

Siemens S7-1200

CPU 1212C AC/DC/Relay

Introduction to Siemens TIA

- Understanding Siemens TIA
- Features of TIA
- LIVE Demonstration
- Summary

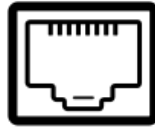


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Modular! Powerful! Easy to use!



NETWORKING

Eliminates the need for additional proprietary programming cables and no Ethernet expansion module



DRIVE & MOTION INTEGRATION

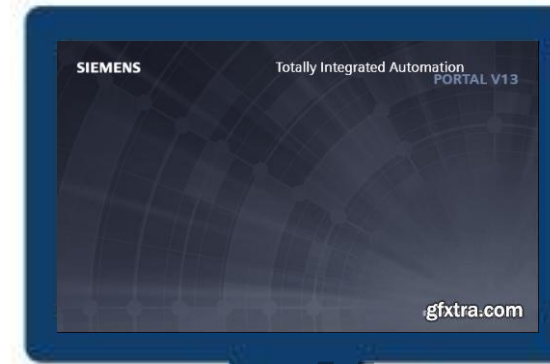
Extensive built-in technology



HARDWARE & MODULARITY

Ability to add additional I/Os without increasing the CPU's footprint

SIEMENS TIA PORTAL



BASIC PANELS



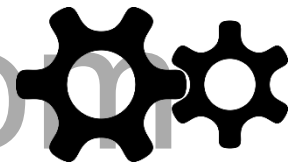
S7- 1200



SECURITY

INTEGRATED

prevent unauthorized third thereby protecting your algorithm or process.



EXPANDED TECHNOLOGY



DIAGNOSTICS

visualization of all SIMATIC hardware's integrated system diagnostics

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Features of TIA

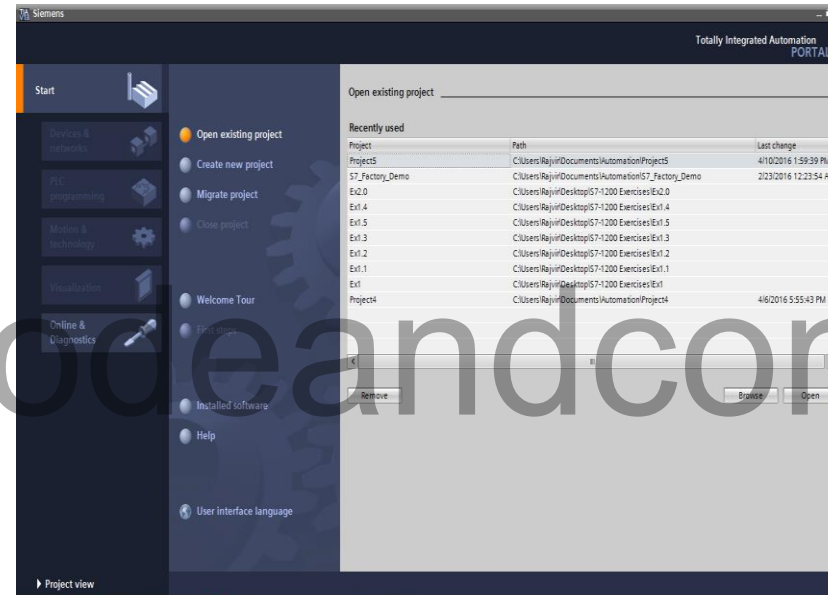
Controller logic

Configure HMI visualization

Setup network communication

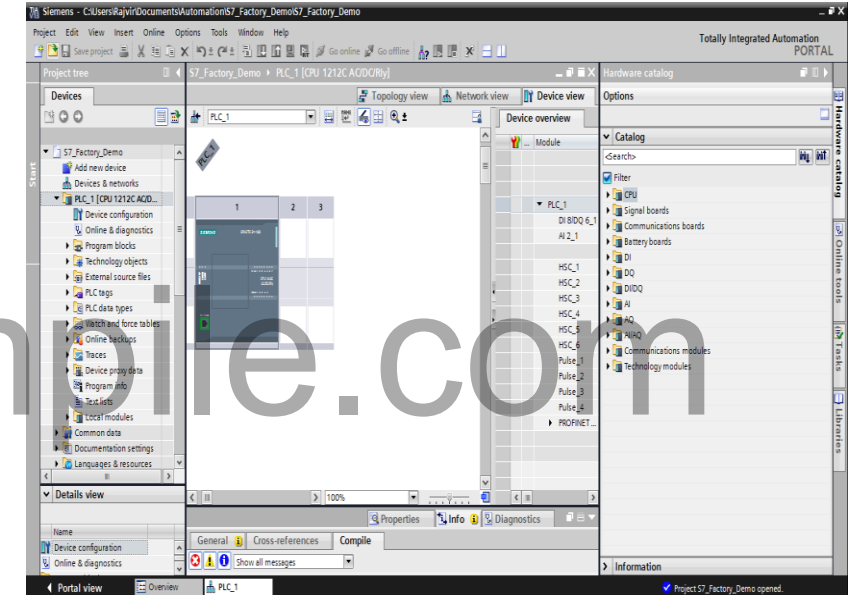


Portal View



- Portals for the different tasks
- Tasks for the selected portal
- Selection panel for the selected action
- Changes to the Project view

Project View



- Menus and toolbar, Project navigator
- Work area, Task cards
- Inspector window
- Changes to Portal view, Editor bar

Quick and Easy changes using drag & drop features

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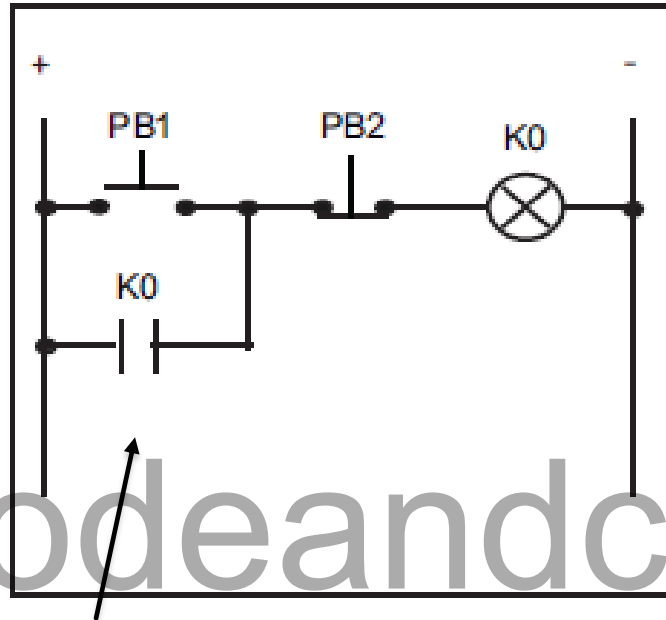
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Simple latch circuit



- The **output K0 is activated (ON)** as soon as the **push-button input PB1 closes (ON)**.
- Because the latching circuit utilizes the state of K0, **K0 remains active (ON)** after **PB1 releases (OFF)**.
- Pressing the **push-button input PB2 deactivates K0 (OFF)**.
- **K0 remains OFF** until push-button input PB1 closes (ON) again.

Using K0 as a parallel input to PB1 ensures that the circuit will be "latched" on until K0 turns off.

Ladder Logic



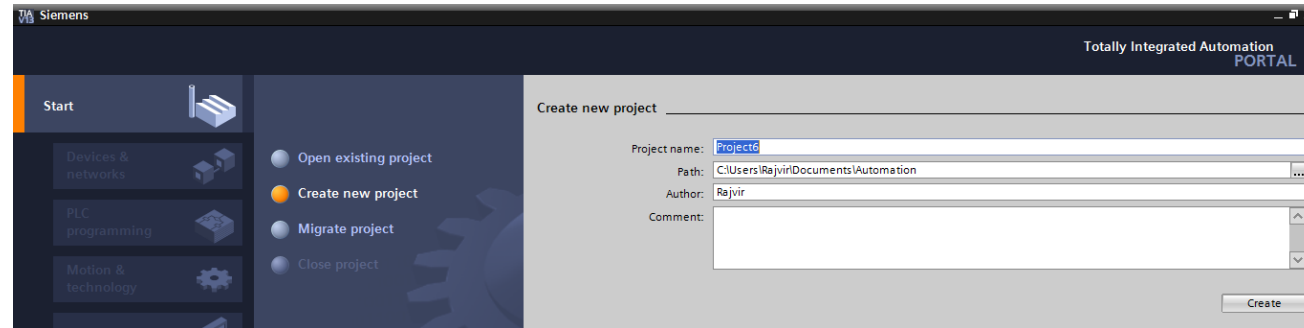
Steps

- Creating a project
- ❑ Inserting LAD instructions
- ❑ Associating the LAD instructions
- ❑ Configuring the CPU
- ❑ Downloading your user program
- ❑ Testing the operation



Creating a Project

After STEP 7 Basic opens, click "Create new project" in the Start portal. Enter the project name and click "**Create**".

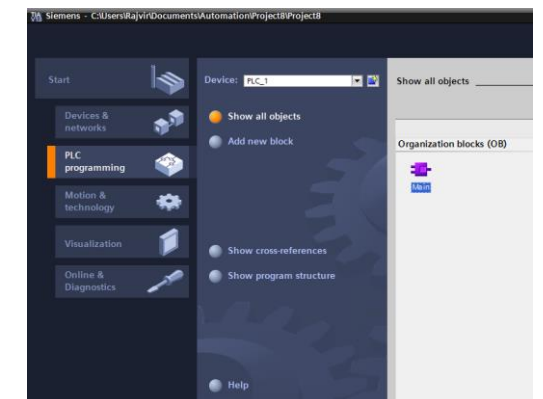
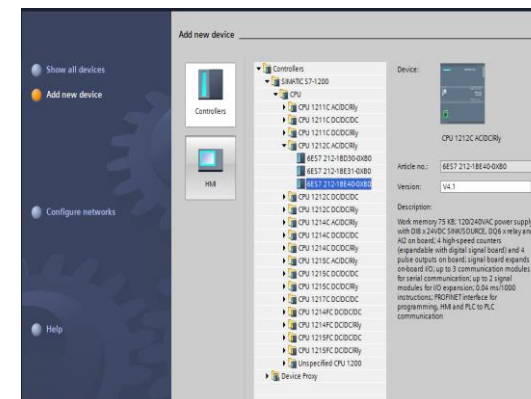
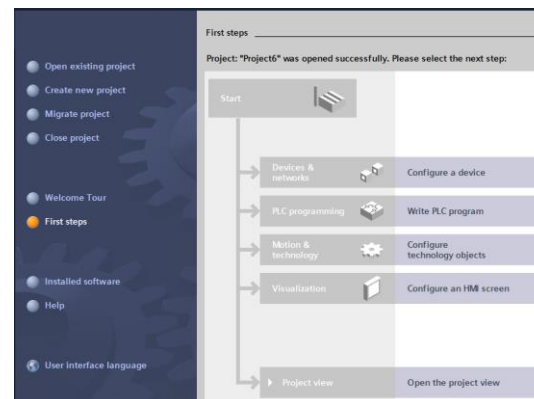


Create a new program by clicking "**Create a PLC program**". STEP 7 Basic creates the "**Main**" code block for your user program and opens the "**PLC Programming**" portal.

Configure a device to add the
Controller S7-1200

Select the appropriate
PLC Model

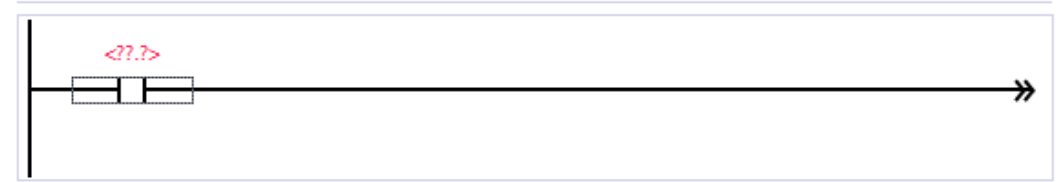
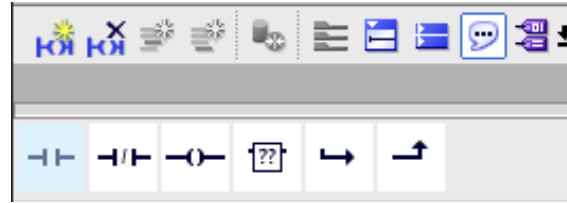
Open the program editor by
double-clicking the "**Main**" block



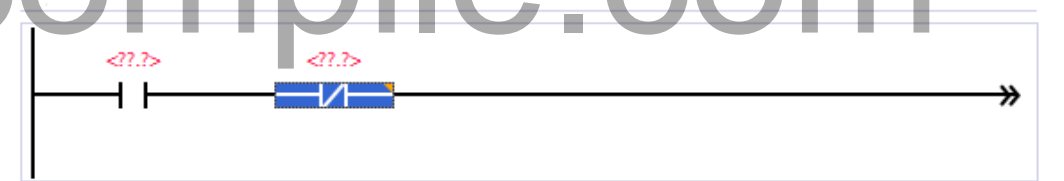
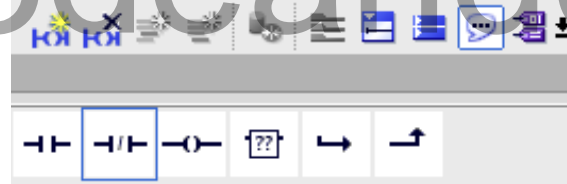


Inserting Ladder Instructions

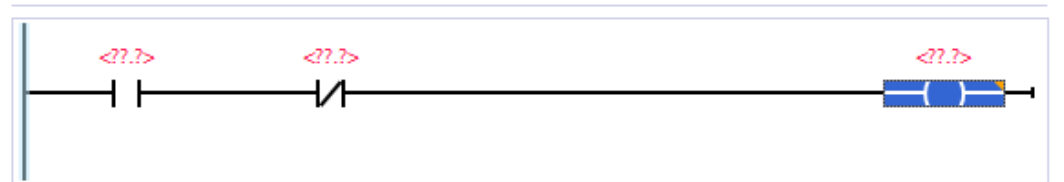
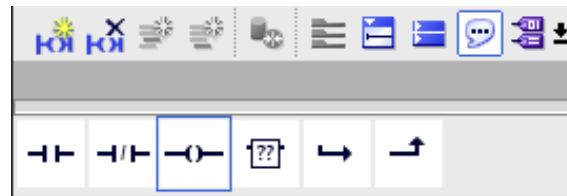
To **enable the latching circuit**, use a **normally open contact**. The normally open contact provides **power flow (current)** when the **switch is turned on**.



To **disable the latching circuit**, use a **normally closed contact**. The **normally closed contact** provides **power flow (current)** until the switch is turned on. Turning on a normally closed contact **interrupts power flow**.



Click the **coil** to **insert a coil onto the network**. Power flows through the two contacts to **energize the coil**.

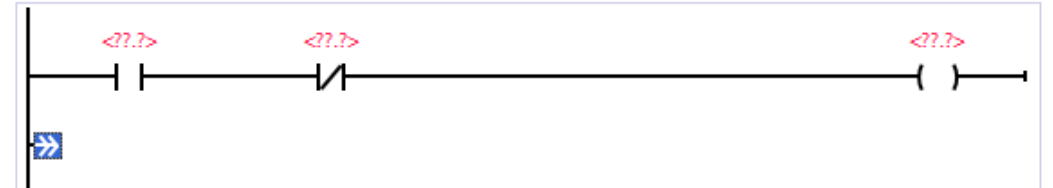
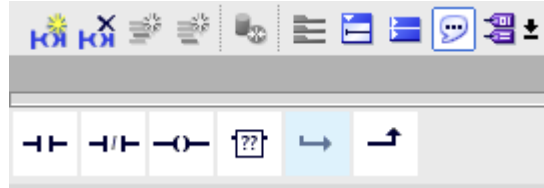




Inserting Ladder Instructions

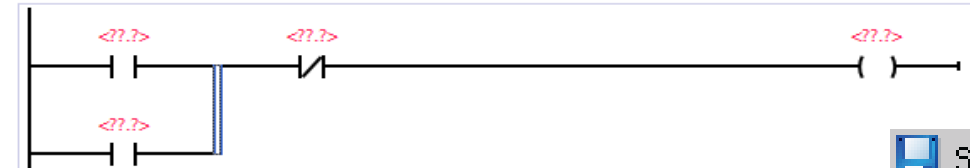
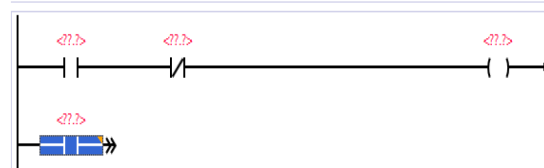
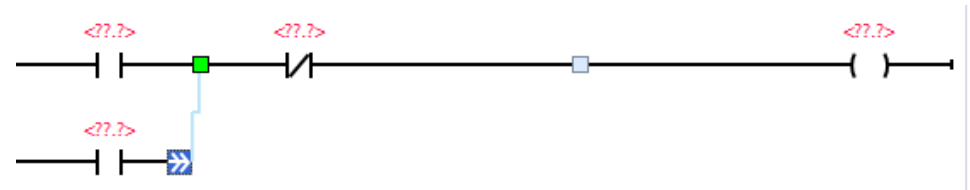
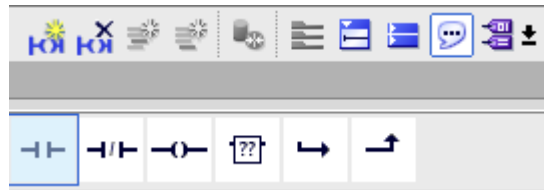
To "latch" the coil after the "On" switch releases, you create a parallel branch.

1. Select the rail of the network.
2. Click the "Open branch" in the "Favorites" to open a branch from the rail.



Click the normally open contact in the "Favorites" to insert the contact onto the branch. Close the branch by dragging the end to the network. Connecting the branch between the two contacts on the network ensures the following conditions:

- The **power to the coil** can flow to the coil after the first switch releases (turns off).
- The normally closed contact can **break the circuit** and **turn the coil off**.

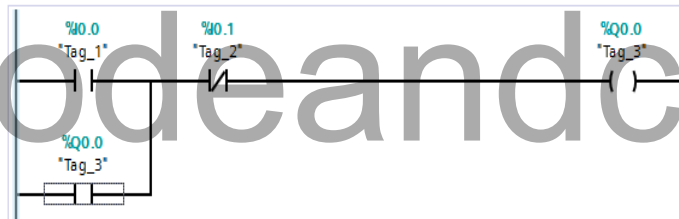
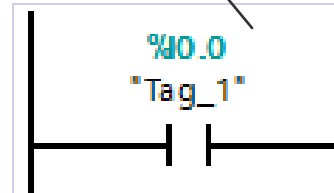
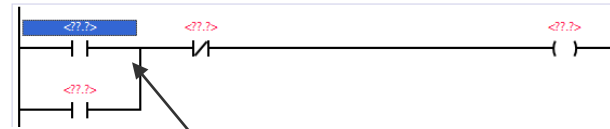




Addressing the Instructions

The next step is to associate the contacts and coils to the inputs and outputs of the CPU. You create "PLC tags" for these addresses.

1. Select the first contact and double-click the operand ("`???.?>`").
2. Enter the address "`I0.0`" to create a default tag for this input.
3. Enter the address "`I0.1`" for the normally closed contact.
4. Enter an address of an output ("`Q0.0`") for the coil.

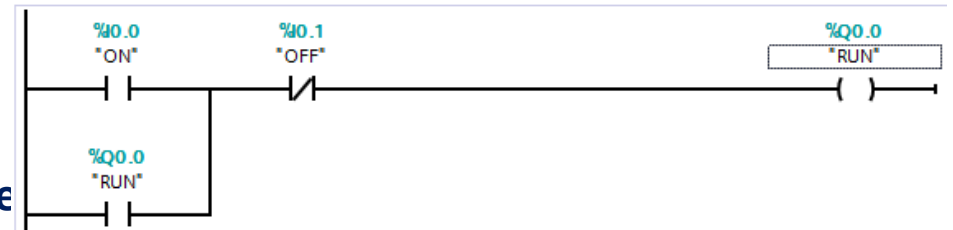


Name	Section	Address	Data type	PLC tag table	Comment
ON	Global Input	%I0.0	Bool	Default tag table	

Change Cancel

Enter the following names for the three instructions:

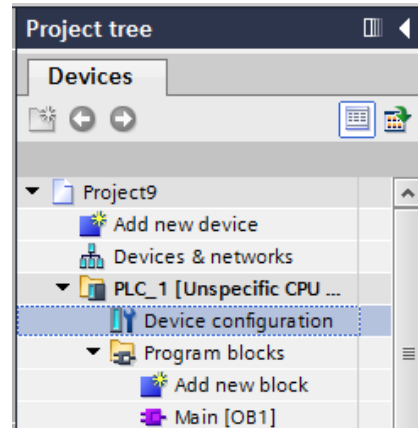
- Change "Tag_1" (I0.0) to "On".
- Change "Tag_2" (I0.1) to "Off".
- Change "Tag_3" (Q0.0) to "Run".



The latching circuit is now complete.



Configure the CPU



You can use the "**Detect CPU**" feature of the Device Configuration to upload the hardware configuration of the CPU.

- In the Project tree, expand the "**PLC**" container.
- Double-click "**Device configuration**" to display the CPU.

STEP 7 Basic had created an "**unspecified**" CPU when you opened the LAD editor. You can now click the "**Detect**" link on the unspecified CPU to connect to the online CPU.



STEP 7 Basic "**detects**" any CPU connected to the computer. Select the CPU and click the "**Load**" button to upload the CPU configuration to your project.

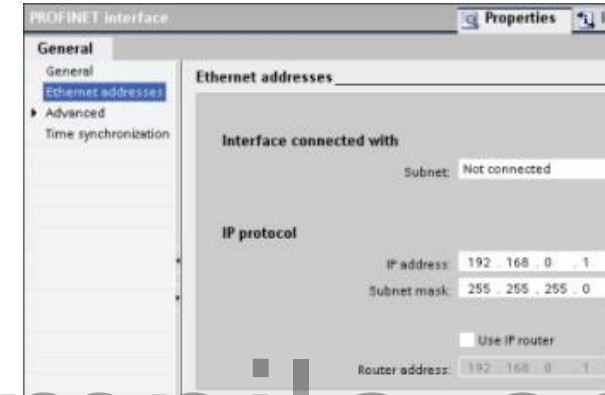


STEP 7 Basic displays the CPU in the device configuration



Assigning the IP in the CPU

As you noticed when you uploaded the CPU configuration, the CPU does not have a preassigned **IP address**. You assign the IP address for each CPU.



- Select the **PROFINET** port on the CPU to display properties for just the **PROFINET** interface. (You can also select "PROFINET interface" in the "General" properties of the CPU.)
- Select "**Ethernet addresses**" in the inspector window. The "**IP protocol**" section displays the default IP address created by **STEP 7 Basic**.

Downloading the configuration to the CPU

1. **Select the CPU.**
2. **Click the "Download" button on the toolbar.**

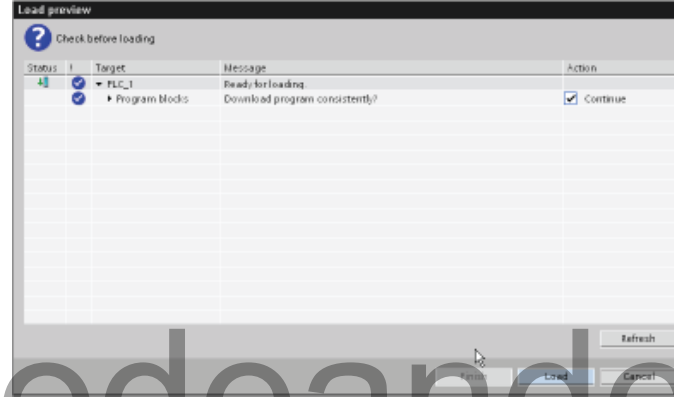
Click "Load" to download the device configuration to the CPU. After the download is complete, Click "Finish". The CPU is now configured to use the default IP address and to go to RUN mode following a power cycle. You can now download the user program.





Download the user program to CPU

Now you can download your user program. Open the program editor and simply click the "Download" button.



After connecting to the CPU, STEP 7 Basic displays the "**Load preview**" dialog.

Click "**Load**" to download the user program to the CPU. Before clicking "**Finish**", select "**Start all**" to ensure that the CPU goes to RUN mode.

Test the operation of your sample user program!





Use of watch table for Monitoring

We will use the online functionality of STEP 7 Basic to monitor the operation of your user program.

What is a "watch table"?

A watch table allows you to **monitor or modify the values of tags** while the CPU executes your user program.



GettingStarted_1 > PLC_1 > Watch tables > Watch table_1					
	Name	Address	Display format	Monitor value	Modify value
1	"On"	%I0.0	Bool	<input type="checkbox"/> FALSE	
2	"Off"	%I0.1	Bool	<input type="checkbox"/> FALSE	
3	"Run"	%Q0.0	Bool	<input type="checkbox"/> FALSE	

The "**Modify**" function allows you to **change the value of a tag**. However, the "**Modify**" function **does not work with inputs (I) or outputs (Q)** because the CPU updates the I/O, overwriting any modified value before reading the modified value.

The watch table provides a "**Force**" function that allows you to **modify the values of the I/O**.



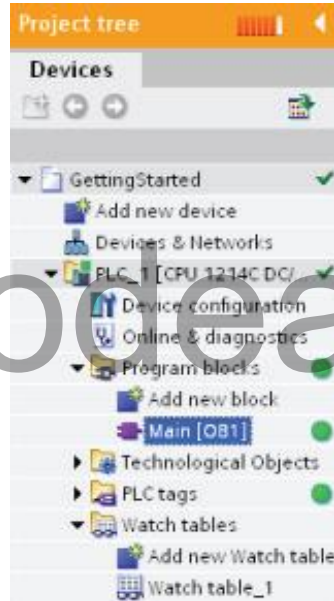
Monitor the data values in your CPU

To monitor the tags, you must have an online connection to the CPU. Simply click the "**Go online**" button in the toolbar.



When you have connected to the CPU, STEP 7 Basic turns the **headers of the work areas orange**.

The project tree displays a **comparison** of the **offline project** and the **online CPU**. **A green circle means** that the CPU and the project are synchronized, meaning that both have the same configuration and user program. **The watch table shows the tags.**



GettingStarted_1 > PLC_1 > Watch tables > Watch table_1					
	Name	Address	Display format	Monitor value	Modify value
1	"On"	%I0.0	Bool		
2	"Off"	%I0.1	Bool		
3	"Run"	%Q0.0	Bool		

To monitor the execution of the user program and to display the values of the tags, click the "**Monitor all**" button in the toolbar. The "**Monitor value**" field shows the value for each tag.

GettingStarted_1 > PLC_1 > Watch tables > Watch table_1					
	Name	Address	Display format	Monitor value	Modify value
1	"On"	%I0.0	Bool	<input type="checkbox"/> FALSE	
2	"Off"	%I0.1	Bool	<input type="checkbox"/> FALSE	
3	"Run"	%Q0.0	Bool	<input type="checkbox"/> FALSE	

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- How Processor Works?
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Summary

What did we learn in this lesson?

Reviewing the tasks for the first exercise

Congratulations! You have transformed a simple electrical circuit into LAD instructions by performing the following tasks.

- Using the current path to **create a logical flow** for the instructions
- **Inserting contacts and coils** to create a latching circuit
- **Creating tags to link** the instructions to the inputs and outputs of the circuit
- **Uploading the configuration of the CPU** to your project
- **Downloading and testing your user program**



Thank you

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