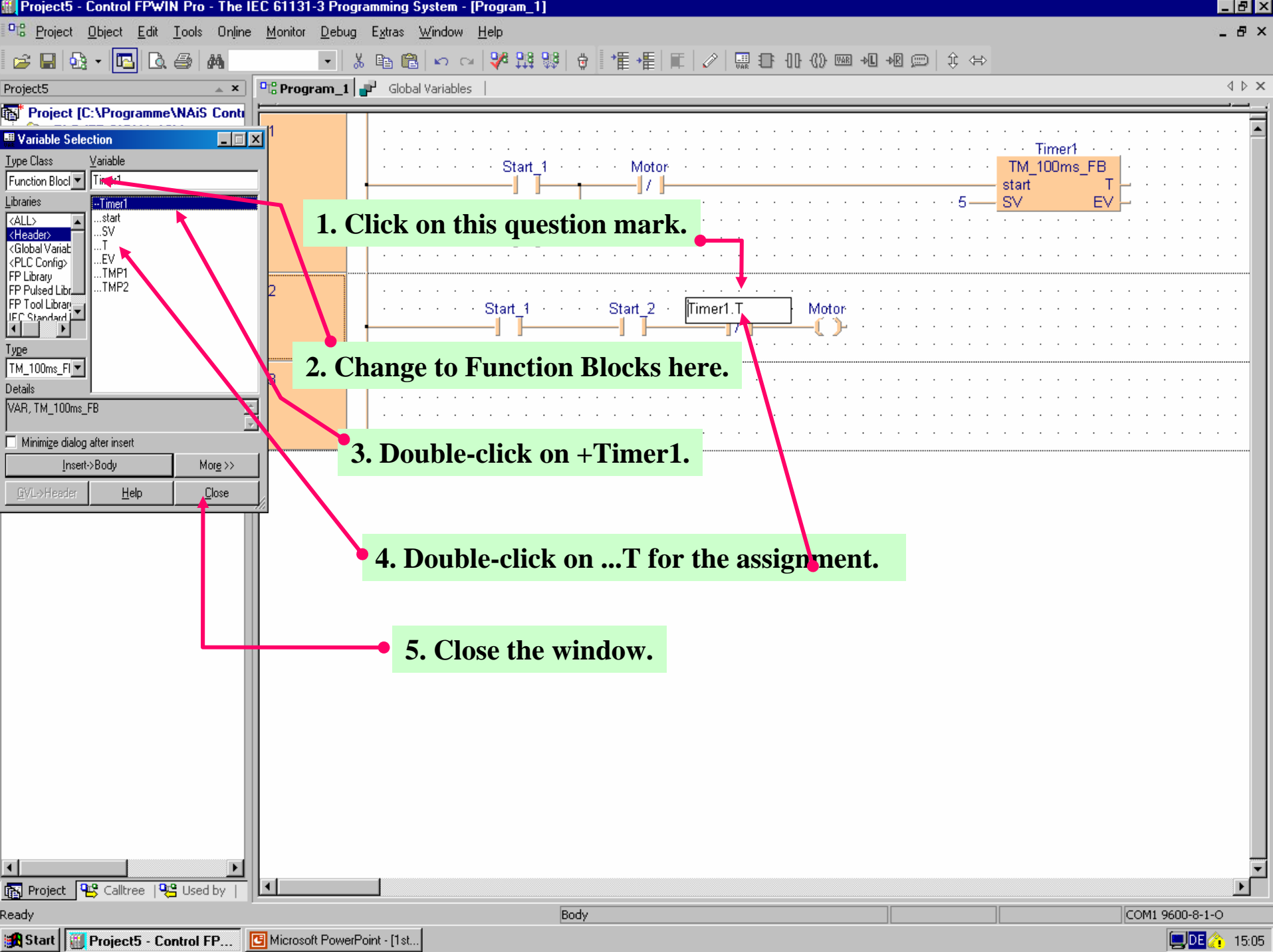
2. Select the Global Variable List as variable source.

3. Assign the contacts by double-clicking the contact name.

4. Assign all Start contacts of the program as shown above.

Variable Selection window opens by pressing F2 at the question mark.

NOTE: In the previous examples you copied the Global Variables Declaration from the Global Variable List into the Local Header in order to use the Global Variables in the body. This is automatically done by the programming software if you insert a Global Variable from the Variable Selection into the Body as described above.



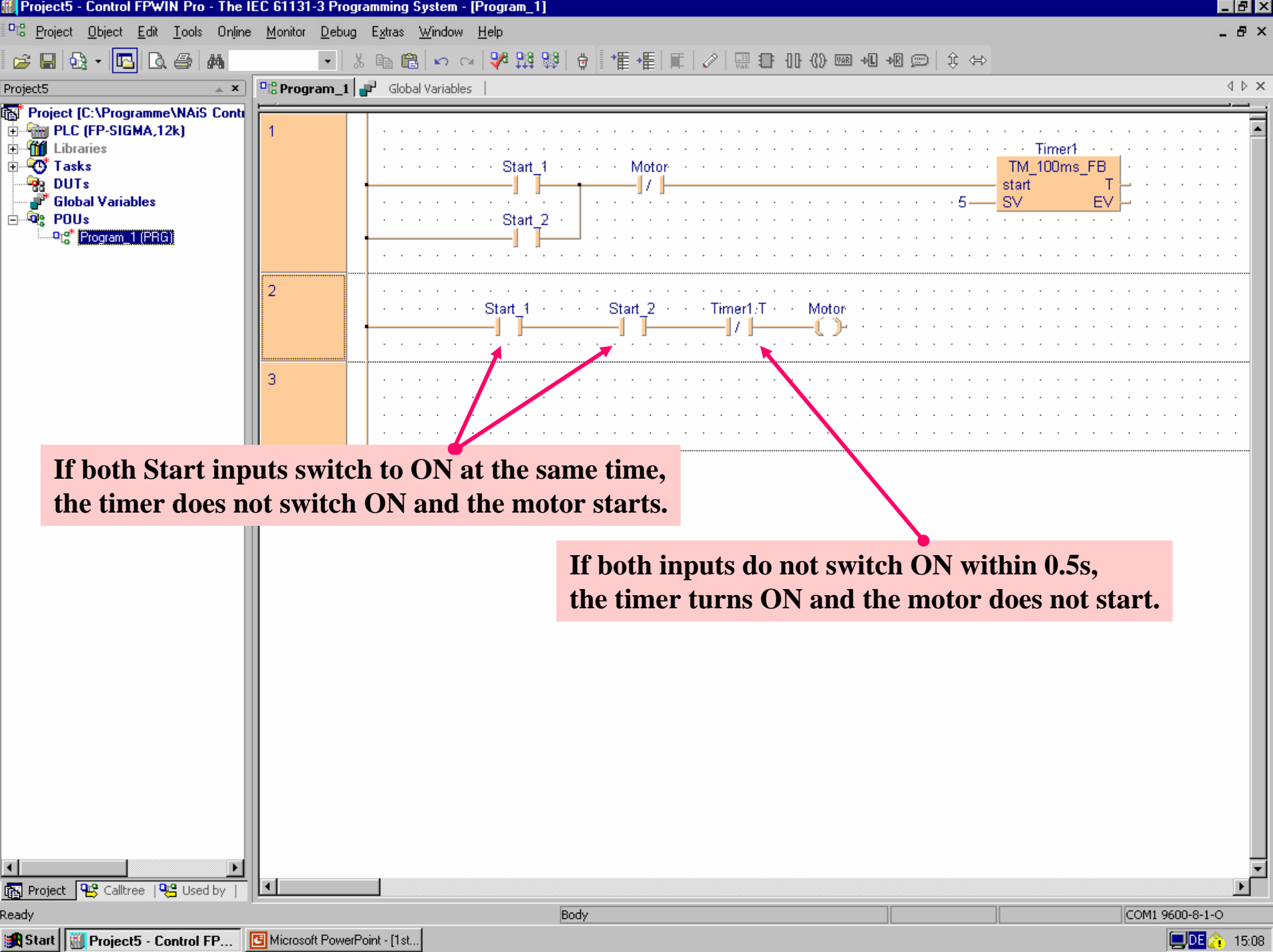
1. Click on this question mark.

2. Change to Function Blocks here.

3. Double-click on +Timer1.

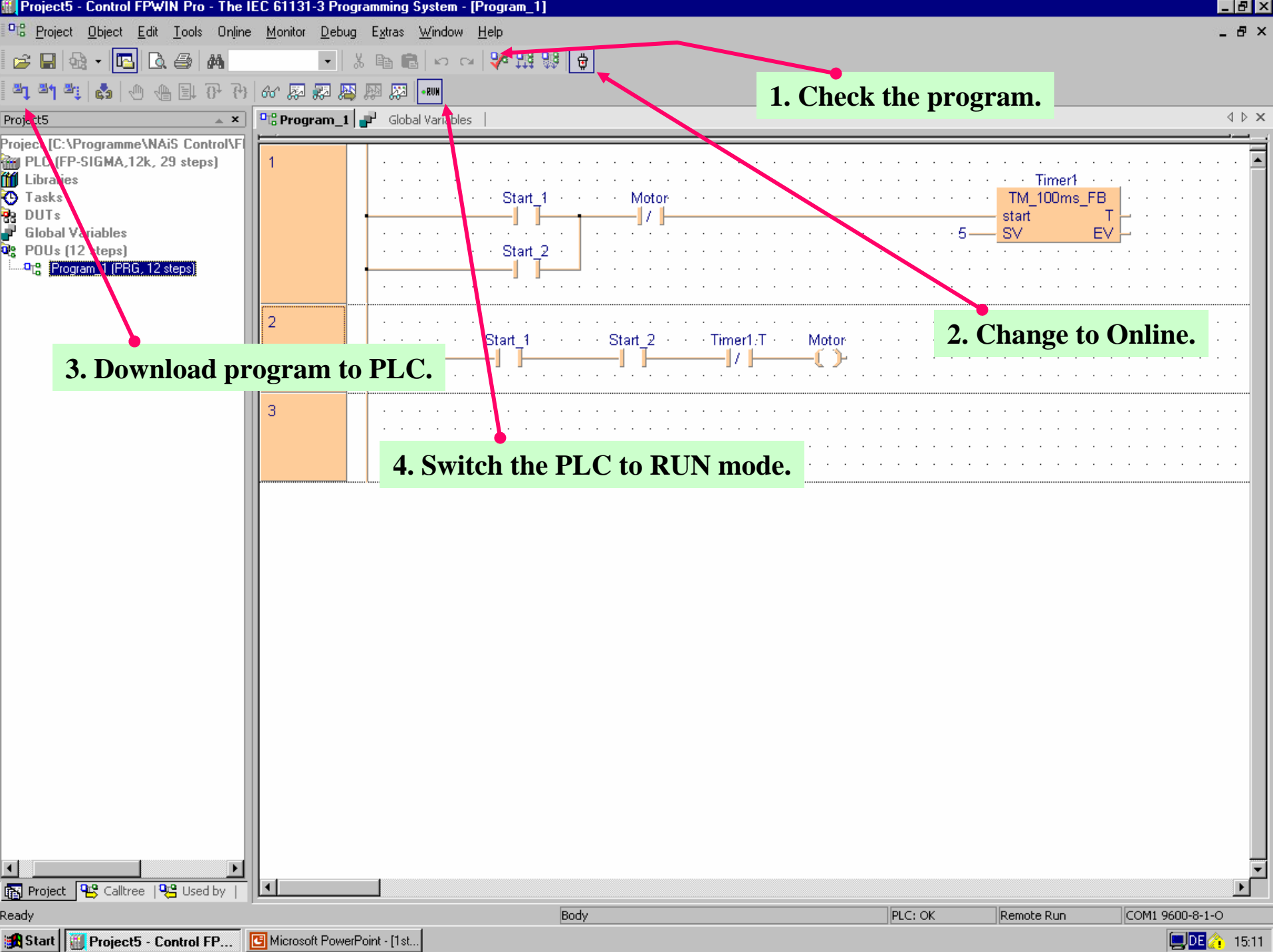
4. Double-click on ...T for the assignment.

5. Close the window.



If both Start inputs switch to ON at the same time, the timer does not switch ON and the motor starts.

If both inputs do not switch ON within 0.5s, the timer turns ON and the motor does not start.

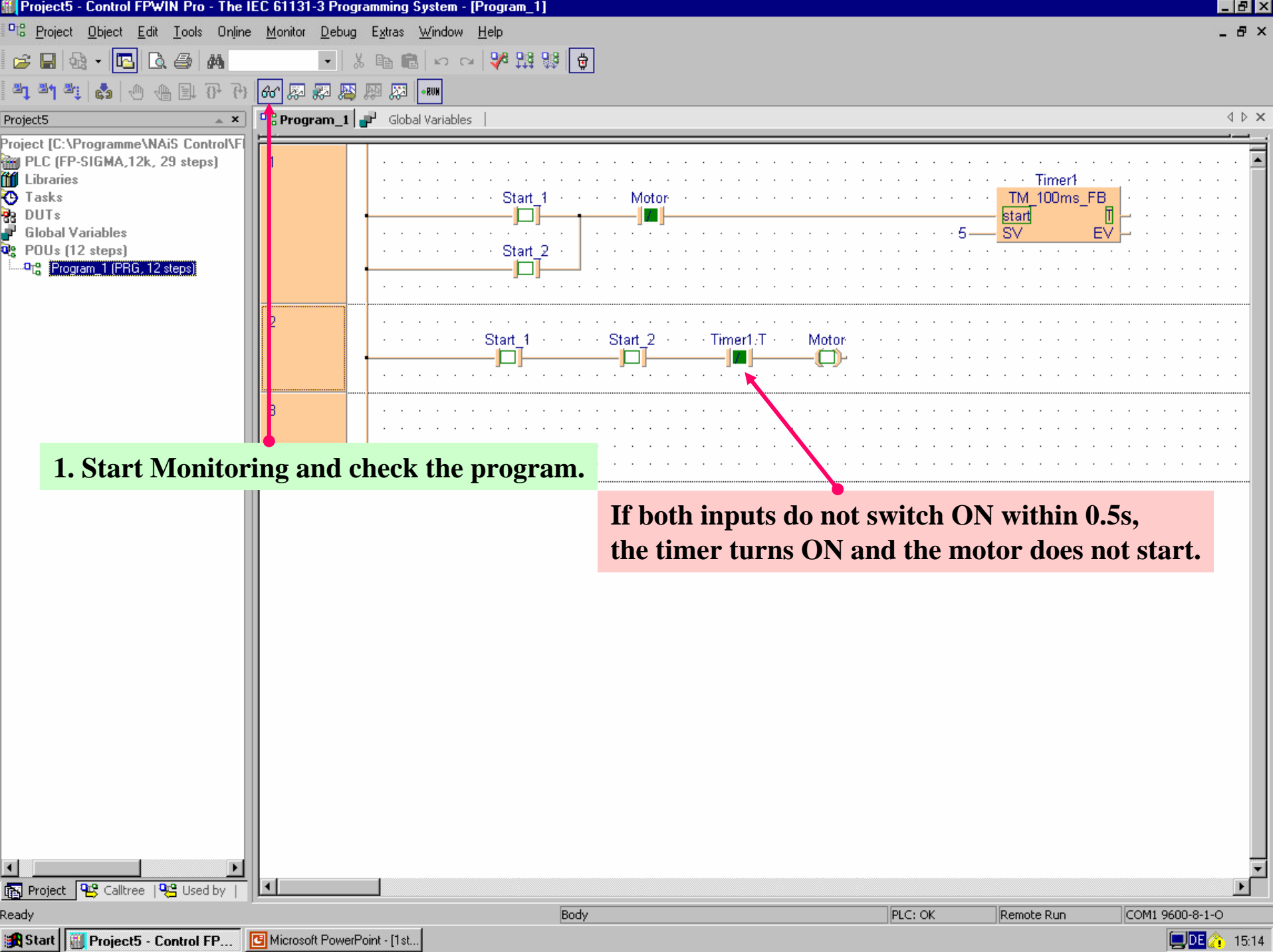


1. Check the program.

2. Change to Online.

3. Download program to PLC.

4. Switch the PLC to RUN mode.



1. Start Monitoring and check the program.

If both inputs do not switch ON within 0.5s, the timer turns ON and the motor does not start.

Navigator explanation:

Hardware

With the sytem registers it is possible to change hardware characteristics (e.g. no. of Timers/Counters)

Libraries

In the Library Pool all instructions, functions and function blocks which are available are stored.

Task pool

The programs of the POU pool have to be entered into the Task pool as program or interrupt. This will be done automatically with the start wizard.

Variables

If IEC 61131-3 programming style is used, the global variables have to be entered here.

POU pool Programs

The programs are stored in the POU pool. Several programs are allowed. Each program has a header (variables) and a body (program code). The header is only used for IEC 61131-3 style. The start wizard installs 1 program; more programs can be added with the menu: EDIT -> New -> POU.

Return to presentation

IEC 61131-3 Address Format

This table enables you to compile the respective IEC address at any time.

IEC address		Explanation
%		IEC address identifier
	I	Input location
	Q	Output location
	M	Memory location
	X	Data type BOOL (1 bit)
	W	Data type WORD (16 bits)
	D	Data type DOUBLE WORD (32 bits)
	No_1	a.) For I and Q: No_1 = word number b.) For M: No_1 = reference for the internal memory Relay, special internal relay R/WR/DWR ⇒ 0 Timer T ⇒ 1 Counter C ⇒ 2 Set value counter/timer SV/DSV ⇒ 3 Elapsed value counter/timer EV/DEV ⇒ 4 Data register, special data register DT/DDT ⇒ 5 Index register IX,IY ⇒ 6 Link relay L/WL/DWL ⇒ 7 Link data register Ld/DLd ⇒ 8 File register FL/DFL ⇒ 9 Alarm relay E ⇒ 10 Impulse relay P ⇒ 11
	.	Separator
	No_2	a.) For I and Q: No_2 ⇒ bit position in the word b.) For M: When No_1 = 0..9, or 11 ⇒ No_2 = word number (D) When No_1 = 10 ⇒ No_2 = relay number
	.	Separator
	No_3	Used when No_1 = 0, 7 or 11 (R, L, P) ⇒ No_3 = bit position in word

Examples:

X0	%IX 0.0
X2F	%IX 2.15
Y0	%QX 0.0
Y30	%QX 3.0
R0	%MX 0.0.0
R5	%MX 0.0.5
R200	%MX 0.20.0
DT0	%MW 5.0
DT200	%MW 5.200
T1	%MX 1.1



Return to presentation

Supported IEC 61131-3 Data Types

Elementary data types

Data Type	Abbreviation	Value Range	Data Width
BOOL	BOOL	0 (FALSE) or 1 (TRUE)	1 bit
INTEGER	INT	-32,768 to 32,768	16 bit
DOUBLE INTEGER	DINT	-2,147,483,648 to 2,147,483,647	32 bit
WORD	WORD	16#0000...16#FFFF	16 bit
DOUBLE WORD	DWORD	16#00000000...16#FFFFFFFF	32 bit
STRING	STRING	1 to 255 bytes (ASCII)	8 bits per byte
TIME 32 bit	TIME	T#0,00s to T#21 474 836,47s	32 bit
REAL	REAL	-1,175494 x 10E-38 to -3,402823 x 10E-38 and 1,175494 x 10E-38 to 3,402823 x 10E-38	32 bit

Others

Type	Meaning	Size	Comment
ARRAY[...]OF...	Array of elements of the same data type	1-255 bytes	Max. three dimensions
FB Name	Used for creation of function block instances	variable	Local or global function block instance
DUT Name	instance of a Data Unit Type	variable	Global DUT instance

Supported IEC 61131-3 Classes

Class field in POU headers and the list of global variables:

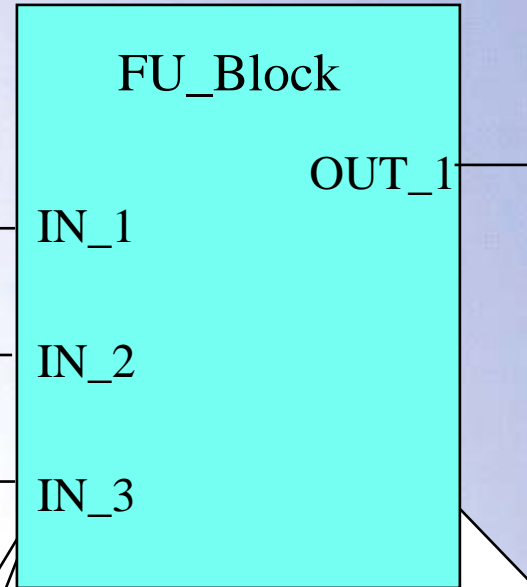
Class	Usage In	Usage of definition of
VAR_GLOBAL	GVL	non-holding global variable
VAR_GLOBAL_RETAIN	GVL	holding global variable
VAR_GLOBAL_CONSTANT	GVL	constant global variable
VAR_EXTERNAL	Header of PRG, FB	non-holding global variable
VAR_EXTERNAL_RETAIN	Header of PRG, FB	holding global variable
VAR_EXTERNAL_CONSTANT	Header of PRG, FB	constant global variable
VAR	Header of PRG, FUN, FB	non-holding local variable
VAR_RETAIN	Header of PRG, FB	holding local variable
VAR_CONSTANT	Header of PRG, FUN, FB	constant local variable
VAR_INPUT	Header of FUN, FB	input variable
VAR_OUTPUT	Header of FB	output variable
VAR_OUTPUT_RETAIN	Header of FB	output holding variable
VAR_IN_OUT	Header of FB	input and output variable

GVL = Global Variable List
 POU = Program Organization Unit
 PRG = Program
 FUN = Function
 FB = Function Block
 DUT = Data Unit Type

- **five IEC 61131-3 languages combined in one software:**
 - **Instruction List**
 - **Structured Text**
 - **Ladder Diagram**
 - **Function Block Diagram**
 - **Sequential Function Chart**
- **all available Panasonic PLC types are programmable without limitations**
- **easy reuse of programs and program parts with self-made Functions and Function Blocks which can be stored in self-defined libraries**
- **a wide range of test and debug functions shorten installation and troubleshooting time**
- **user-friendly comment and documentation features**
- **modem functions for remote programming and testing**
- **the PLCopen Base Level IL certificate**
- **PLCopen Conformity Level ST and Reusability Level ST certificate**

Function Blocks can be easily reused

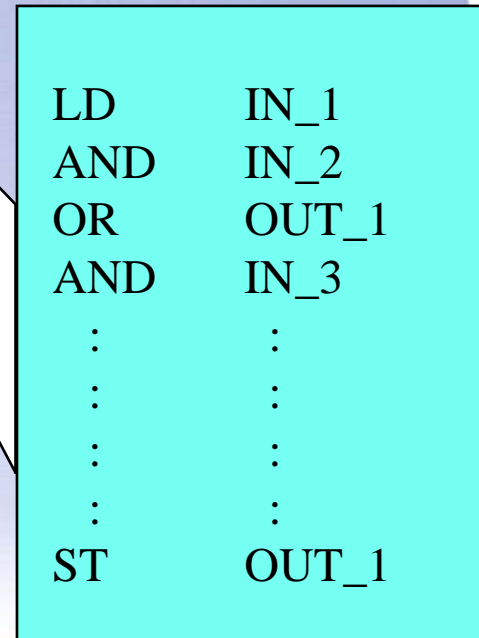
1. Function Block Body



2. Variable Interface

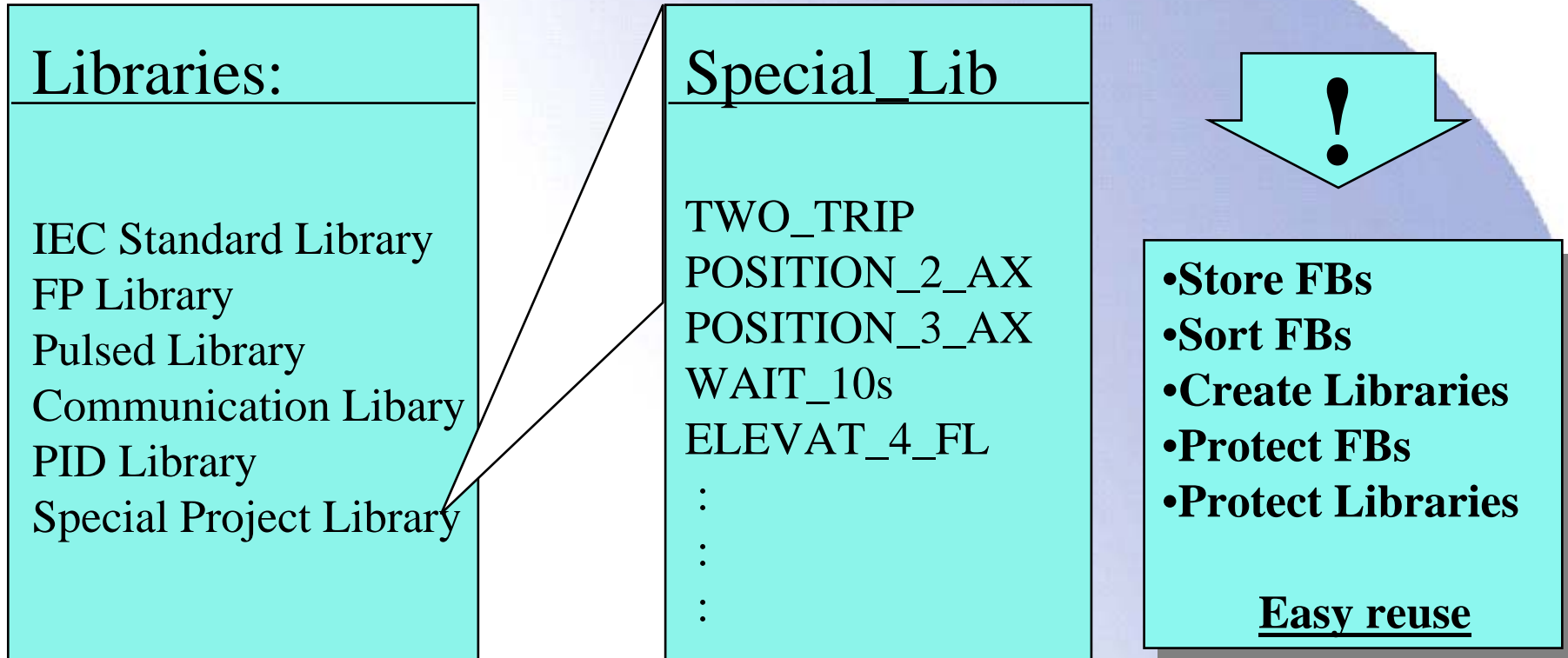
FU-Block Header			
Class	Identifier	Type	
0	VAR_INPUT	IN_1	BOOL
1	VAR_INPUT	IN_2	BOOL
2	VAR_INPUT	IN_3	BOOL
3	VAR_OUPUT	OUT_1	BOOL

3. Program



Panasonic's Library Concept

Additional Panasonic feature



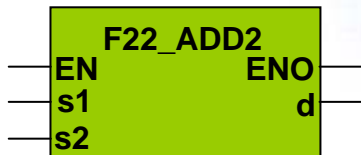
- Self-created Function Blocks (FBs) can be stored in libraries.
- Comfortable structuring and sorting in the libraries.
- Know-how protection of FBs and libraries.
- Easy reuse of tested software --> saves time.

IEC 61131-3 Functions

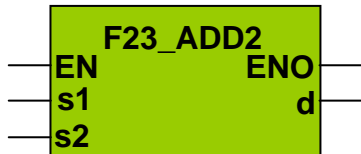
Conventional programming requires different functions for e.g.:

Flexible IEC instructions:
1 function instead of several

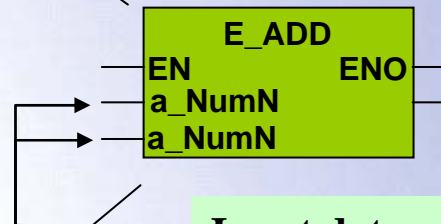
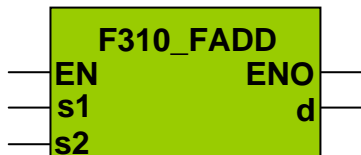
16-bit



32-bit

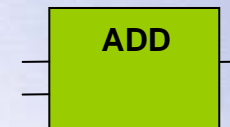


Floating point data

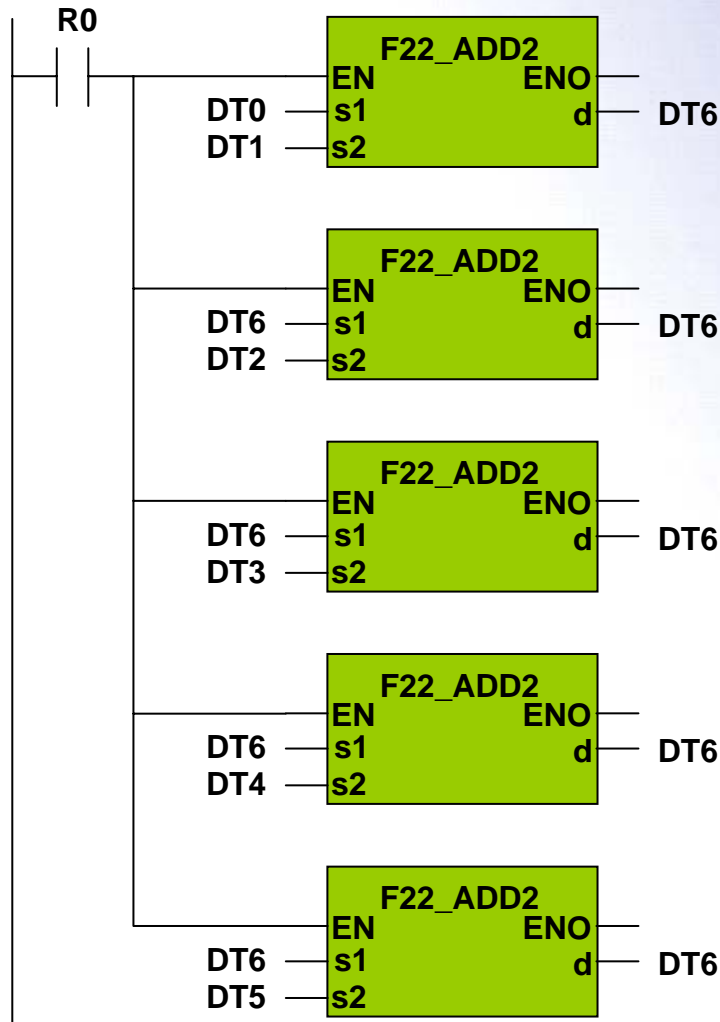


Input data must be of the same type!

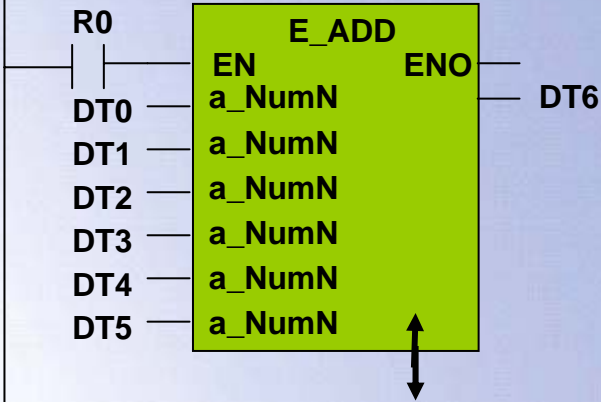
Or execution in every PLC cycle (R9010) with:



IEC 61131-3 Functions



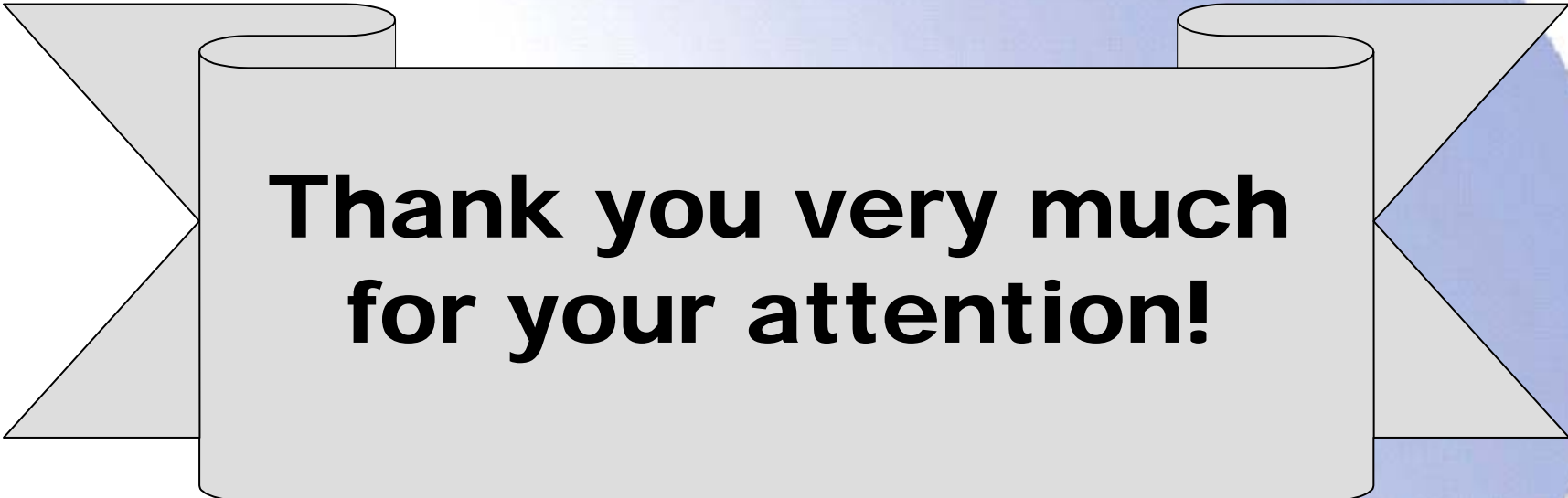
Extensible Instructions:
1 Function instead of several



To extend the function:

- 1. Place cursor on the bottom edge.**
-The cursor has an arrow on each end.
- 2. Pull to desired length.**

Good luck!



Thank you very much
for your attention!