

Lab 1 : Getting Started with TIA Portal

- **Introduction with TIA Portal**

- This lab will introduce you to the basics of SIMATIC STEP 7 (TIA Portal) V16.
- The program allows students to design electrical networks with various elements to control certain processes.



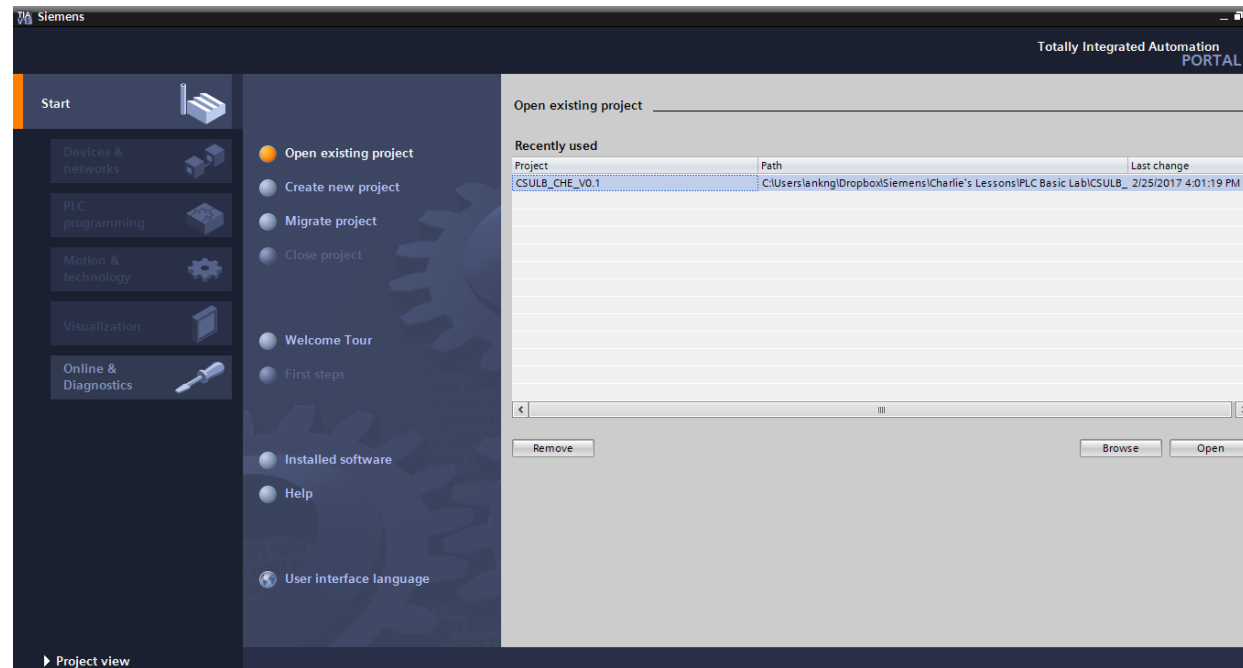
Create a New Project

- To create a project in TIA Portal, first launch the program on your desktop, if you do not see it, search TIA Portal in the windows search bar at the bottom left of your screen.



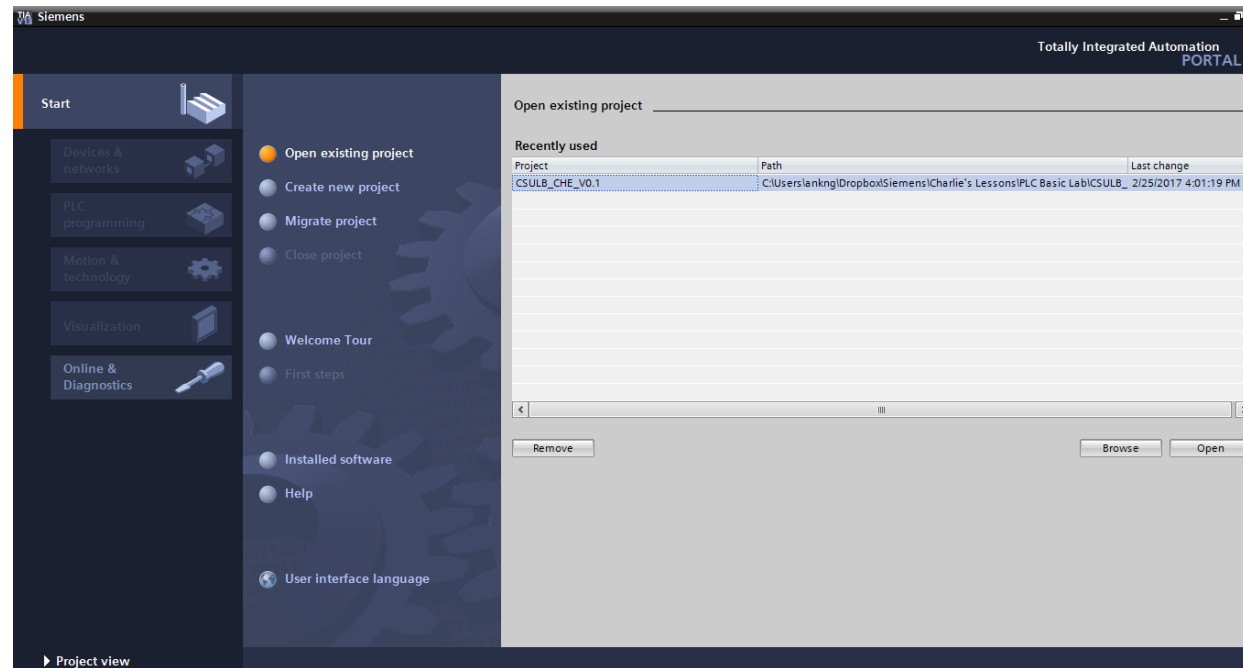
Create a New Project

- After the portal successfully loads, you should be able to see a display like below.



Create a New Project

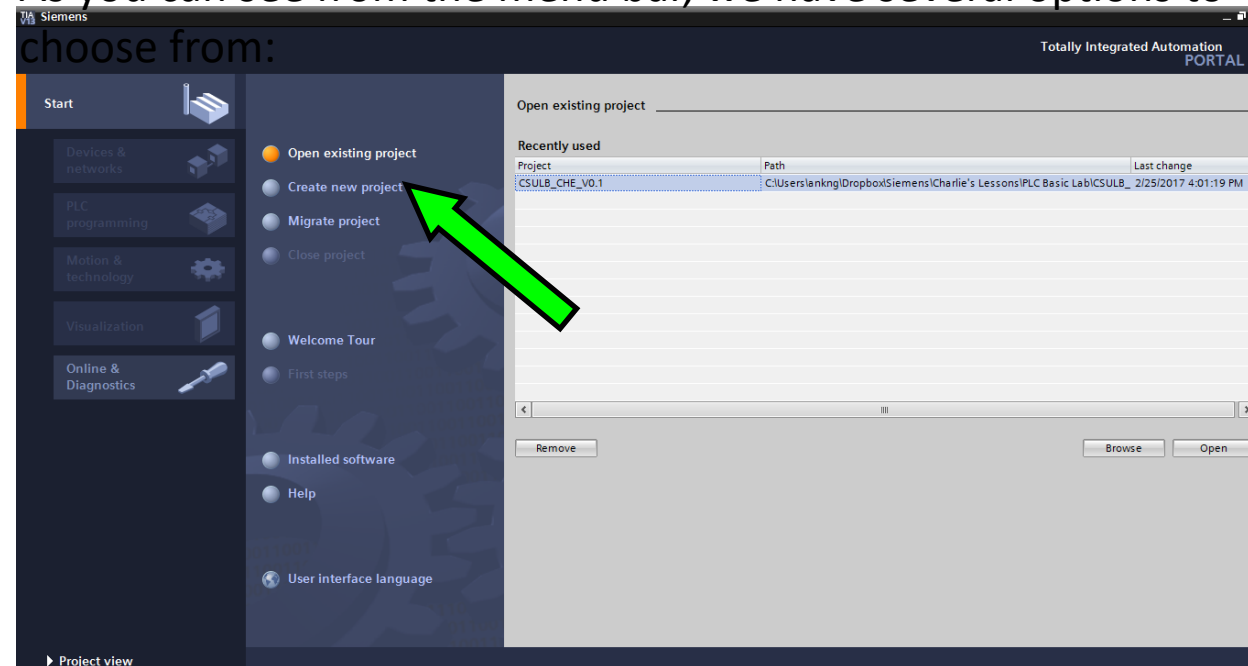
- After the portal successfully loads, you should be able to see a display like below.



Create a New Project

- After the portal successfully loads, you should be able to see a display like below.

As you can see from the menu bar, we have several options to choose from:

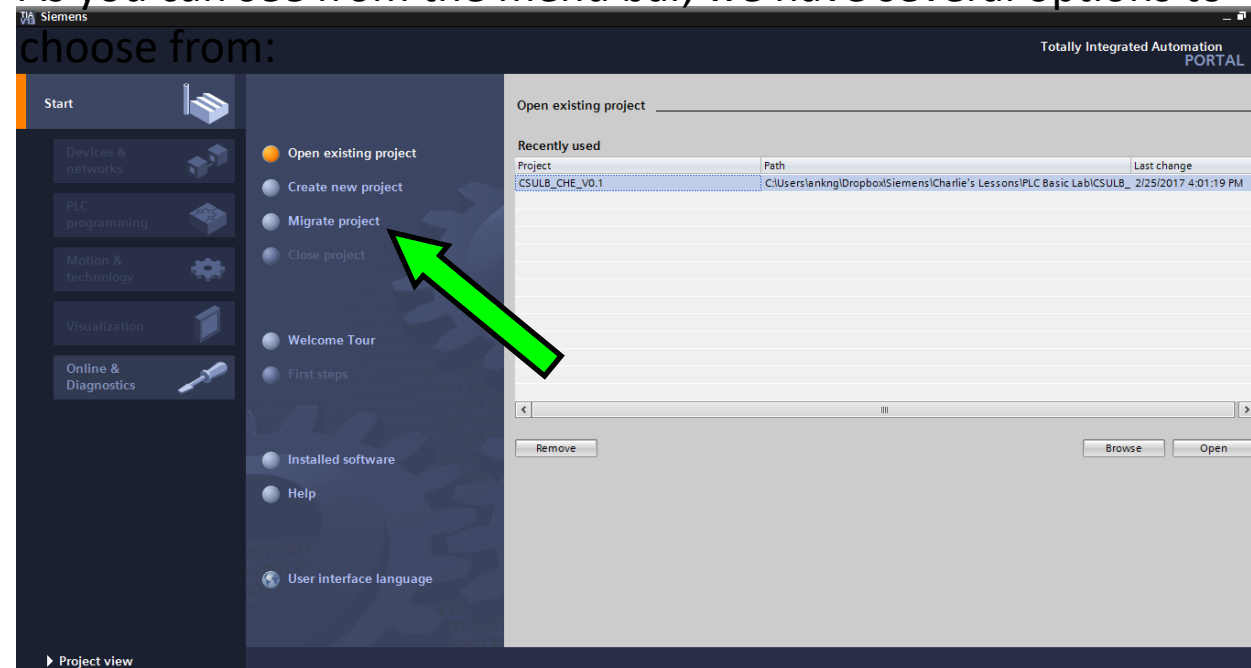


Open existing project and create new project are self-explanatory.

Create a New Project

- After the portal successfully loads, you should be able to see a display like below.

As you can see from the menu bar, we have several options to choose from:

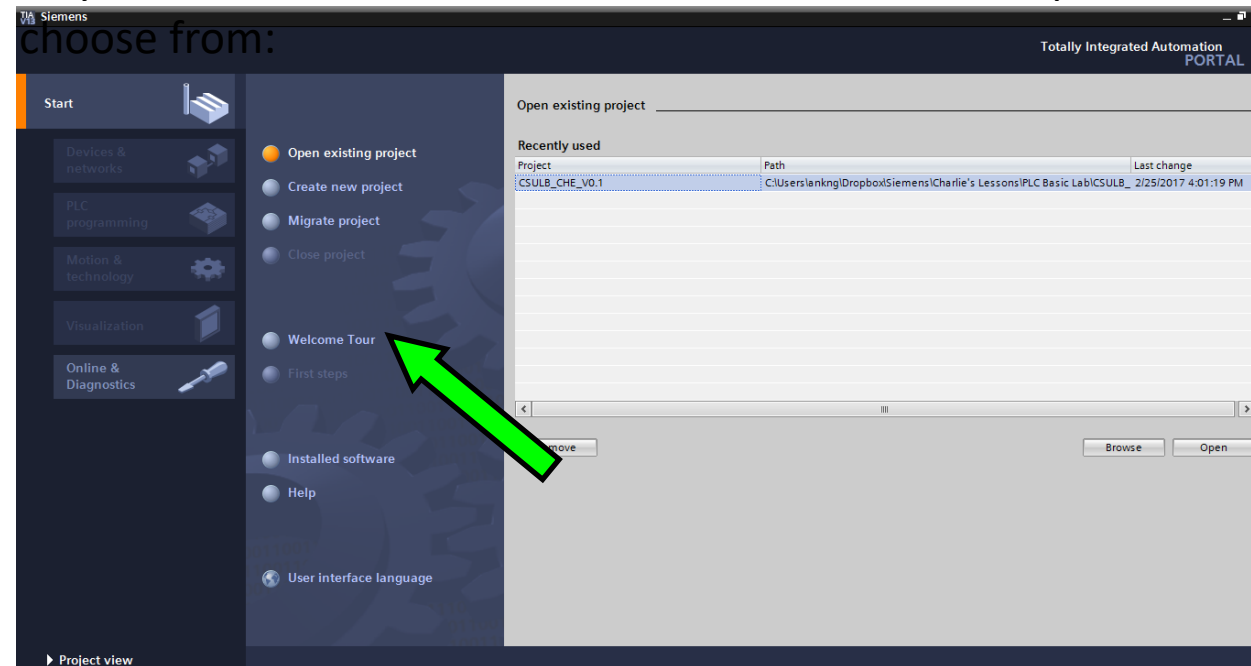


Migrate project takes mature PLC programs and migrate it to new PLC programs.

Create a New Project

- After the portal successfully loads, you should be able to see a display like below.

As you can see from the menu bar, we have several options to choose from:

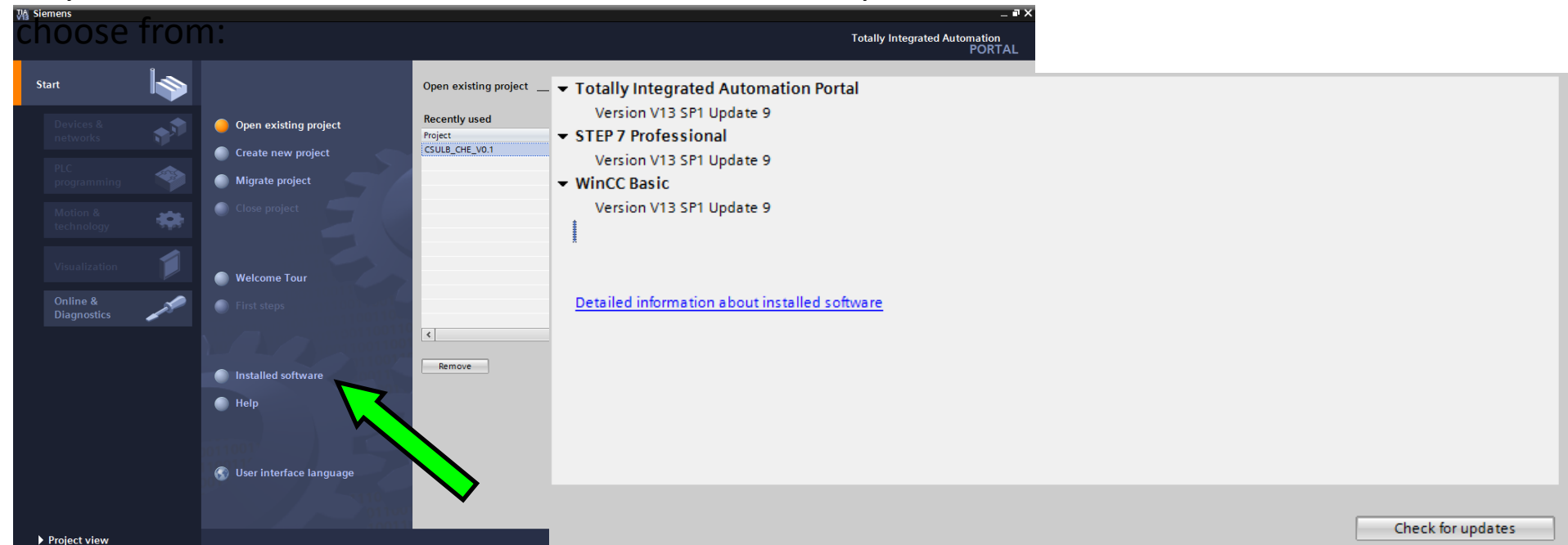


Welcome Tour shows you the features of TIA portal, if you are interested and have time to spare, you can proceed with that.

Create a New Project

- After the portal successfully loads, you should be able to see a display like below.

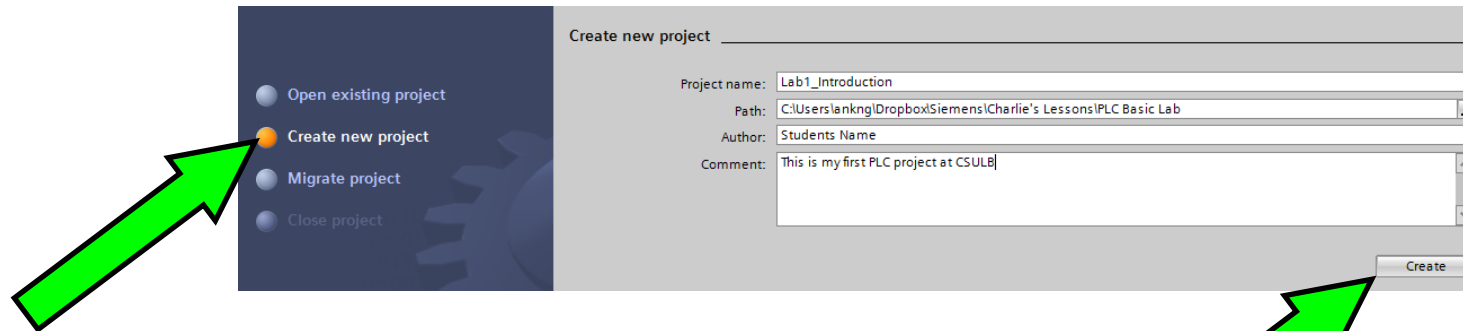
As you can see from the menu bar, we have several options to choose from:



Installed Software shows you the currently software that is installed, which is important to check to see if all your software is up to date. Below is an example of the screen, showing which software is installed and their versions.

Create a New Project

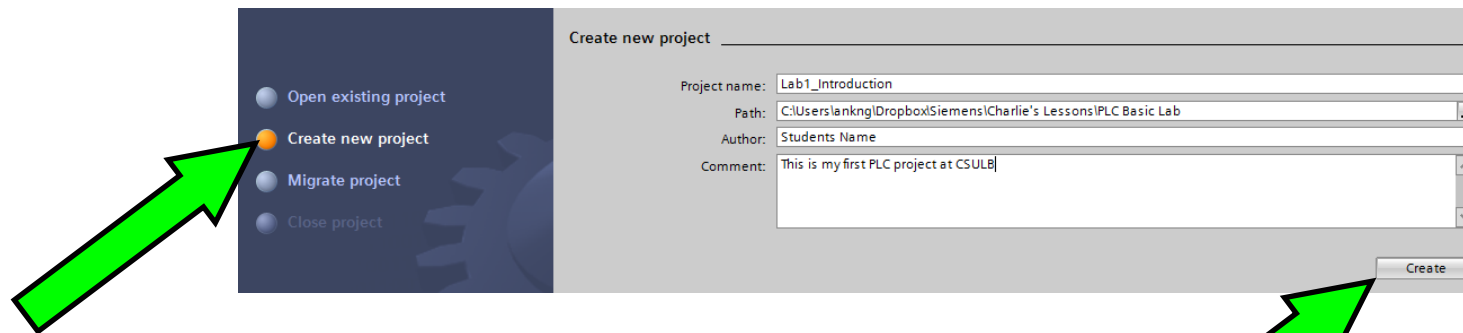
- Let's go ahead and proceed with creating a new project, next enter the required information as shown below, take note of the path where you save the project so opening it next time will be much easier.



Click create

Create a New Project

- Let's go ahead and proceed with creating a new project, next enter the required information as shown below, take note of the path where you save the project so opening it next time will be much easier.

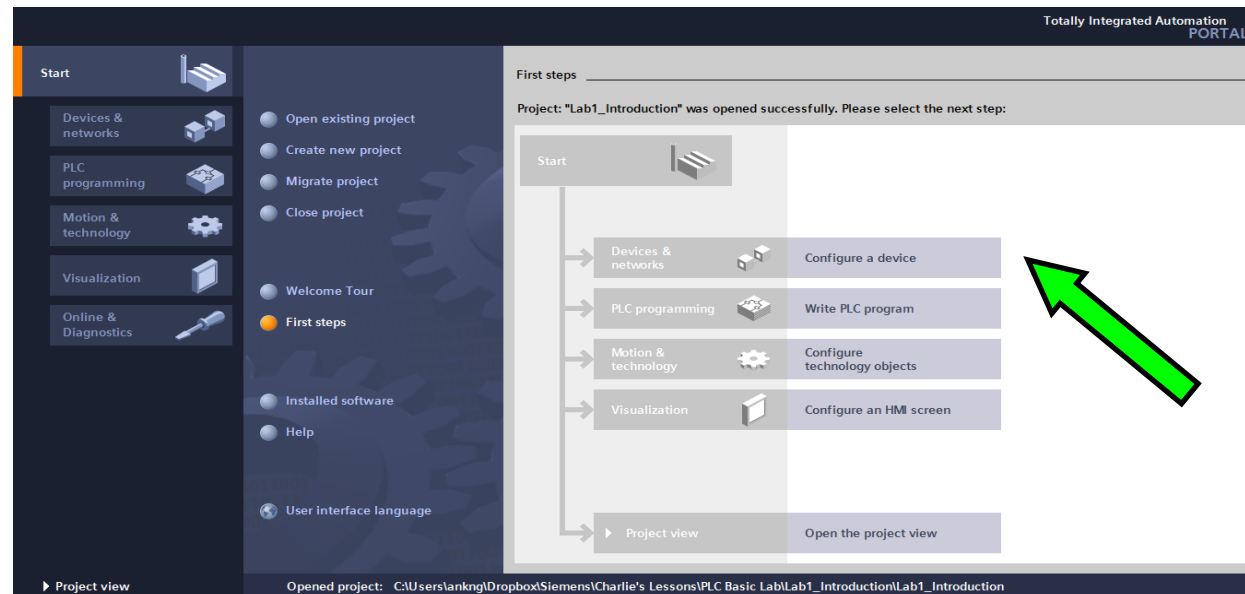


Click create

Configure Device & Network

- Now you should the new addition option on the menu, **First Steps**, here you will see some other options such as:

As you can see from the menu bar, we have several options to choose from:

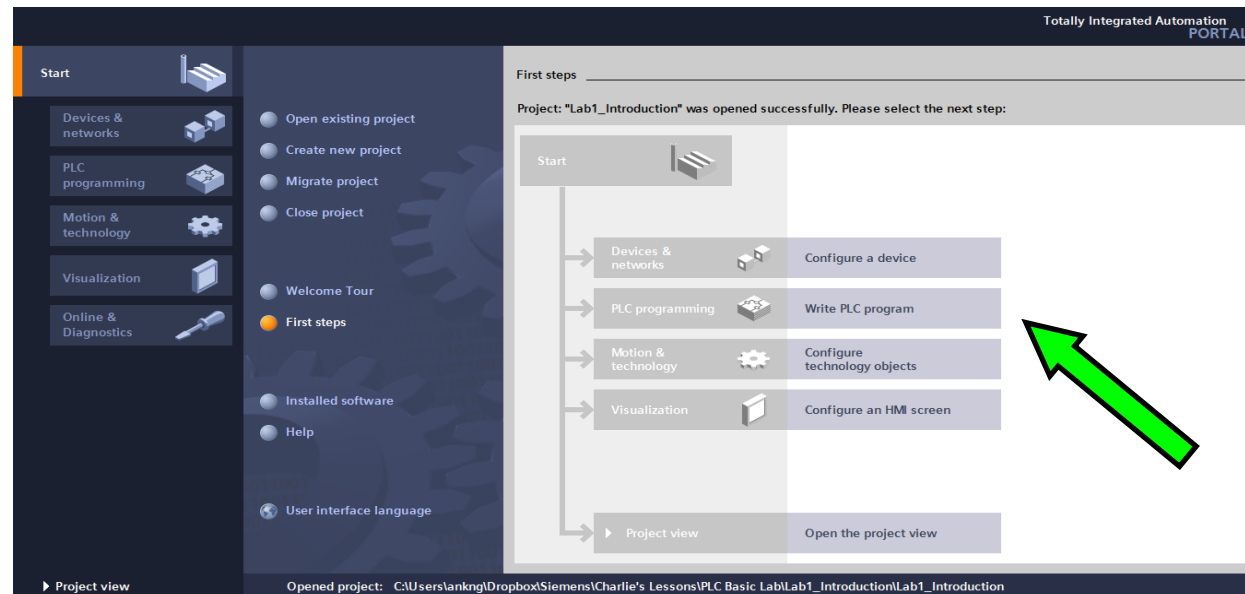


Configure a device – Allows you to link or set up your PLC (Programmable Logic Controller)

Configure Device & Network

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As you can see from the menu bar, we have several options to choose from:

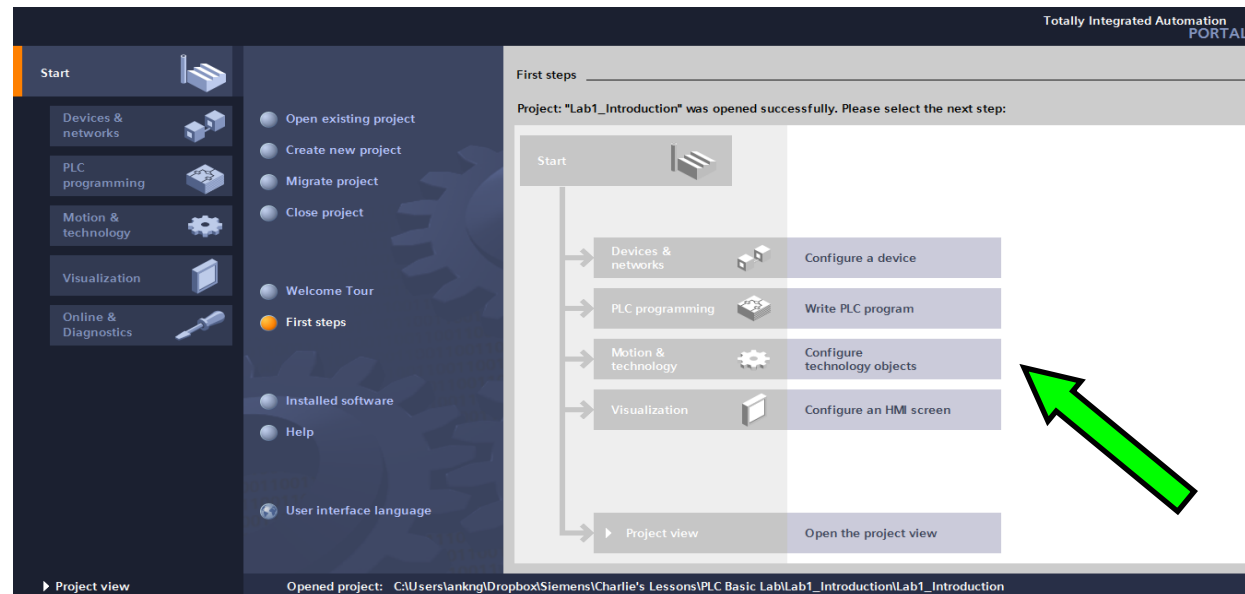


Write PLC program – Allows you to create just the PLC program without any hardware

Configure Device & Network

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As you can see from the menu bar, we have several options to choose from:

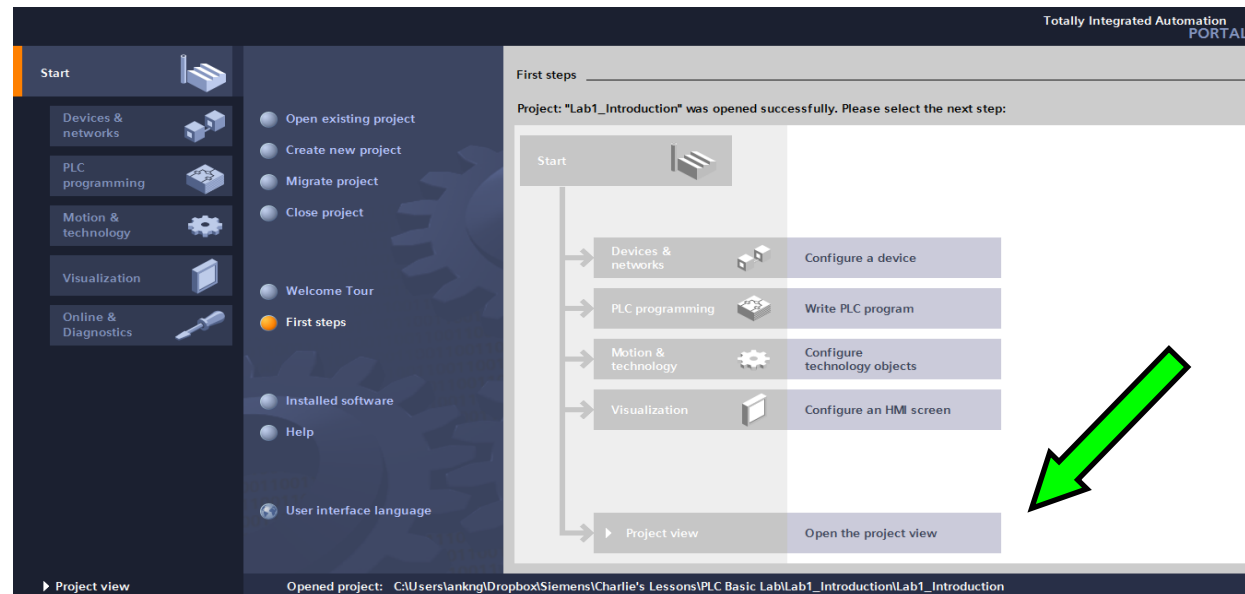


Configure technology objects – Allow you to work in motion modules and drives

Configure Device & Network

- Now you should the new addition option on the menu, **First Steps**, here you will see some other options such as:

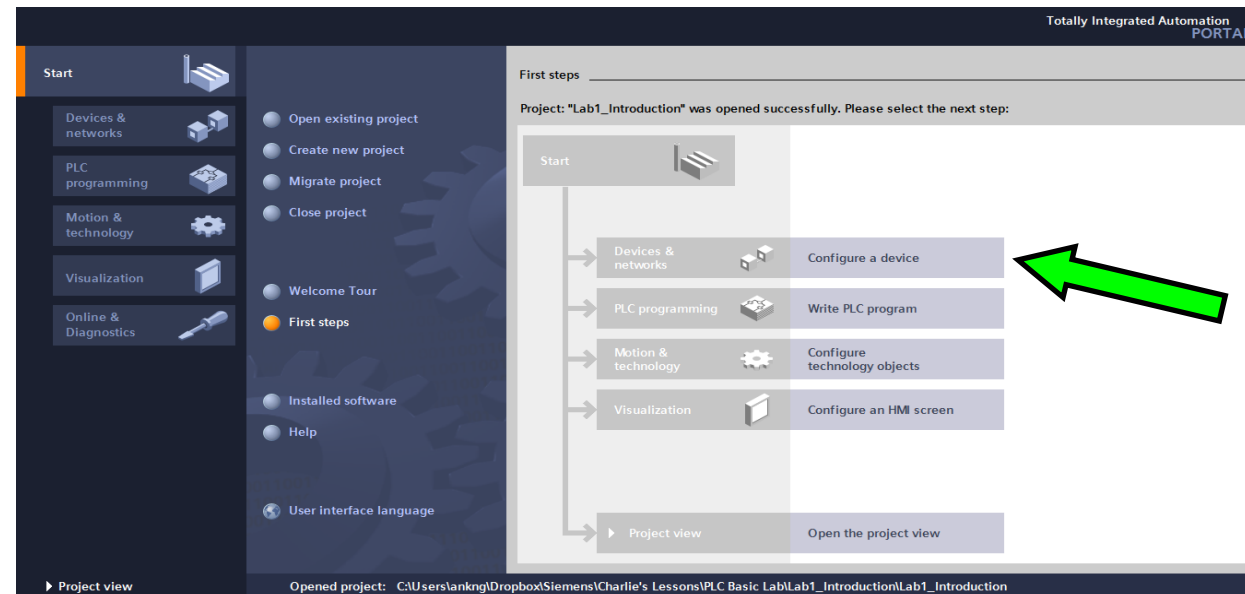
As you can see from the menu bar, we have several options to choose from:



Open the project view – Allows you to access the project view without any of the above options, useful for returning to your older projects.

Configure Device & Network

- Since it is our first program, go ahead and click on **configure a device**.



The screenshot displays the Siemens Totally Integrated Automation PORTAL interface. The main window shows a 'First steps' section with a message: 'Project: "Lab1_Introduction" was opened successfully. Please select the next step:'. Below this message is a list of options:

Category	Action
Start	Start
Devices & networks	Configure a device
PLC programming	Write PLC program
Motion & technology	Configure technology objects
Visualization	Configure an HMI screen
Project view	Open the project view

A green arrow points to the 'Configure a device' option under the 'Devices & networks' category. The left sidebar contains navigation options: Start, Devices & networks, PLC programming, Motion & technology, Visualization, and Online & Diagnostics. The bottom status bar shows the path: 'Opened project: C:\Users\lankng\Dropbox\Siemens\Charlie's Lessons\PLC Basic Lab\Lab1_Introduction\Lab1_Introduction'.

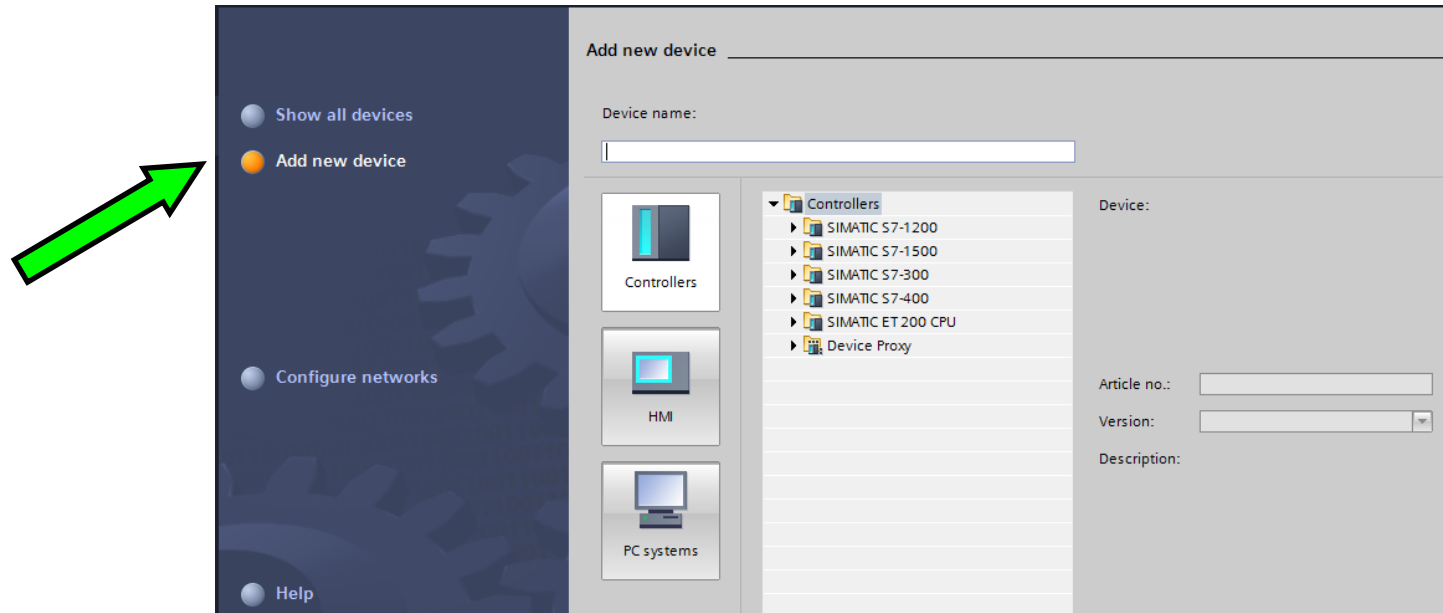
Configure Device & Network

- Since it is our first program, go ahead and click on **configure a device**.

You can see two options:

Show all devices- Show all the devices you have on your project

Add new device-Configure a new device

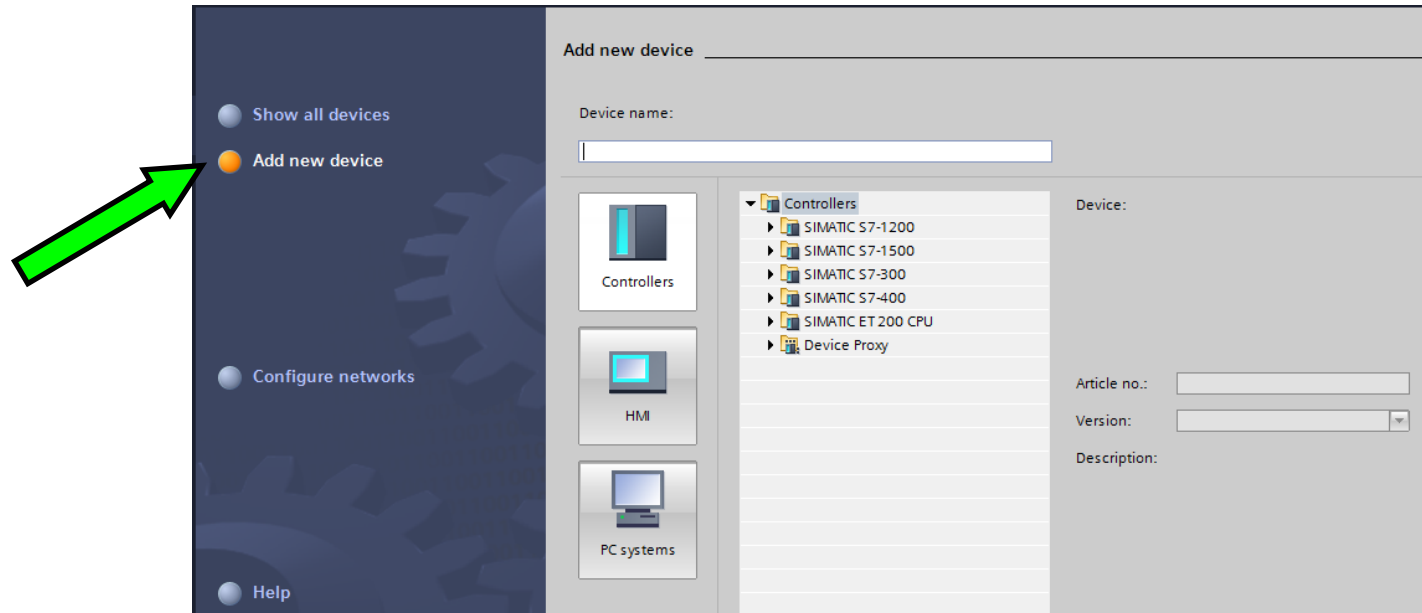


Configure Device & Network

- Since it is our first program, go ahead and click on **configure a device**.

Click on **Add new device**. You can see a similar display as the bottom figure. Here you can configure your Controllers (which are PLCs), HMI screens, and PC systems.

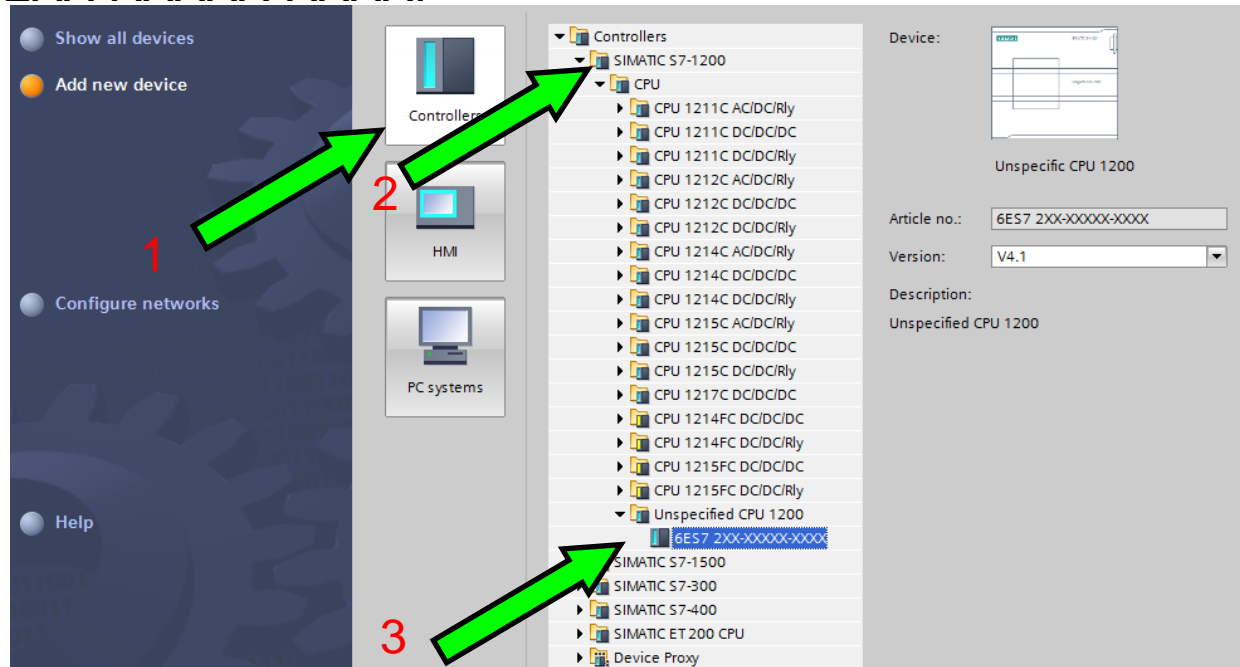
Here you can name your PLC however you like. Such as Ryan's PLC 0.1



Configure Device & Network

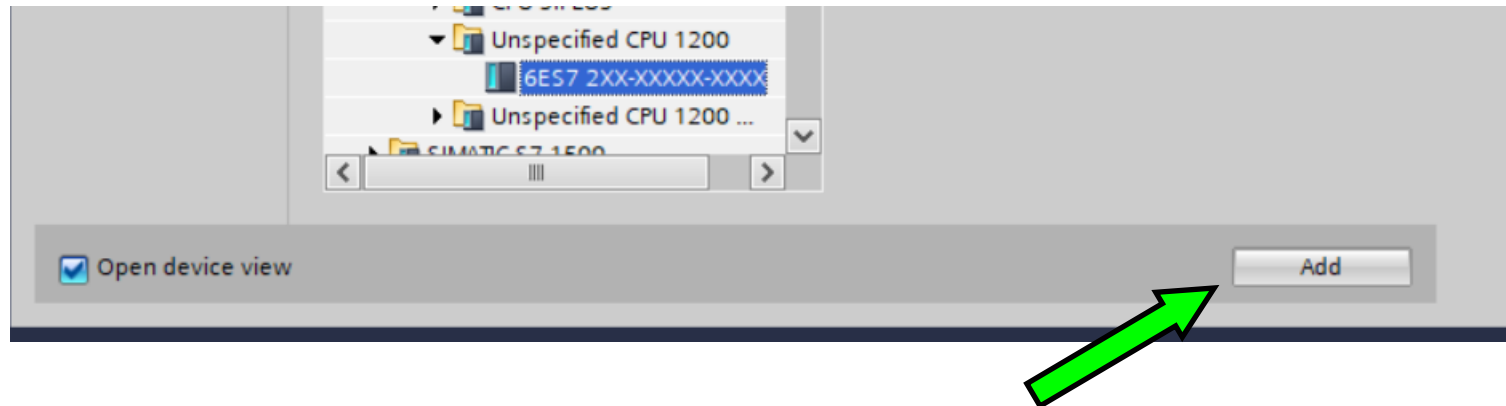
- Since it is our first program, go ahead and click on **configure a device**.

Click on **Controllers**, you will see a drop-down menu that has all sorts of different types of PLC. The one we will be using is one of the SIMATIC S7-1200, so click on the small black arrow next to SIMATIC S7-1200 to get another drop menu one. Continue until you see Unspecified → 6ES7 2XX-XXXX-XXXX.



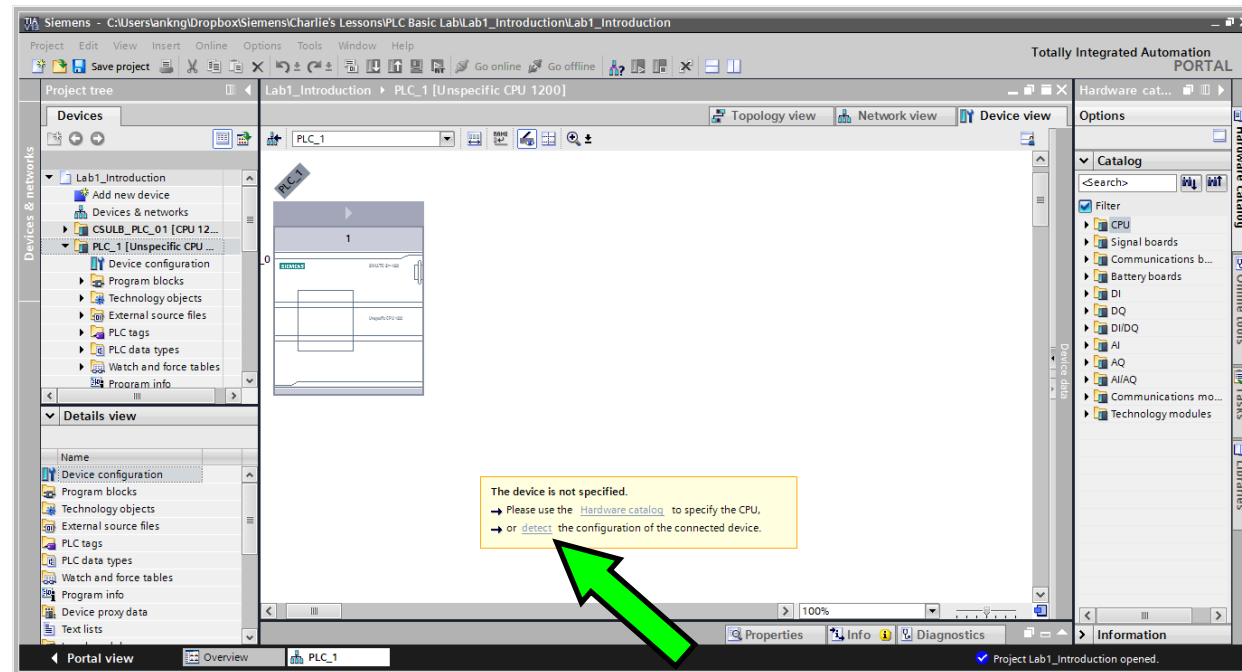
Configure Device & Network

- Since it is our first program, go ahead and click on **configure a device**.
Scroll down a bit to see the add button and click it.



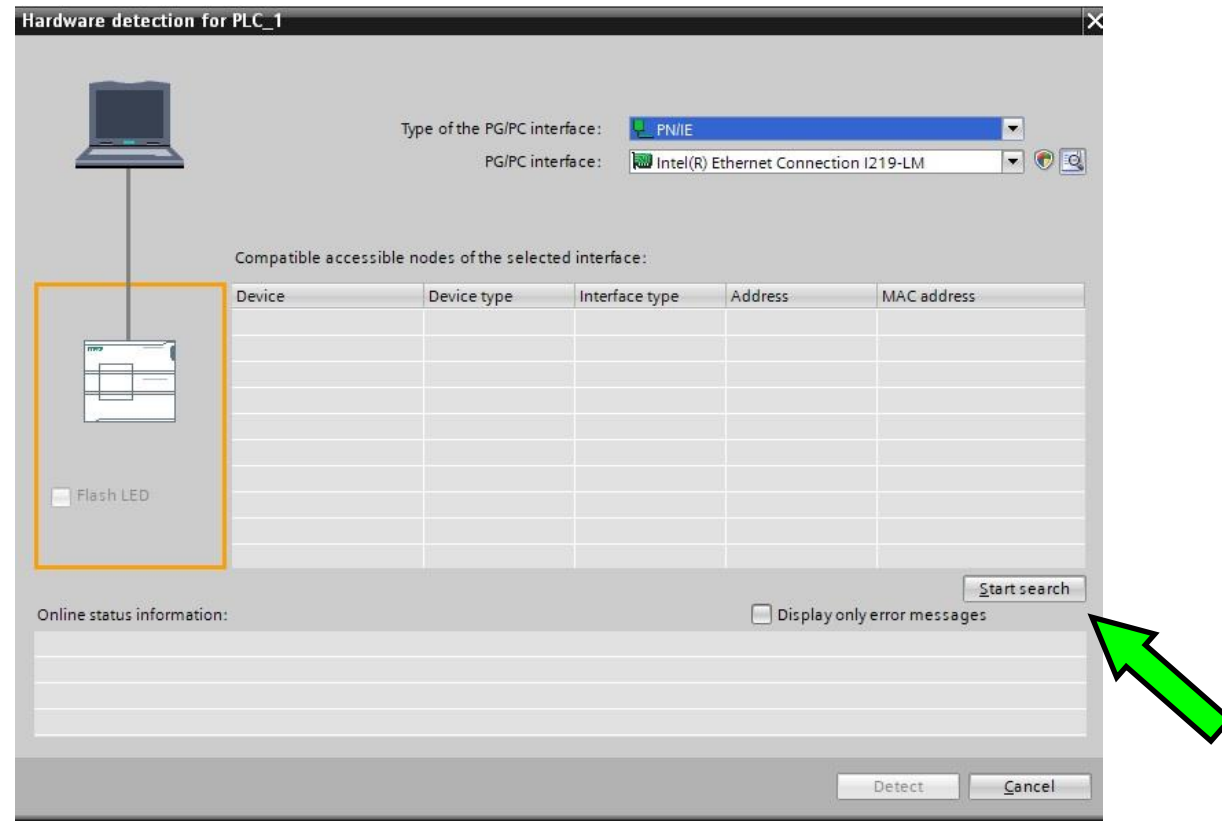
Configure Device & Network

After successfully adding the PLC, the Portal View will be displayed, this is the main screen you will work on. Currently your PLC is not configured yet, click detect to configure your device. Make sure you have connection between your PLC and your Computer via Ethernet.



Configure Device & Network

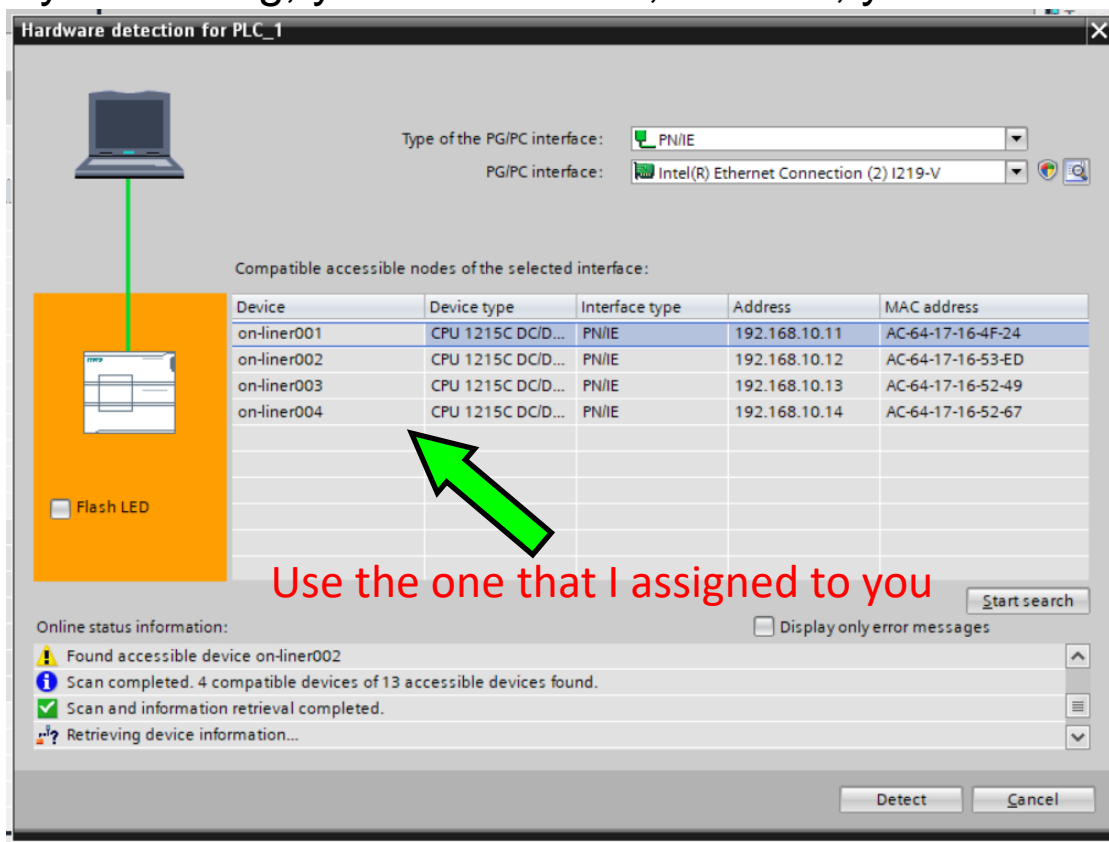
Another window should show up as shown below



There are several drop down options, but we won't bother with that for now, click **Start Search**.

Configure Device & Network

After successfully searching, you will see this, be care, you need the correct controller.

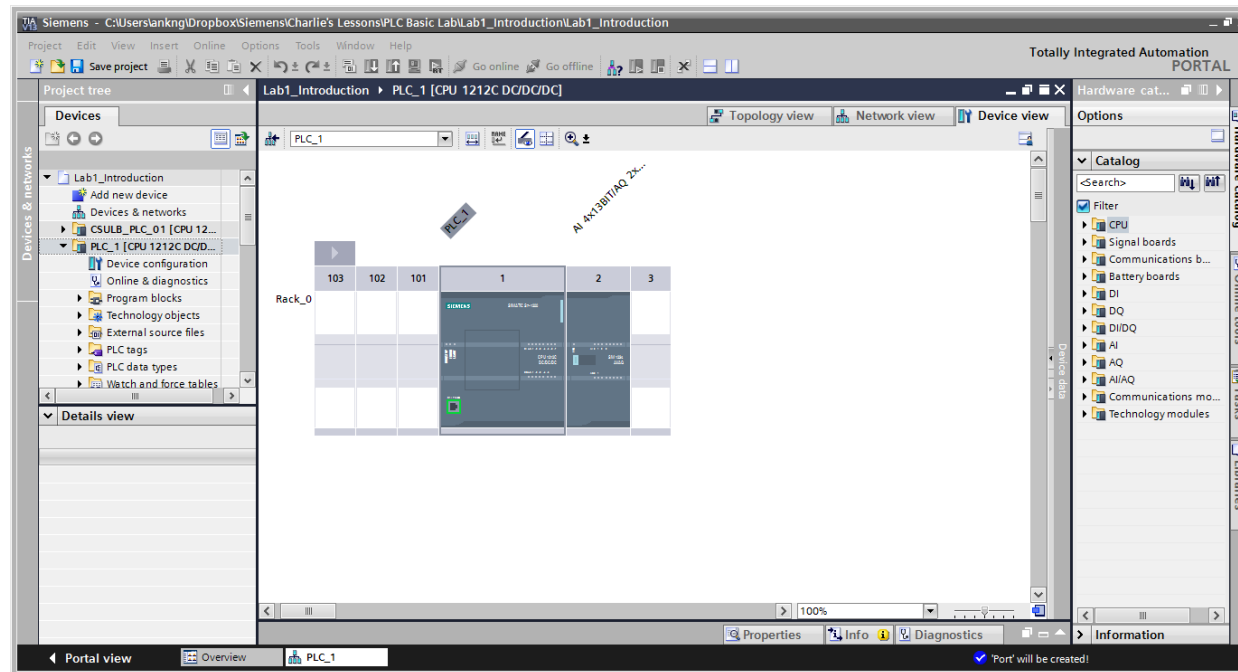


Use the one that I assigned to you

There are several controllers on this network, pick your correct one

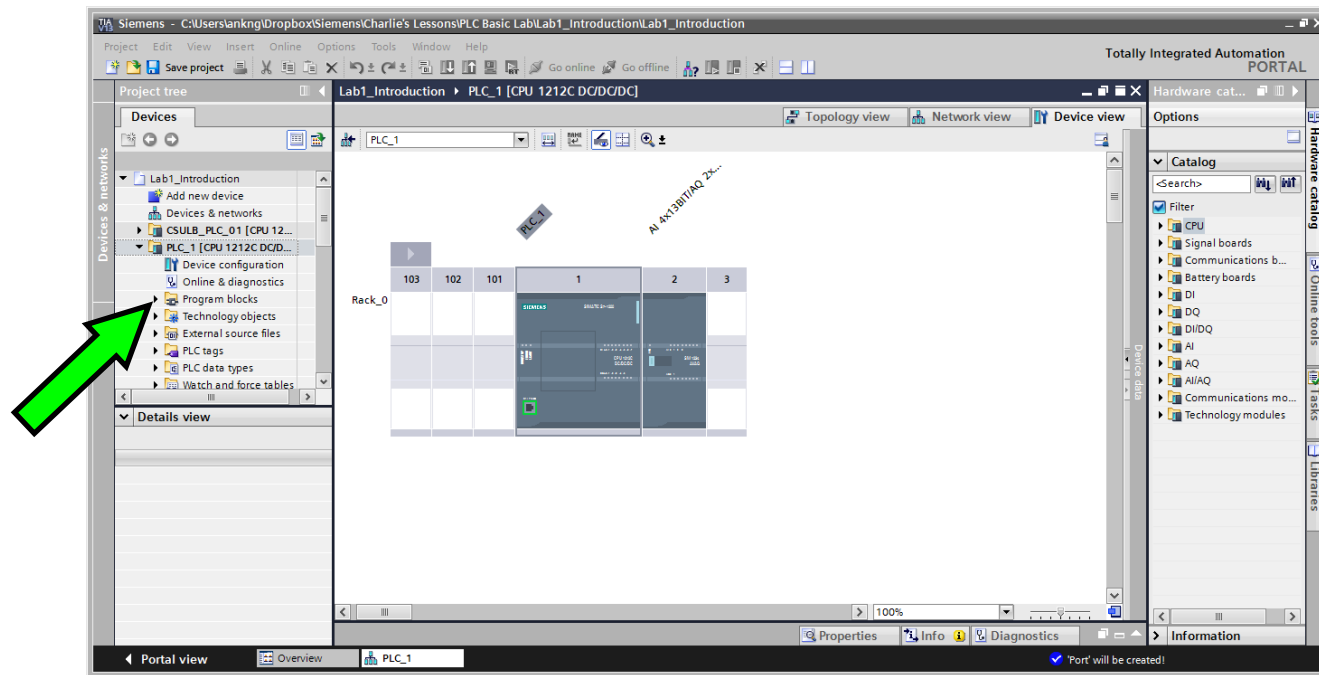
Configure Device & Network

When the structure of the PLC is greyed out as below, you have successfully configured the device.



Programming Blocks

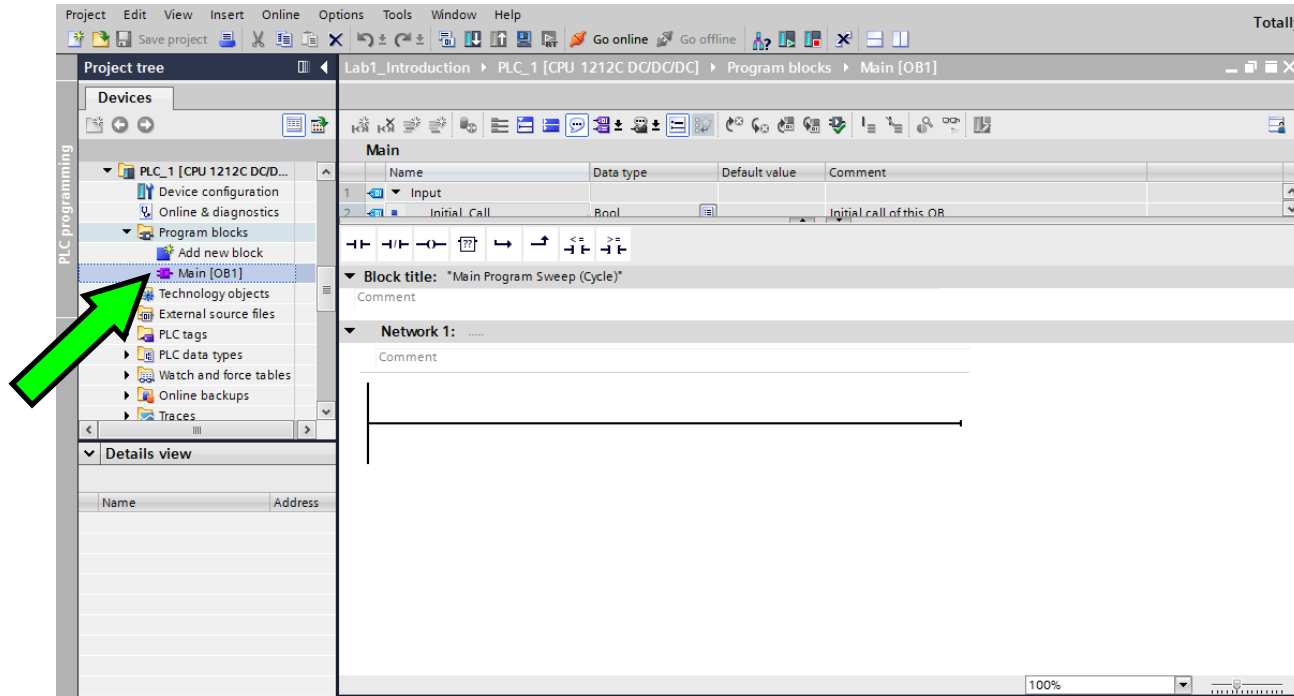
This portion of the lab shows you how to create your first program using network. A network is like an electrical wire, where you can place components such as contacts and assignments.



To access the networks, drop down the menus from your PLC in the Project Tree, until you see Program Blocks

Programming Blocks

This portion of the lab shows you how to create your first program using network. A network is like an electrical wire, where you can place components such as contacts and assignments.



Drop down from that and double click Main[OB1].

Programming Blocks

Network 1 is already made for you

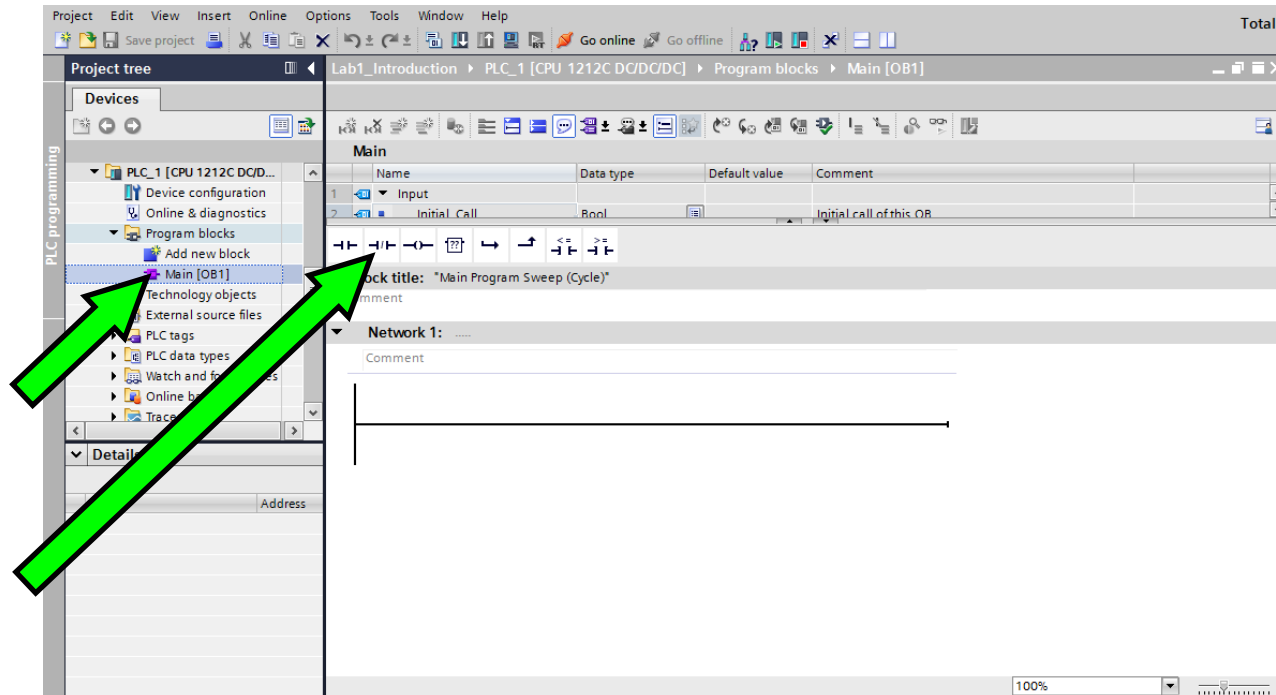
Also you can see some of the favorite blocks on the top of the workspace.

These are contacts   and this is a coil 

The coil is necessary to complete the line and assign the output.

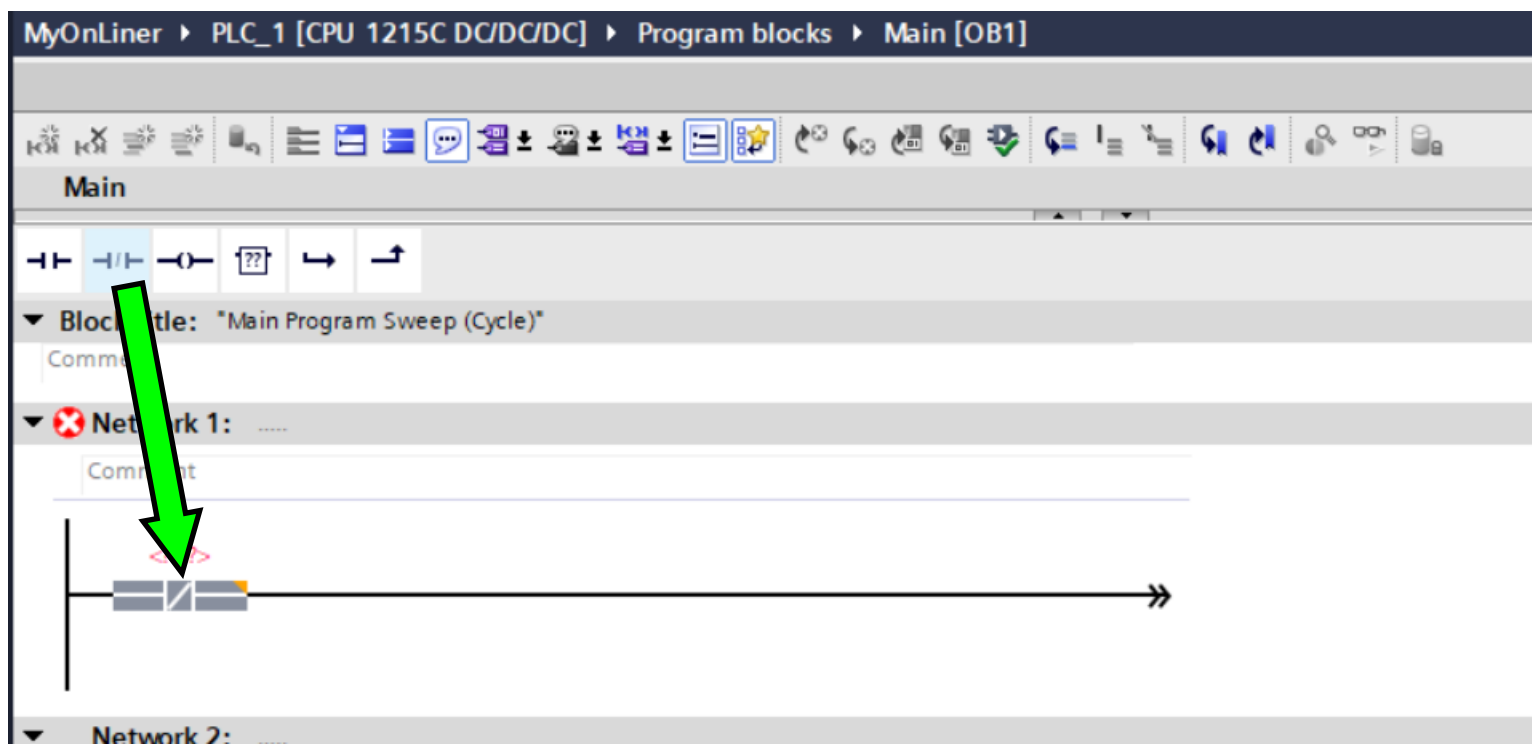
Main OB1

Favorite Bar




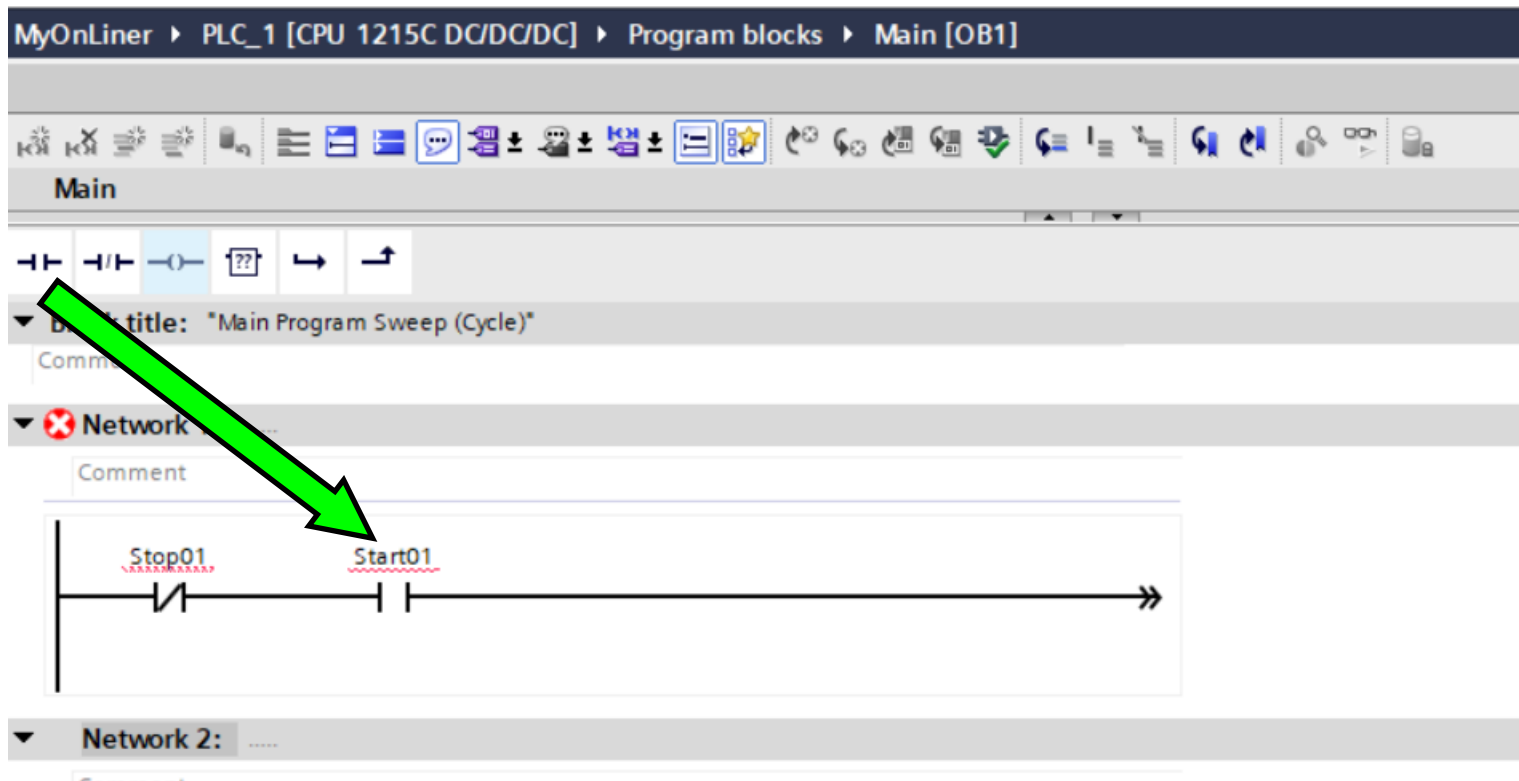
Programming Blocks

Begin with grabbing the normally closed contact (N/C)  from the favorite's bar at the top.




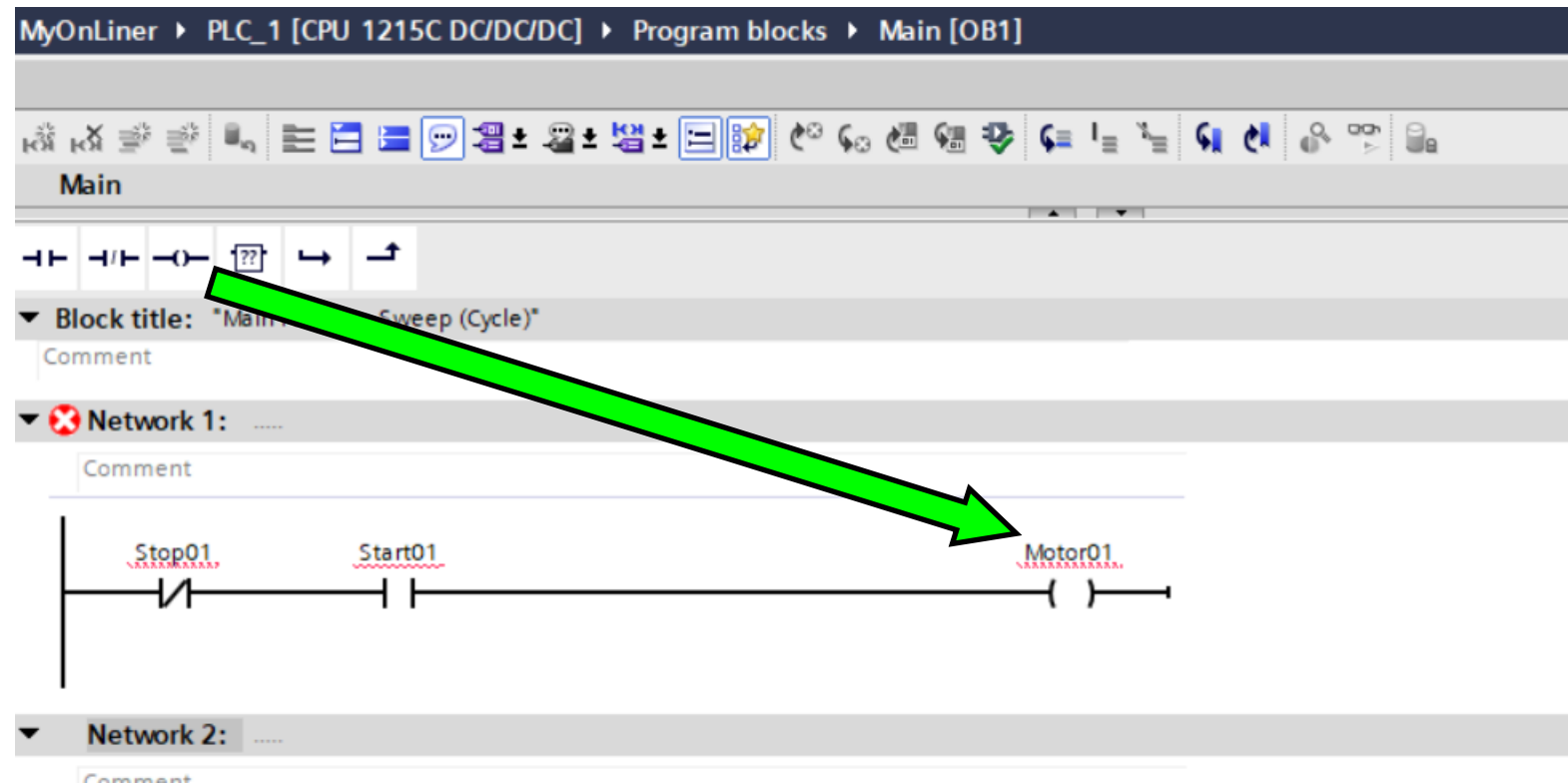
Programming Blocks

Now grab the normally open contact (N/O)  from the favorite's bar at the top. Drag it on to the network line and name it "Start01".



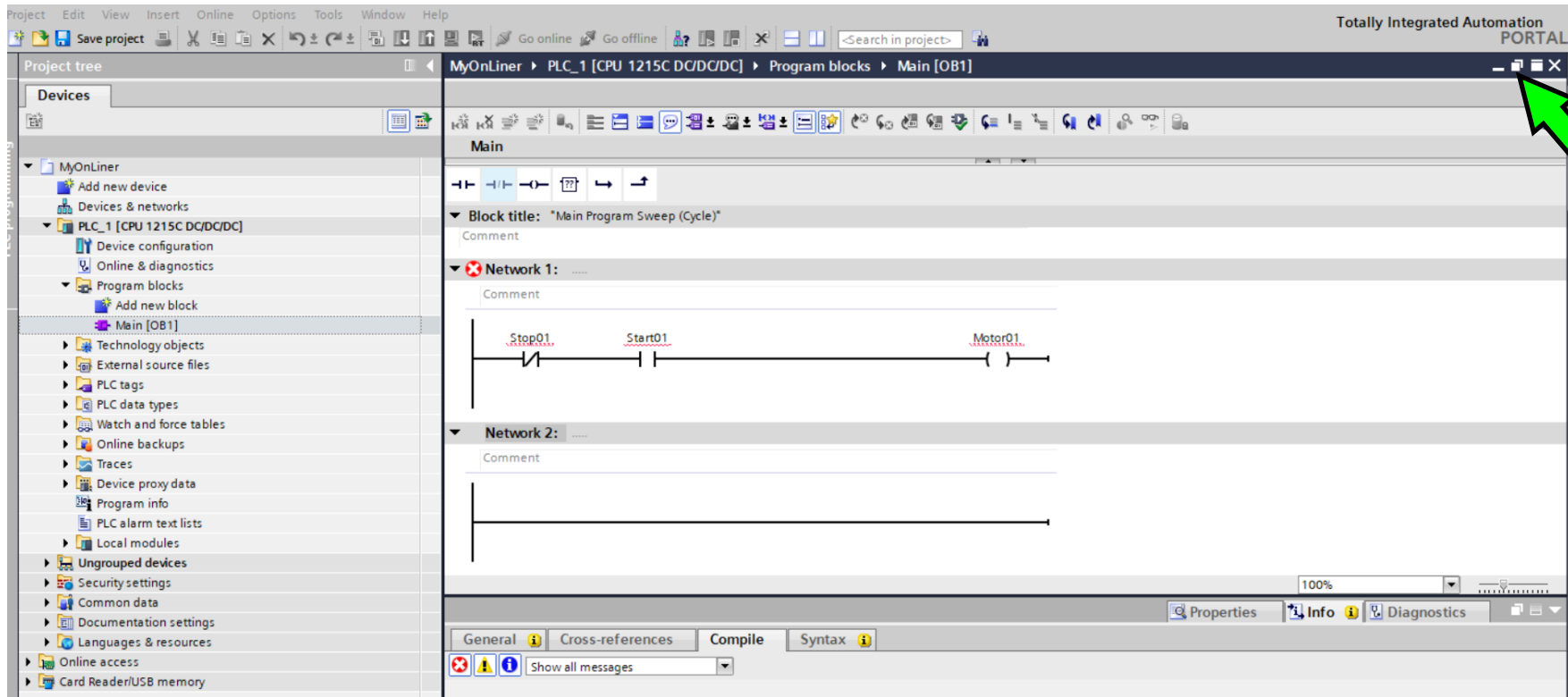
Programming Blocks

Grab the coil  to complete the circuit
Drag it on to the network line and name it "Motor01".



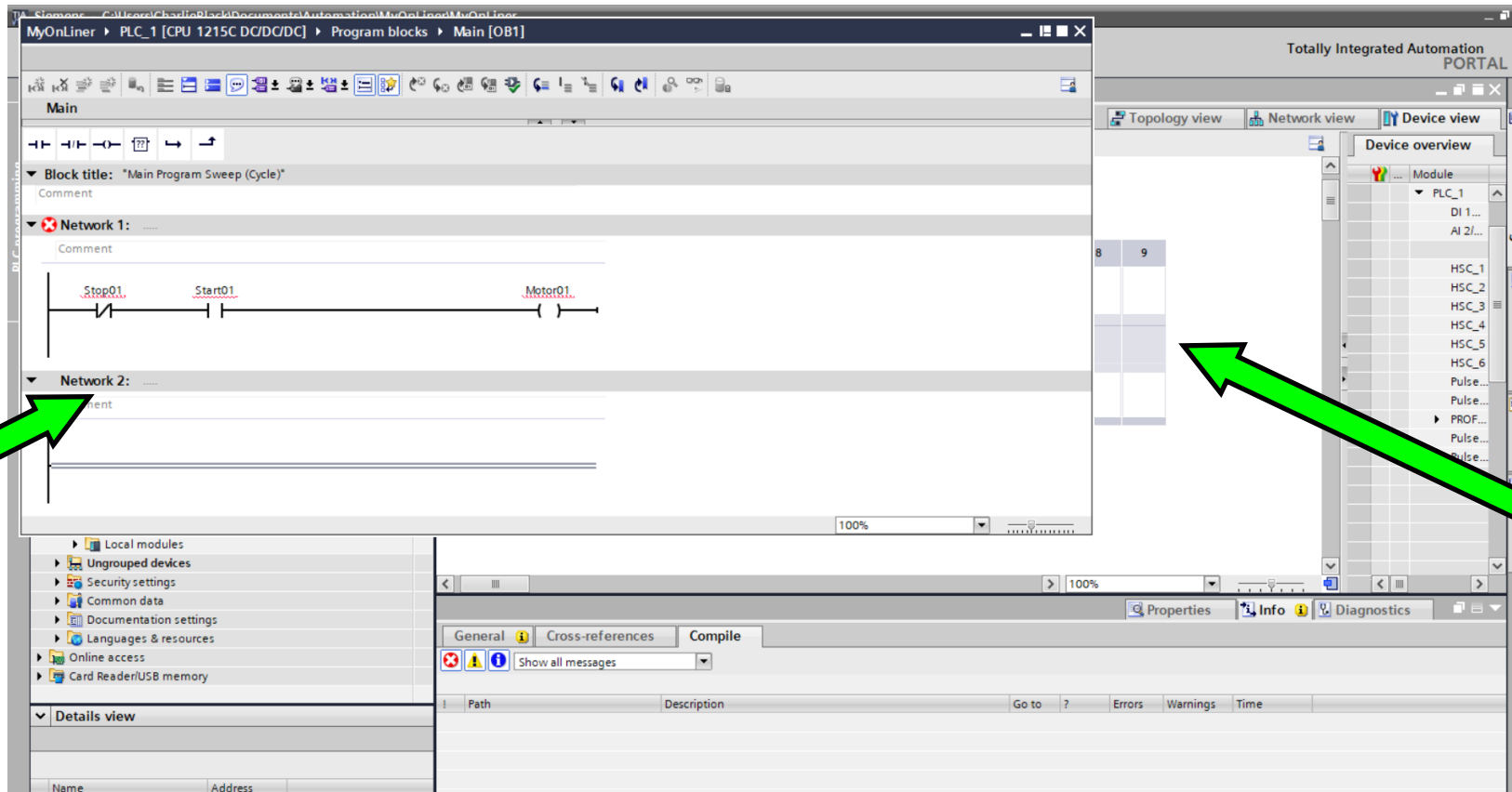
Programming Blocks

Now everything is set up and we are going to float the screen by selecting the float option on the upper right-hand side. You should now be able to see the Device configuration (PLC) window (your plc) and the Program block window over it.



Programming Blocks

You should now be able to see the Device configuration (PLC) window behind the Program block window

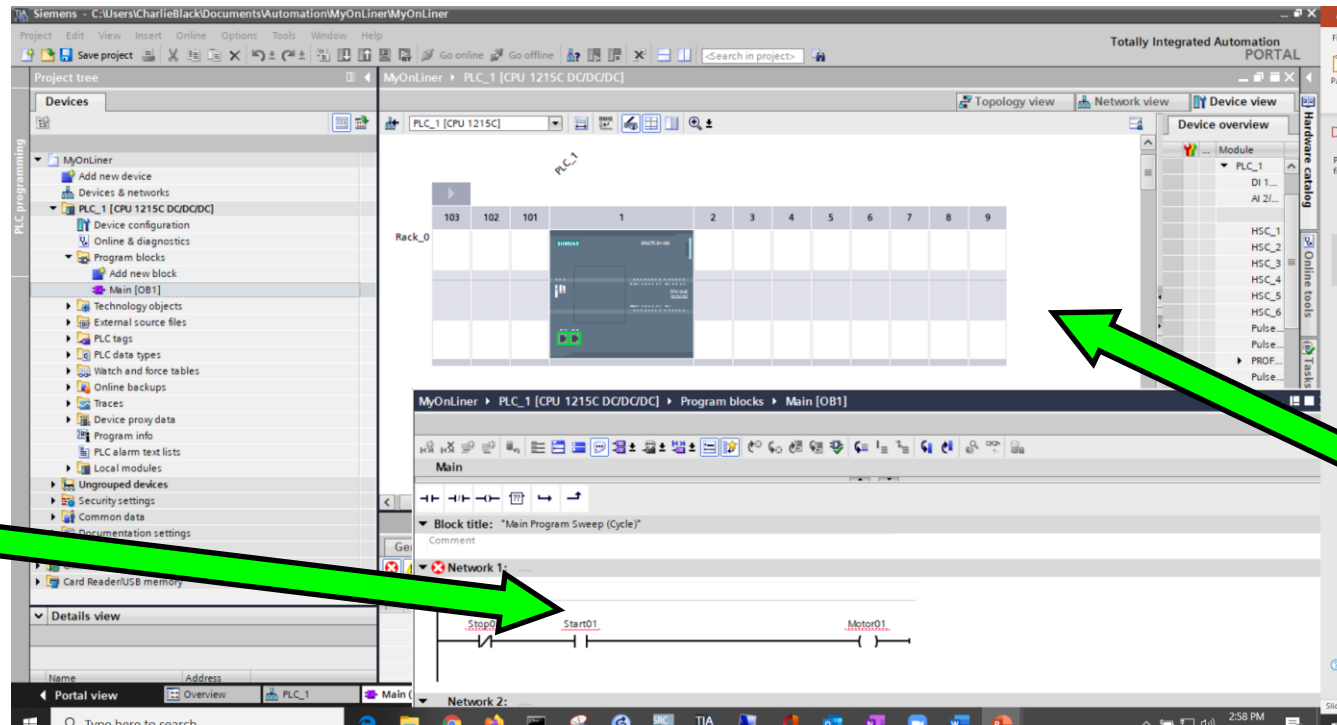


Program block window

Device configuration window

Programming Blocks

Move Program block window so you can see Device configuration window



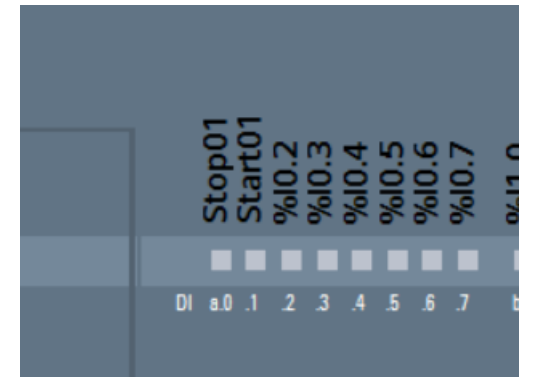
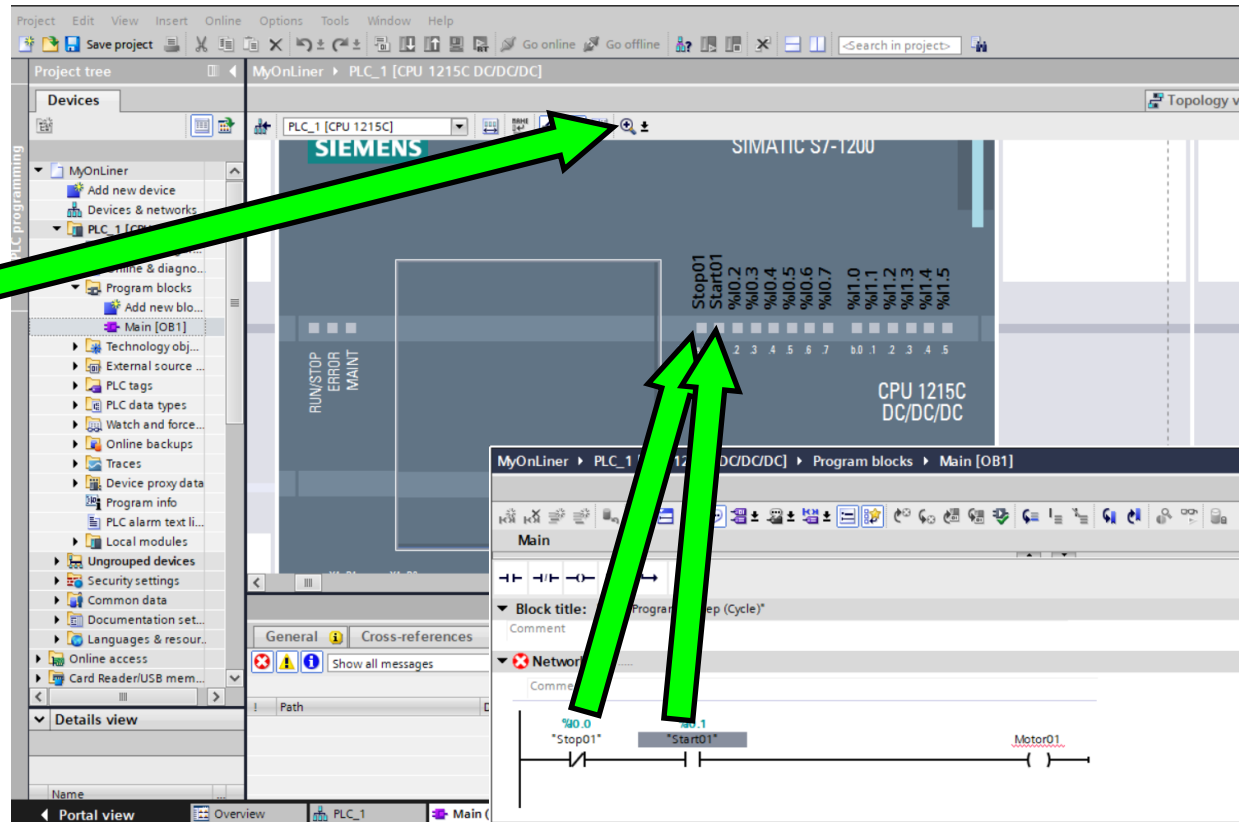
Program block window

Device configuration window

Programming Blocks

Zoom in onto the CPU on the Device configuration screen. From here, select the “Stop01” contact on the program block window and drag “%I0.0” then “Start01” to “%I0.1” on the CPU.

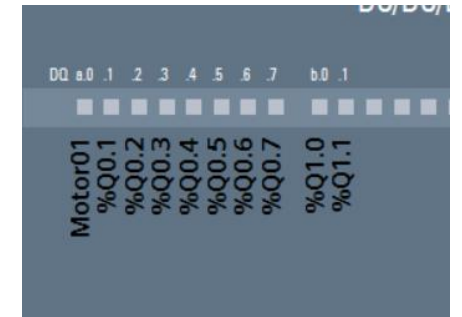
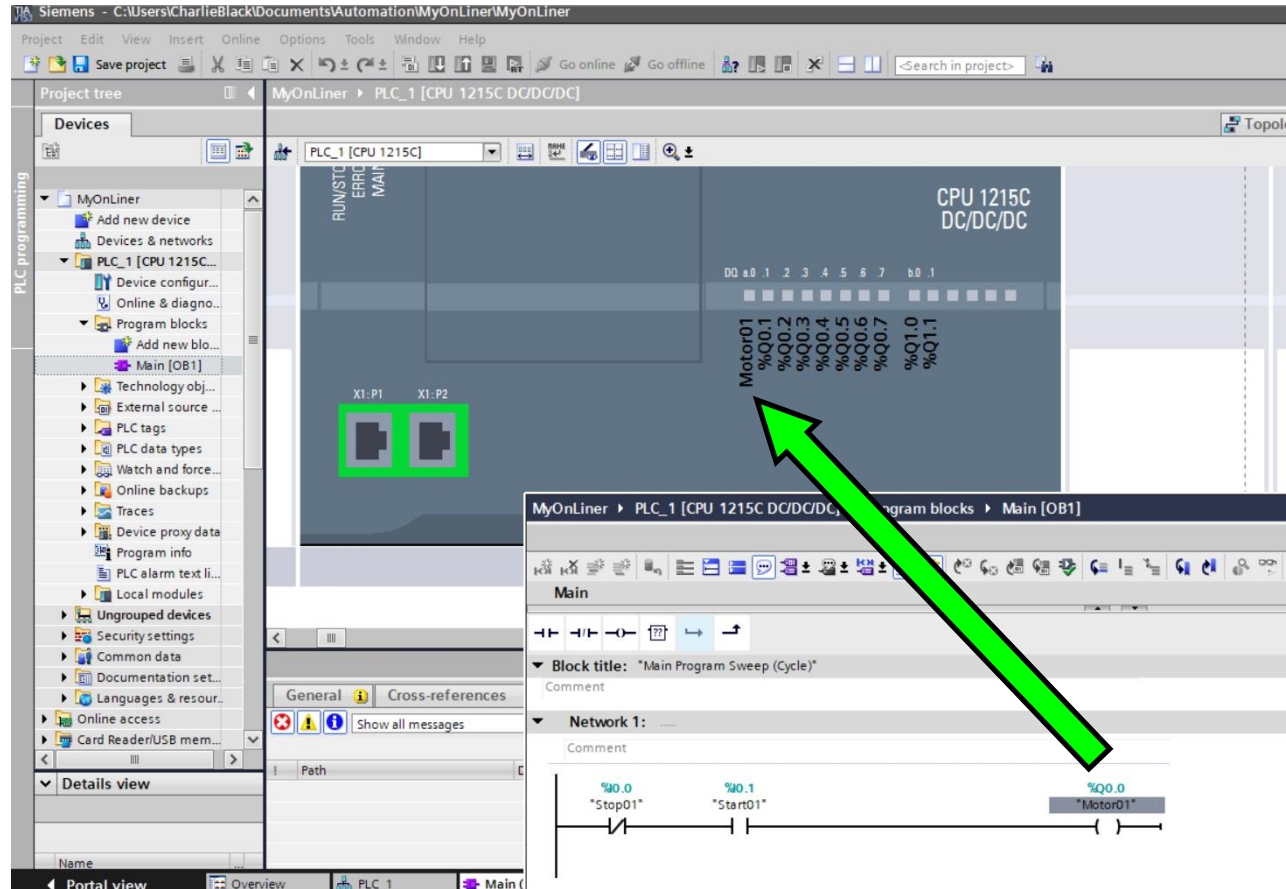
Zoom in to enlarge



IO.0 Stop01
IO.1 Strat01

Programming Blocks

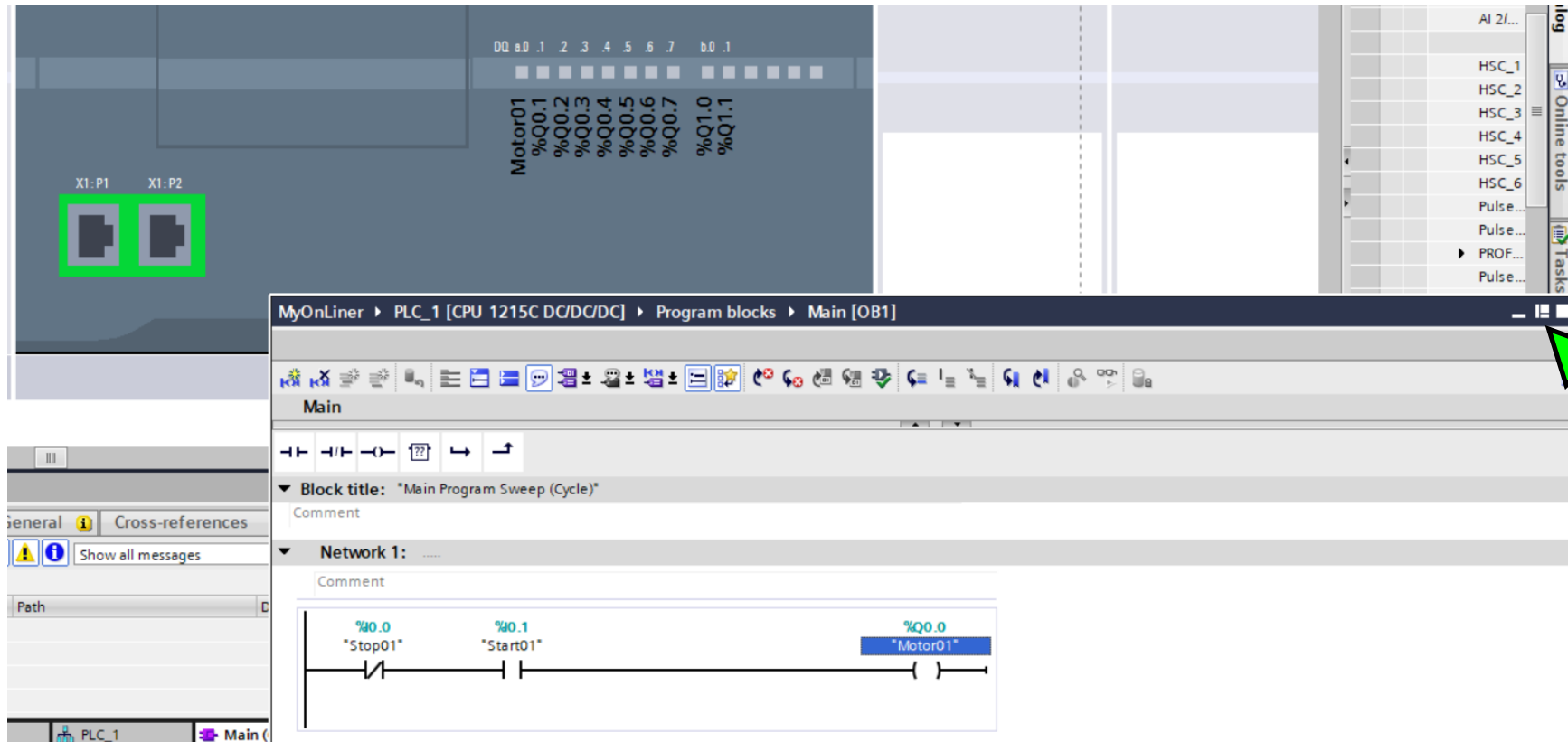
Move Device configuration screen to see outputs. From here, select the “Motor01” coil on the program block window and drag “%Q0.0”



Q0.0 Motor01

Programming Blocks

Now put the screen back to the way we started. Click the Program screen, then Embed

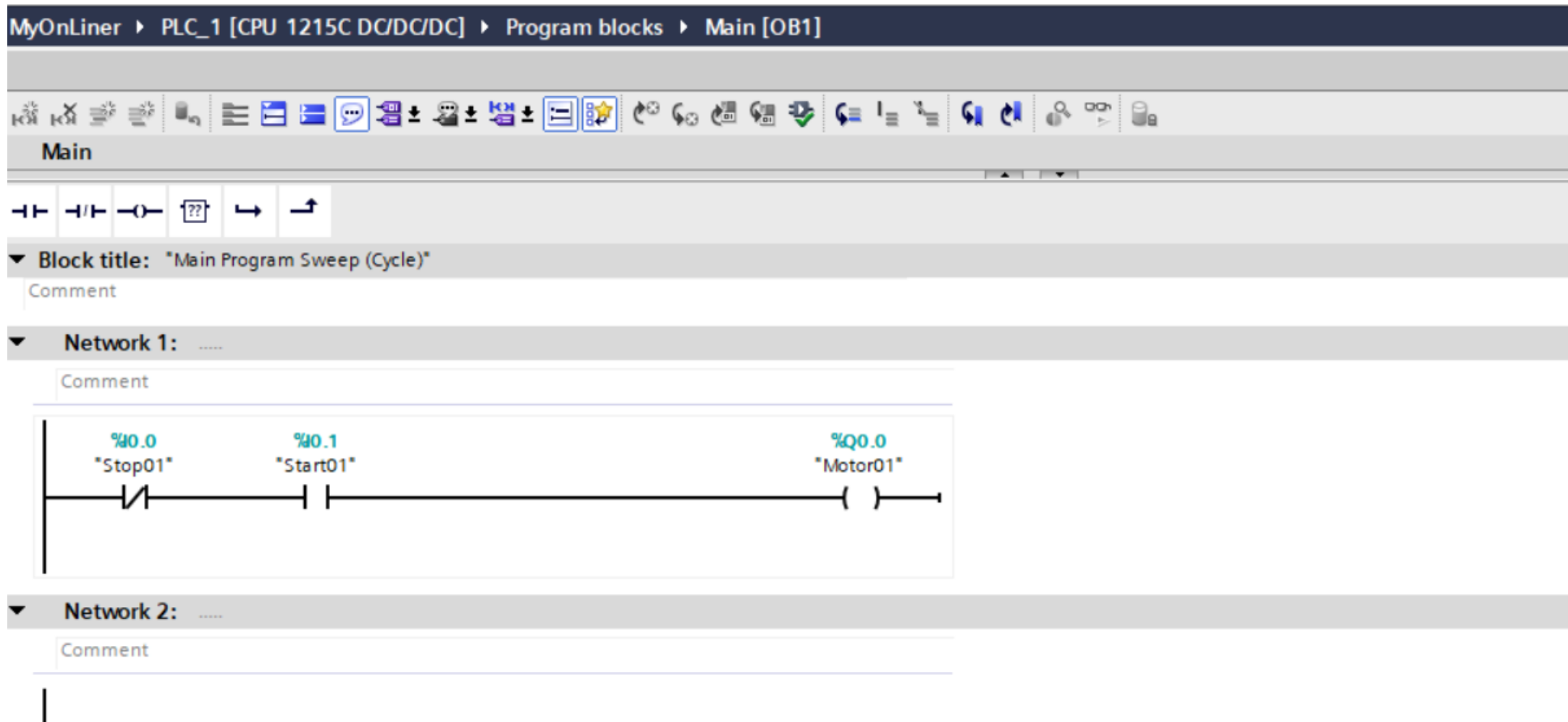


The screenshot displays the Siemens SIMATIC Manager interface. The top-left pane shows a hardware rack configuration with two digital input modules labeled X1-P1 and X1-P2 highlighted in green. The top-right pane shows a list of modules including AI 2/..., HSC_1 through HSC_6, and Pulse... modules. The main workspace shows a ladder logic program for 'Main [OB1]'. The program title is 'Main Program Sweep (Cycle)'. Network 1 contains a normally open contact labeled '%I0.0' with the comment '*Stop01*', followed by a normally closed contact labeled '%I0.1' with the comment '*Start01*', and a coil labeled '%Q0.0' with the comment '*Motor01*'. A green arrow points from the 'Embed' button (a square icon with a smaller square inside) in the bottom-right corner of the software window to the 'Embed' button in the bottom-right corner of the overall image.

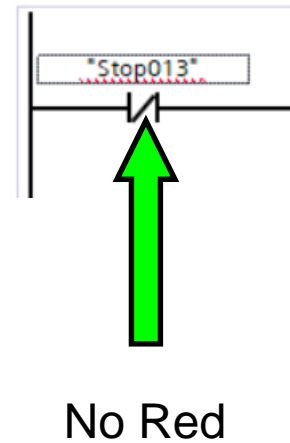

Embed

Programming Blocks

Your screen should look like this, no red lines where you have configured the contacts and coils

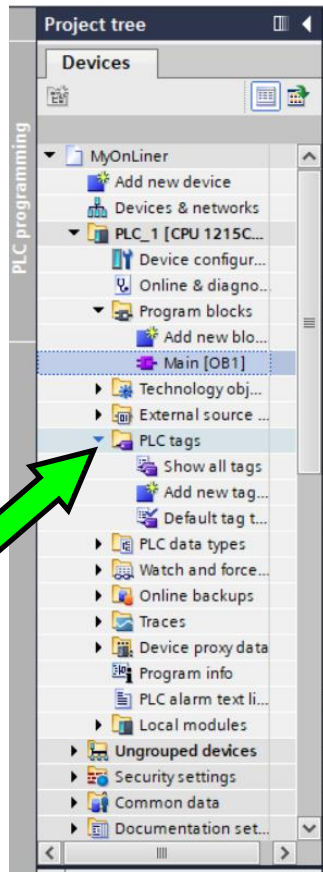


The screenshot shows the SIMATIC Manager interface for a PLC program. The breadcrumb path is: MyOnLiner > PLC_1 [CPU 1215C DC/DC/DC] > Program blocks > Main [OB1]. The main window title is "Main". Below the title bar is a toolbar with various icons. The main area shows a ladder logic network for "Main Program Sweep (Cycle)". The network contains three elements: a normally closed contact labeled "%I0.0 *Stop01*", a normally open contact labeled "%I0.1 *Start01*", and a coil labeled "%Q0.0 *Motor01*". There are no red lines or error messages visible in the network.

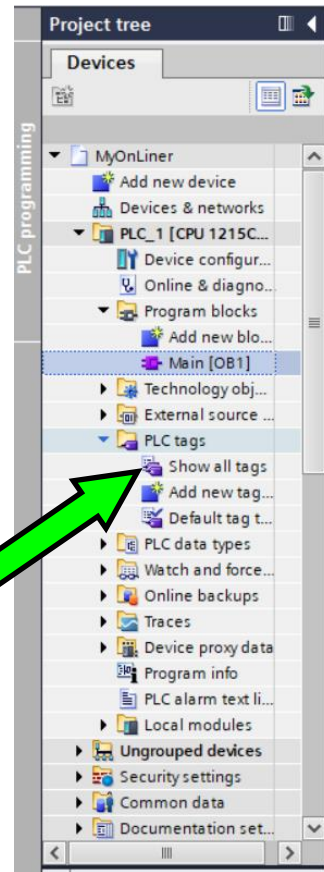


Programming Blocks

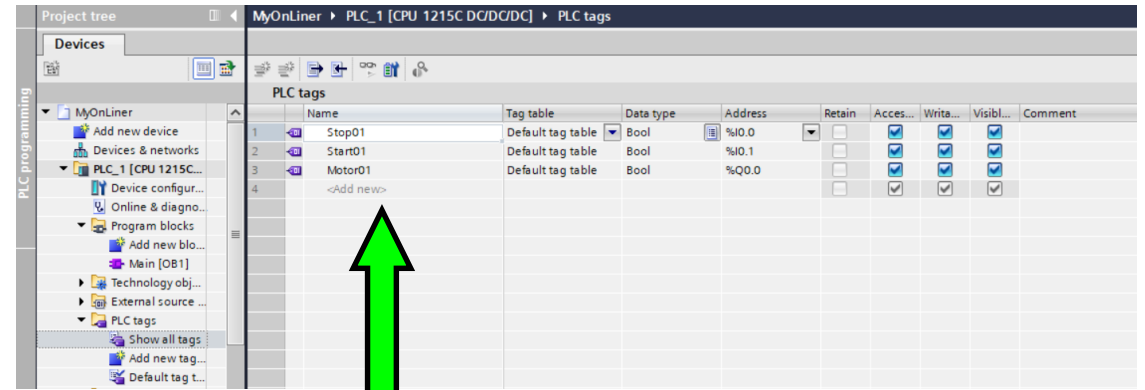
If you have Red, we need to go to the PLC Tags area.



PLC Tags



Show all
Tags



Your Tags must look like this:

Stop01 I0.0

Start01 I0.1

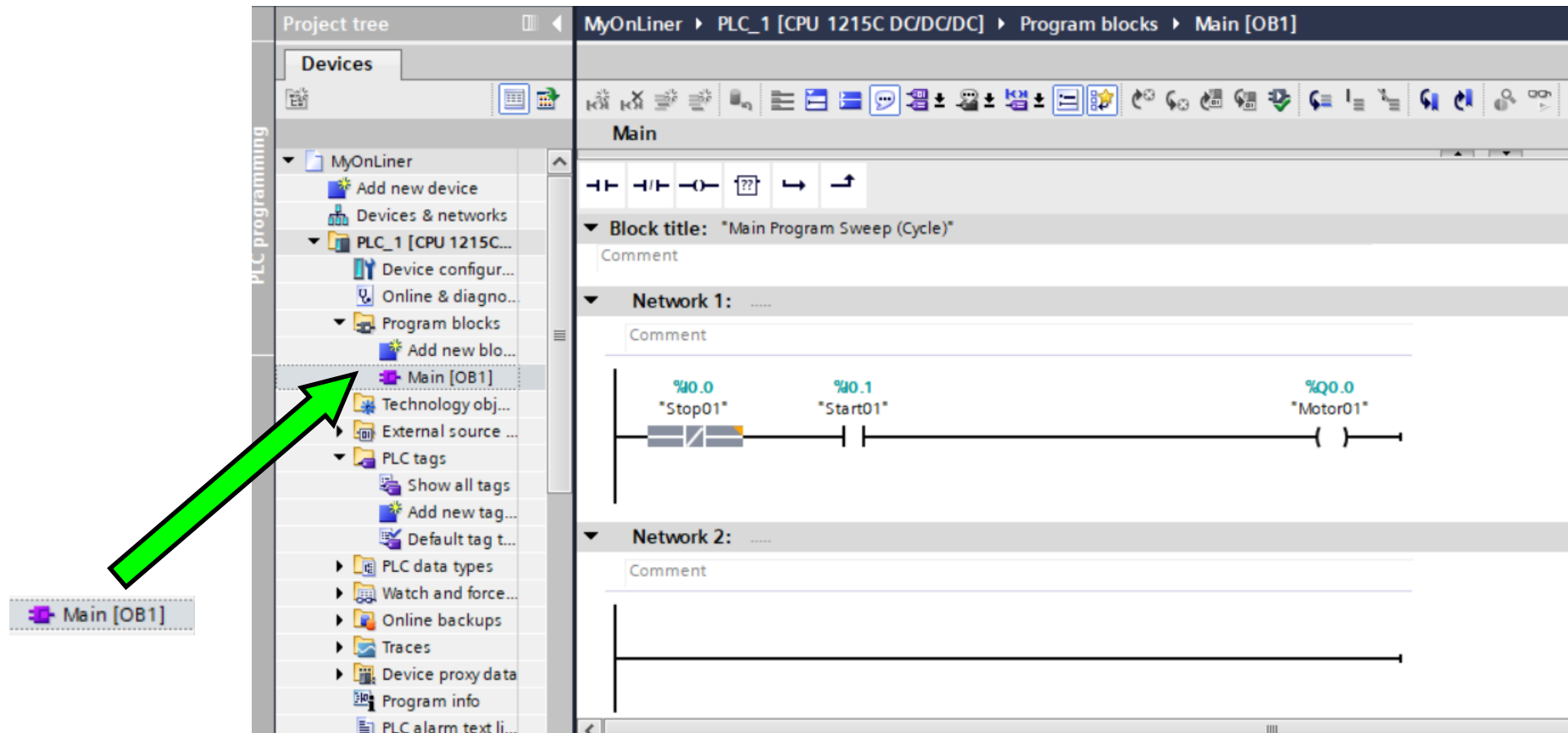
Motor01 Q0.0

Just fill in if you have issues

	Name	Address
1	Stop01	%I0.0
2	Start01	%I0.1
3	Motor01	%Q0.0
4	<Add new>	

Programming Blocks

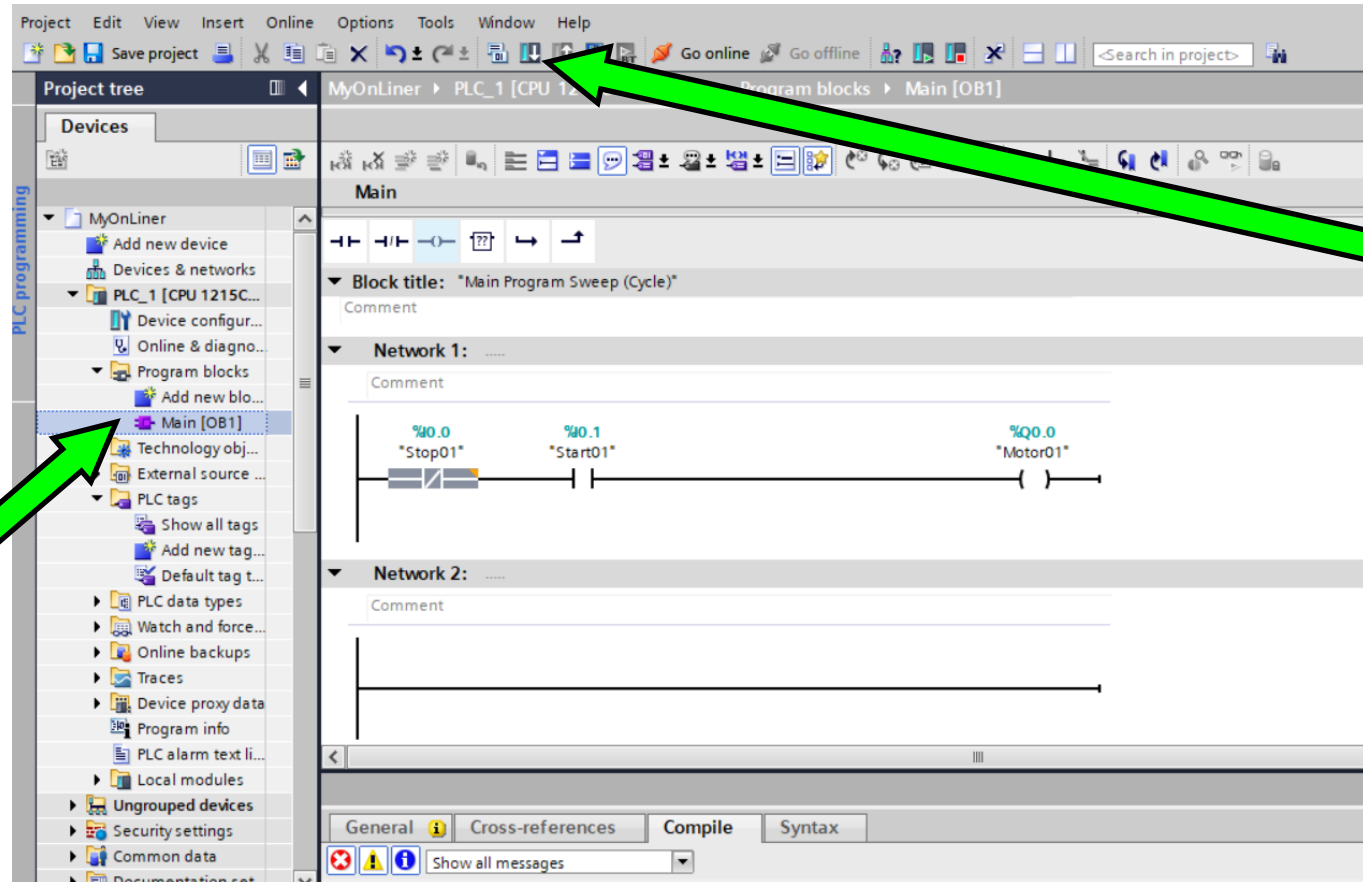
Now go back to your Program blocks area, then Main OB1



The screenshot displays the Siemens SIMATIC Manager interface. On the left, the 'Project tree' shows the hierarchy: MyOnLiner > PLC_1 [CPU 1215C DC/DC/DC] > Program blocks > Main [OB1]. A green arrow points to the 'Main [OB1]' block in the tree. Below the tree, a 'Main [OB1]' button is visible. The main workspace shows the 'Main' block with the title 'Main Program Sweep (Cycle)'. The ladder logic diagram consists of two networks. Network 1 contains a normally open contact labeled '%I0.0 *Stop01*', a normally closed contact labeled '%I0.1 *Start01*', and a coil labeled '%Q0.0 *Motor01*'. Network 2 is currently empty.

Programming Blocks

Now click the download icon at the top

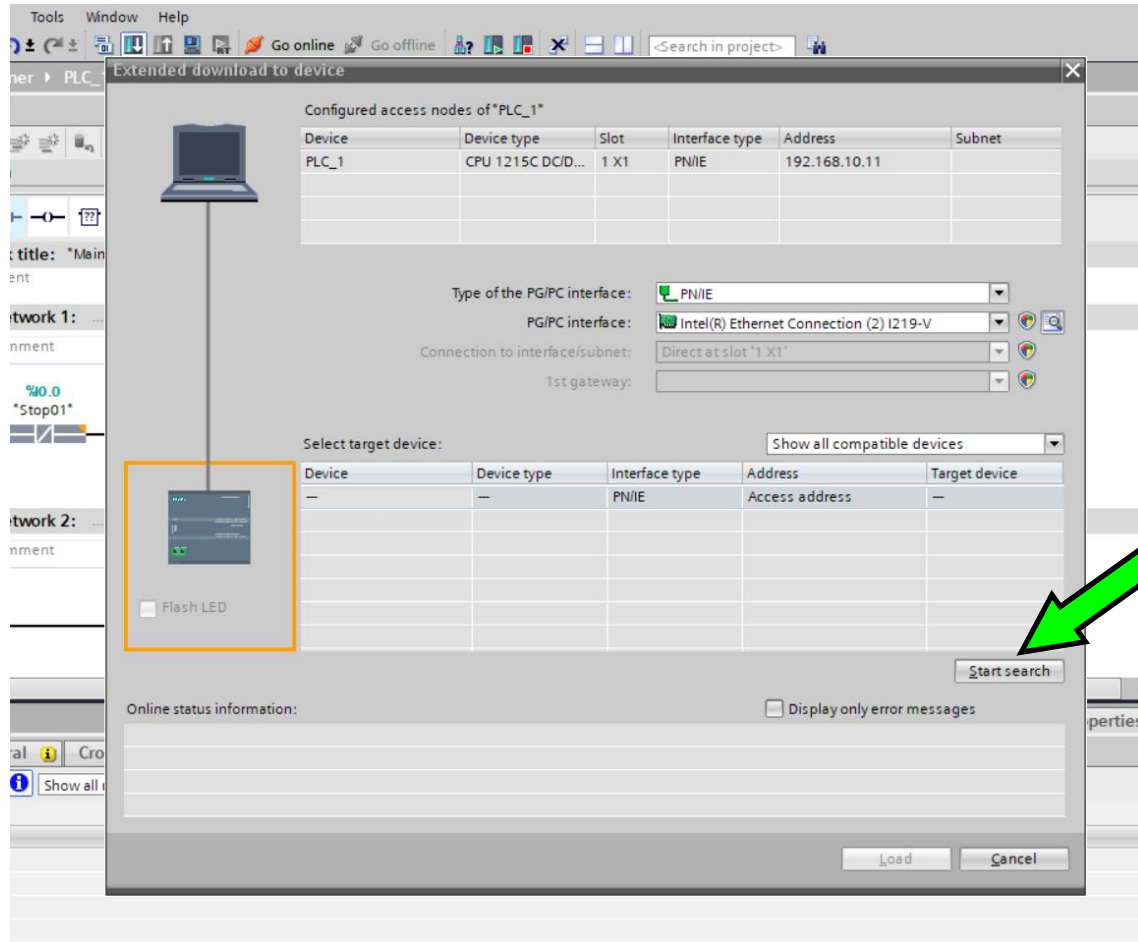


Click download Icon

Main OB1
must be high lighted

Programming Blocks

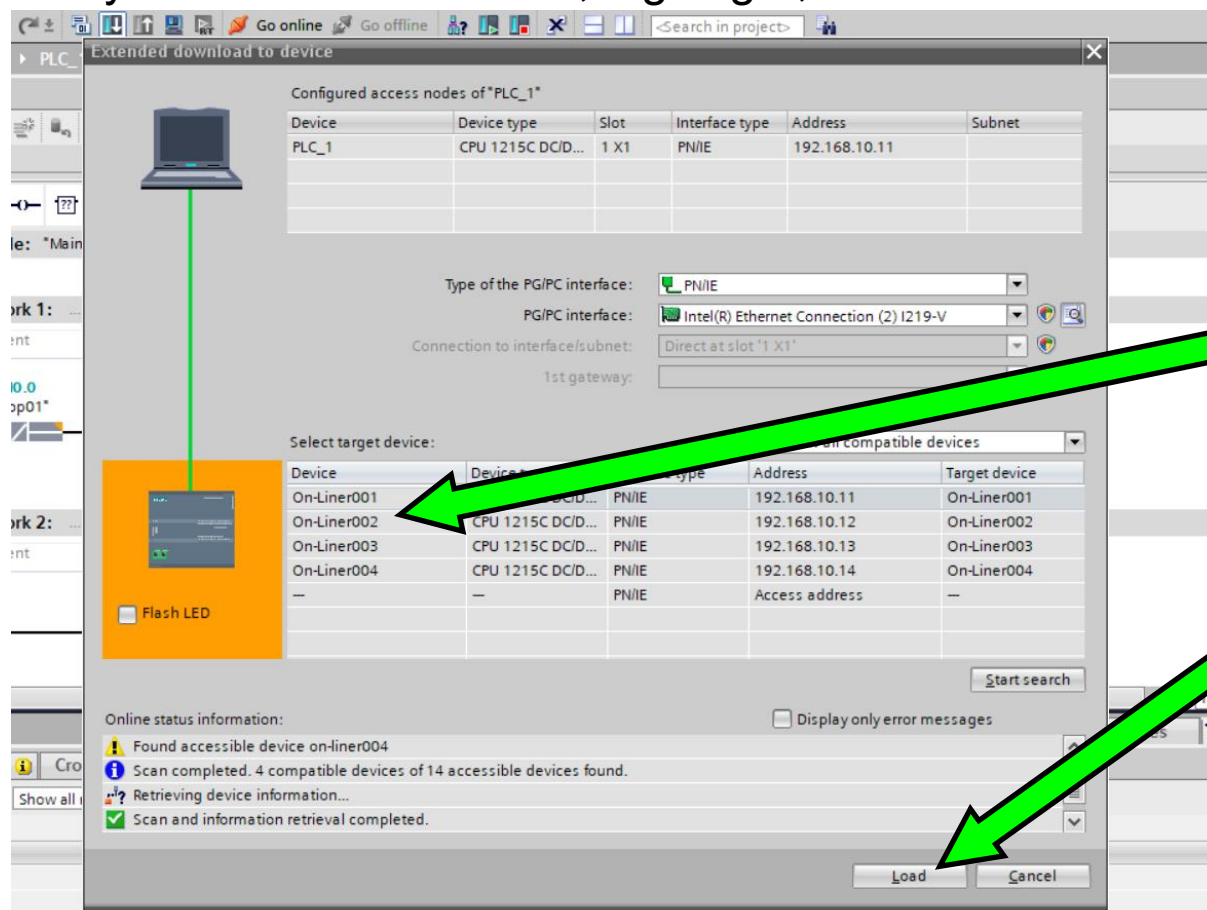
Click “Start search”



Click start search

Programming Blocks

Again... find your correct connector, high light, then click "Load"

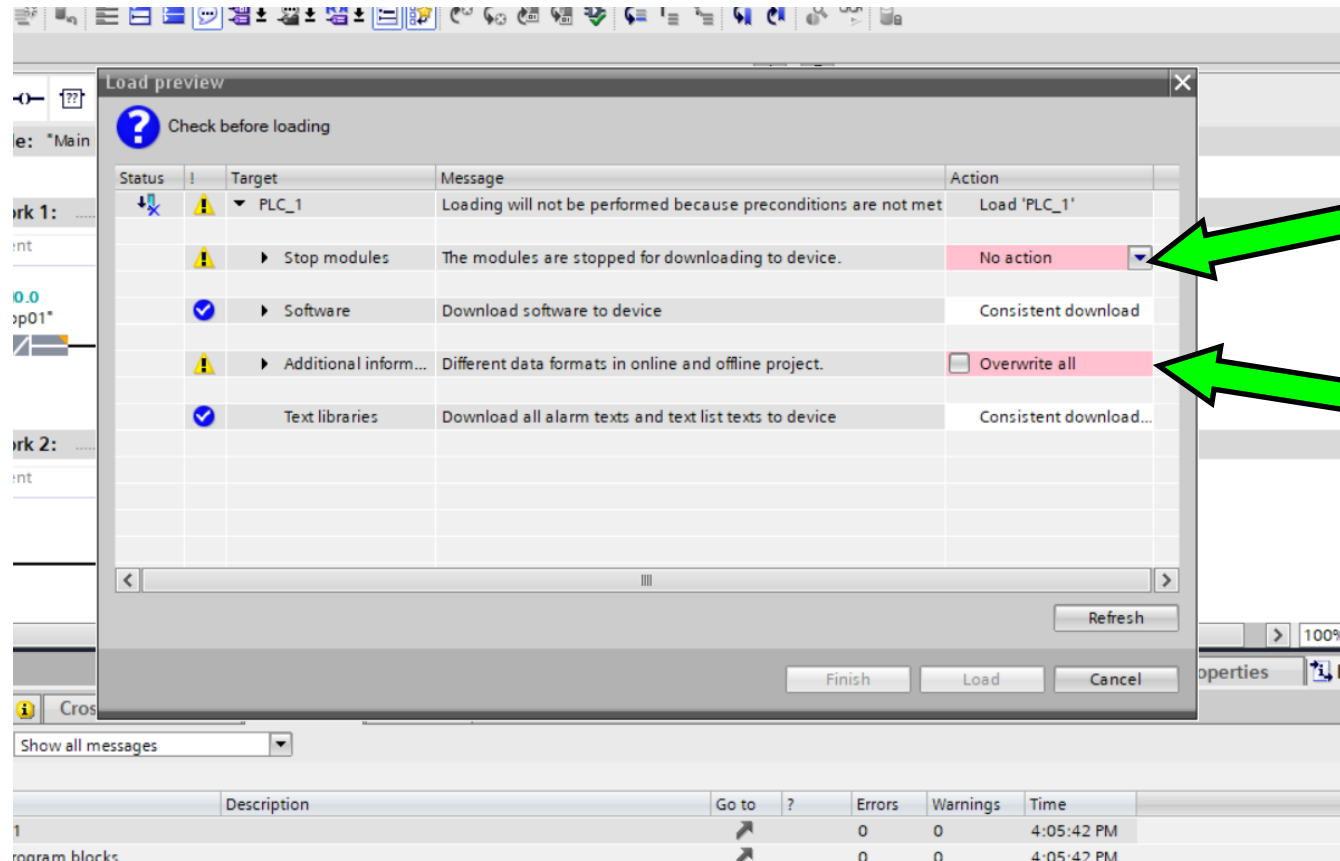


Make sure you high light the correct controller

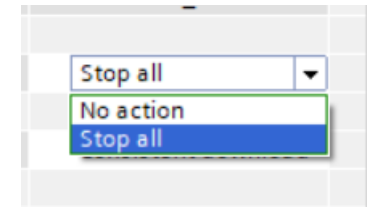
Click Load to download

Programming Blocks

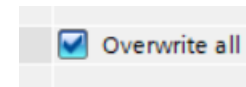
Continue loading...



Change from “No Action” to “Stop all by pulling down box

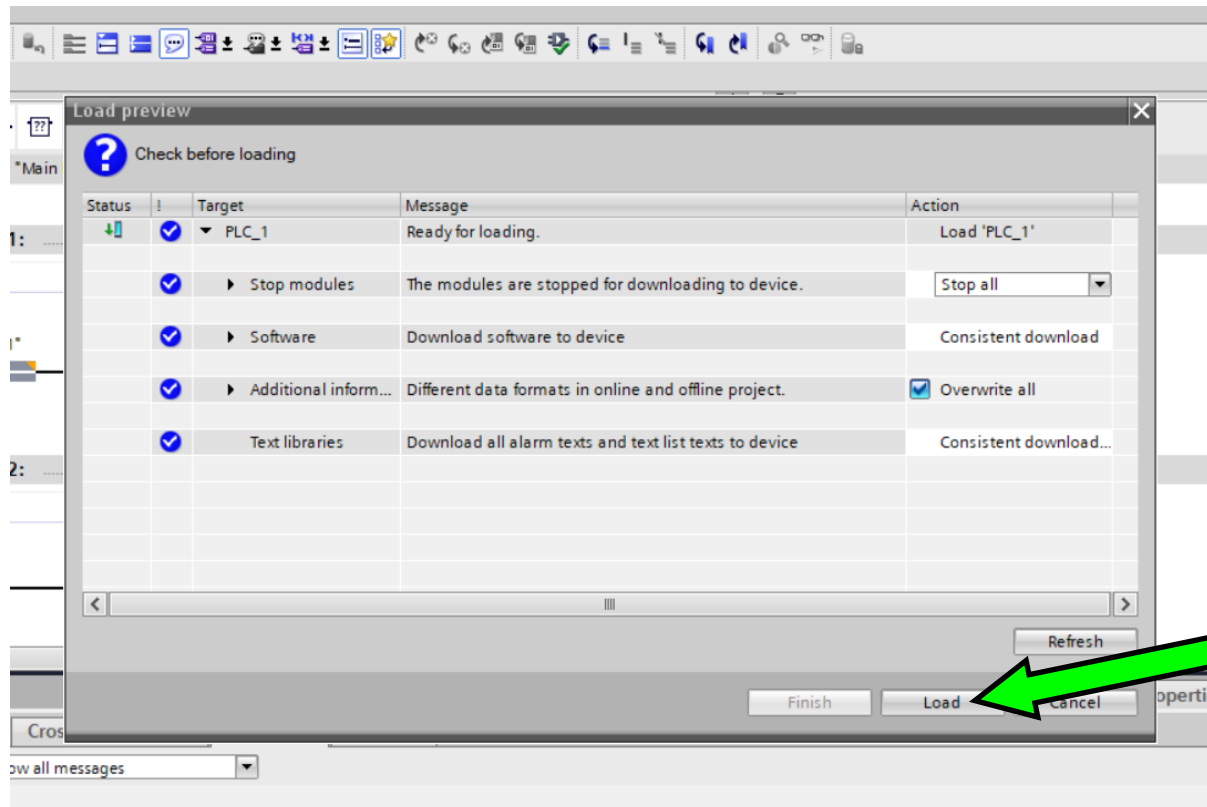


Check “Overwrite all”



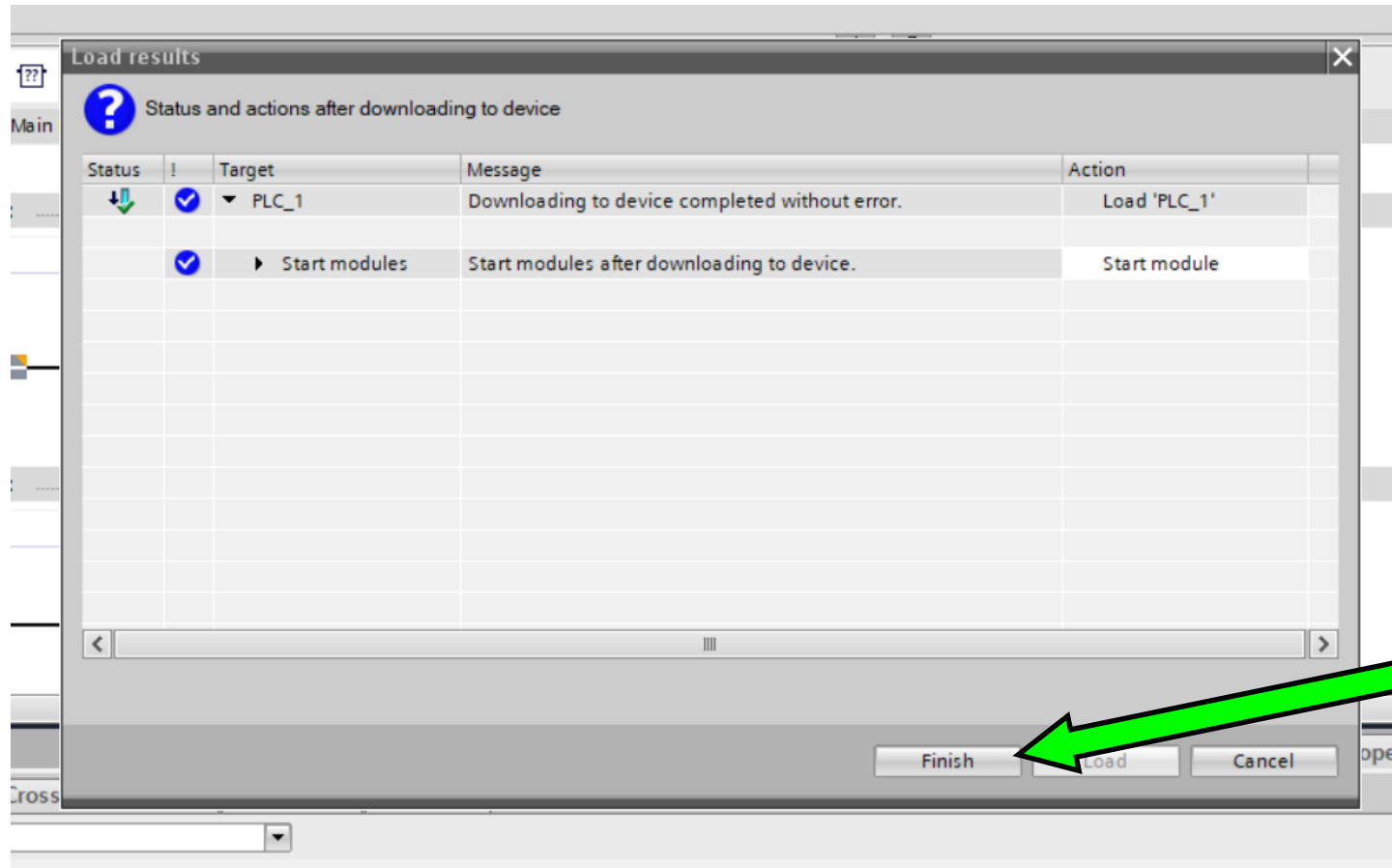
Programming Blocks

Finish loading...



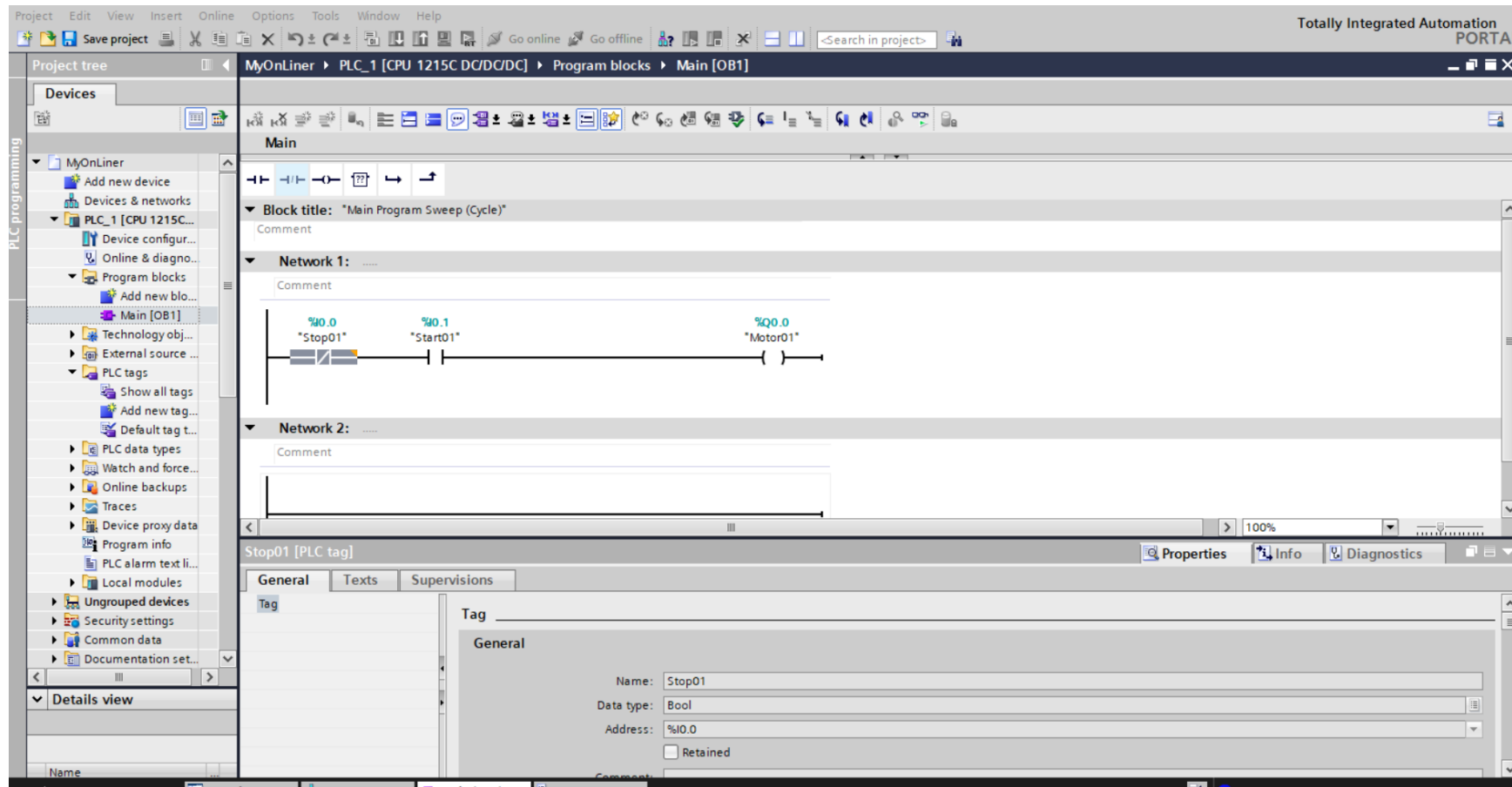
Programming Blocks

Start module, put controller back in run mode.



Programming Blocks

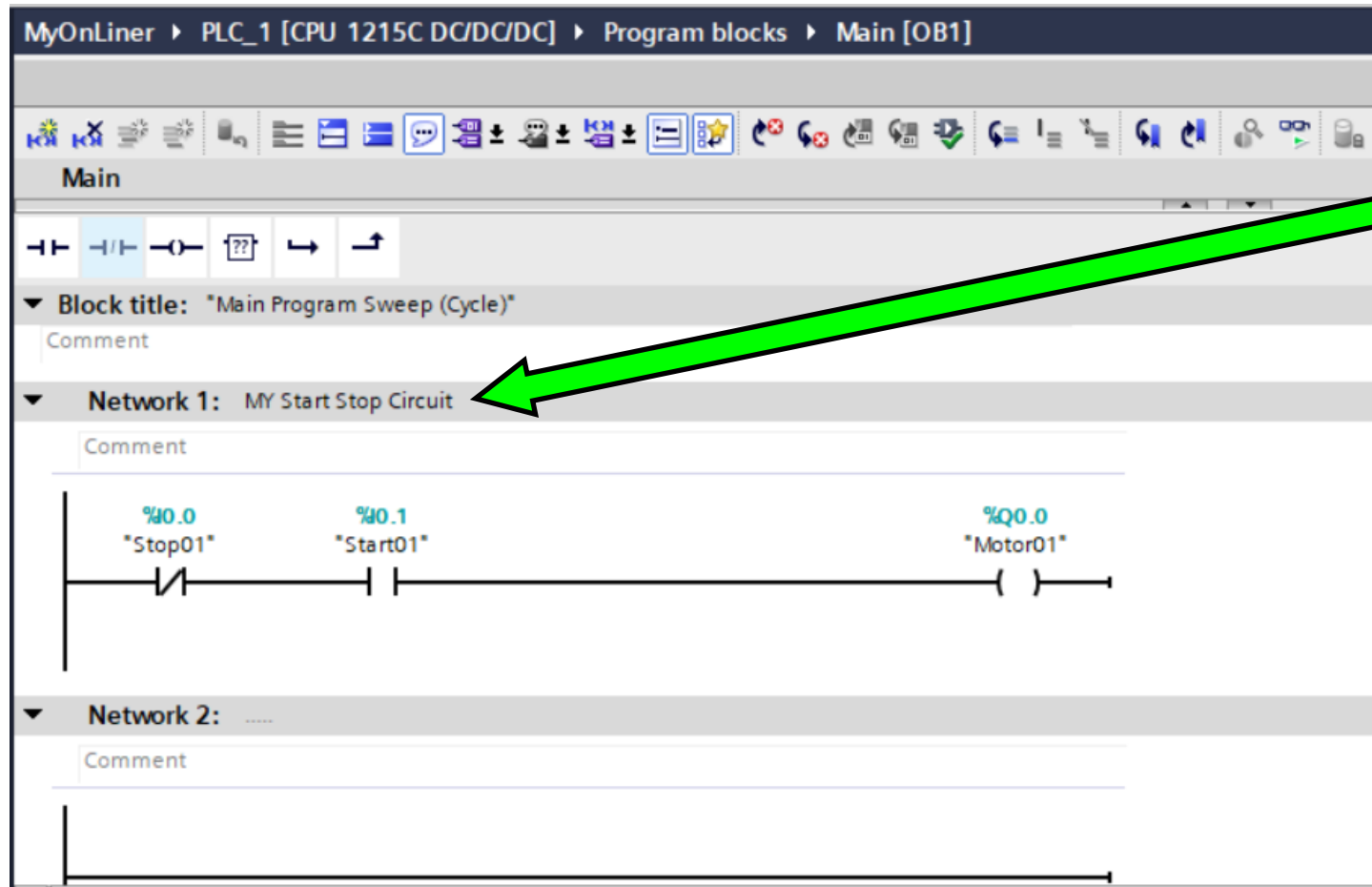
If everything went well, you have successfully downloaded your first project



The screenshot displays the Siemens SIMATIC Manager interface. The top menu bar includes Project, Edit, View, Insert, Online, Options, Tools, Window, and Help. The main window is titled "Totally Integrated Automation PORTAL" and shows a project tree on the left. The project tree is expanded to show "MyOnLiner" > "PLC_1 [CPU 1215C DC/DC/DC]" > "Program blocks" > "Main [OB1]". The main workspace shows a ladder logic program with two networks. Network 1 is titled "Main Program Sweep (Cycle)" and contains a normally open contact labeled "%I0.0 Stop01", a normally closed contact labeled "%I0.1 Start01", and a coil labeled "%Q0.0 Motor01". Network 2 is currently empty. Below the ladder logic, the "Stop01 [PLC tag]" properties window is open, showing the "General" tab. The tag name is "Stop01", the data type is "Bool", and the address is "%I0.0". There is an unchecked checkbox for "Retained".

Programming Blocks

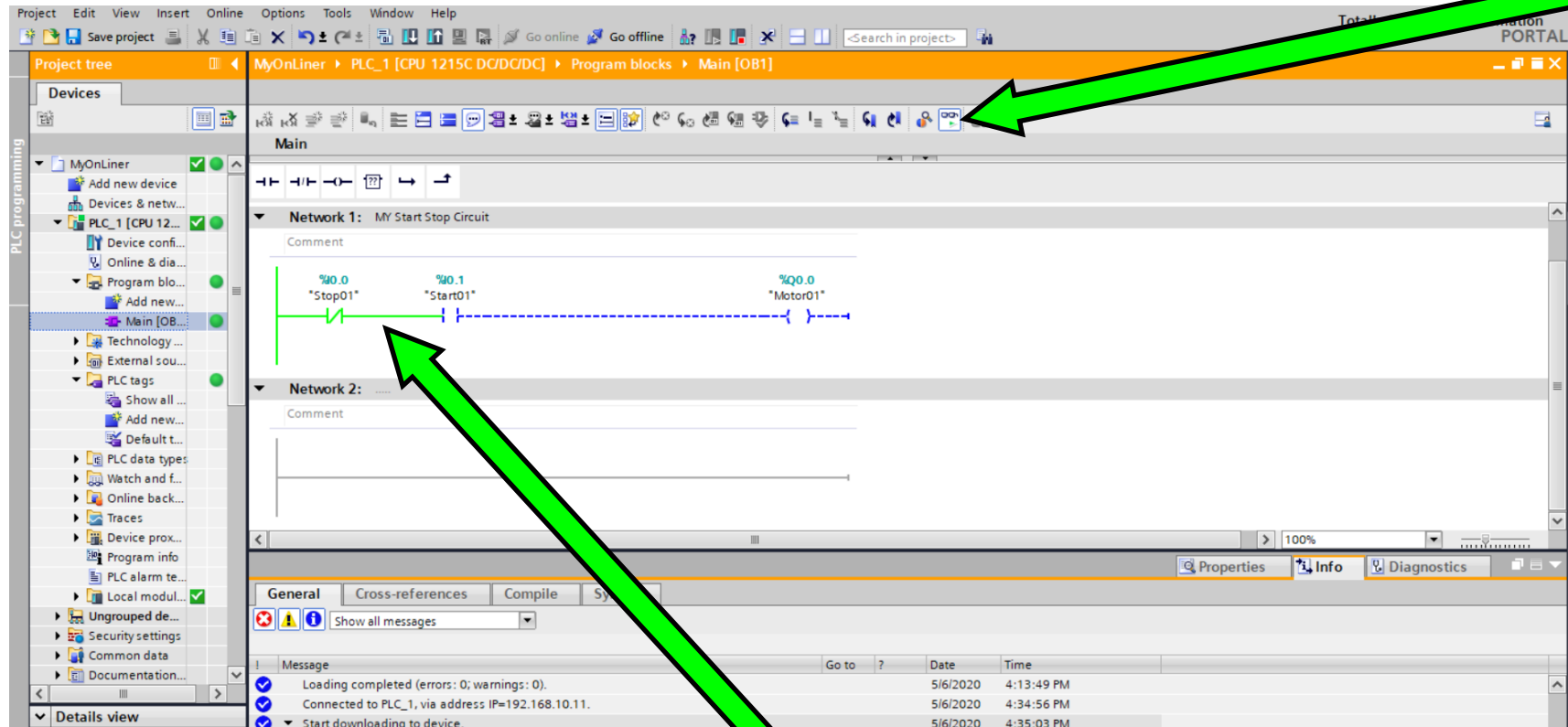
Now give your network a description, then download again. 



My Start Stop Circuit

Programming Blocks

Now let's go on-line with the controller



On-Line Icon

Note ... Green lines indicating power flow through the NC contact and stopping at the NO contact.

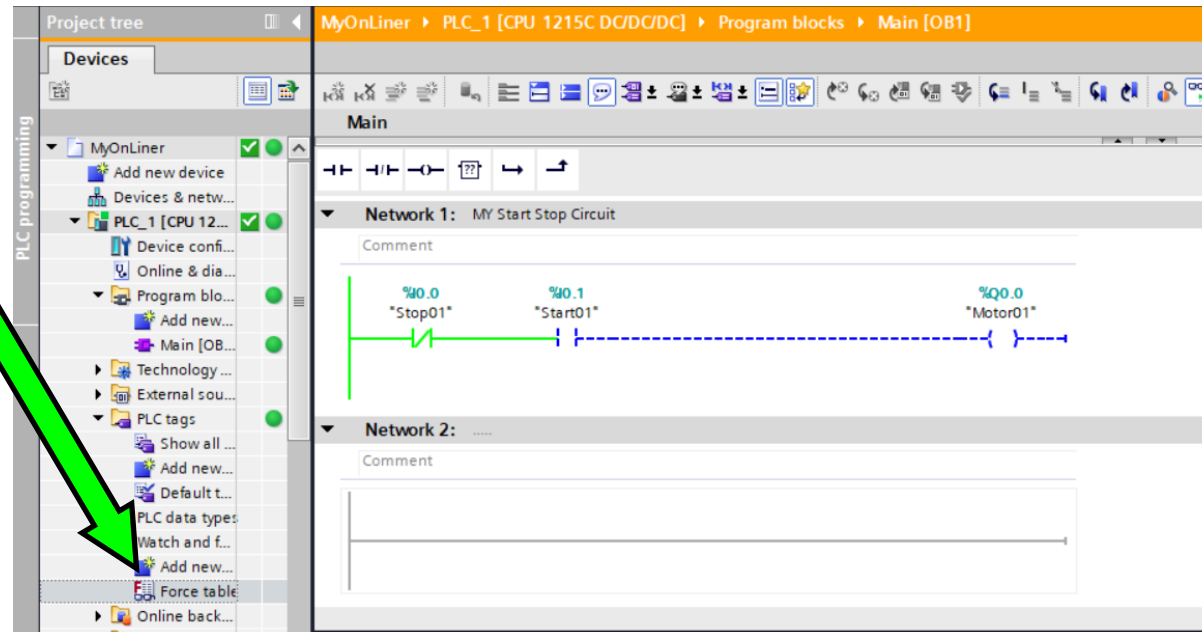
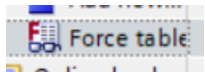
Programming Blocks

Now we must force

Because we are connected to the Real-World Inputs, which are designed to have push buttons connected to them. We can not turn them on because you are far away being remotely connected.

We will use a command called force; this lets us override what the Real World Input is reading so we can test our program.

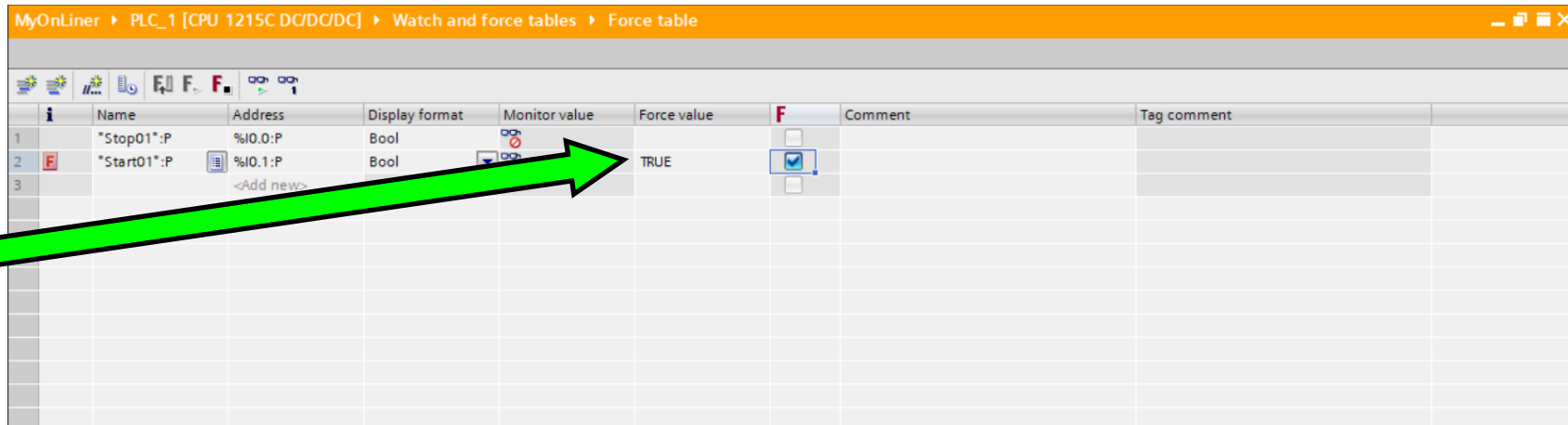
Go to Force table.



The screenshot displays the Siemens SIMATIC Manager interface. On the left, the 'Project tree' shows the 'PLC programming' section expanded, with the 'Force table' option highlighted. A green arrow points from a 'Force table' icon to this option. The main window shows the 'Main' ladder logic diagram for 'Network 1: MY Start Stop Circuit'. The diagram includes a normally open contact labeled '%I0.0 *Stop01*', a normally closed contact labeled '%I0.1 *Start01*', and a coil labeled '%Q0.0 *Motor01*'. The 'Network 2' section is currently empty.

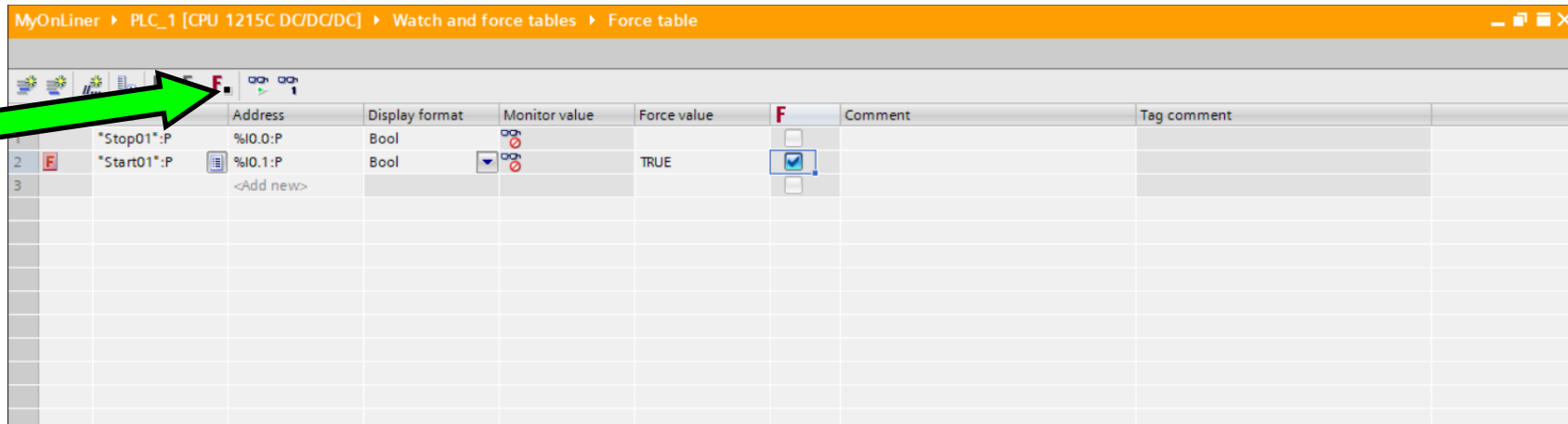
Programming Blocks

Type "True" under "Force value of your "Start01"



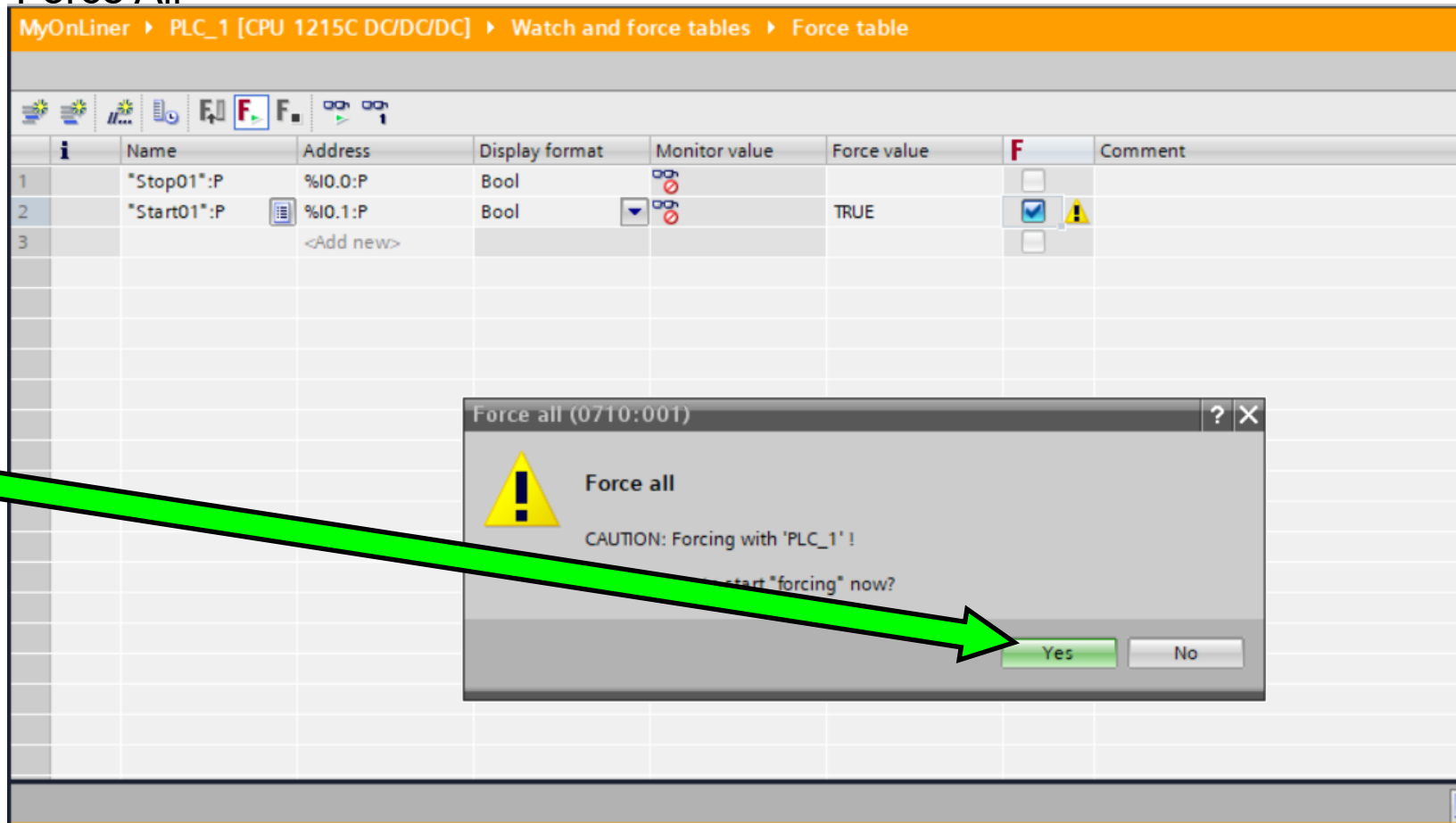
TRUE

Click Icon to "Force All"



Programming Blocks

Click “yes” to “Force All”



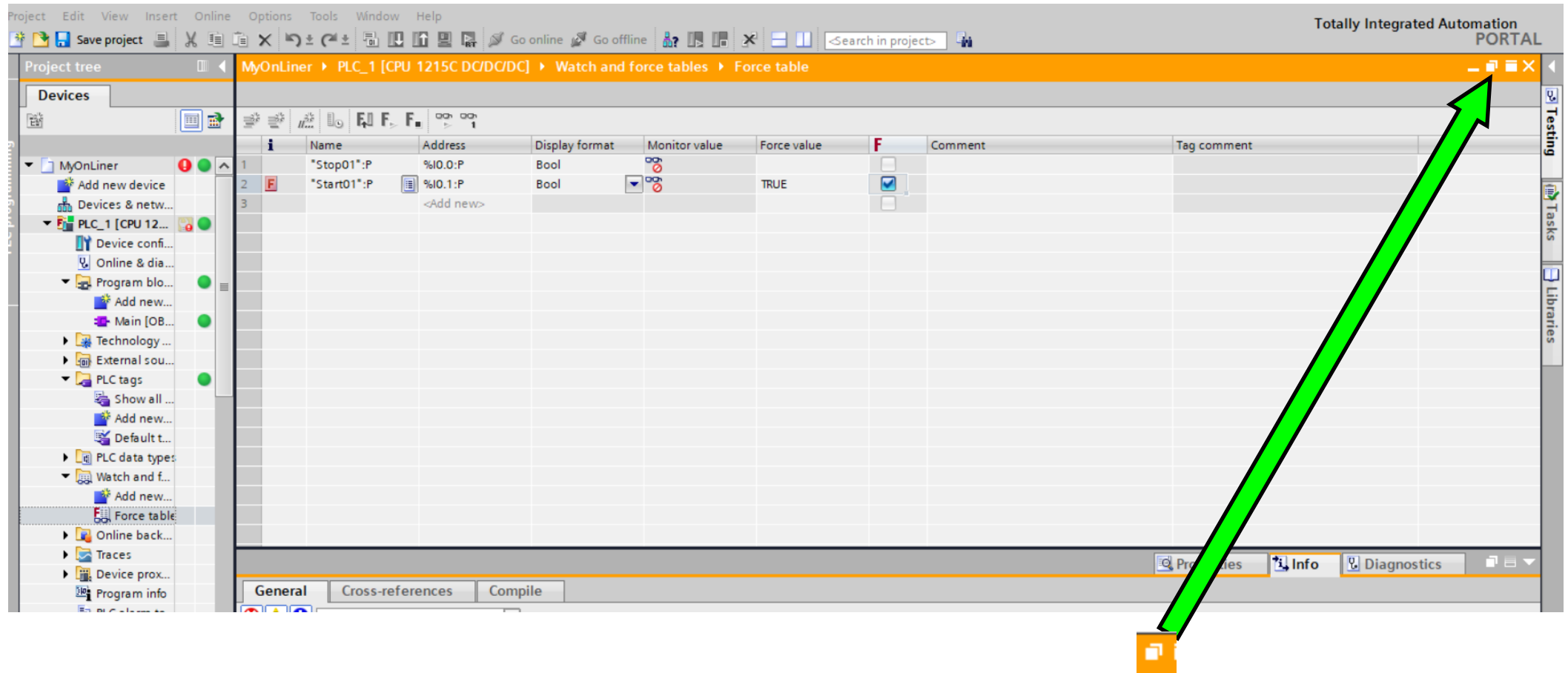
The screenshot shows the 'Force table' window in SIMATIC Manager. The table contains the following data:

	Name	Address	Display format	Monitor value	Force value	F	Comment
1	*Stop01*:P	%I0.0:P	Bool			<input type="checkbox"/>	
2	*Start01*:P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/>	
3		<Add new>				<input type="checkbox"/>	

Overlaid on the table is a 'Force all (0710:001)' dialog box with a yellow warning triangle icon. The text in the dialog reads: 'Force all', 'CAUTION: Forcing with 'PLC_1'!', and 'start "forcing" now?'. At the bottom of the dialog are 'Yes' and 'No' buttons. A large green arrow points from the left side of the image towards the 'Yes' button.

Programming Blocks

Now float again



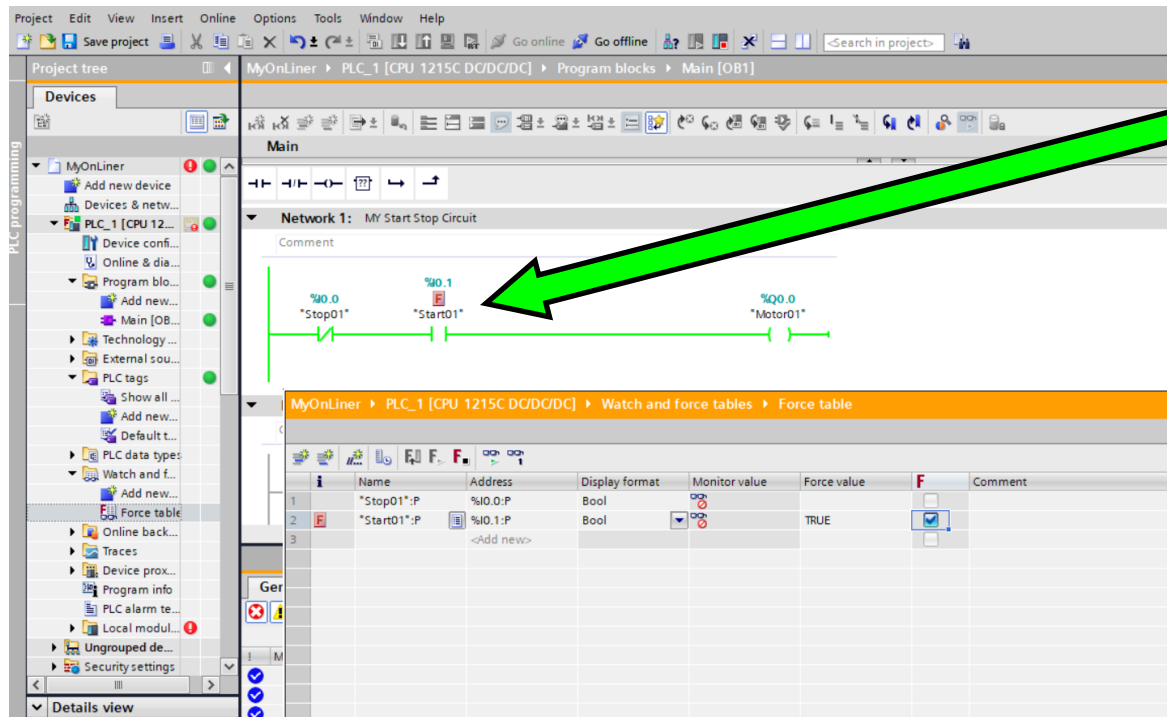
The screenshot displays the Siemens TIA Portal interface. The main window is titled "Force table" and shows a table with the following data:

	Name	Address	Display format	Monitor value	Force value	F	Comment	Tag comment
1	*Stop01*:P	%I0.0:P	Bool			<input type="checkbox"/>		
2	*Start01*:P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/>		
3		<Add new>				<input type="checkbox"/>		

A green arrow originates from a floating window icon at the bottom center of the screen and points to the title bar of the "Force table" window, illustrating the process of floating the window.

Programming Blocks

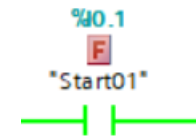
Move screen near bottom, now on your network you will see that I0.0 Start01 is Forced on and power flow now goes through and turn the coil on.



The screenshot shows the SIMATIC Manager interface. The main window displays a ladder logic network with three elements: a normally open contact labeled "%I0.0 *Stop01*", a normally closed contact labeled "%I0.1 *Start01*", and a coil labeled "%Q0.0 *Motor01*". A large green arrow points from the force table below to the "%I0.1 *Start01*" contact. The force table below the network is as follows:

	Name	Address	Display format	Monitor value	Force value	F	Comment
1	*Stop01*.P	%I0.0:P	Bool			<input type="checkbox"/>	
2	*Start01*.P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/>	
3	<Add new>	<Add new>				<input type="checkbox"/>	

Force on contact

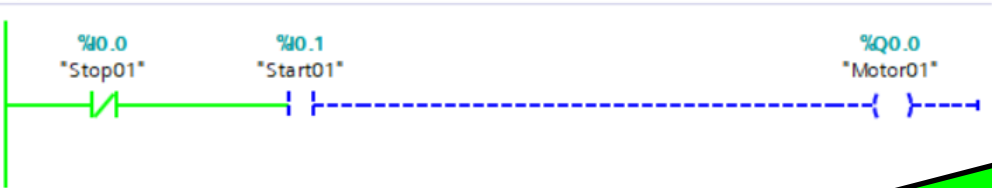


Now change Force value back to “False and see how the coil goes off. This will be used through the rest of the training!

Programming Blocks




Now turn the “Force Off” and see how we lose power to the coil.

Network 1: MY Start Stop Circuit



Network 2:

MyOnLiner > PLC_1 [CPU 1215C DC/DC/DC] > Work Area > Tables > Force table

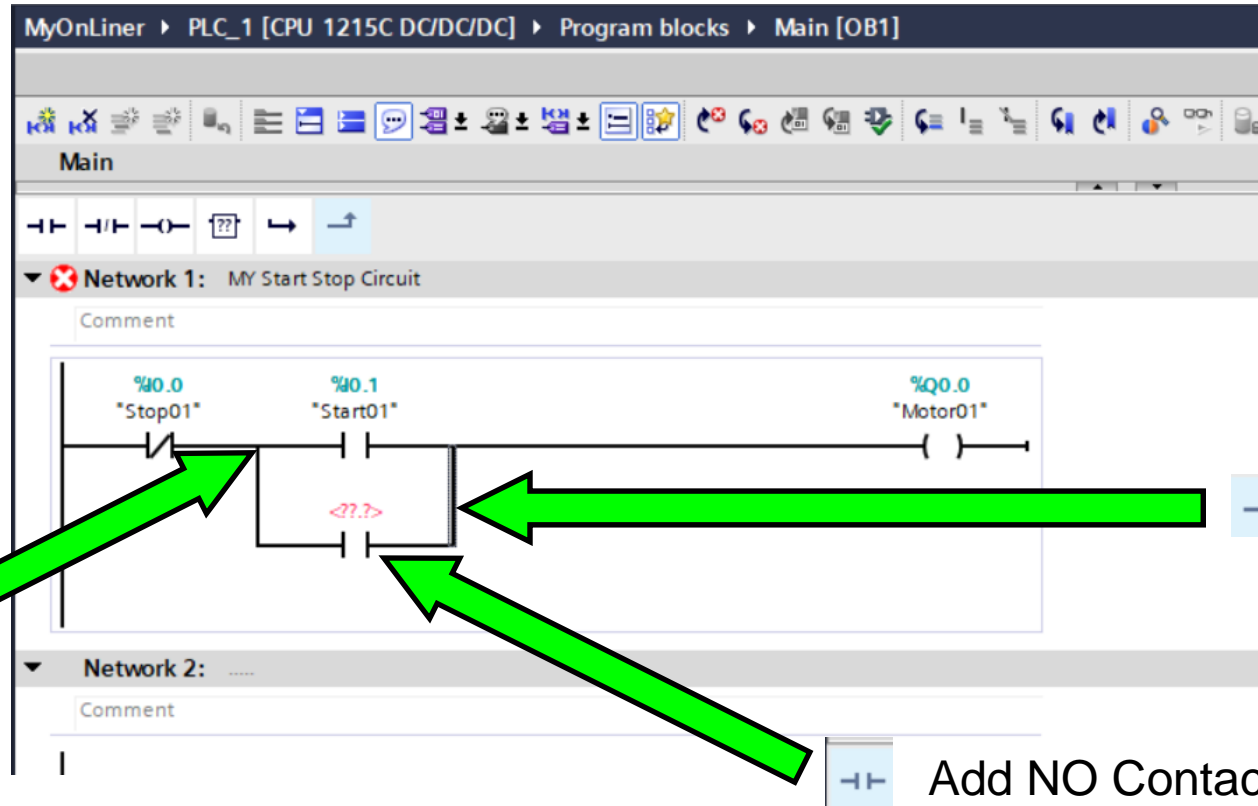
	i	Name	Address	Display format	Monitor value	Force value	F	Comment
1		"Stop01":P	%I0.0:P	Bool			<input type="checkbox"/>	
2		"Start01":P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/> 	
3		<Add new>					<input type="checkbox"/>	

Turn Force Off

This will be used through the rest of the training!

Programming Blocks

Creating a latch.



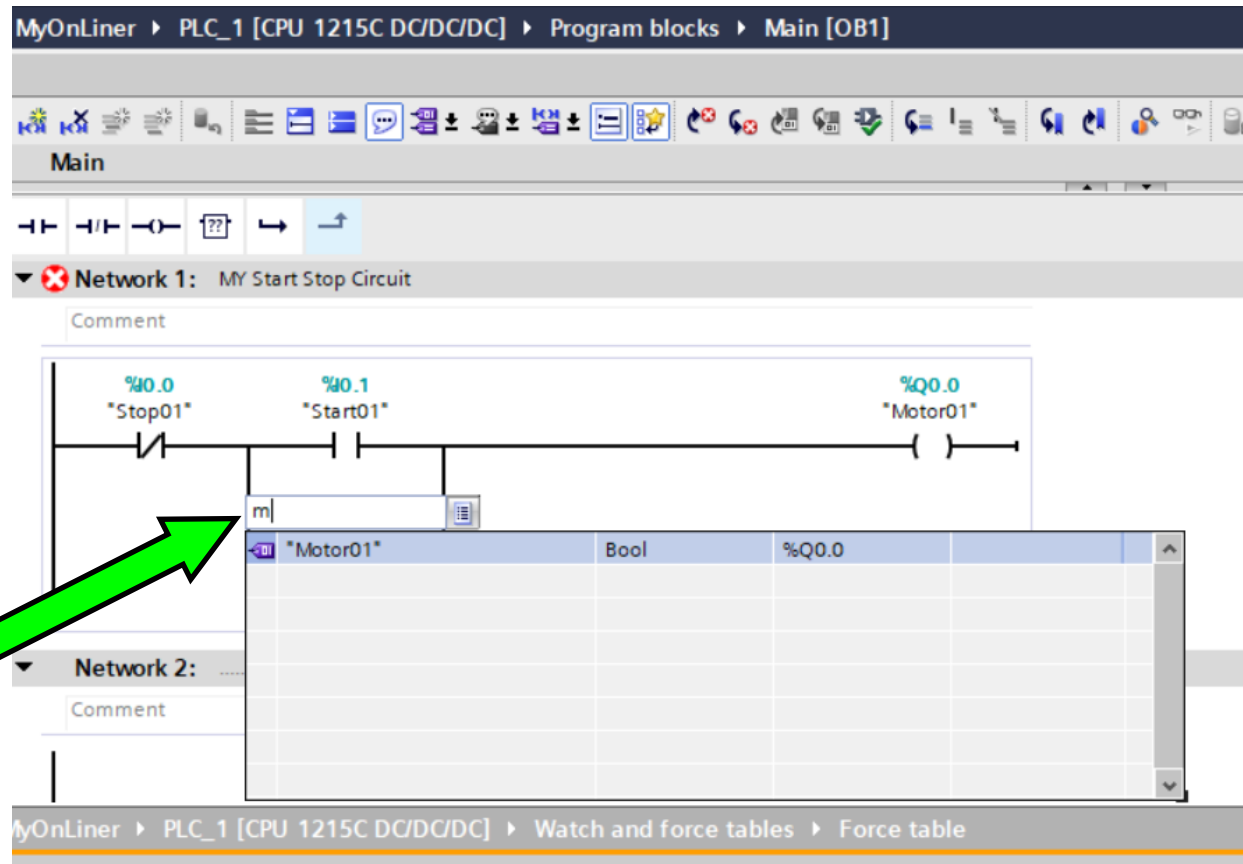
Get from Favorites

Get from Favorites

Add NO Contact from Favorites

Programming Blocks

Add Motor01 Tag



The screenshot shows the SIMATIC Manager interface for a PLC program. The main window displays a ladder logic network (Network 1) with the following components:

- Input: %I0.0 (Stop01) with a normally closed contact.
- Input: %I0.1 (Start01) with a normally open contact.
- Output: %Q0.0 (Motor01) with a coil.

A variable declaration table is open, showing the following entry:

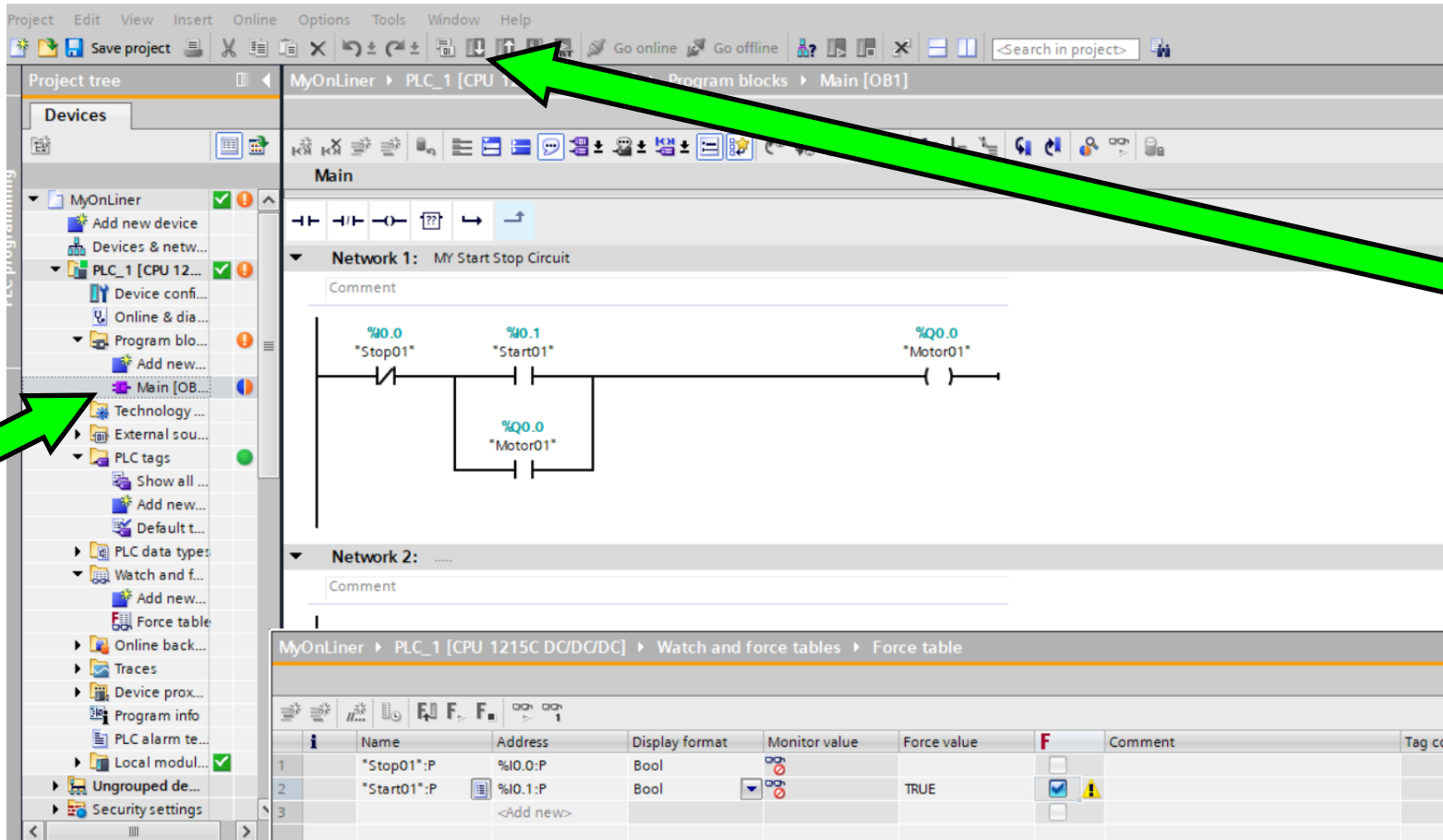
Symbol	Variable	Data Type	Address
Motor01	Motor01	Bool	%Q0.0

A green arrow points from the text 'Type "m" Enter Enter Loads "Motor01" Tag' to the 'm' input field in the variable declaration table.

Type "m"
Enter
Enter
Loads "Motor01" Tag

Programming Blocks

Add Motor01 Tag

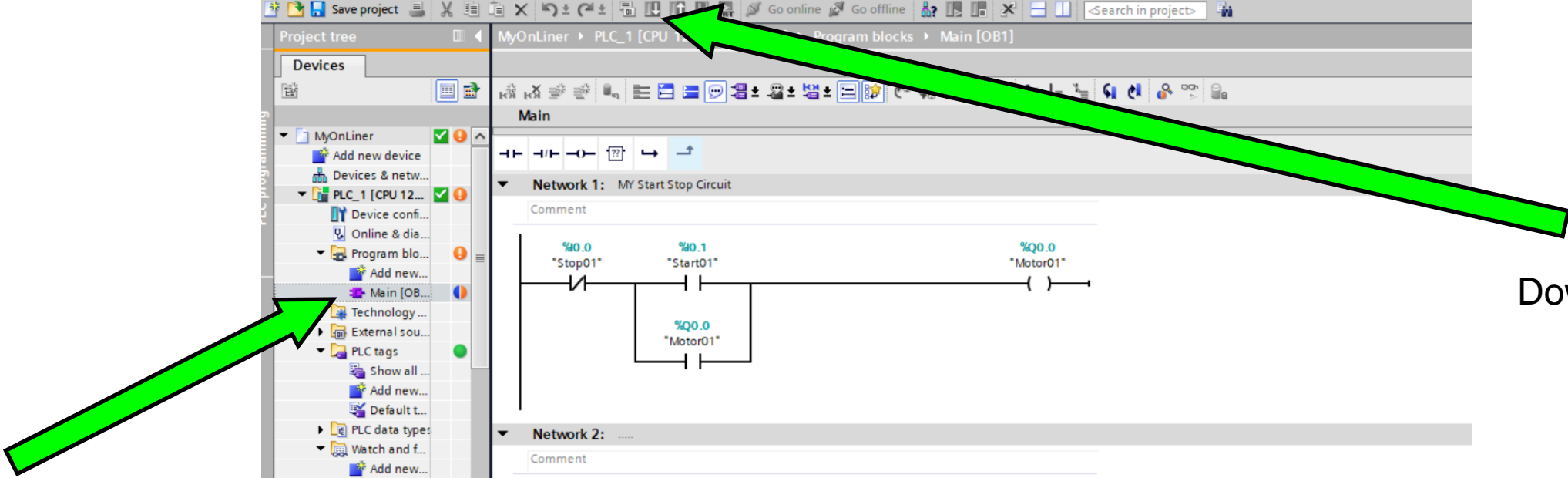


The screenshot shows the SIMATIC Manager interface. The Project tree on the left has 'Main [OB1]' selected. The main workspace displays a ladder logic network with the following components:

- Network 1: MY Start Stop Circuit
- Inputs: %I0.0 (Stop01) with a normally closed contact, and %I0.1 (Start01) with a normally open contact.
- Output: %Q0.0 (Motor01) with a normally open contact.
- A feedback loop: %Q0.0 (Motor01) with a normally closed contact in parallel with the Start01 input.

At the bottom, the 'Force table' is visible with the following data:

i	Name	Address	Display format	Monitor value	Force value	F	Comment	Tag com
1	*Stop01*:P	%I0.0:P	Bool			<input type="checkbox"/>		
2	*Start01*:P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/>		
3		<Add new>				<input type="checkbox"/>		



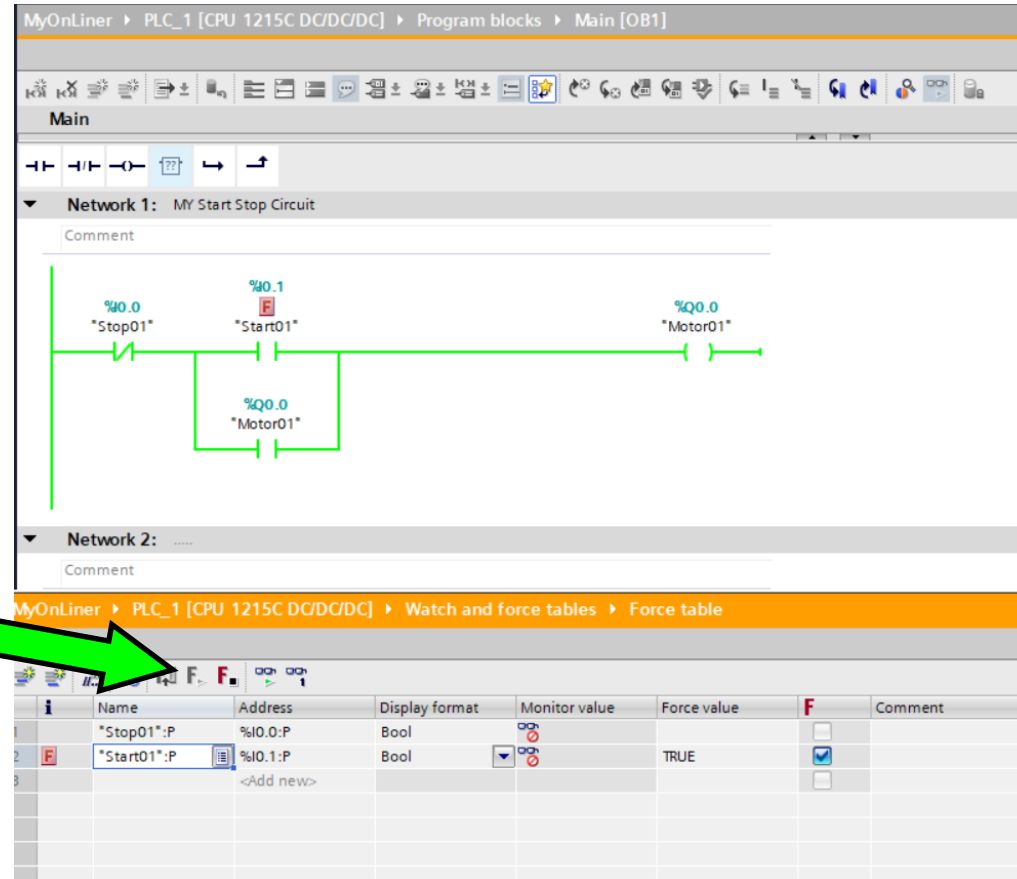
Download



Click Main OB1

Programming Blocks

Force one more time

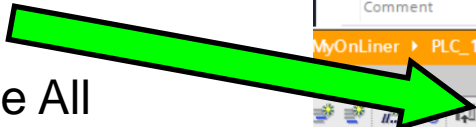


The screenshot shows the SIMATIC Manager interface. The top part displays a ladder logic network (Network 1: MY Start Stop Circuit) with the following components:

- Input: %I0.0 (*Stop01) - normally open contact
- Input: %I0.1 (*Start01) - normally open contact
- Output: %Q0.0 (*Motor01) - coil
- Feedback: %Q0.0 (*Motor01) - normally open contact in parallel with the start input.

The bottom part shows the 'Force table' window with the following data:

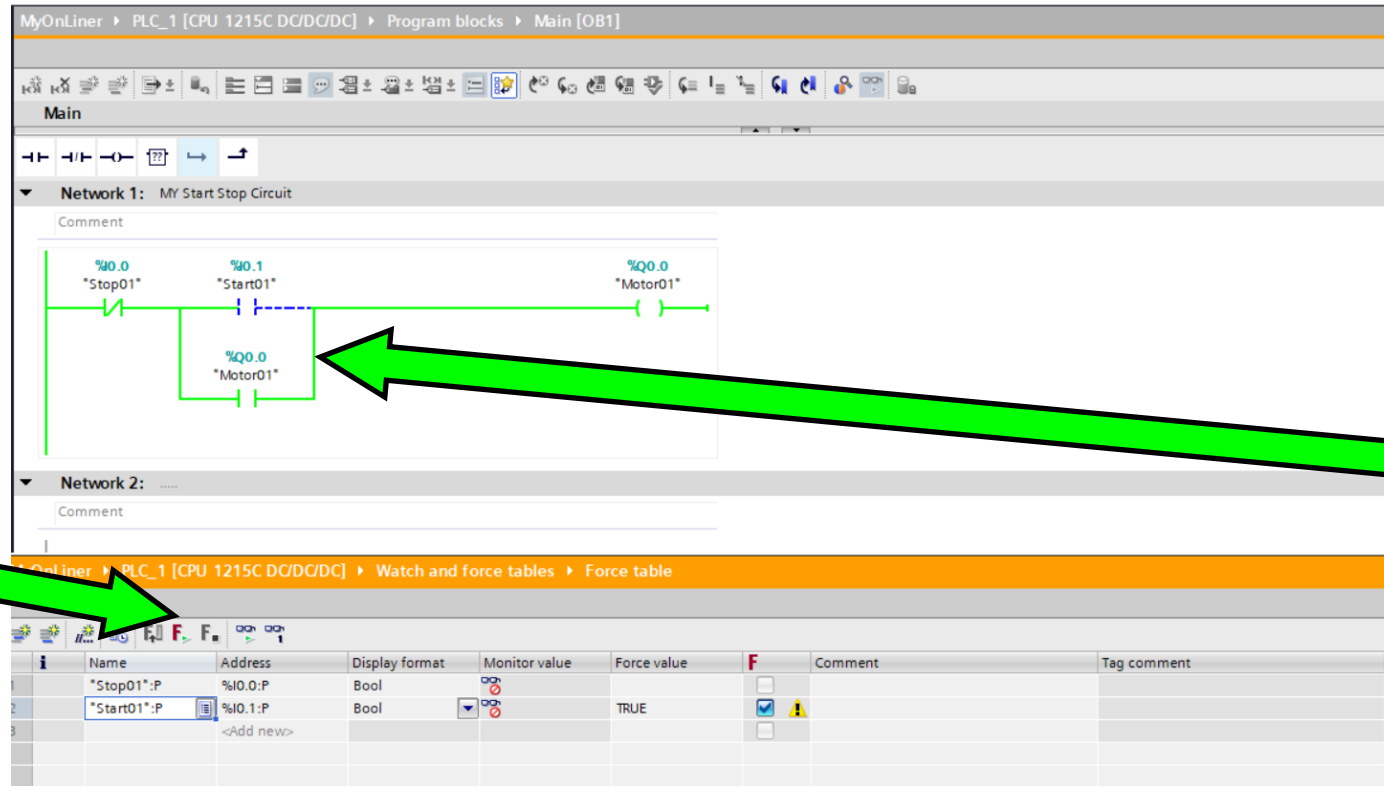
Name	Address	Display format	Monitor value	Force value	F	Comment
Stop01:P	%I0.0:P	Bool	<input type="checkbox"/>		<input type="checkbox"/>	
Start01:P	%I0.1:P	Bool	<input checked="" type="checkbox"/>	TRUE	<input checked="" type="checkbox"/>	
<Add new>					<input type="checkbox"/>	



Click Force All

Programming Blocks

Unforce one more time



The screenshot shows the SIMATIC Manager interface. The top part displays a ladder logic network (Network 1: MY Start Stop Circuit) with the following components: a normally open contact for %I0.0 (*Stop01*), a normally open contact for %I0.1 (*Start01*), a normally open coil for %Q0.0 (*Motor01*), and a normally closed contact for %Q0.0 (*Motor01*) in parallel with the coil. A green arrow points from the force table below to the %Q0.0 coil in the network. The bottom part shows the 'Force table' with the following data:

Name	Address	Display format	Monitor value	Force value	F	Comment	Tag comment
Stop01.P	%I0.0:P	Bool			<input type="checkbox"/>		
Start01.P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/>		
<Add new>							

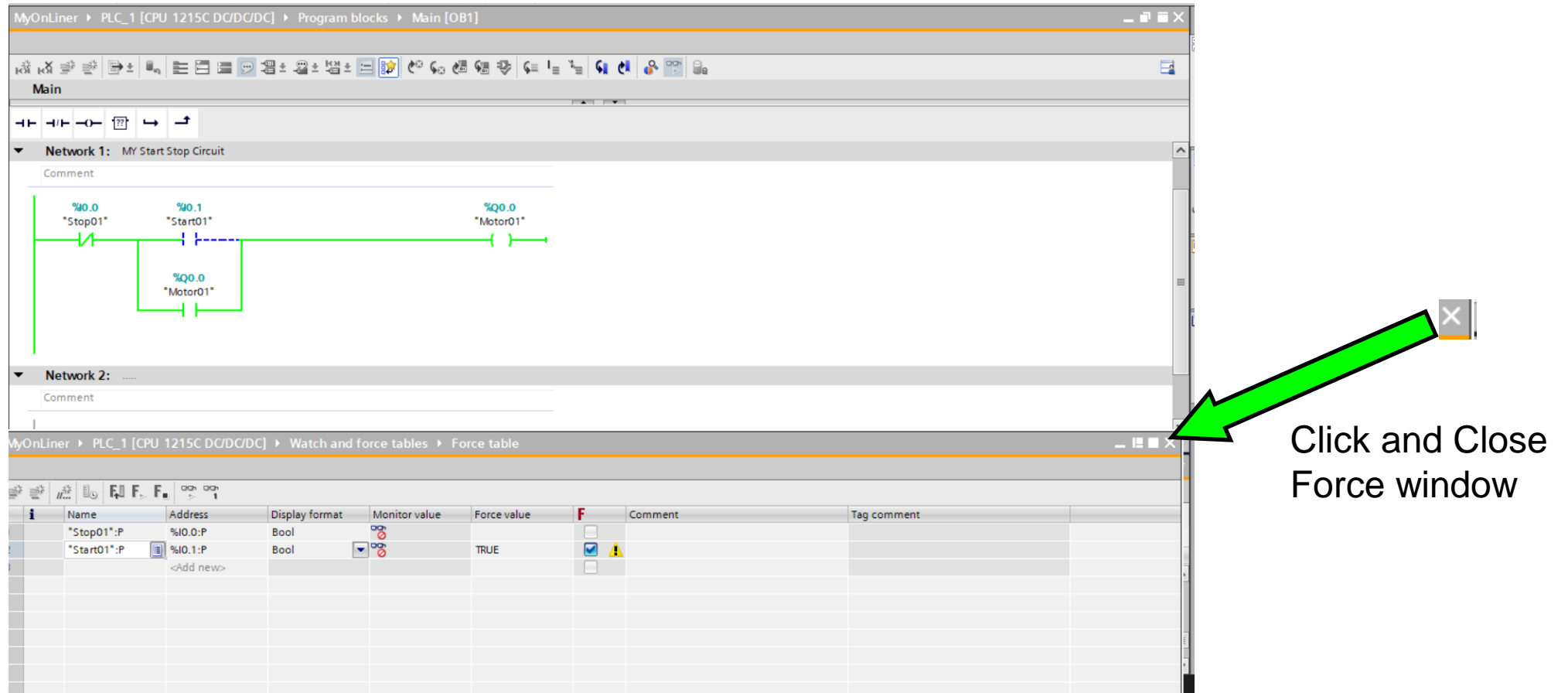


Click Unforce All




Note now that you have created what is called a Latch.

Programming Blocks

Close Force Window



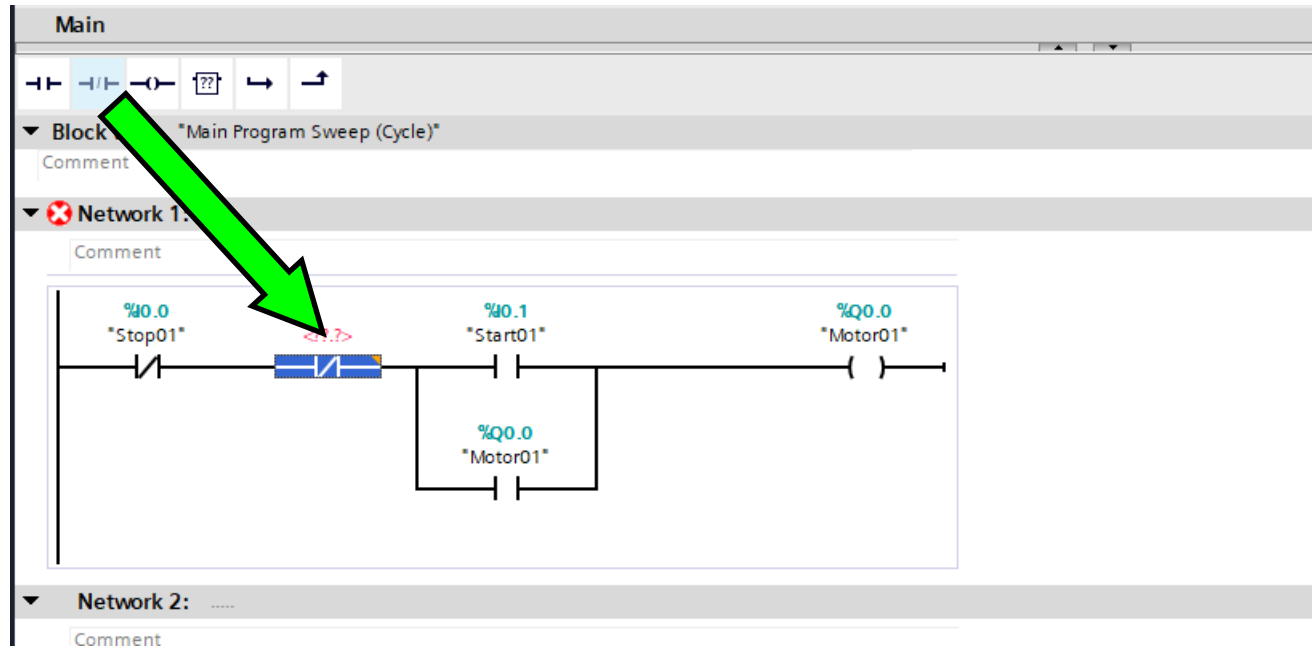
The screenshot displays the Siemens SIMATIC Manager interface. The top window shows a ladder logic network titled "Network 1: MY Start Stop Circuit". The network contains three elements: a normally closed contact labeled "%I0.0 *Stop01", a normally open contact labeled "%I0.1 *Start01", and a coil labeled "%Q0.0 *Motor01". A feedback loop is shown with a normally closed contact labeled "%Q0.0 *Motor01" connected back to the start contact. Below the network is "Network 2:", which is currently empty. The bottom window is titled "Force table" and contains the following data:

Name	Address	Display format	Monitor value	Force value	F	Comment	Tag comment
*Stop01:P	%I0.0:P	Bool			<input type="checkbox"/>		
*Start01:P	%I0.1:P	Bool		TRUE	<input checked="" type="checkbox"/> 		
<Add new>							

Programming Blocks

Add two internal contacts

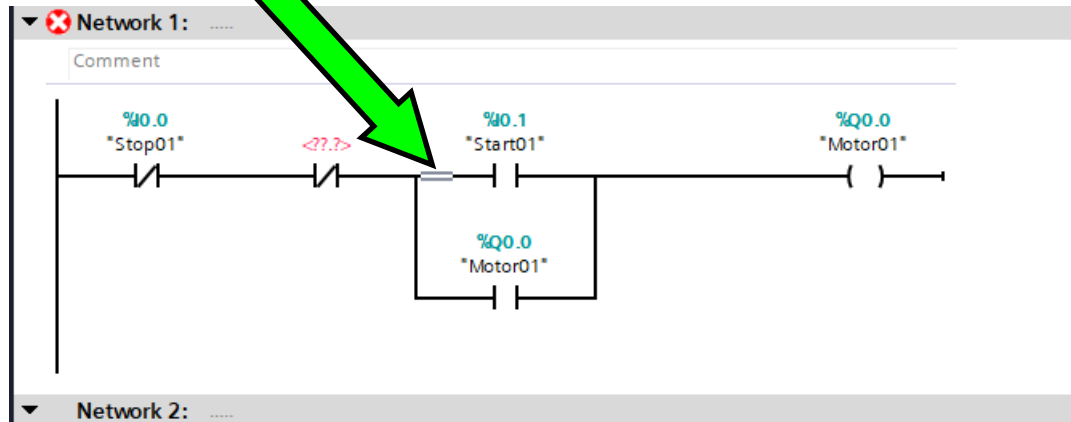
Click



Programming Blocks

Add two internal contacts

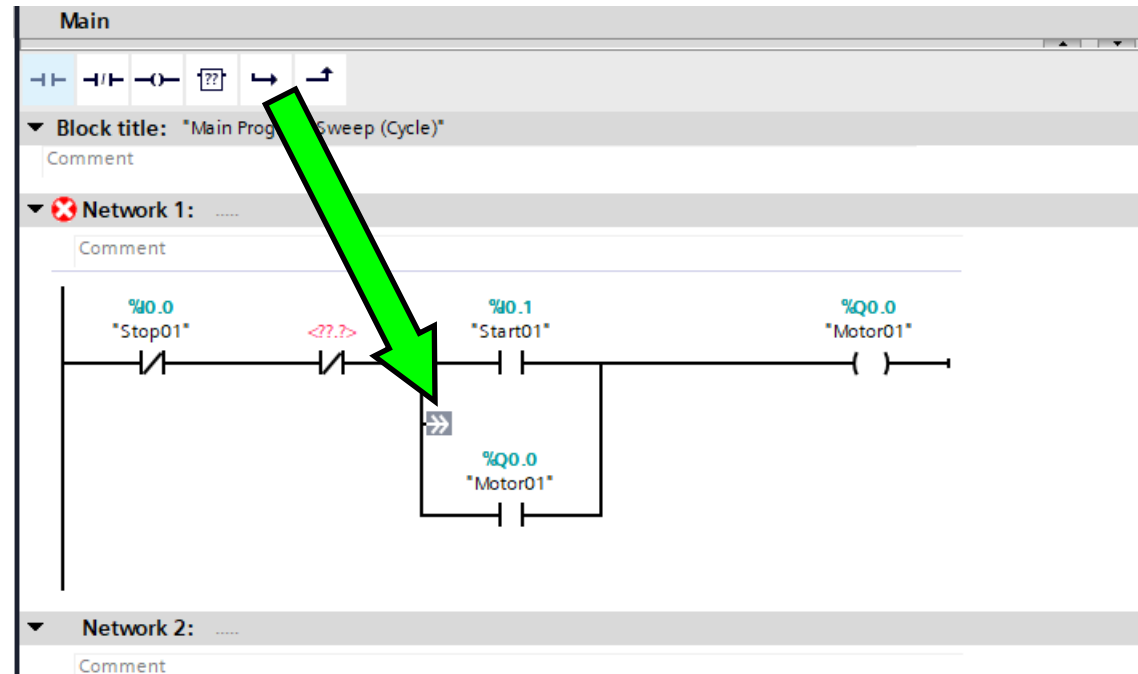
Highlight



Programming Blocks

Add two internal contacts

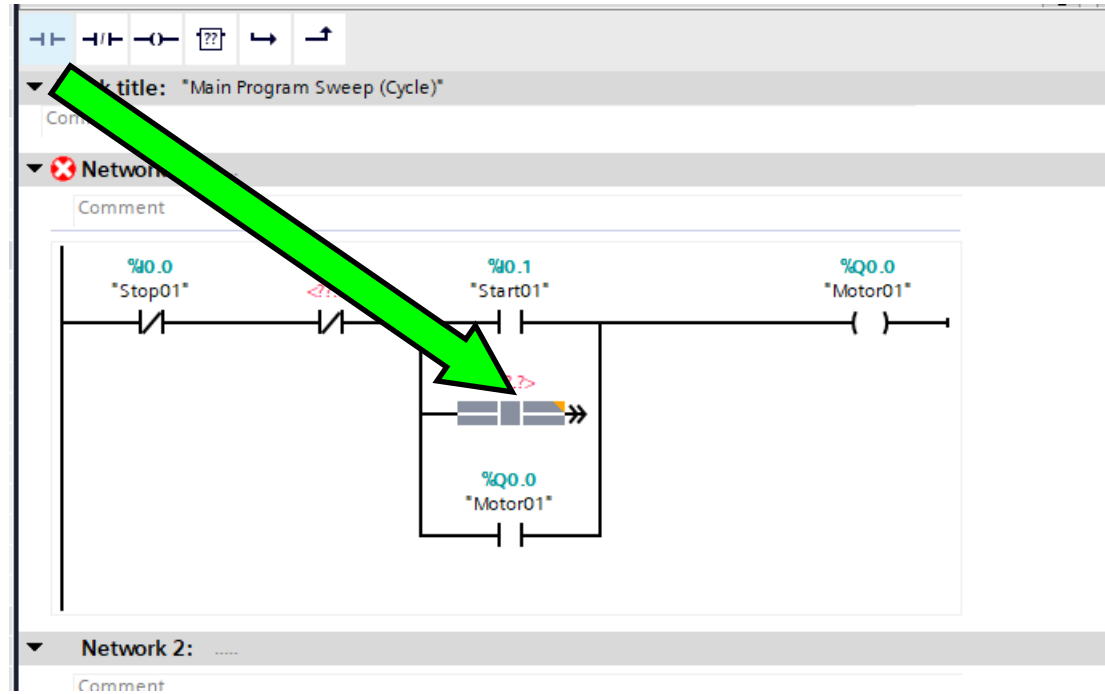
Click 



Programming Blocks

Add two internal contacts

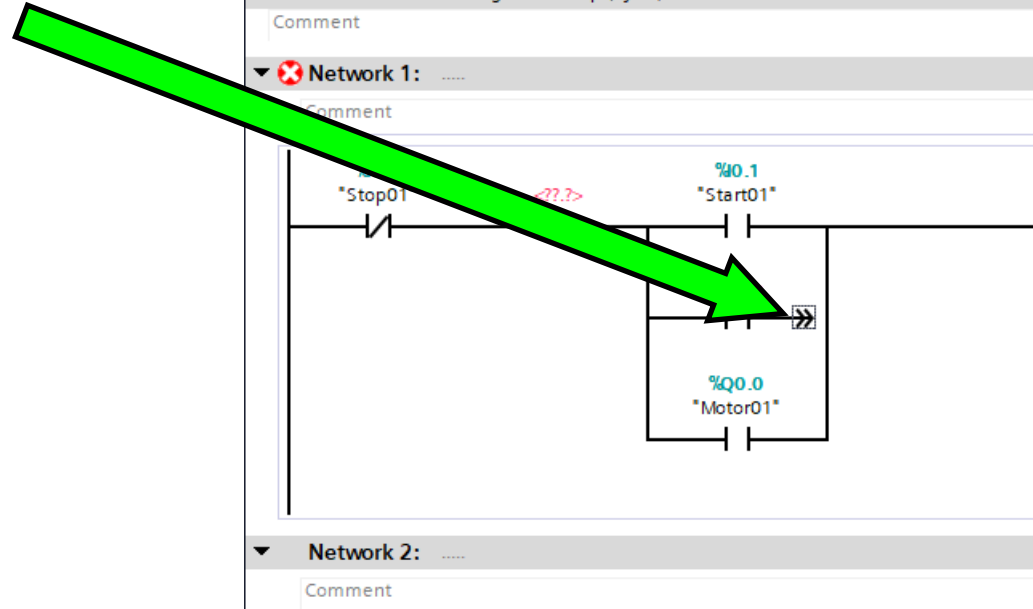
Click



Programming Blocks

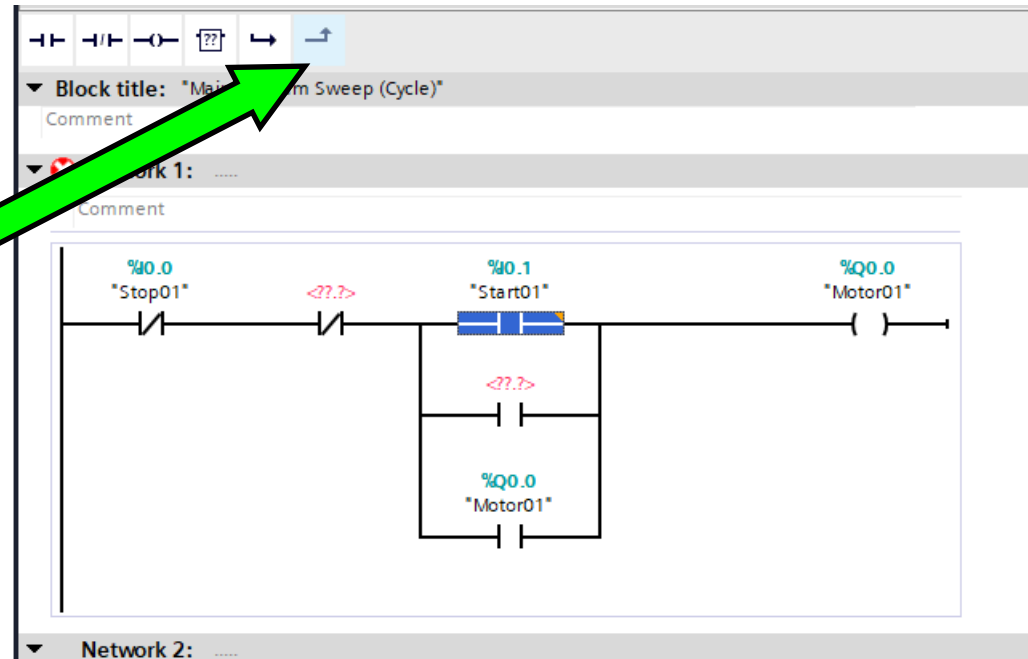
Add two internal contacts

Highlight



Programming Blocks

Add two internal contacts

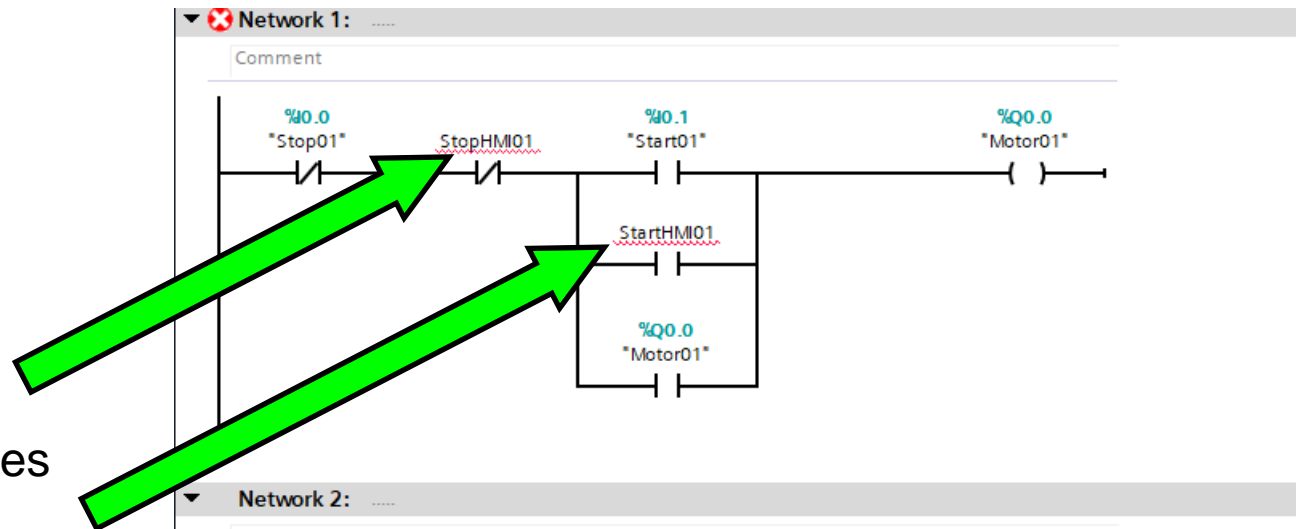


Click 

Programming Blocks

Add two internal contacts

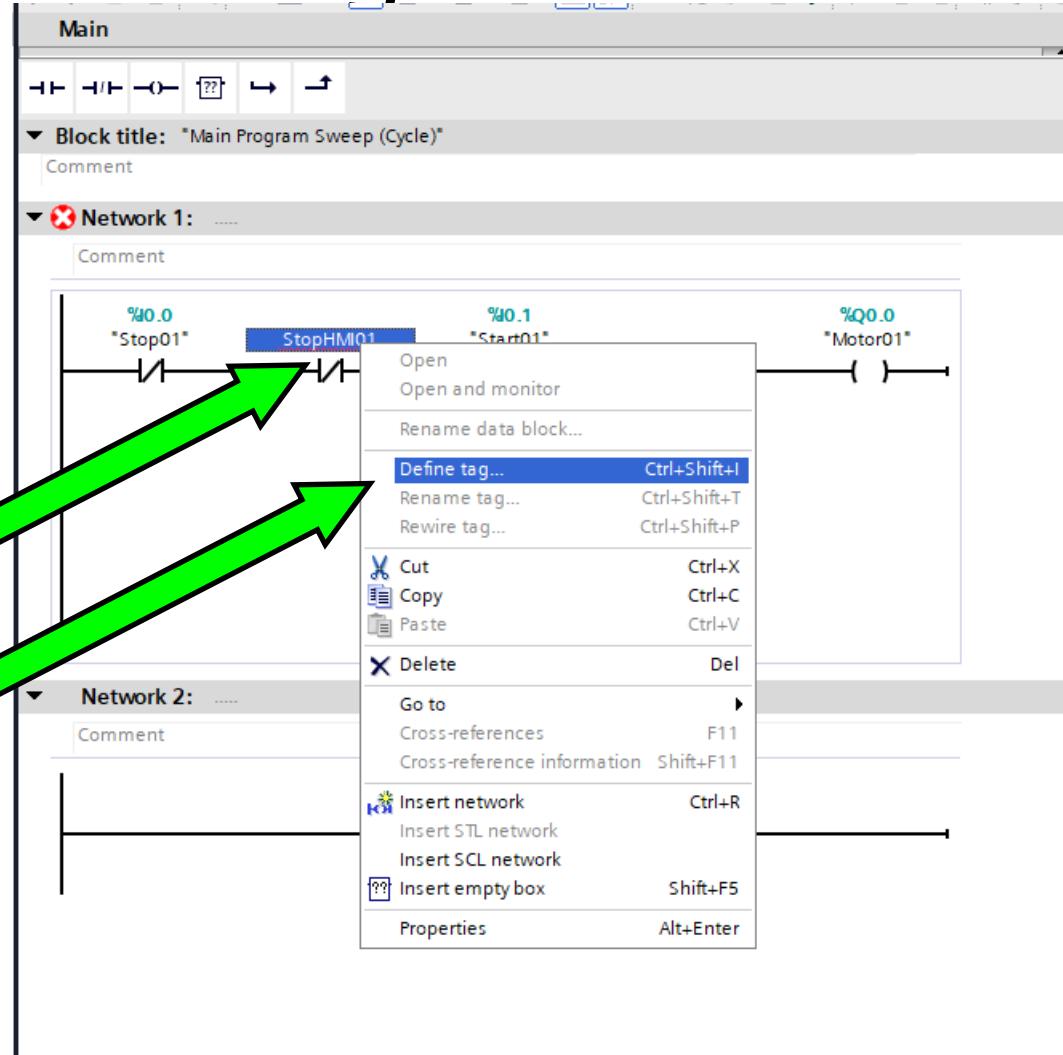
Add Tag Names



Programming Blocks

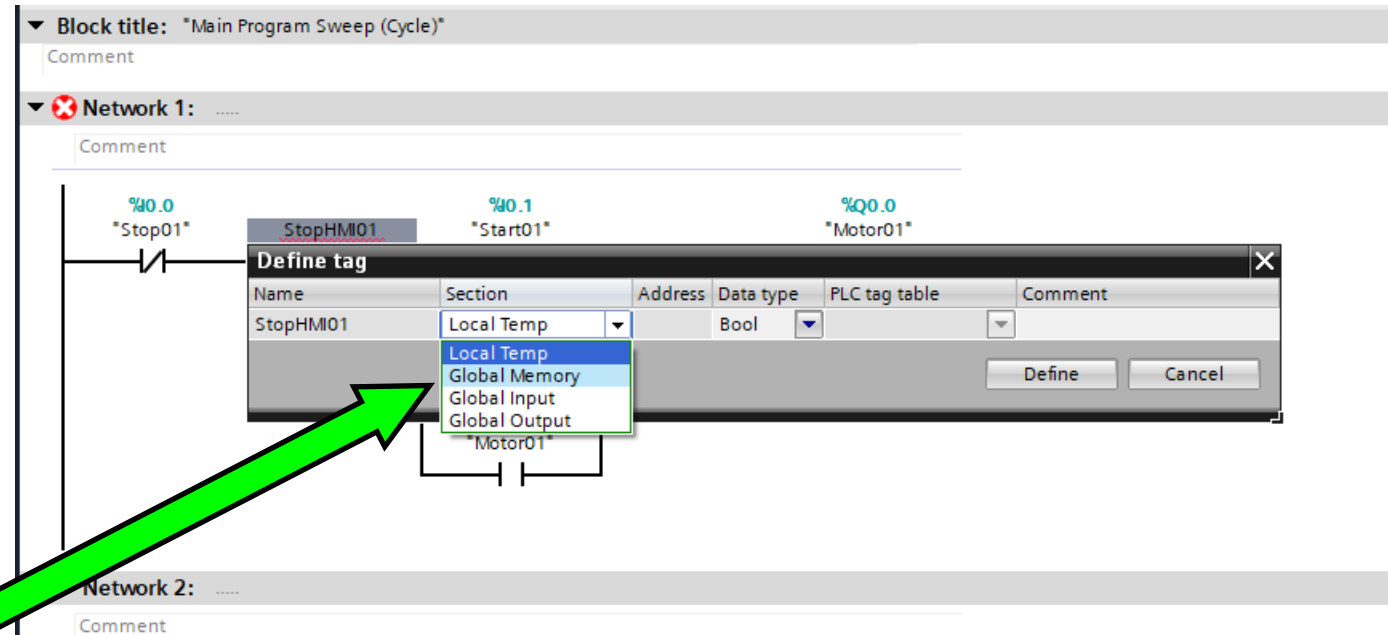
Add two internal contacts

Right Click on StopHMI01
Then Click Define tag



Programming Blocks

Add two internal contacts



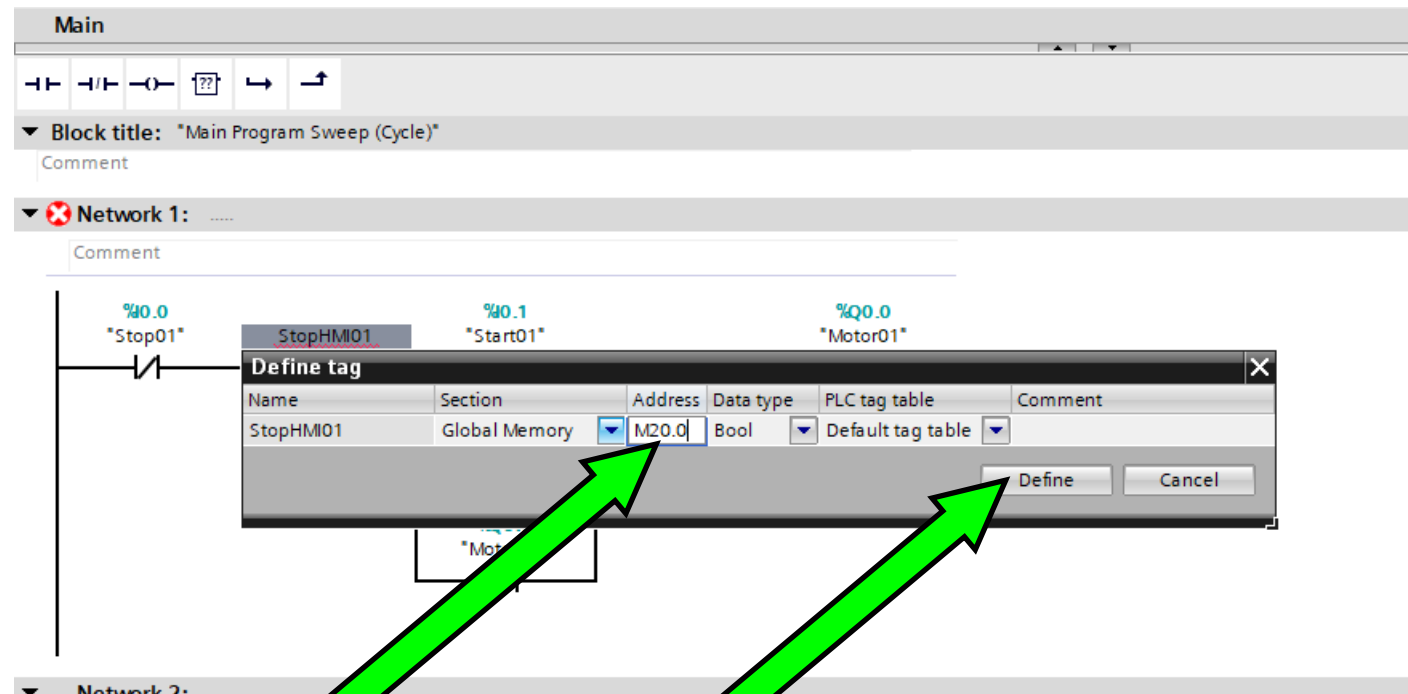
The screenshot shows a 'Define tag' dialog box in the SIMATIC Manager software. The dialog box is overlaid on a ladder logic network. The network has three inputs: %I0.0 (Stop01), %I0.1 (Start01), and %Q0.0 (Motor01). The 'Define tag' dialog box has a table with the following columns: Name, Section, Address, Data type, PLC tag table, and Comment. The table contains one row: StopHMI01, Local Temp, , Bool, , . The dropdown menu for the 'Section' column is open, showing the following options: Local Temp, Global Memory, Global Input, and Global Output. A green arrow points to the 'Global Memory' option.

Name	Section	Address	Data type	PLC tag table	Comment
StopHMI01	Local Temp		Bool		

Click Global Memory

Programming Blocks

Add two internal contacts



Network 1:

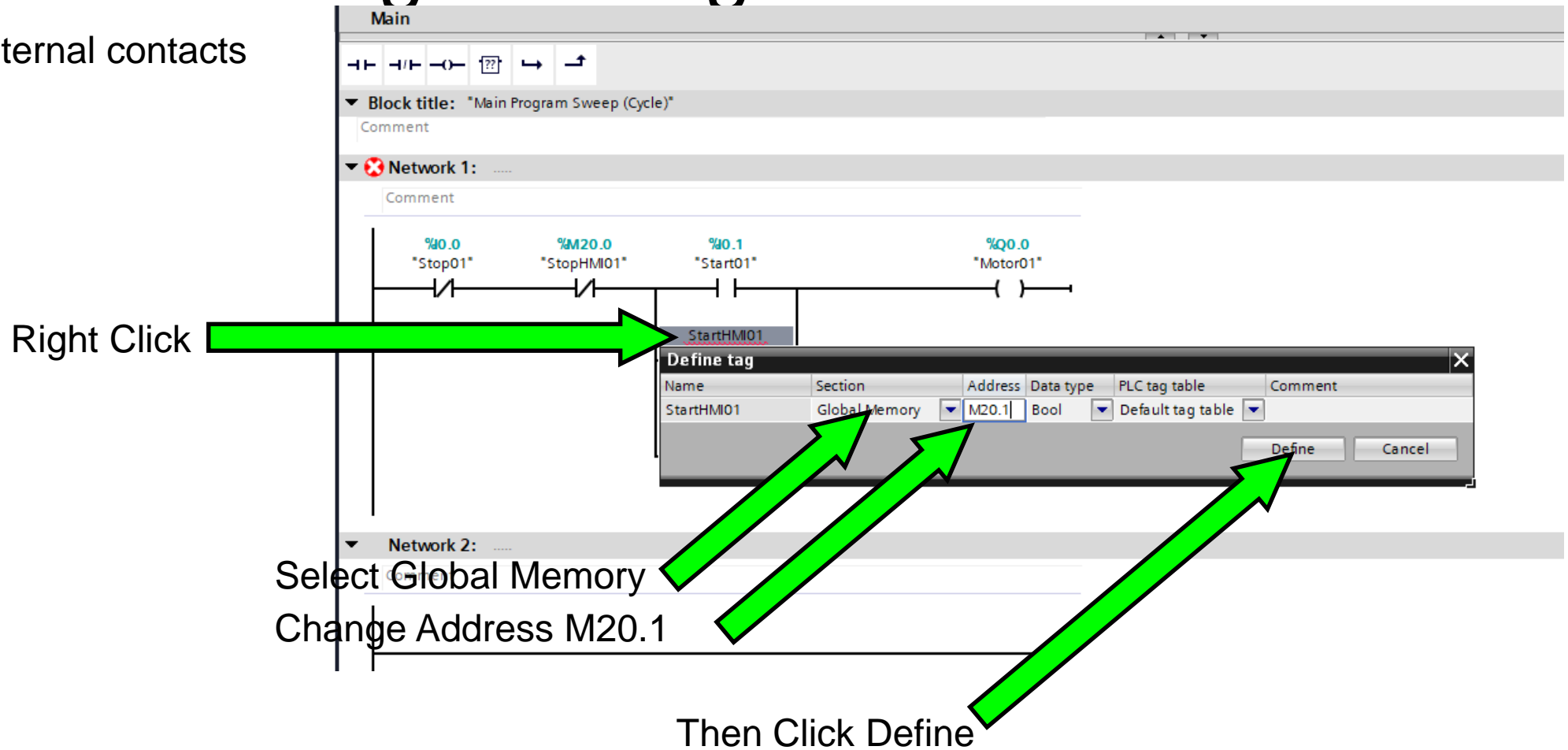
Name	Section	Address	Data type	PLC tag table	Comment
StopHM01	Global Memory	M20.0	Bool	Default tag table	

Change Address to: M20.0

Then Click Define

Programming Blocks

Add two internal contacts



Right Click

Select Global Memory

Change Address M20.1

Then Click Define

Name	Section	Address	Data type	PLC tag table	Comment
StartHMI01	Global Memory	M20.1	Bool	Default tag table	

Programming Blocks

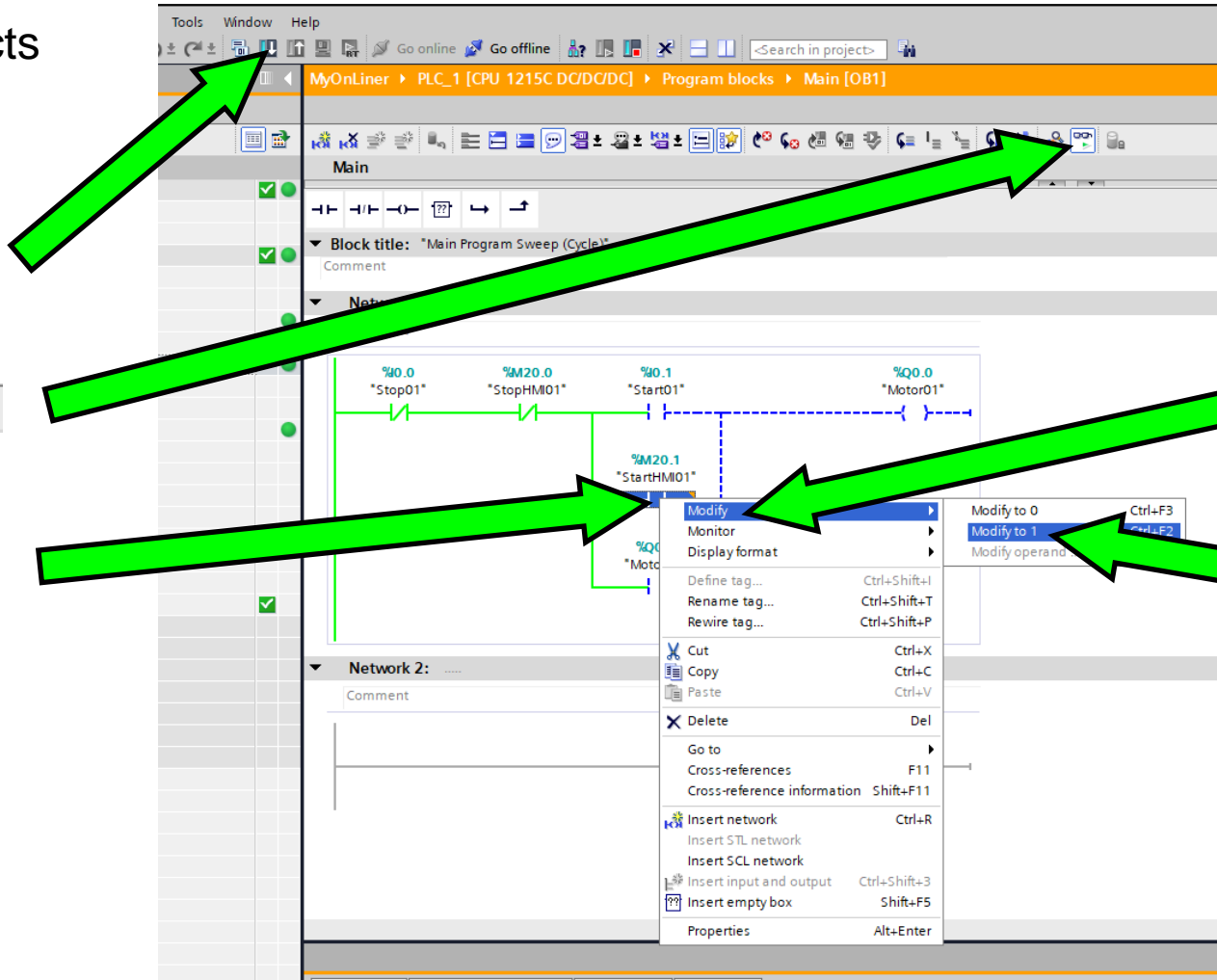
Add two internal contacts

Download 

Motoring ON 

Right Click

Select Global Memory



Modify

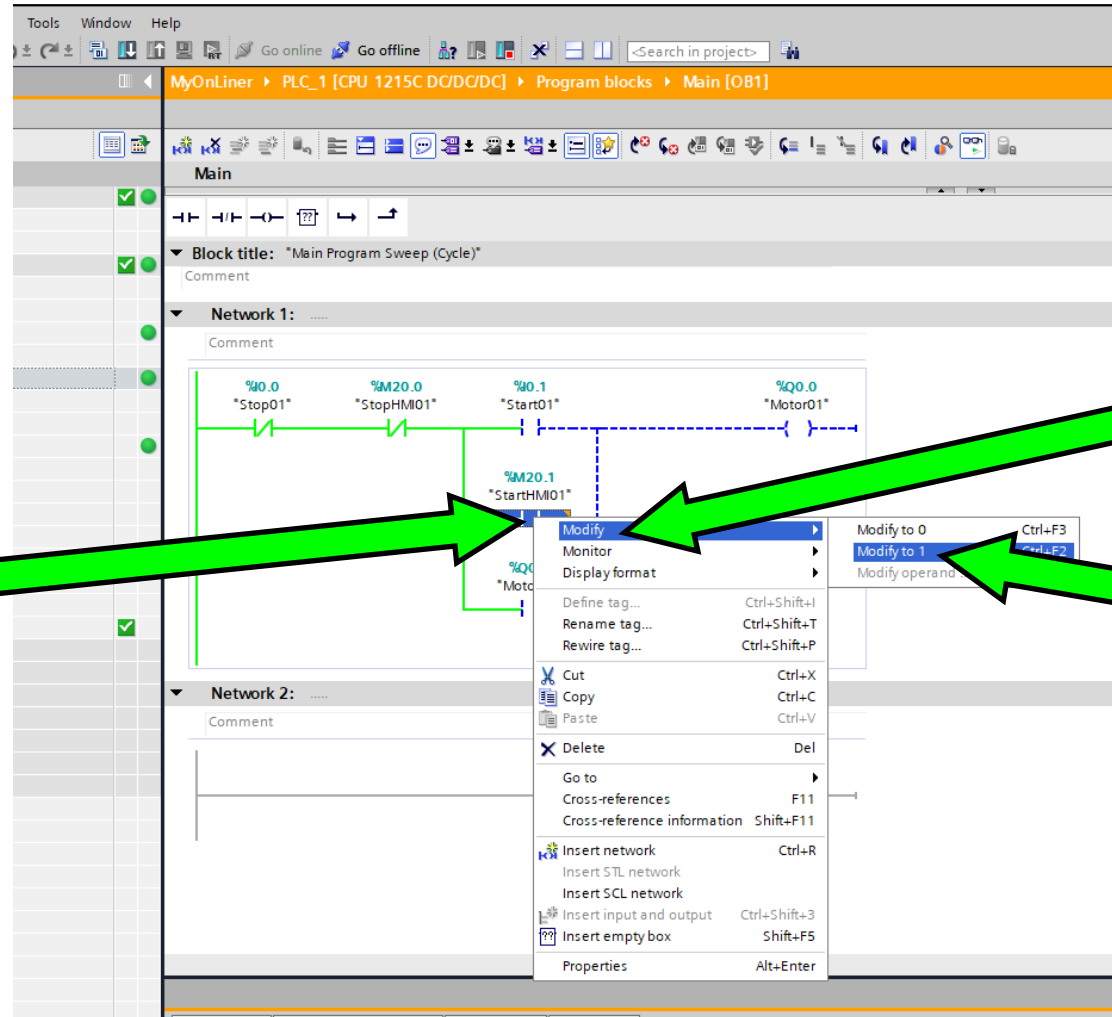
Modify to 1

Programming Blocks

Add two internal contacts

Right Click

Select Global Memory

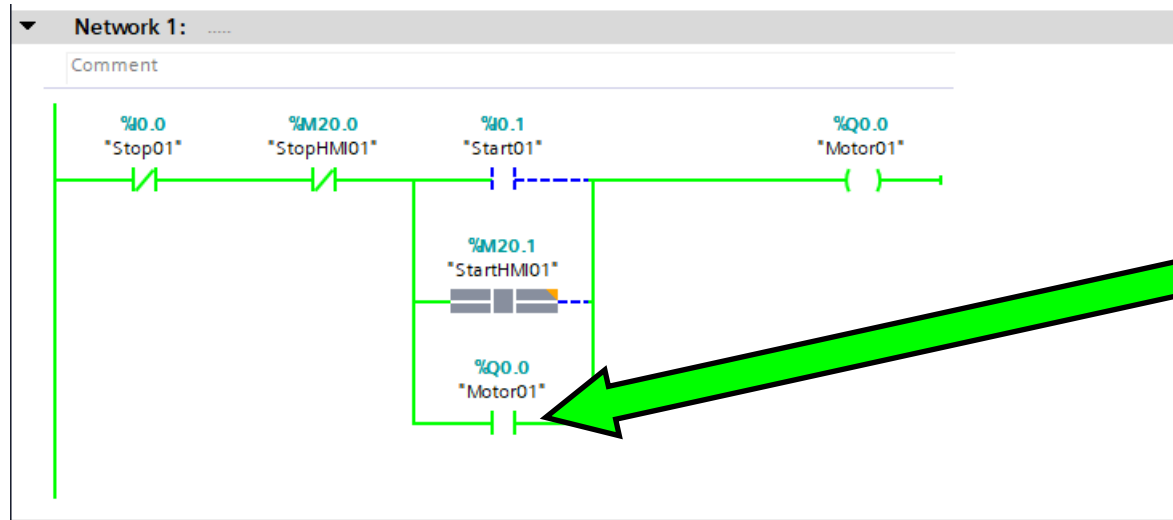


Modify

Modify to 0

Programming Blocks

Add two internal contacts



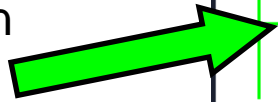
Interlock on now
Power flow to motor

Select Global Memory

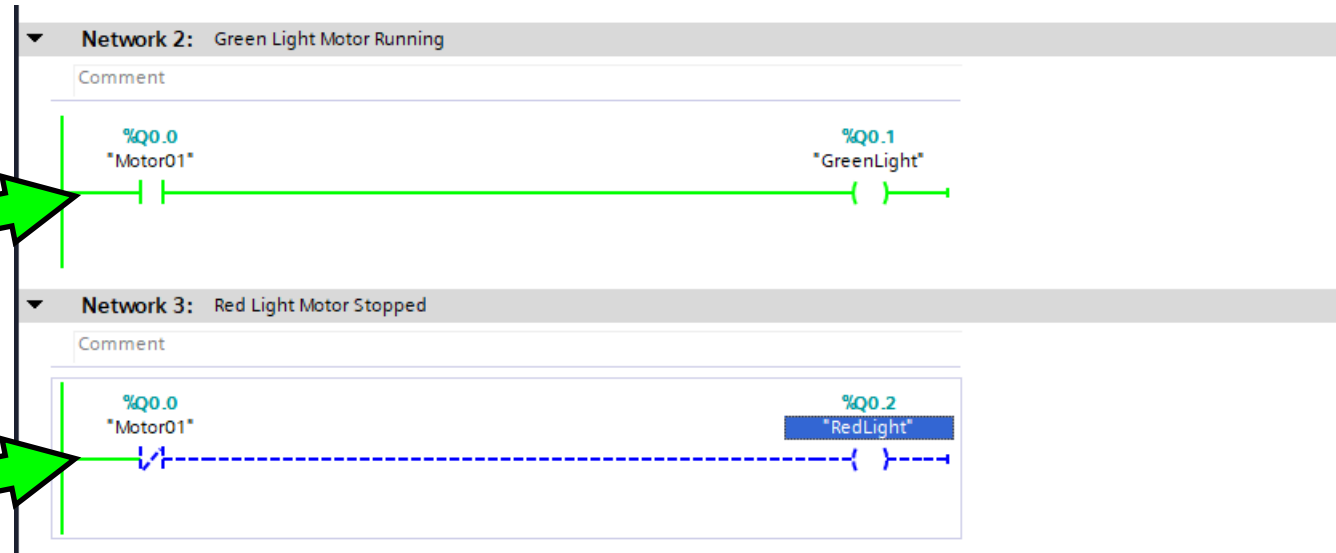
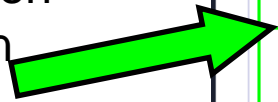
Programming Blocks

Create two new networks

Network 2
If Motor01 is on
Turn Q0.1 On
GreenLight



Network 3
If Motor01 is on
Turn Q0.2 On
RedLight



1. Download
2. Monitor
3. Test with Modify Value

Refer to Page 71

M20.0 turns motor OFF by modifying from a 1 the modify to a 0

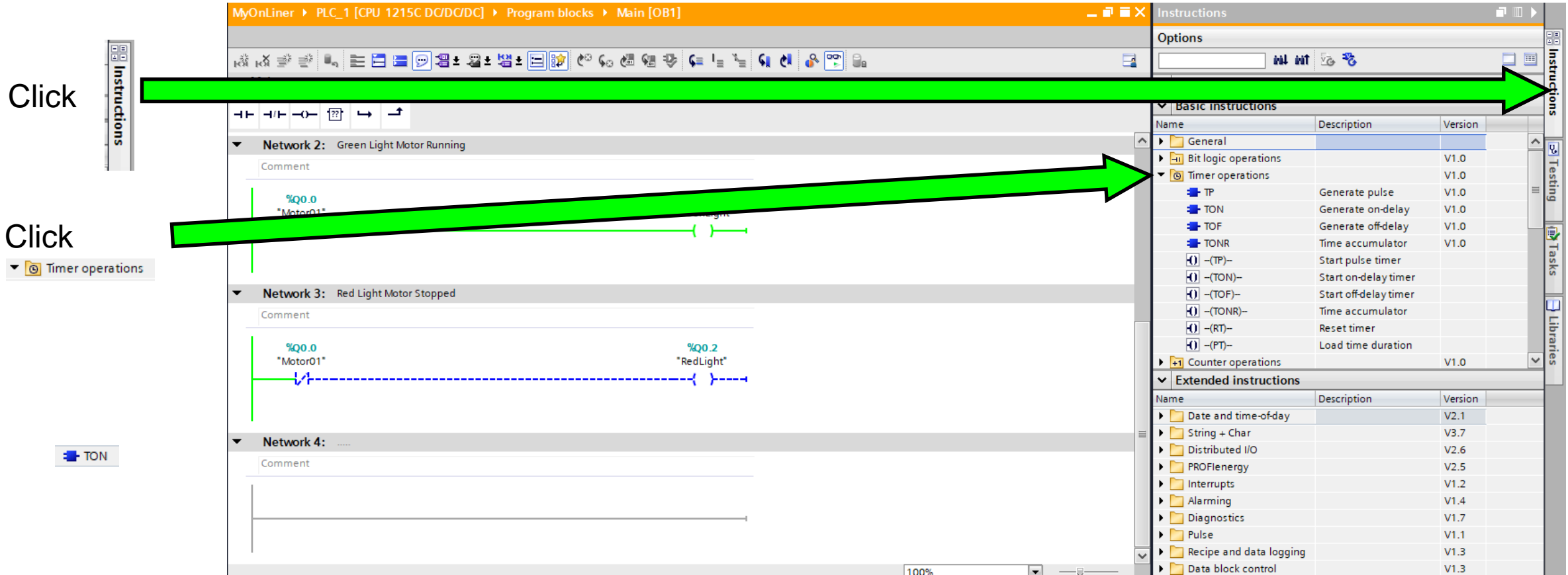
M20.1 turns motor On by modifying from a 1 the modify to a 0

Programming Blocks

Create Timer

Click

Click

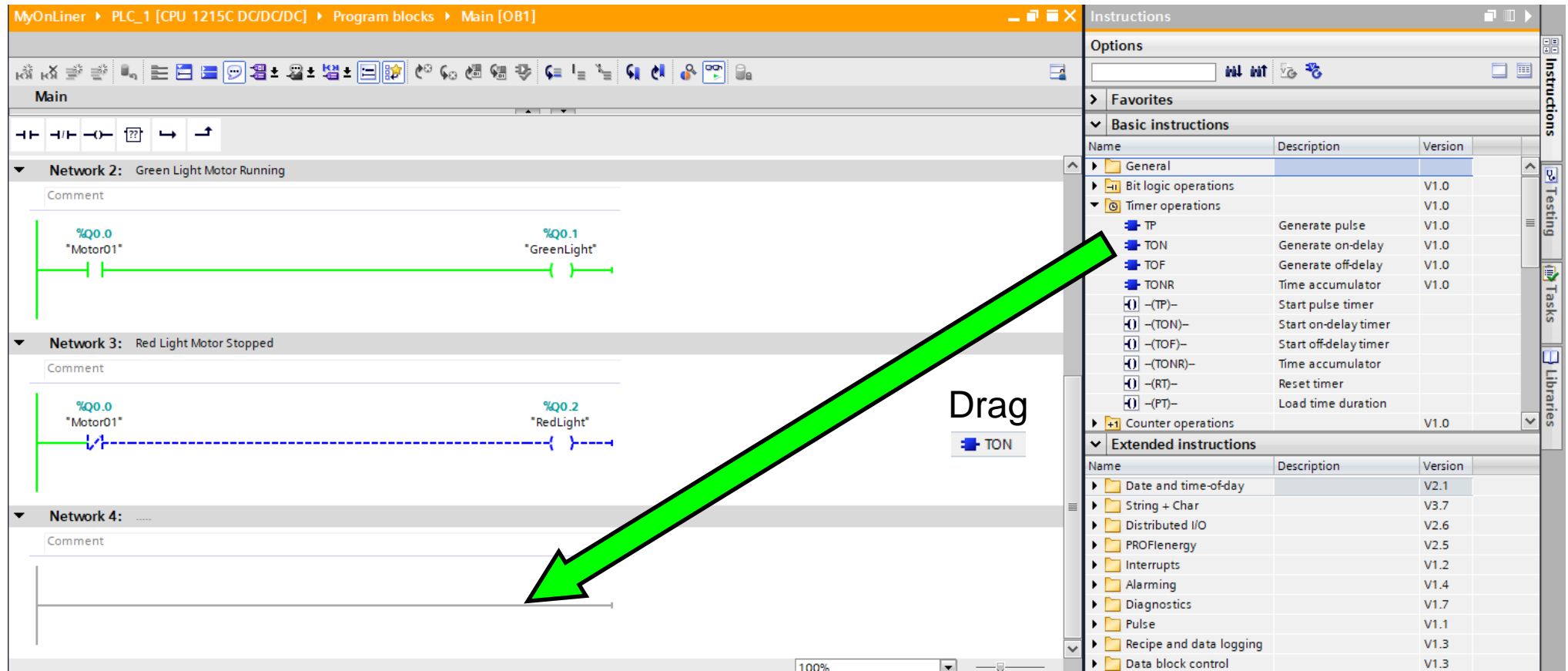


The screenshot shows the SIMATIC Manager interface. The 'Instructions' panel on the right is open, displaying a list of timer operations. The 'Timer operations' folder is expanded, showing various timer types like TP, TON, TOF, and TONR. The 'TON' (On-Delay Timer) block is highlighted. A green arrow points from the 'Click' text to the 'TON' block in the instructions panel. Another green arrow points from the 'Click' text to the 'TON' block in the ladder logic network. The ladder logic network shows a normally open contact labeled '%Q0.0 *Motor01*' connected to a coil labeled '%Q0.2 *RedLight*'. The 'TON' block is placed in series with the coil. The 'TON' block is also shown in a separate window at the bottom left of the screenshot.

Name	Description	Version
General		
Bit logic operations		V1.0
Timer operations		V1.0
TP	Generate pulse	V1.0
TON	Generate on-delay	V1.0
TOF	Generate off-delay	V1.0
TONR	Time accumulator	V1.0
-(TP)-	Start pulse timer	
-(TON)-	Start on-delay timer	
-(TOF)-	Start off-delay timer	
-(TONR)-	Time accumulator	
-(RT)-	Reset timer	
-(PT)-	Load time duration	
Counter operations		V1.0
Extended instructions		
Date and time-of-day		V2.1
String + Char		V3.7
Distributed I/O		V2.6
PROFenergy		V2.5
Interrupts		V1.2
Alarming		V1.4
Diagnostics		V1.7
Pulse		V1.1
Recipe and data logging		V1.3
Data block control		V1.3

Programming Blocks

Create Timer

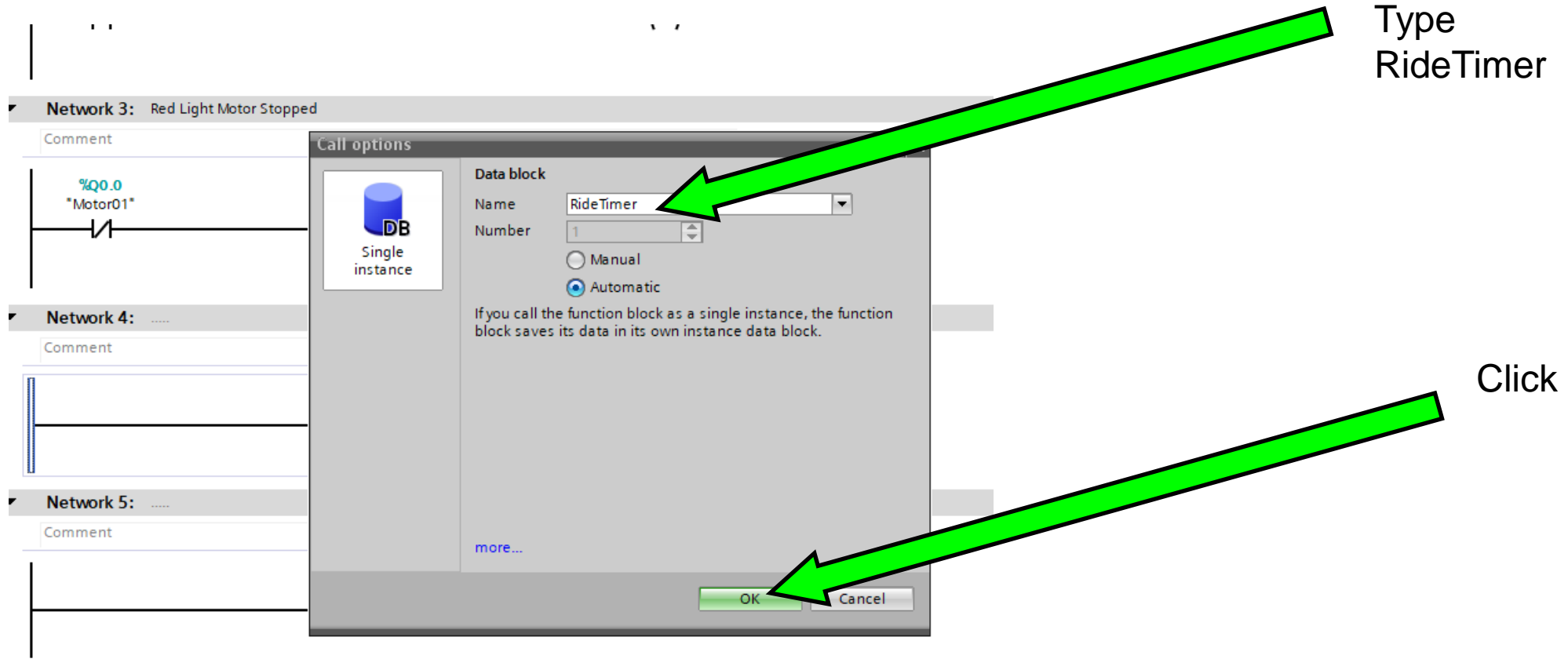


The screenshot shows the SIMATIC Manager interface. The main window displays a ladder logic network with three networks. Network 2 is titled "Green Light Motor Running" and shows a normally open contact labeled "%Q0.0 *Motor01*" connected to a coil labeled "%Q0.1 *GreenLight*". Network 3 is titled "Red Light Motor Stopped" and shows a normally open contact labeled "%Q0.0 *Motor01*" connected to a coil labeled "%Q0.2 *RedLight*". Network 4 is currently empty. The right-hand side of the screen shows the "Instructions" panel, which is expanded to show the "Timer operations" section. A green arrow points from the "TON" (Generate on-delay) block in the "Timer operations" list to the empty Network 4, with the word "Drag" written next to it.

Name	Description	Version
General		
Bit logic operations		V1.0
Timer operations		V1.0
TP	Generate pulse	V1.0
TON	Generate on-delay	V1.0
TOF	Generate off-delay	V1.0
TONR	Time accumulator	V1.0
(S) -(TP)-	Start pulse timer	
(S) -(TON)-	Start on-delay timer	
(S) -(TOF)-	Start off-delay timer	
(S) -(TONR)-	Time accumulator	
(R) -(RT)-	Reset timer	
(L) -(PT)-	Load time duration	
Counter operations		V1.0
Extended instructions		
Date and time-of-day		V2.1
String + Char		V3.7
Distributed I/O		V2.6
PROFenergy		V2.5
Interrupts		V1.2
Alarming		V1.4
Diagnostics		V1.7
Pulse		V1.1
Recipe and data logging		V1.3
Data block control		V1.3

Programming Blocks

Create Timer



Network 3: Red Light Motor Stopped

Comment

%Q0.0
*Motor01

Network 4:

Comment

Network 5:

Comment

Call options

DB
Single instance

Data block

Name: RideTimer

Number: 1

Manual

Automatic

If you call the function block as a single instance, the function block saves its data in its own instance data block.

more...

OK Cancel

Type
RideTimer

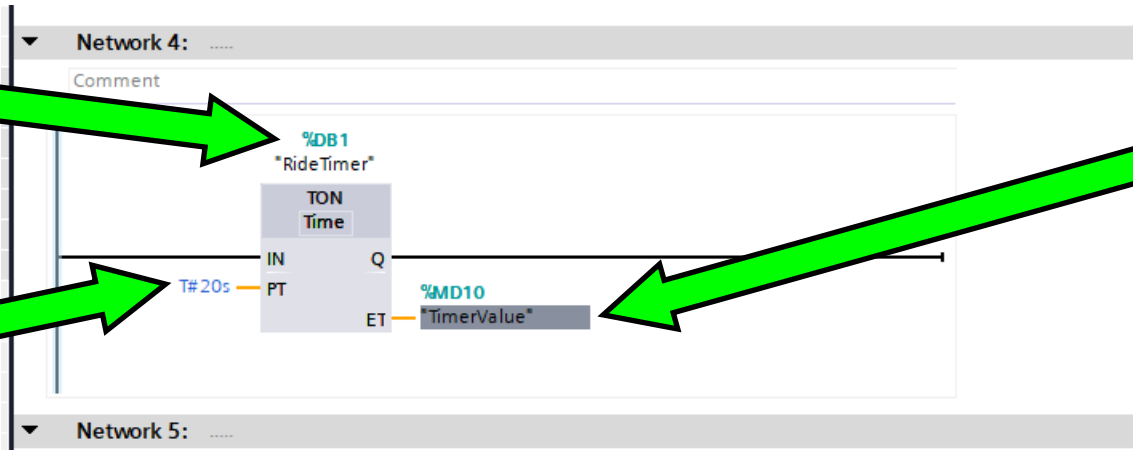
Click

Programming Blocks

Create Timer

Added
New Timer

Type:
20s

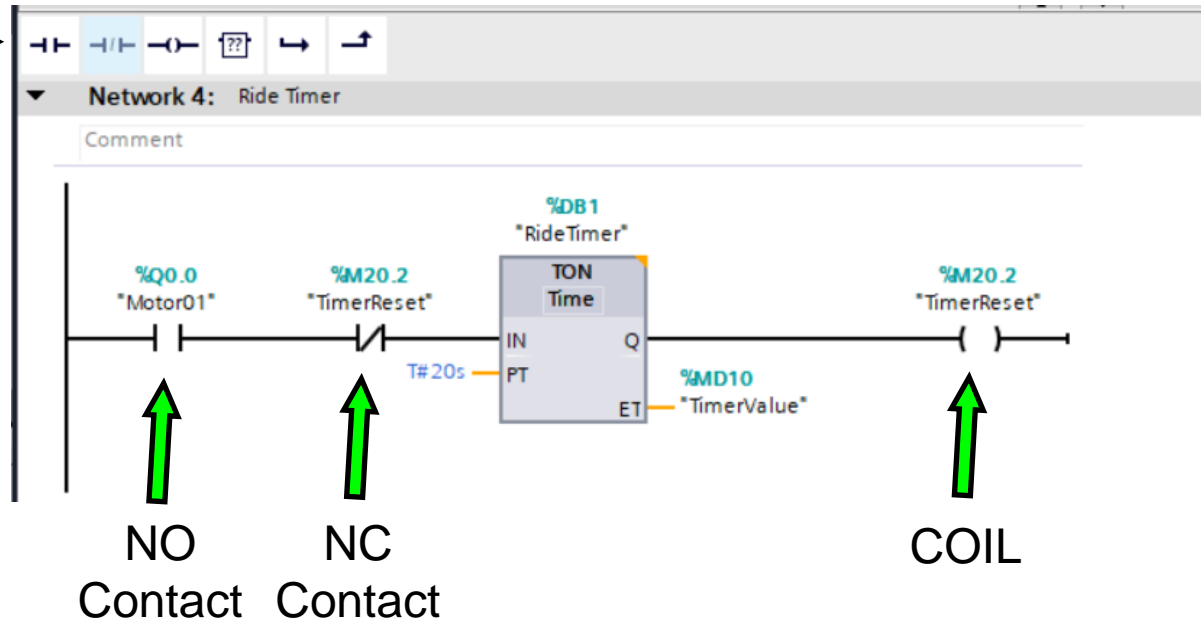


Add MD10
Rename Tag to:
TimerValue

Programming Blocks

Create Timer

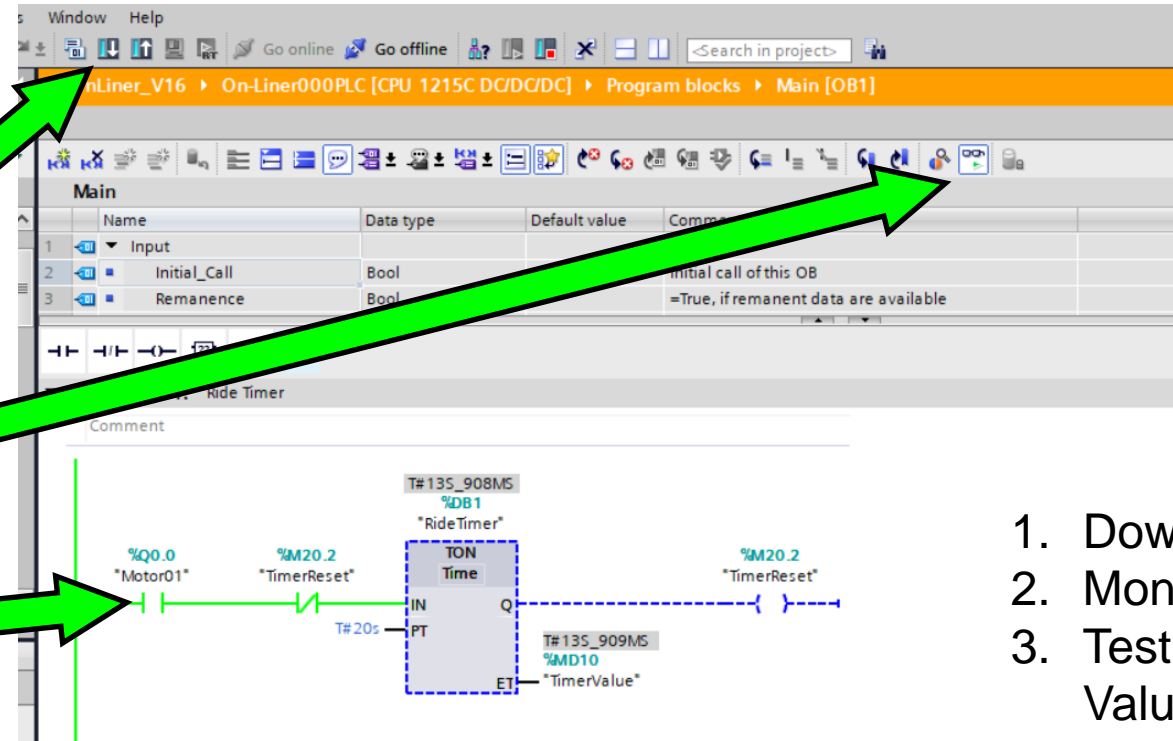
Add contacts and coils



Note: Follow slide 66 to 69 for defining the tag name "TimerReset"

Programming Blocks

Create Timer



Download

Monitoring ON

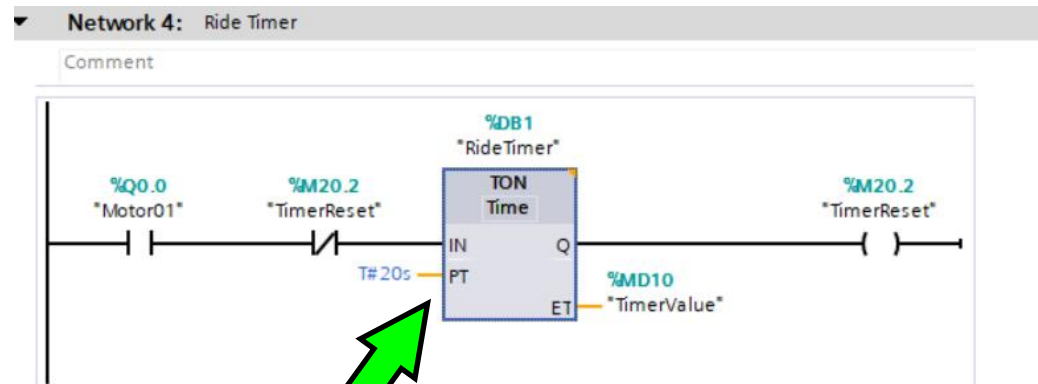
Right Click
Modify
Modify to 1

1. Download
2. Monitor
3. Test with Modify Value

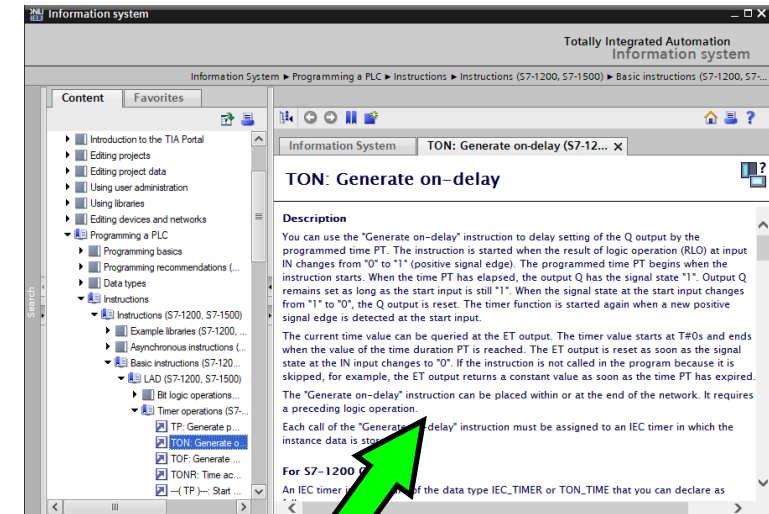
“Motor01 Q0.0” turns RideTimer ON by modifying from 0 to 1

Programming Blocks

Create Timer



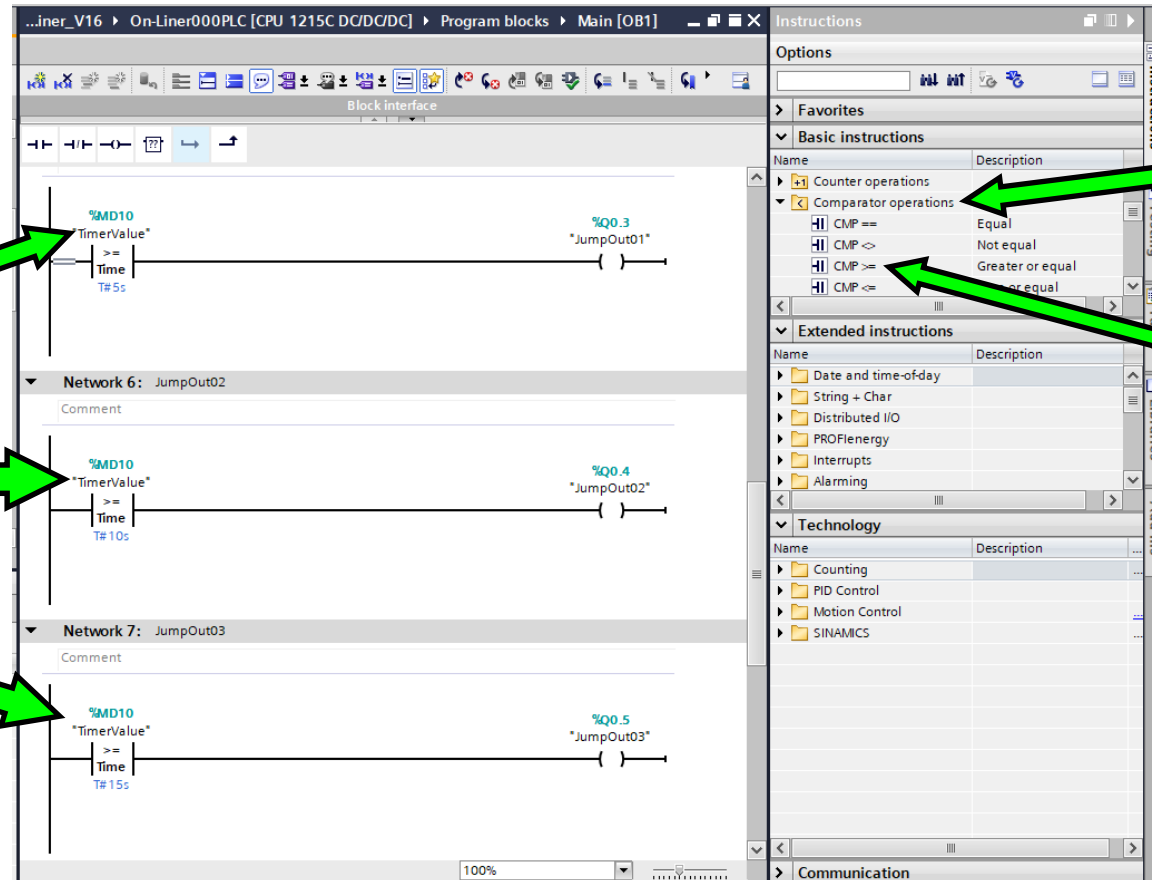
To know more about TON (Timer ON Delay) select the TON block and press F1 on the keyboard



Information window pops up

Programming Blocks

Create Comparator



Instructions

1. Click

2. Click

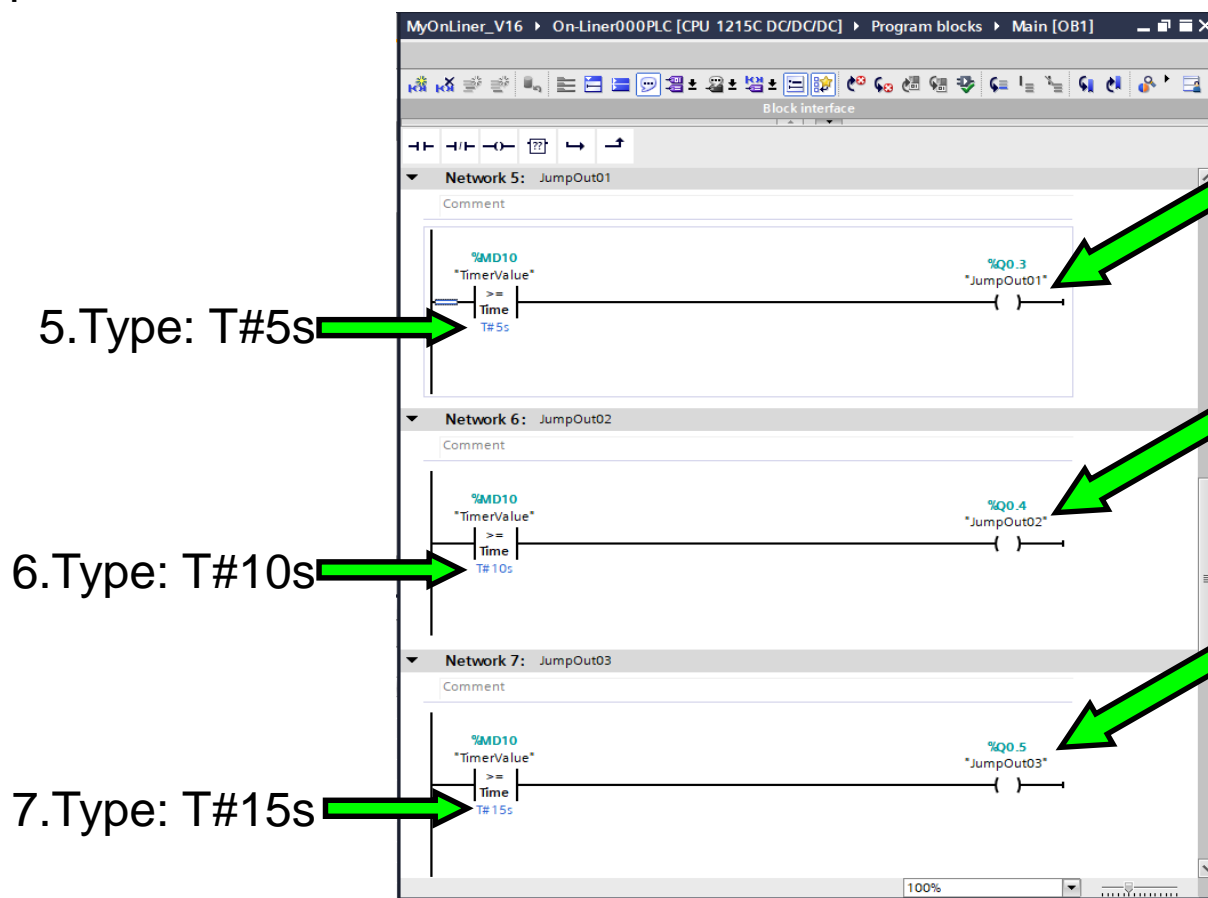
3. Select and Drop Greater or equal in network 5, 6 and 7

Note: Ignore adding coils 

4. Tag Name: TimerValue
Type: Time
Address: MD10

Programming Blocks

Create Comparator



8.Add Coil and Define global output tag name: "JumpOut01"; Address: Q0.3, Type: BOOL

9.Add Coil and Define global output tag name: "JumpOut02"; Address: Q0.4, Type: BOOL

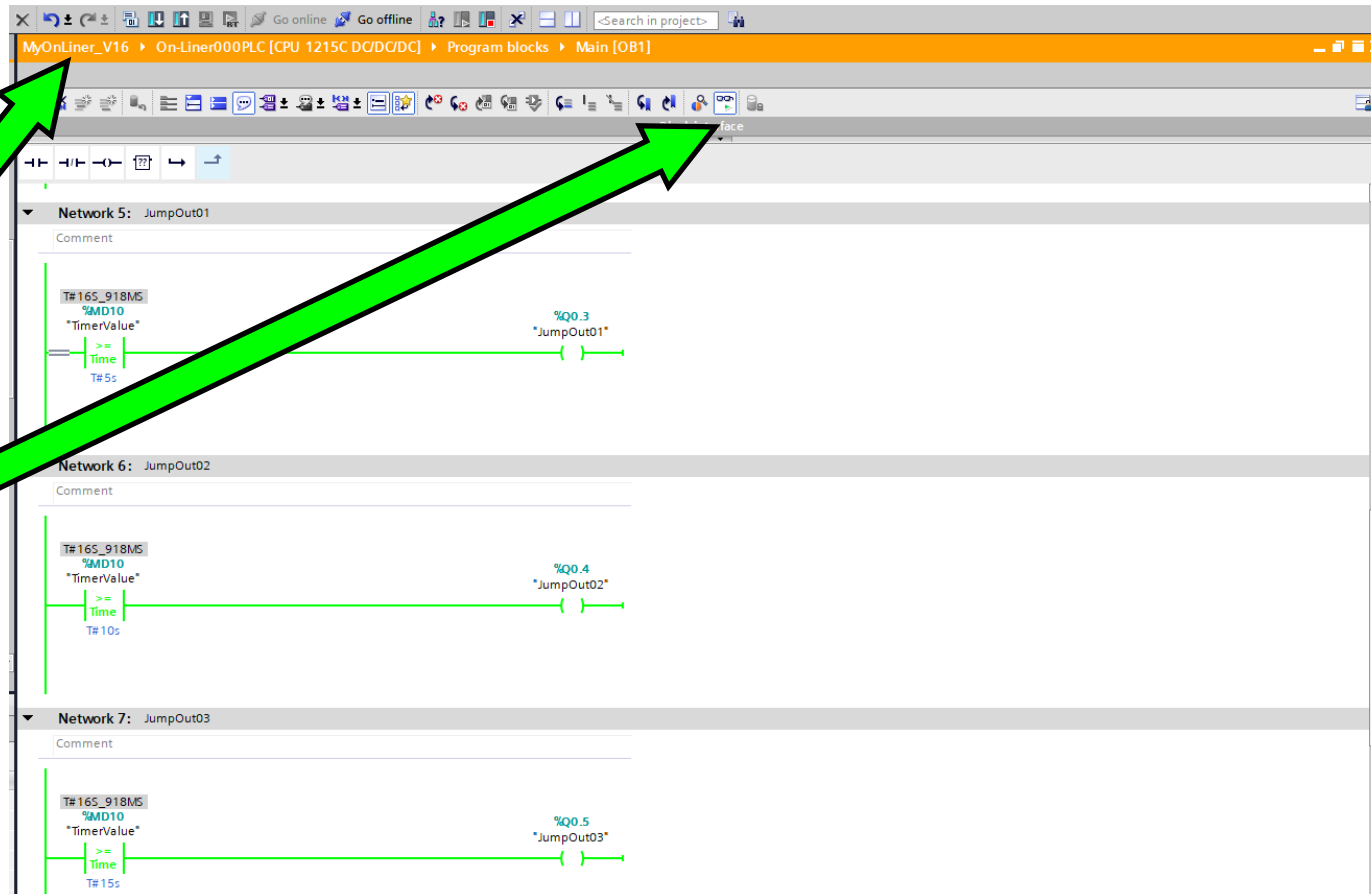
10.Add Coil and Define global output tag name: "JumpOut03"; Address: Q0.5, Type: BOOL

Programming Blocks

Create Comparator

Download

Monitoring
ON



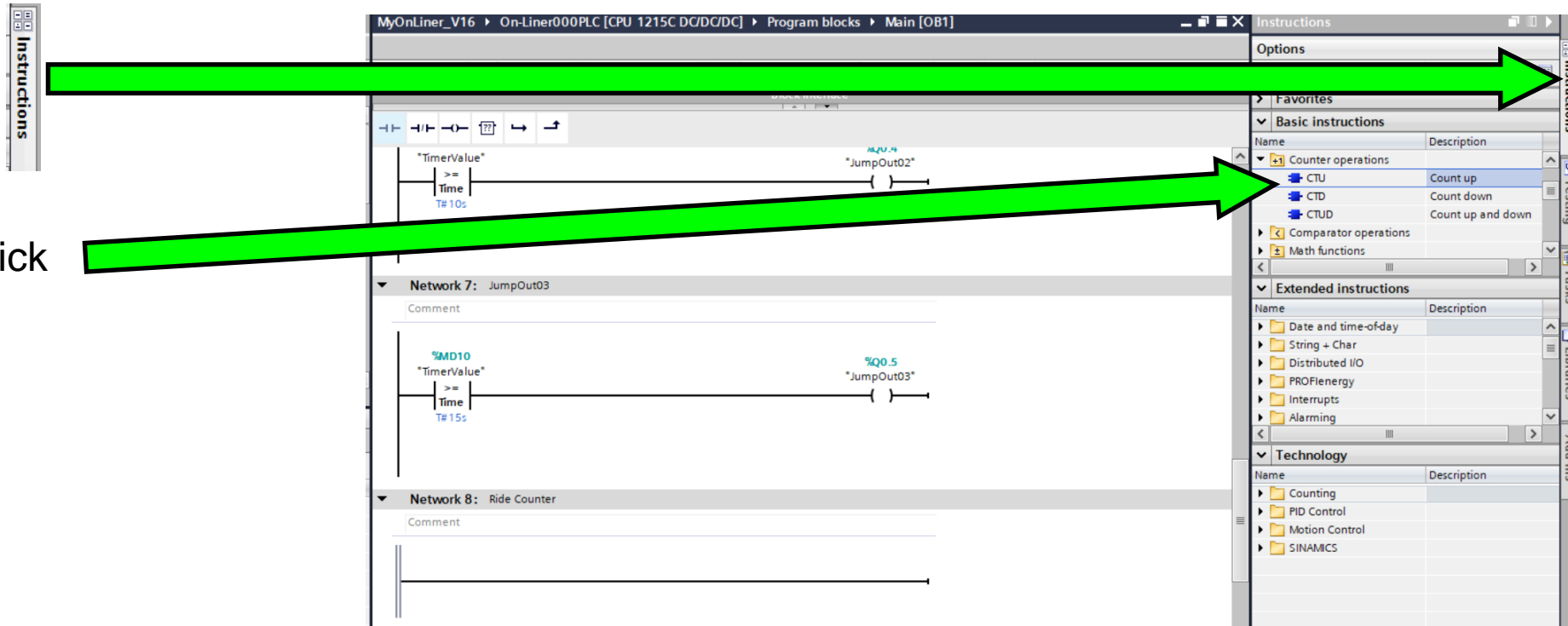
1. Download
2. Monitor
3. Test with Modify Value for “Motor01”

Programming Blocks

Create Counter

Click

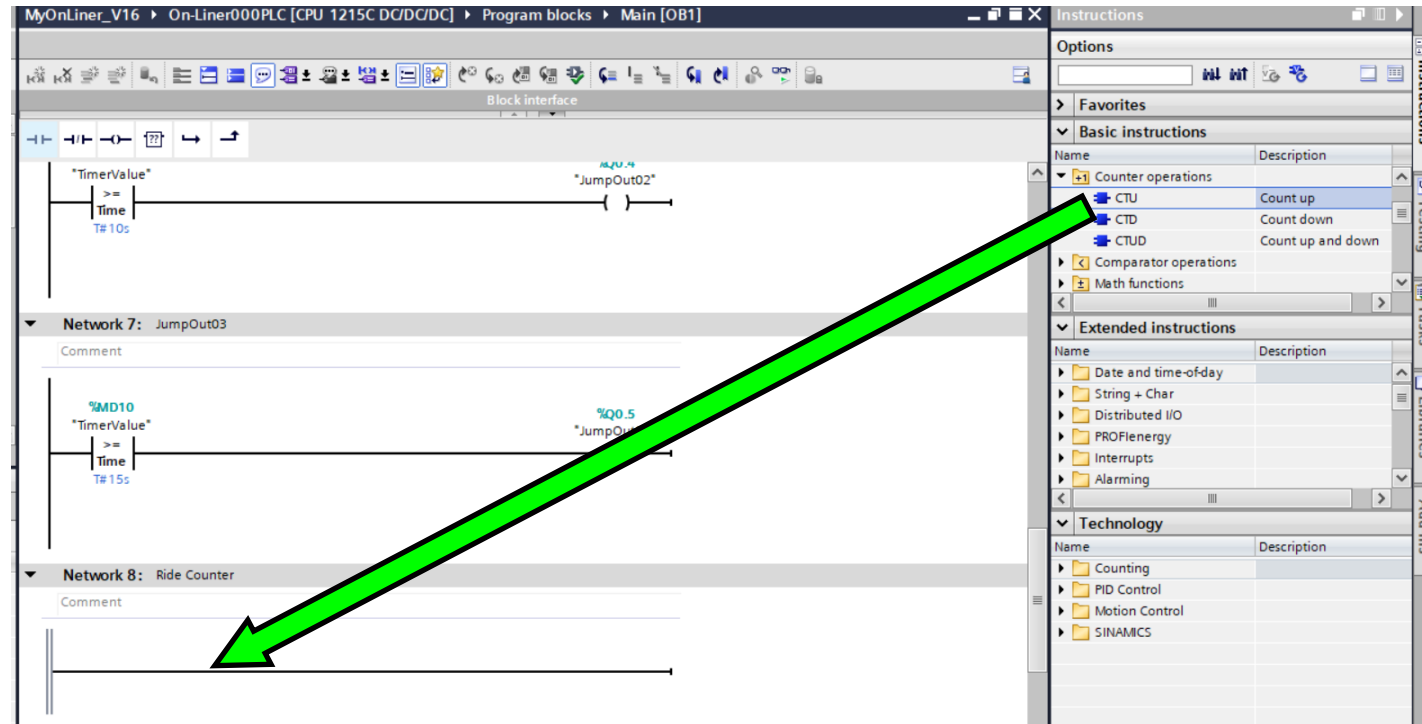
Click



The screenshot shows the SIMATIC Manager interface for a PLC program. The main window displays a ladder logic network with two rungs. The first rung contains a timer T#10s with a comparison operator >= and a jump instruction *JumpOut02*. The second rung contains a timer T#15s with a comparison operator >= and a jump instruction *JumpOut03*. The right-hand side of the screen shows the 'Instructions' palette, which is categorized into 'Basic instructions', 'Extended instructions', and 'Technology'. Under 'Basic instructions', the 'Counter operations' folder is expanded, showing three options: CTU (Count up), CTD (Count down), and CTUD (Count up and down). The 'CTU' option is highlighted. A green arrow points from the 'Click' label to the 'Instructions' palette, and another green arrow points from the 'Click' label to the 'CTU' option.

Programming Blocks

Create Counter



The screenshot displays the SIMATIC Manager interface for a Siemens PLC. The main window shows a ladder logic program with three networks. Network 7, labeled 'JumpOut03', contains a timer block 'TimerValue' with a value of 10s and a comparison '>=' leading to a jump instruction 'JumpOut02'. Network 8, labeled 'Ride Counter', contains a timer block 'TimerValue' with a value of 15s and a comparison '>=' leading to a jump instruction 'JumpOut03'. A large green arrow points from the 'CTU' (Count Up) block in the 'Instructions' library to the jump instruction in Network 8. The 'Instructions' library is open on the right side of the screen, showing a tree view of instruction categories: Basic instructions, Extended instructions, and Technology. The 'Counter operations' sub-category is expanded, showing 'CTU' (Count up), 'CTD' (Count down), and 'CTUD' (Count up and down). The 'Technology' sub-category is also expanded, showing 'Counting', 'PID Control', 'Motion Control', and 'SINAMCS'.

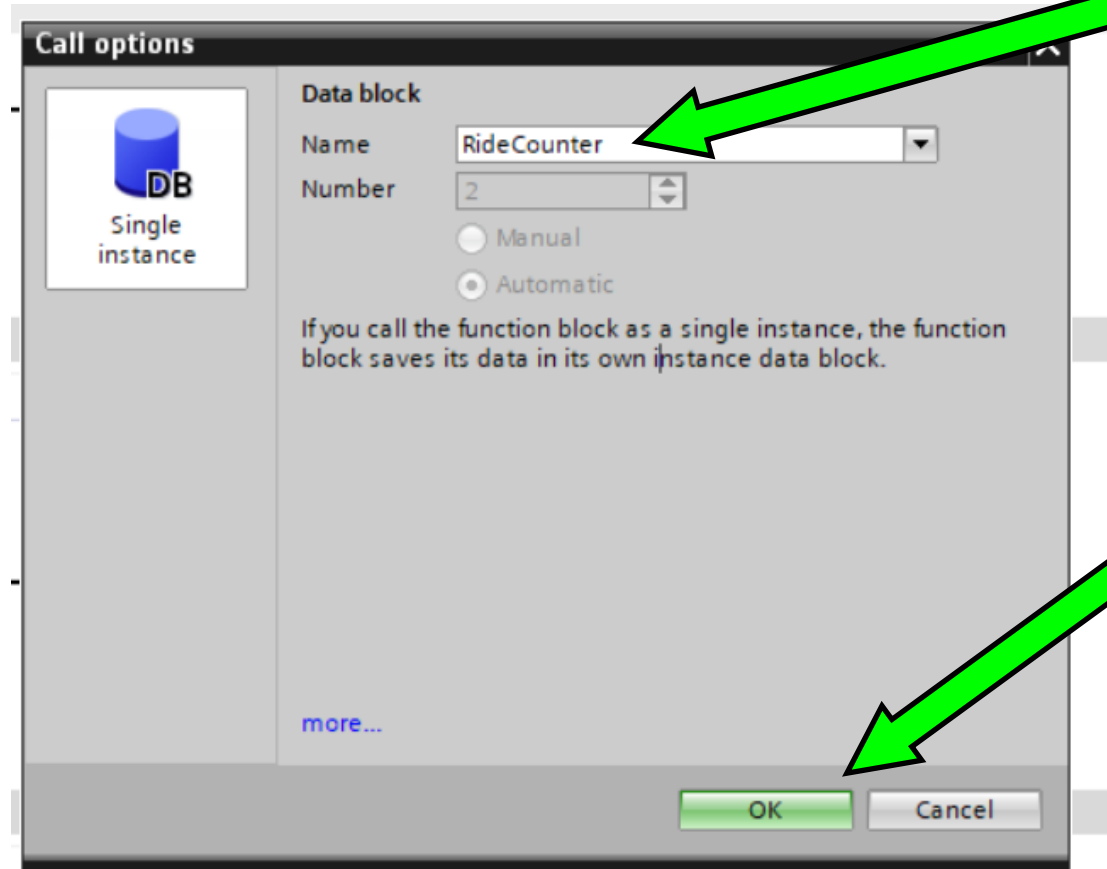
Name	Description
CTU	Count up
CTD	Count down
CTUD	Count up and down

Name	Description
Counting	
PID Control	
Motion Control	
SINAMCS	


Programming Blocks

Create Counter

Type:
RideCounter



Call options

 DB
Single instance

Data block

Name

Number

Manual
 Automatic

If you call the function block as a single instance, the function block saves its data in its own instance data block.

[more...](#)

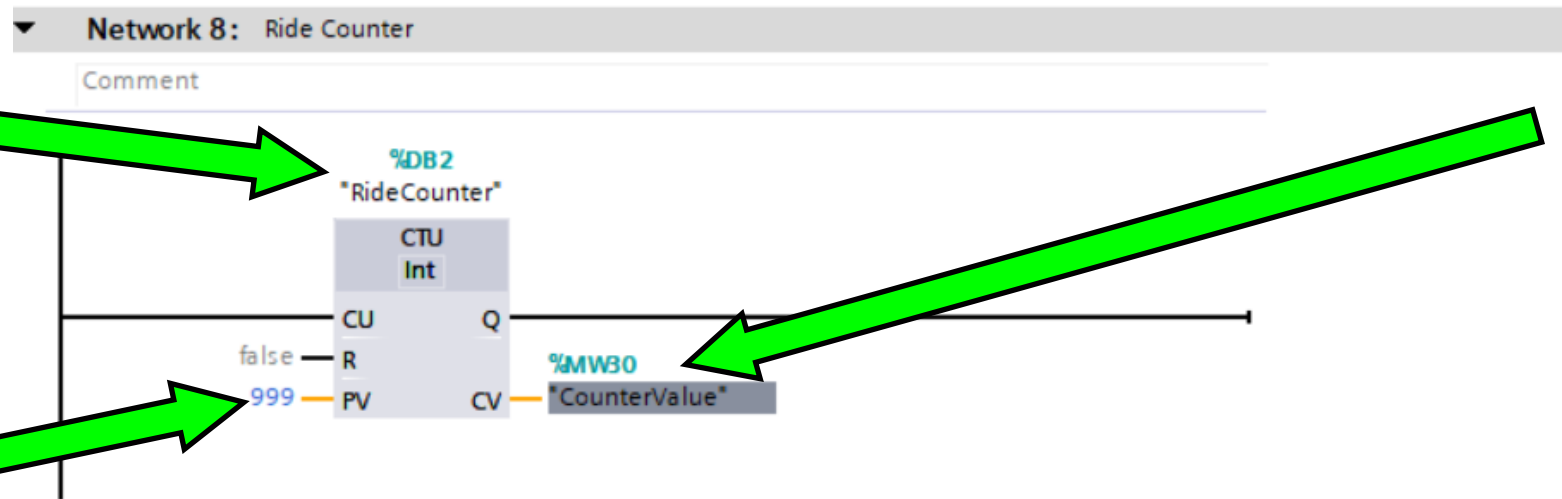
Click

Programming Blocks

Create Counter

Added
New Counter

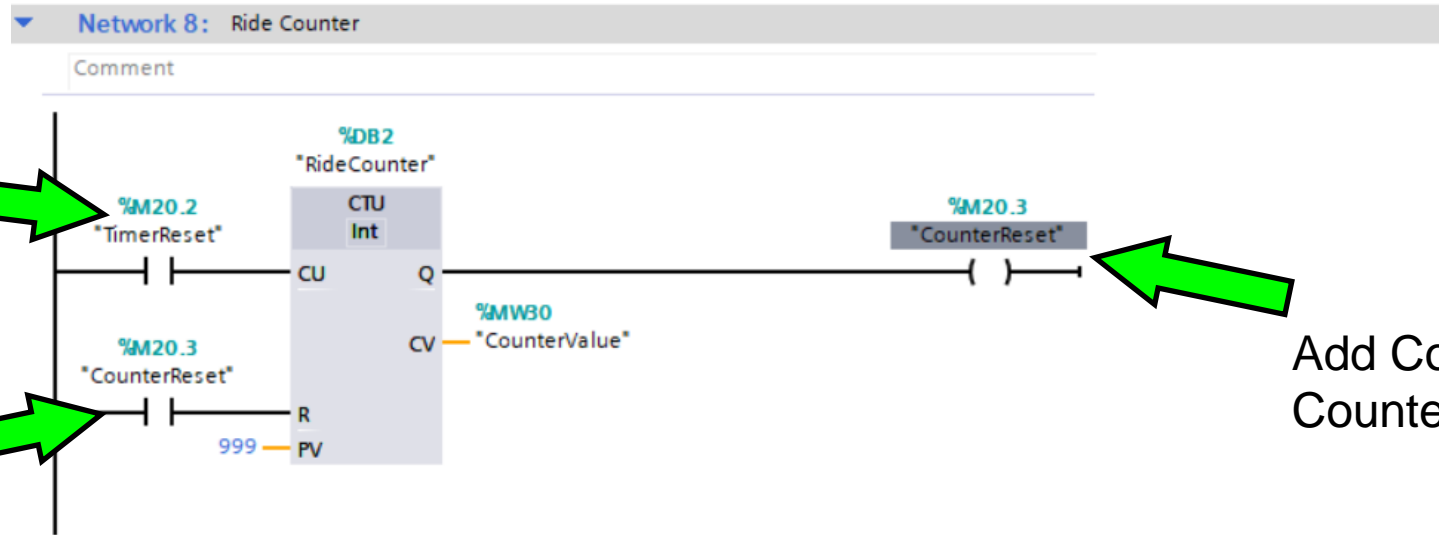
Preset Value: 999



Define a tag with
Name: CounterValue
Address: MW30
Type: Int

Programming Blocks

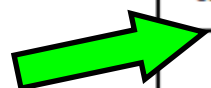
Create Counter



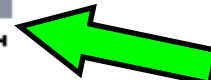
Add NO contact with name "TimerReset"



Add NO contact
Name:"CounterReset"
Address:M20.3
Type:Bool



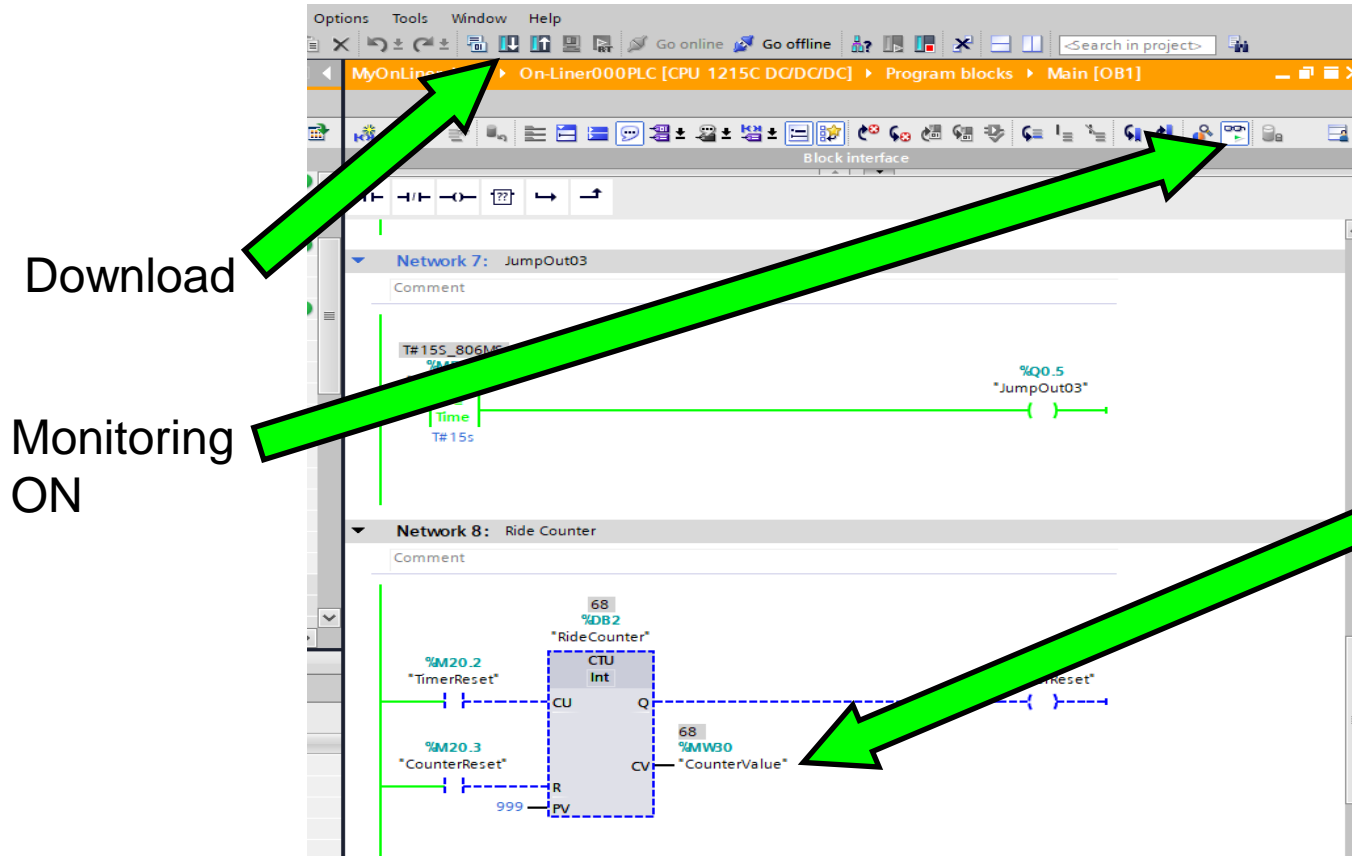
Add Coil with name CounterReset



Note: To know more about CTU(Count Up), select the CTU block and press F1 on the keyboard

Programming Blocks

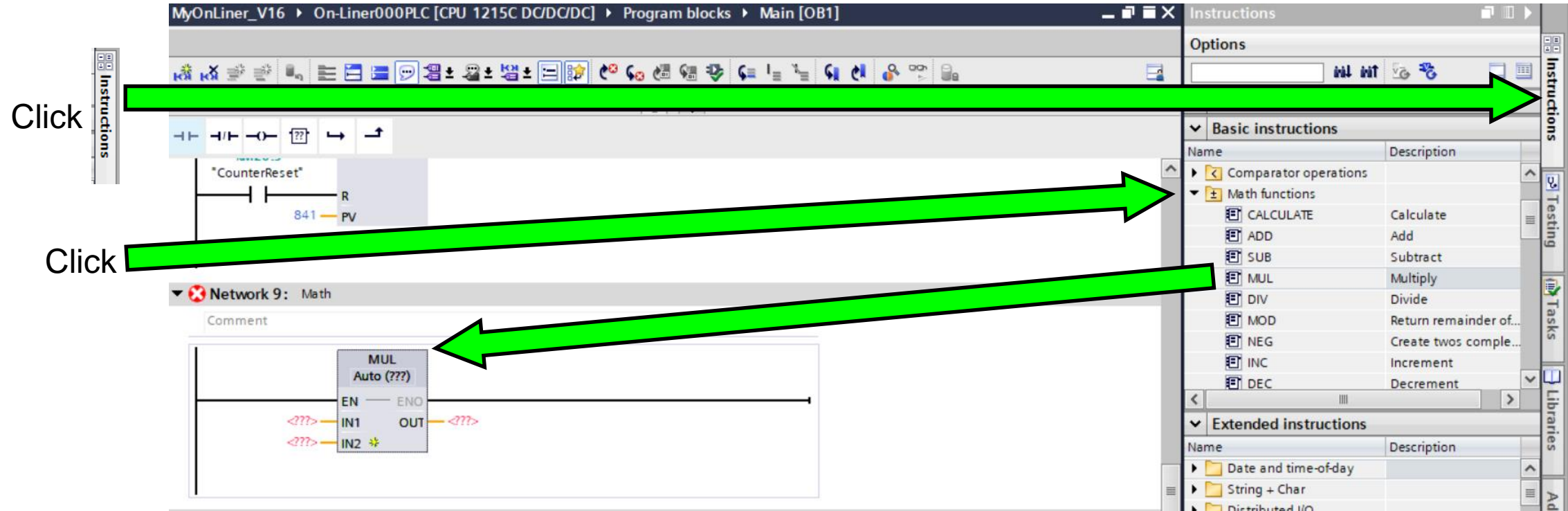
Create Counter



1. Download
2. Monitor
3. See "CounterValue" that gets update after every 20sec

Programming Blocks

Create Math Functions



The screenshot shows the SIMATIC Manager interface with the following components:

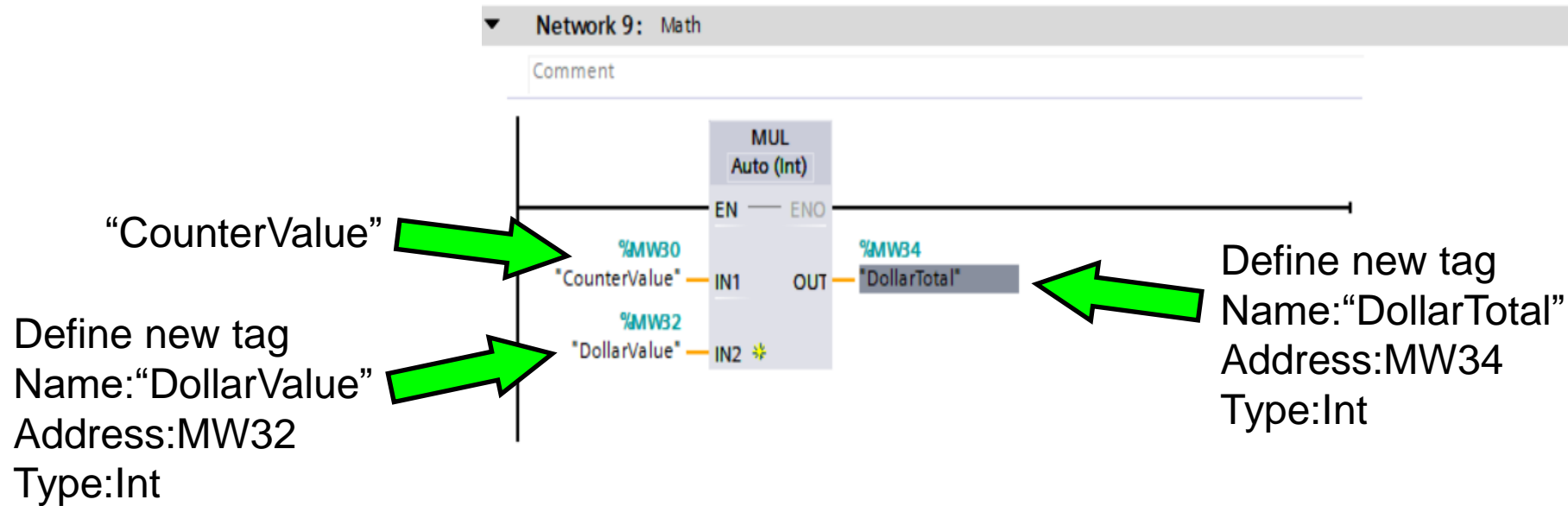
- Top Bar:** Project path: MyOnLiner_V16 > On-Liner000PLC [CPU 1215C DC/DC/DC] > Program blocks > Main [OB1].
- Left Panel:** Ladder logic editor showing a network with a reset coil (R) and a pulse generator (PV).
- Right Panel:** "Instructions" library with a tree view showing "Basic instructions" > "Math functions".
- Bottom Panel:** A detailed view of the "Network 9: Math" network, showing a "MUL Auto (???)" block with inputs IN1 and IN2, and output OUT.

Three green arrows indicate the workflow:

- Click:** An arrow points from the "Instructions" library to the main editor area.
- Click:** An arrow points from the "Math functions" category in the library to the "MUL" block in the network.
- Click:** An arrow points from the "MUL" block in the network back to the "Math functions" category in the library.

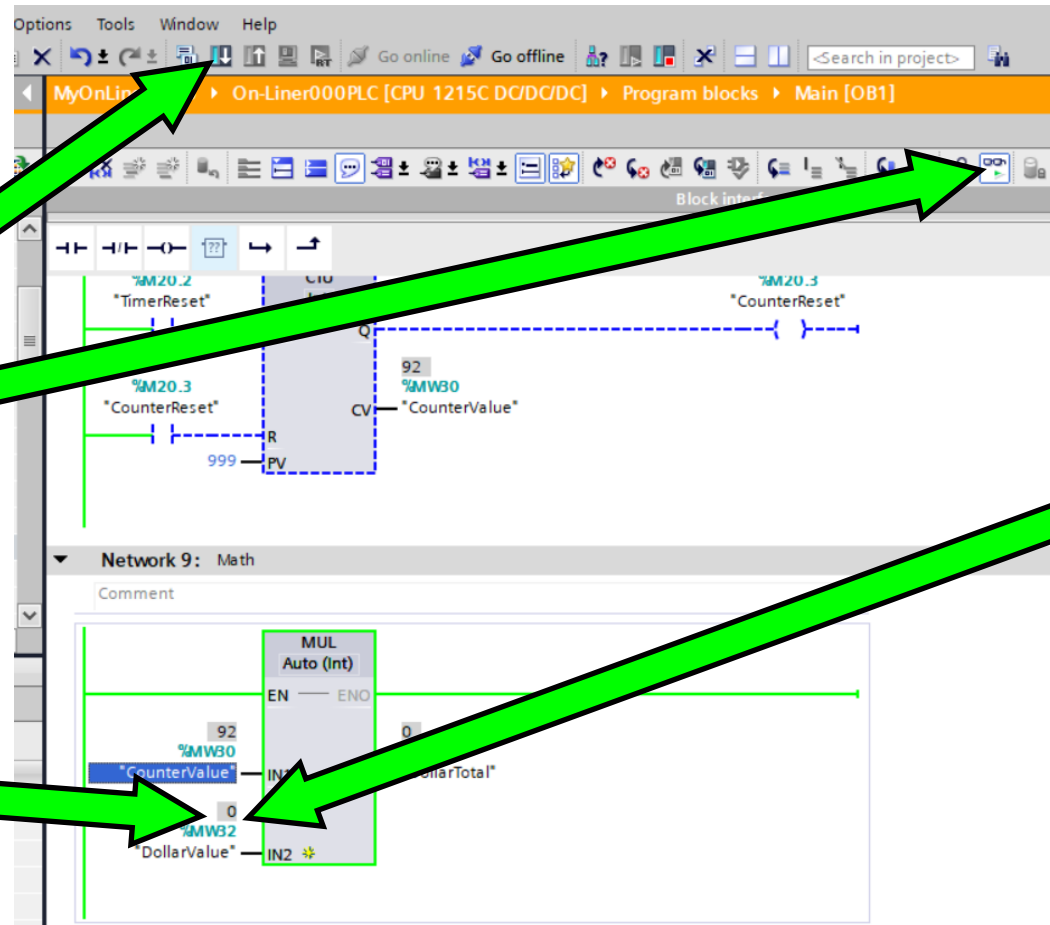
Programming Blocks

Create Math Functions



Programming Blocks

Create Math Functions



Download

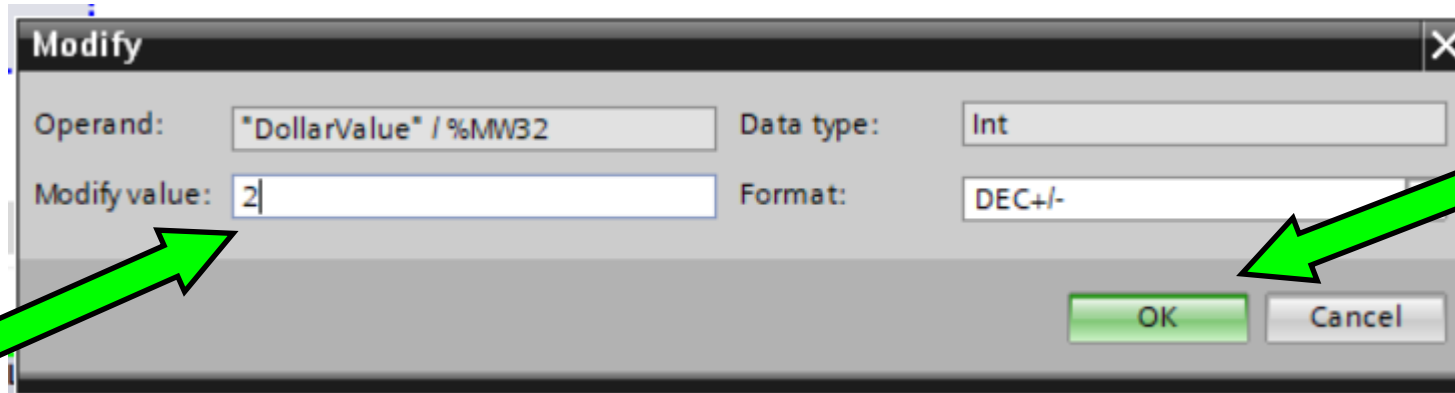
Monitoring ON

Default "DollarValue" will be 0

1. Download
2. Monitor
3. See "CounterValue" that gets update after every 20sec
4. Modify "DollarValue" to 2 by double click

Programming Blocks

Create Math Functions



Modify

Operand: Data type:

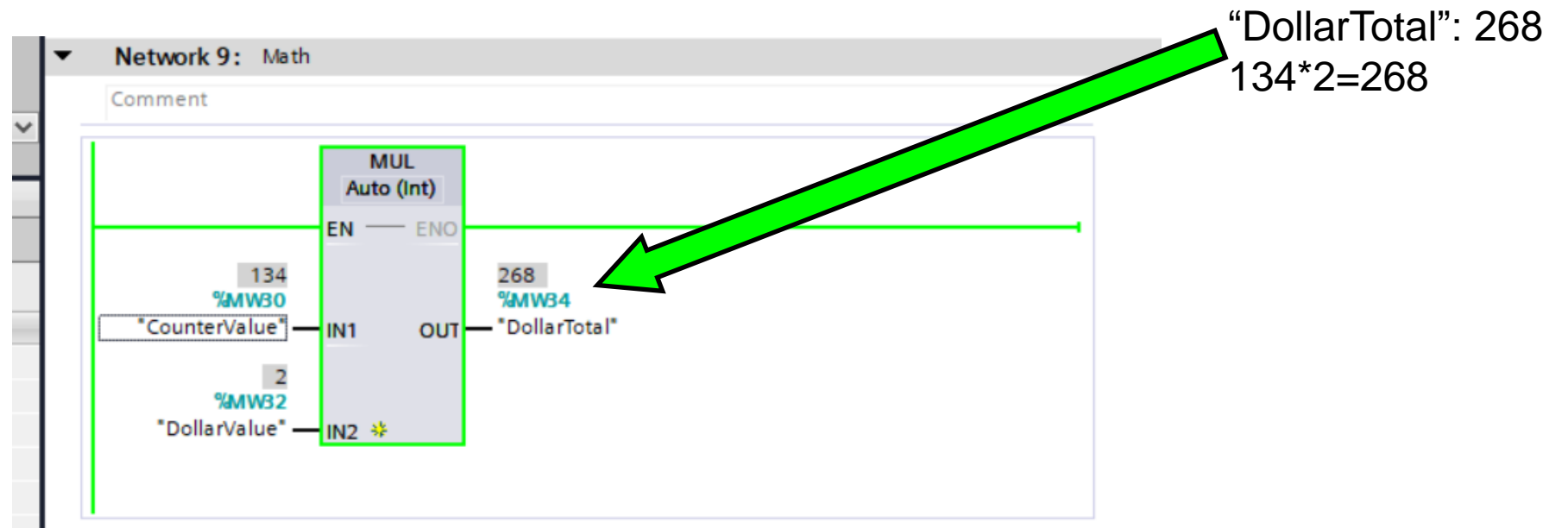
Modify value: Format:

Type 2

Click

Programming Blocks

Create Math Functions



Note: To know more about different Math Functions, drag and drop different math functions on the network and press F1



SIEMENS

Programming Blocks

Thank You