

# docs

## ATOM / Fieldbus / EtherNet/IP

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# ATOM / Fieldbus / EtherNet/IP / Overview

ⓘ INFO



ATOM is ODVA EtherNet/IP CT19 Conformant.

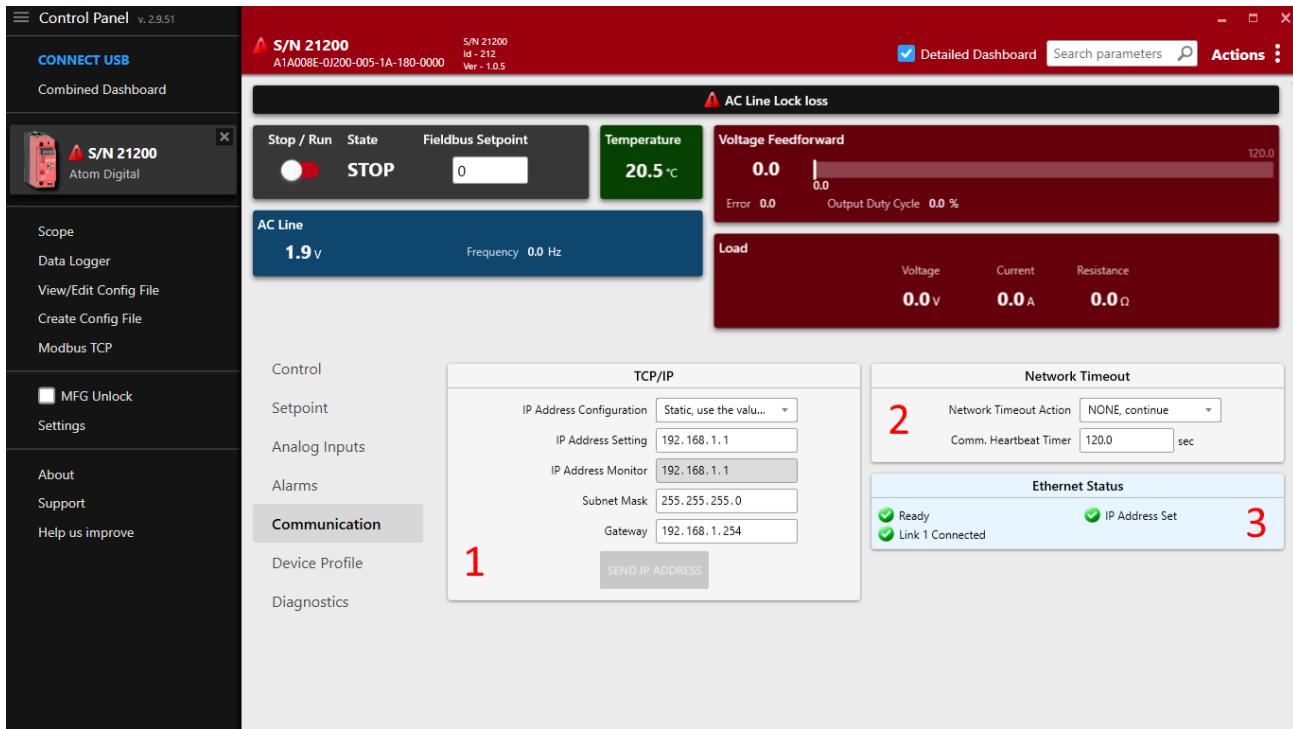
- [Statement of Conformance](#)
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- [Passing Test Report](#)
- [ODVA listing](#)

## EDS

ⓘ INFO

Download the EDS file for ATOM [here](#).

## Control Panel Communication Settings



Some communication settings can be configured in the **Communication** tab in **Control Panel**.

- Section 1: TCP/IP settings
  - **IP Address Configuration**
    - **Static**: Use the IP address, subnet mask, and gateway specified below.
    - **DHCP**: Use DHCP to obtain an IP address.
  - **IP Address Setting**: The IP address of the ATOM controller.
  - **IP Address Monitor**: The current IP address of the ATOM controller.
  - **Subnet Mask**: The subnet mask of the ATOM controller.
  - **Gateway**: The gateway address for the ATOM controller.
- Section 2: Network Timeout
  - The EtherNet/IP heartbeat timeout (Encapsulation Inactivity Timeout) in seconds.
  - You can configure a network timeout action to perform when the device loses communication with the PLC:
    - **None**: Do nothing

- **STOP, fault shutdown:** STOP the controller, disabling output
  - **Use network timeout setpoint:** Configure an alternative setpoint to use when the controller loses communication with the PLC.
- Section ③: Ethernet status
    - Indicates the status of both RJ45 ports, IP address configuration, conflict detection, and any other errors with the EtherNet/IP connection.

### ⓘ INFO

## Control Panel and PLC software

These settings are synchronized with your PLC environment. You do not have to use Control Panel to change these settings - you can stay in your PLC software. Control Panel merely provides them as an alternative way to configure ATOM's EtherNet/IP settings.

You can use Control Panel simultaneously with your PLC software without issues.

### ⚠ WARNING

## IP Address Conflict Detection

ATOM uses **IP Address Conflict Detection** to detect IP address conflicts on the network. If ATOM detects another device using the same IP address, it will disable all network communication until the conflict is resolved.

Please ensure all devices on the network are assigned unique a IP address.

# Hardware considerations

**⚠️ WARNING**

## Daisy chaining

As ATOM has two RJ45 ports, it can be easily daisy-chained. When daisy-chaining ATOM, take care to avoid a loop in the network. In some loop configurations, ATOM is susceptible to network broadcast storms, which can cause the controller to become unresponsive. If you are daisy-chaining ATOM, ensure that the network is loop-free.

ATOM works with both unmanaged and managed switches. We recommend a managed switch for larger networks to give you more control over the network topology.

# Parameters

## Overview

ATOM makes 30 parameters accessible to EtherNet/IP. These parameters are made available through the CIP Assembly Object (code `0x04`) and a custom ParameterLink object (code `0x64`). The assembly object is most commonly used to read and write parameters from a PLC. The ParameterLink object is a custom object defined by Control Concepts that can be used to individually control parameters and is less commonly used.

## Output Assembly (Class `0x04`, Instance `0x01`)

#	Name	Type	Description	Read/Write
1	Digital setpoint	DINT	A value between 0 and 10,000 indicating the desired output current. The value is scaled to the output range of ATOM. For example,	Read/Write

#	Name	Type	Description	Read/Write
			if the output range is 0-100A, a value of 5000 would set the output to 50A.	
2	Digital run enable	BOOL	Enables or disables the output current. When disabled, the output current is set to 0A.	Read/Write

## Input Assembly (Class 0x04, Instance 0x02)

#	Name	Type	Description	Read/Write
3	Inhibit Alarm Status	BYTE	A bitfield indicating alarms that are preventing controller operation. See <a href="#">Inhibit Alarm Status</a> .	Read
4	Warning Alarm Status	BYTE	A bitfield indicating warning alarms. See <a href="#">Warning Alarm Status</a> .	Read
5	Feedback Read Status	BOOL	A bitfield indicating if controller has acquired feedback. See <a href="#">Feedback Read Status</a> .	Read
6	AC Line Frequency	REAL	The AC line frequency in Hz.	Read
7	AC Line Voltage	REAL	The AC line voltage in volts.	Read

#	Name	Type	Description	Read/Write
8	Load Voltage	REAL	The load voltage in volts.	Read
9	Load Current	REAL	The load current in amps.	Read
10	Load Resistance	REAL	The load resistance in ohms.	Read
11	Heatsink Temperature	REAL	Heatsink temperature, in degrees celsius.	Read
12	Output Duty Cycle %	REAL	Indicates the amount, in percent, that the output of the controller is ON	Read
13	Setpoint reference	REAL	Reference input to control compensation loop in units determined by "feedback type"	Read
14	Feedback	REAL	The control output supplied to the load in units determined by "feedback type"	Read
15	Partial Load Fault Target Resistance	REAL	Expected nominal resistance, in Ohms, of the load. Used for partial load fault detection.	Read
16	Partial Load Fault Resistance	REAL	The actual load resistance in Ohms. Compared with #15 to determine if a partial load fault has occurred.	Read

#	Name	Type	Description	Read/Write
17	Partial Load Fault Resistance Deviation	REAL	The tolerable percentage that parameter #15 and #16 may differ by until a partial load fault will be triggered.	Read
18	Firmware ID	DINT	Indicates the version of firmware that is loaded, dictating which features are available.	Read
19	Firmware major revision	DINT	Indicates which revision of the firmware is loaded. Major revisions fix critical bugs or add significant new features.	Read
20	Firmware minor revision	DINT	Indicates which minor revision of the firmware is loaded. Minor revisions fix minor issues and/or add minor improvements.	Read
21	Full Scale Voltage	DINT	The expected output voltage when the controller output is fully on.	Read
22	Full Scale Current	REAL	The expected current when the controller output is fully on.	Read
23	AC Line Status	BYTE	A bitfield indicating the status of the connected AC Line. See <a href="#">AC Line Status</a> .	Read

#	Name	Type	Description	Read/Write
24	Load Status	BYTE	A bitfield indicating the load status. See <a href="#">Load status</a> .	Read
25	Controller Status	BYTE	A value indicating the operational status of the controller. See <a href="#">Controller status</a> .	Read
26	Controller State	BYTE	A value indicating the controller state. See <a href="#">Controller state</a> .	Read
27	EEPROM Status	WORD	A bitfield indicating the EEPROM status. See <a href="#">EEPROM Status</a> .	Read
28	EEPROM Status 2	WORD	Identical to parameter #27	Read
29	Error Latch	BYTE	A bitfield used for diagnostic troubleshooting. See <a href="#">Error Latch</a> .	Read
30	Miscellaneous Status	BYTE	A bitfield indicating miscellaneous status information. See <a href="#">Miscellaneous Status</a> .	Read

## Additional parameter descriptions

### Inhibit Alarm Status

Inhibit alarm status is a 8-bit bitfield:

7	6	5	4	3	2	1
Reserved	Reserved	Reserved	Reserved	Feedback Loss	Over Temperature	Over Current Trip

If any bit is set to 1, the controller will *not* be allowed to run.

## Warning Alarm Status

Warning alarm status is a 8-bit bitfield:

7	6	5	4	3	2	1	0
Reserved	Reserved	High temperature	Shorted SCR	Open Load	Partial Load Fault	Current Limit	Voltage Limit

Warning alarms are not considered critical and will not prevent the controller from running.

## Feedback Read Status

Feedback status is a 8-bit bitfield:

7	6	5	4	3	2	1
Reserved Ti						

Indicates whether the controller has acquired feedback on the line. If any bit is set to 1, then the controller has lost feedback.

## AC Line Status

AC Line status is a 8-bit bitfield:

7	6	5	4	3	2	1	0
Reserved	Reserved	Sync-Locked (to AC Line)	Pre-Lock 2	Pre-Lock 1	Reserved	AC Line B OK	AC Line A OK

Bits 5 must be set to 1 before the controller can provide power to the load.

## Load Status

Load status is a 8-bit bitfield:

7	6	5	4	3	2	1	0
Reserved	Reserved	Reserved	Open Load	Reserved	Reserved	Reserved	Short SCR

## Controller Status

Controller status is one of:

Value	Description
0	Disabled
1	Initialization
2	Normal, operating

Value	Description
3	Calibration
4	Diagnostic

## Controller State

Controller state is one of:

Value	State	Description
0	STOP	The state the controller is in when AC Line voltage is not present.
1	RUN	The state the controller is in when AC Line voltage is present and the controller is synchronized to the AC line.
2	FAULT	A latching state of output shutdown caused by over current or over temperature alarms. A power cycle or processor reset is required to clear this state.
3	FAULT RESET	Used as a temporary state to transition from FAULT to RUN once again.

## EEPROM Status

EEPROM status is an 16-bit bitfield. EEPROM is used to store controller configuration and calibration data. Any errors in EEPROM may indicate that the firmware is corrupted.

Bit	Description
0	EEPROM Initialization
1	SP Table Error
2	MFG CP Table Error
3	Calibration Table Error
4	Reserved
5	Reserved
6	Backup Calibration Table Error
7	Bottom Board Calibration Table Error
8	SP Definition Table needs updating
9	Bottom Board Calibration Backup Error
10	Reserved
11	Reserved
12	EEPROM is write protected
13	Reserved
14	Reserved

Bit	Description
15	Feedback Calibration Table has changed, store to EEPROM

## Error Latch

Error latch is a 8-bit bitfield:

7	6	5	4	3	2	1	0
Reserved	Reserved	Reserved	Feedback loss	SCR timing loss	Line Frequency failure	Phase loss or missing cycle	Line Lock Loss

Error latch is provided as a diagnostic troubleshooting aid.

## Miscellaneous Status

Miscellaneous status is an 8-bit bitfield:

7	6	5	4	3	2	1
Reserved	Initialization in progress	Reserved	Reserved	Waiting for ENTER key during initialization	Reserved	USB Poweron

## Data types

The data types listed above in the parameter table are defined in the CIP standard as:

Type	Size	Description
BOOL	1 byte	Boolean value
BYTE	1 byte	8-bit bitmap
WORD	2 bytes	16-bit bitmap
DWORD	4 bytes	32-bit bitmap
LWORD	8 bytes	64-bit bitmap
USINT	1 byte	Unsigned 8-bit integer
UINT	2 bytes	Unsigned 16-bit integer
UDINT	4 bytes	Unsigned 32-bit integer
ULINT	8 bytes	Unsigned 64-bit integer
SINT	1 byte	Signed 8-bit integer
INT	2 bytes	Signed 16-bit integer
DINT	4 bytes	Signed 32-bit integer
LINT	8 bytes	Signed 64-bit integer
REAL	4 bytes	32-bit floating point number
LREAL	8 bytes	64-bit floating point number

**ⓘ INFO**

Rockwell's RSLogix Studio 5000 does not support unsigned integers. Any EDS file that contains unsigned integers will cause issues when it is imported into Studio 5000. To avoid this issue, ATOM uses signed integers for all integer types, regardless of whether the value may be negative or not. For example, parameter #1, *Digital setpoint* is represented as a signed 32-bit integer, but it may never be negative.

## Other resources

 **ⓘ INFO**

Detailed information about ATOM's EtherNet/IP profile is also available as a [downloadable word document](#).

## Advanced

ATOM has many more parameters beyond the 30 made available through EtherNet/IP. The default profile listed above should be sufficient for the majority of use cases.

If this is not the case, you can use [Control Panel](#) to adjust or monitor all parameters.

In the rare case that you need more parameters available through ATOM's EtherNet/IP profile, Control Concepts does have the ability to make additional parameters available or to change the data type of included parameters. Please [contact us](#) if you would like a custom EtherNet/IP profile. There may be a service fee for custom EtherNet/IP profiles as they require new EDS files, device-reconfiguration and testing.

# ATOM / Fieldbus / EtherNet/IP / RSLogix Studio 5000

## Overview

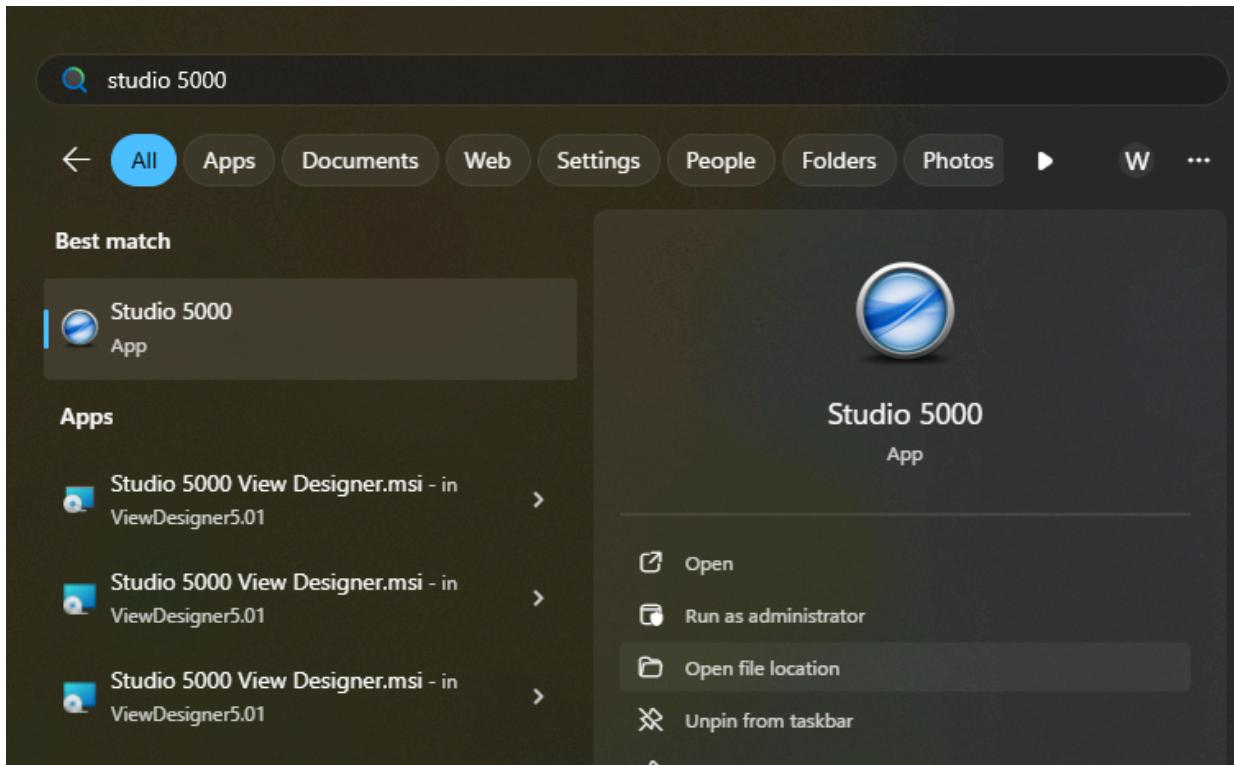
In this tutorial, you'll learn how to control ATOM over EtherNet/IP with RSLogix Studio 5000.

 **NOTE**

If you'd like to skip this tutorial, download the completed example project:  
[AtomExampleStudio5000.zip](#).

## Prerequisites

1. A PC with RSLogix Studio 5000 installed (See [Installation Troubleshooting](#) for help with installation issues):

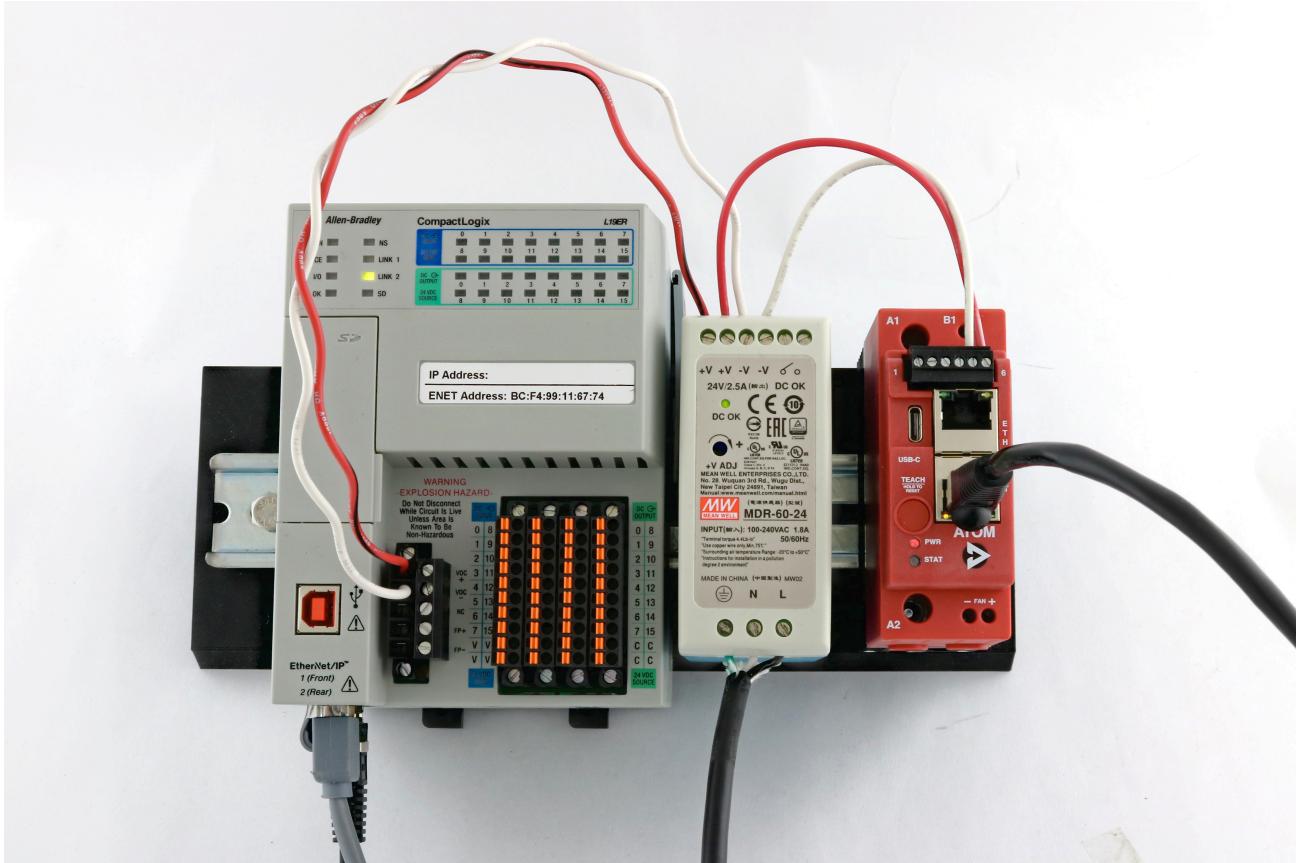


2. A Logix PLC - a CompactLogix 1769-L19ER-BB1B is used in this example, but you can follow along with any Logix PLC that supports EtherNet/IP.
3. Download ATOM's EDS file: [Atom.eds](#)

## Hardware Setup

Connections:

- Connect port **1 (Front)** on your PLC to your PC
- Connect port **2 (Rear)** on your PLC to ATOM (either port)
- Connect a 24VDC power supply to ATOM and your PLC

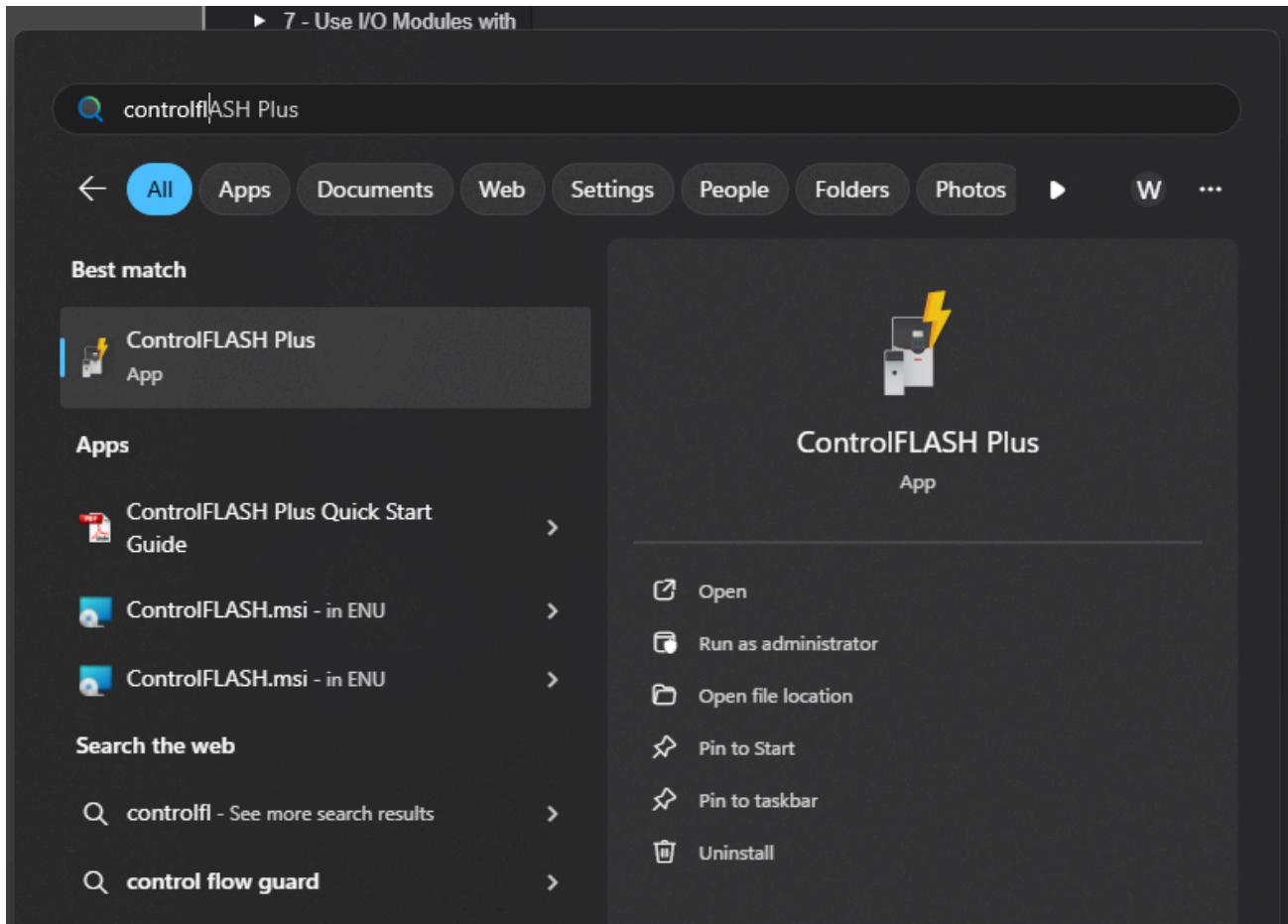


# PLC Configuration

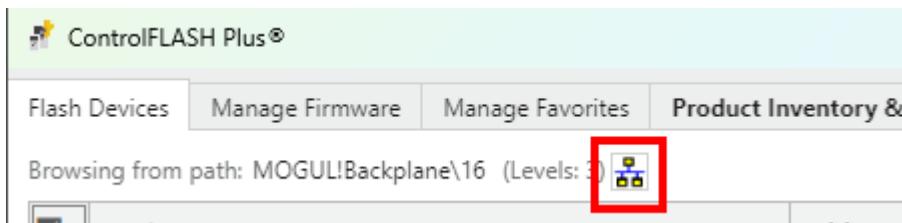
## Upgrading firmware

Make sure to upgrade your PLC firmware to the lastest version to ensure compatibility with Studio 5000.

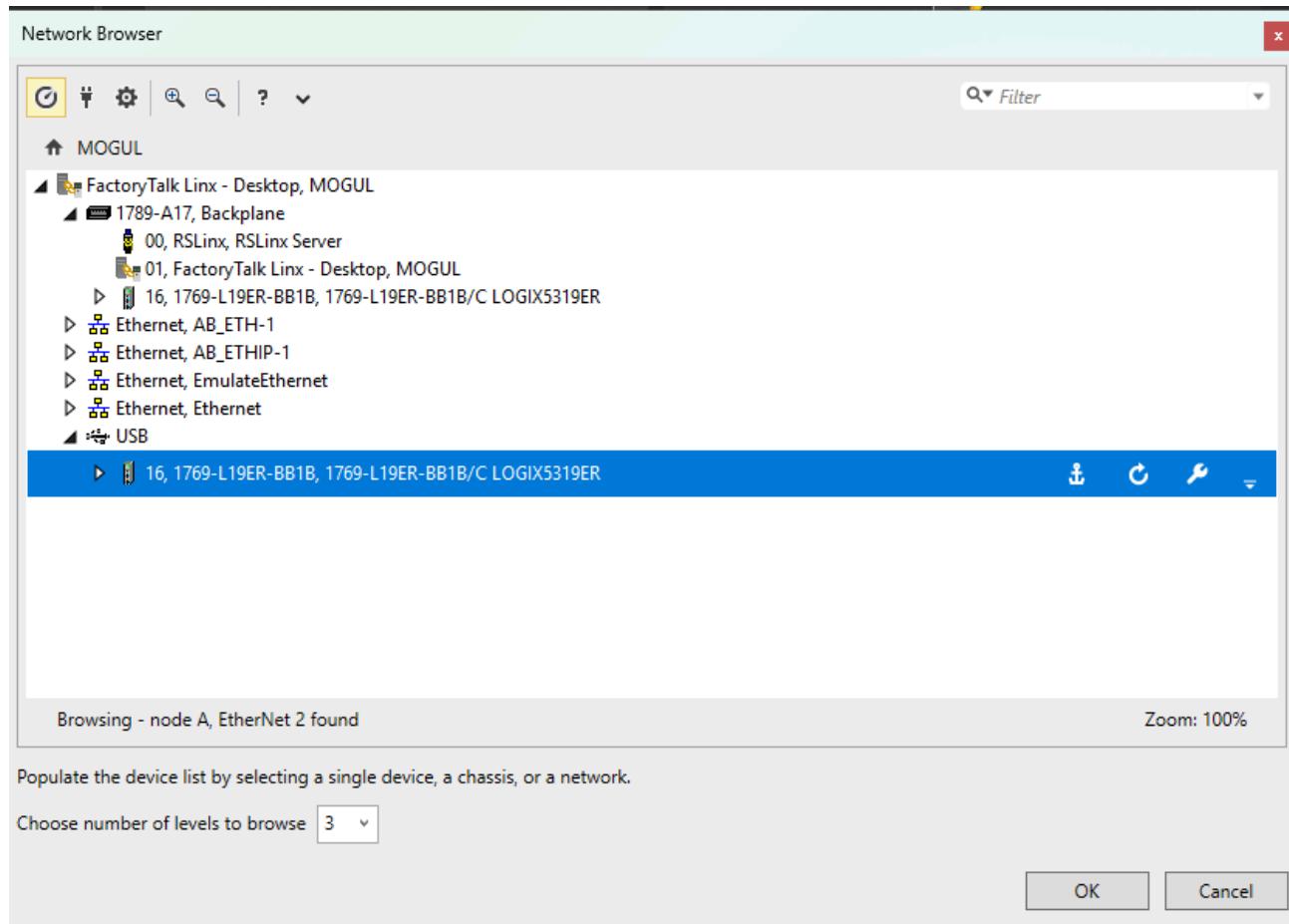
1. Connect your Logix PLC to your PC with a USB cable.
2. Launch **ControlFLASH Plus**:



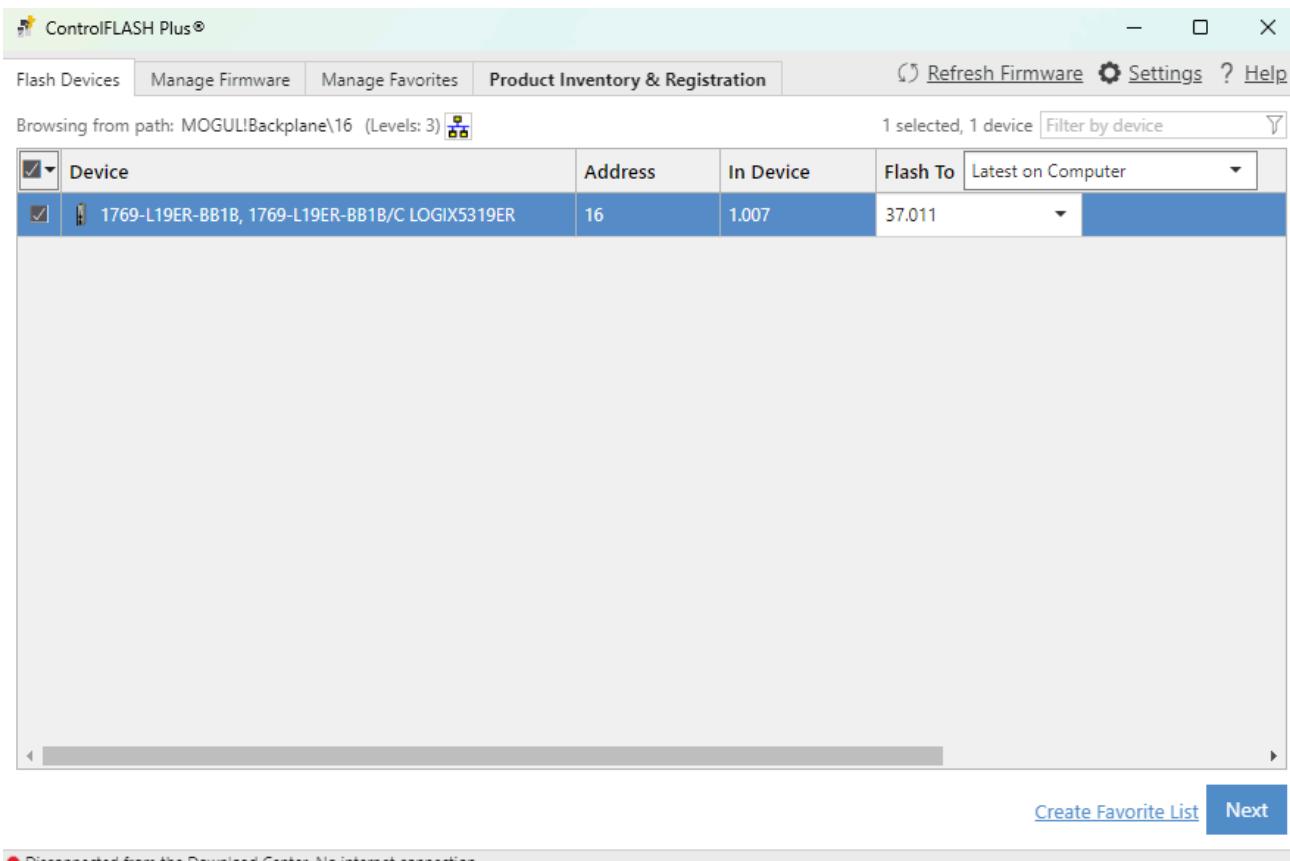
3. Open the network browser:



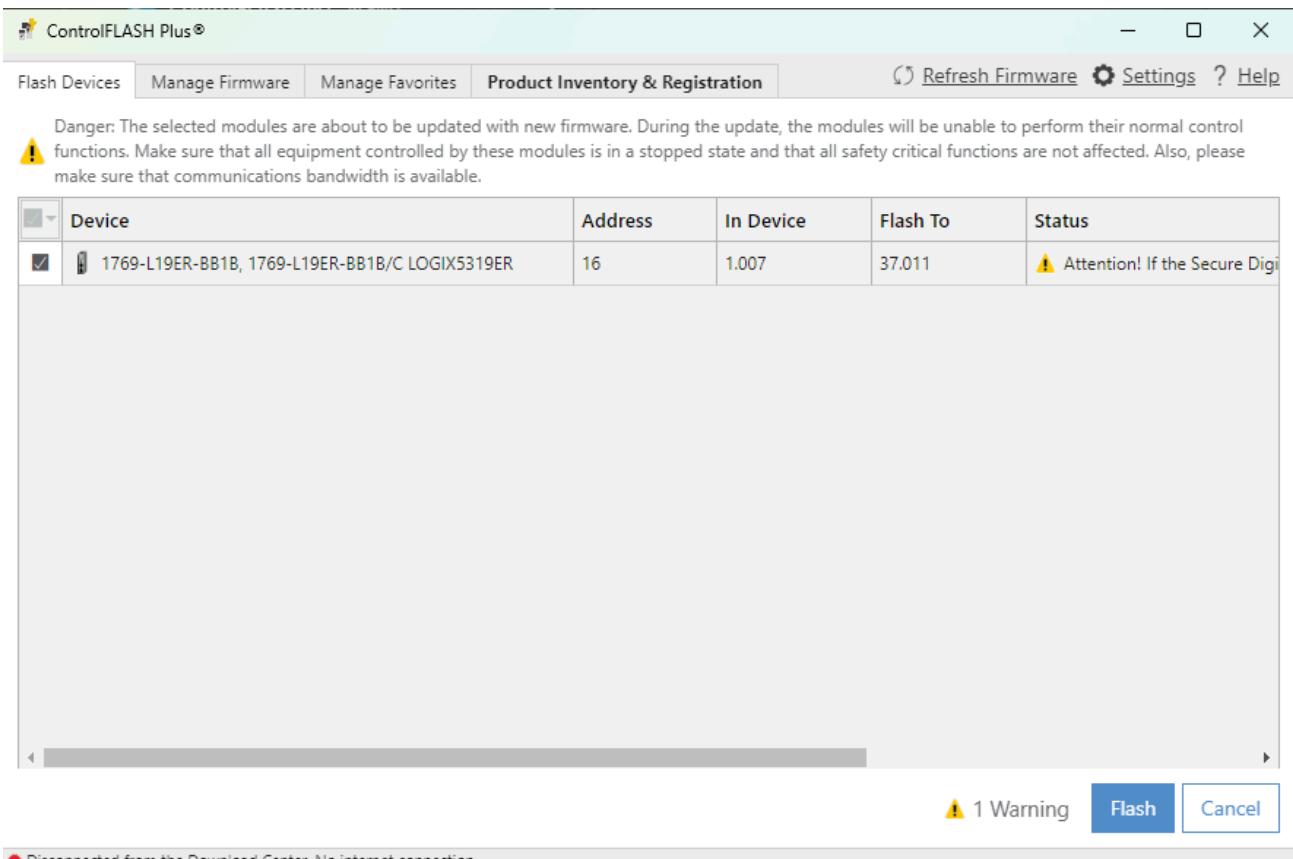
4. Select your PLC under the **USB** category:



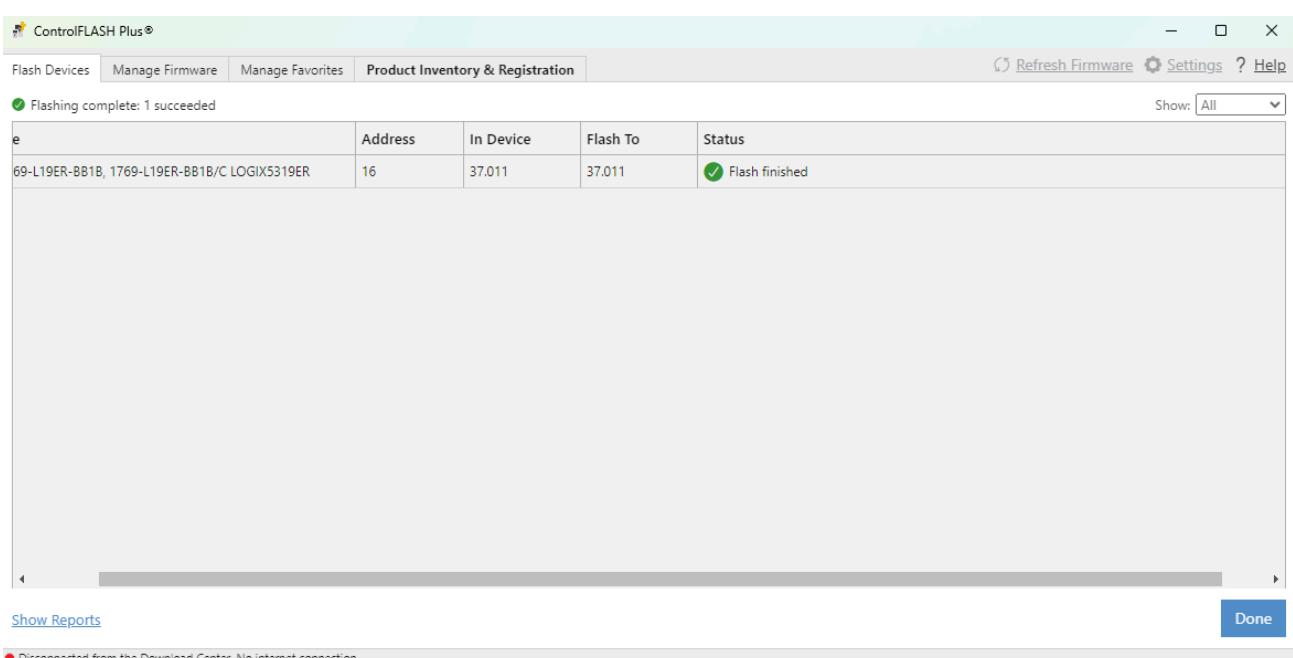
5. Select the device and latest firmware version, then click **Next**:



6. Click **Flash**:

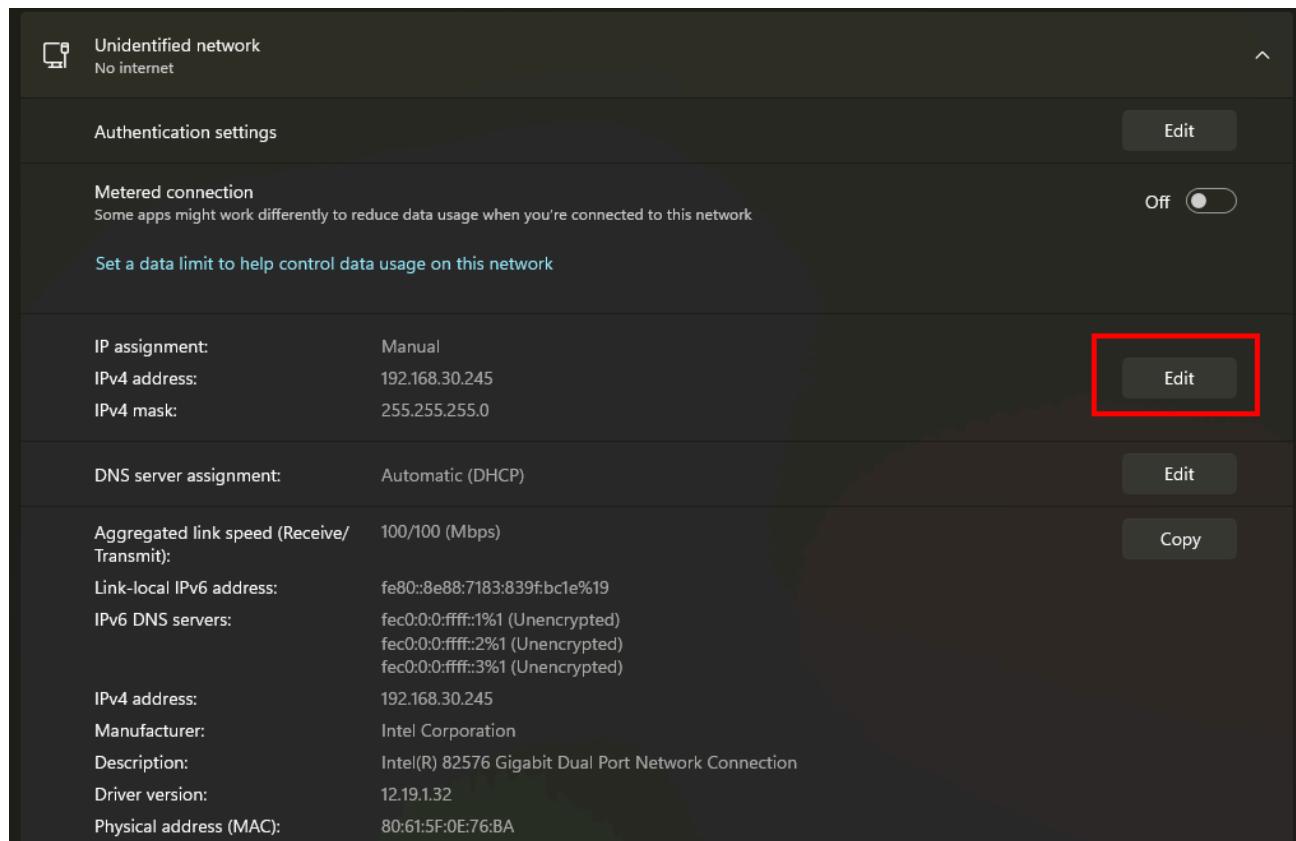


## 7. After flashing succeeds, reboot your PLC.



## Configuring your PC's network settings

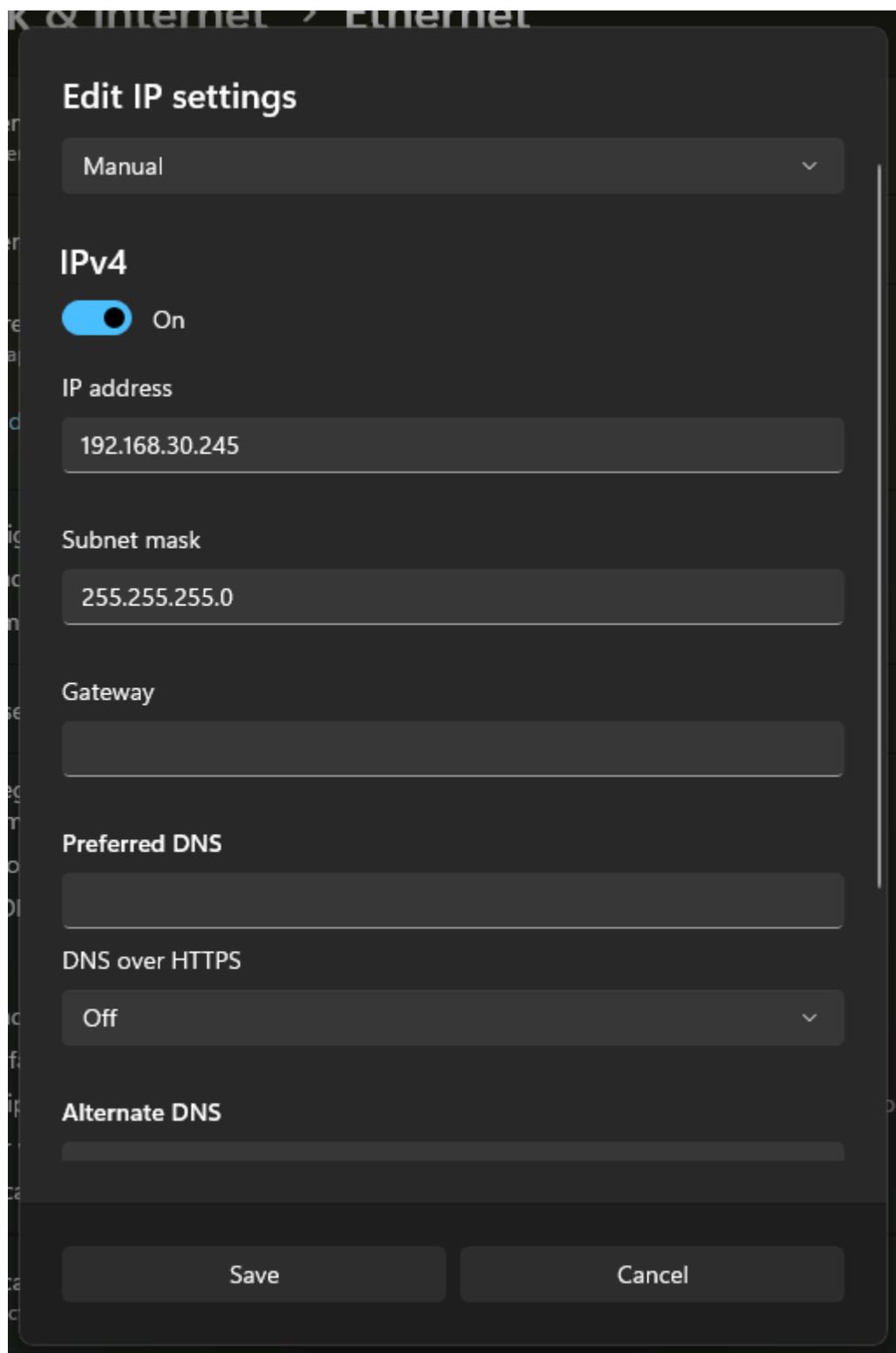
1. Open your PC's network settings and select edit on the Ethernet adapter connected to your PLC:



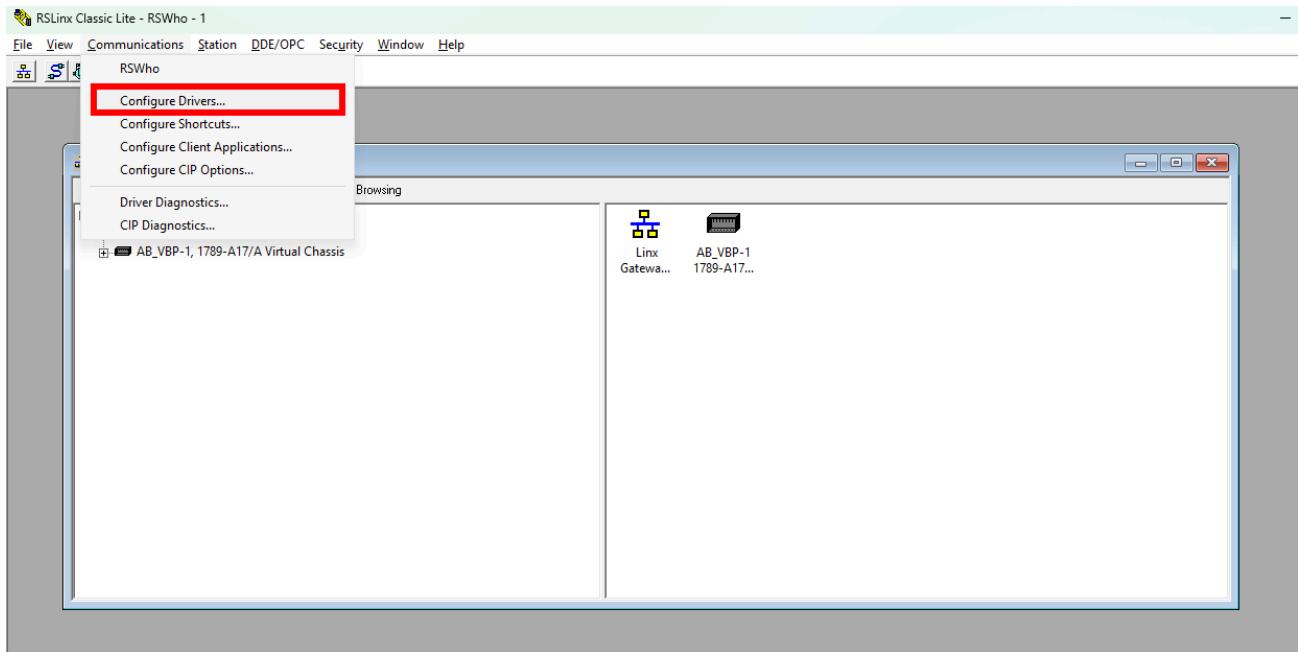
2. In the **Edit IP Settings** dialog, set:

- **IP Address:** 192.168.30.245
- **Subnet Mask:** 255.255.255.0

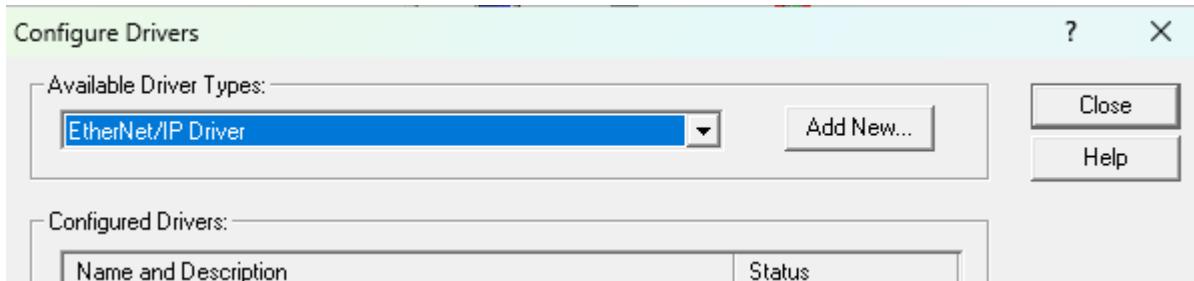
Click **Save** to apply the settings.



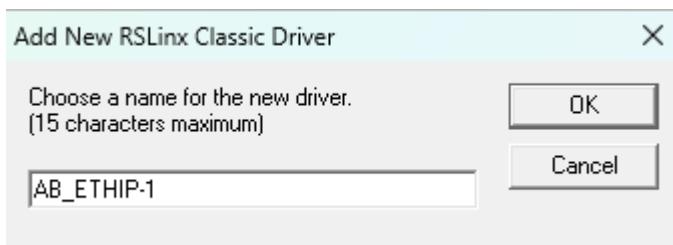
3. Open RSLogix Classic and select **Communications > Configure Drivers:**



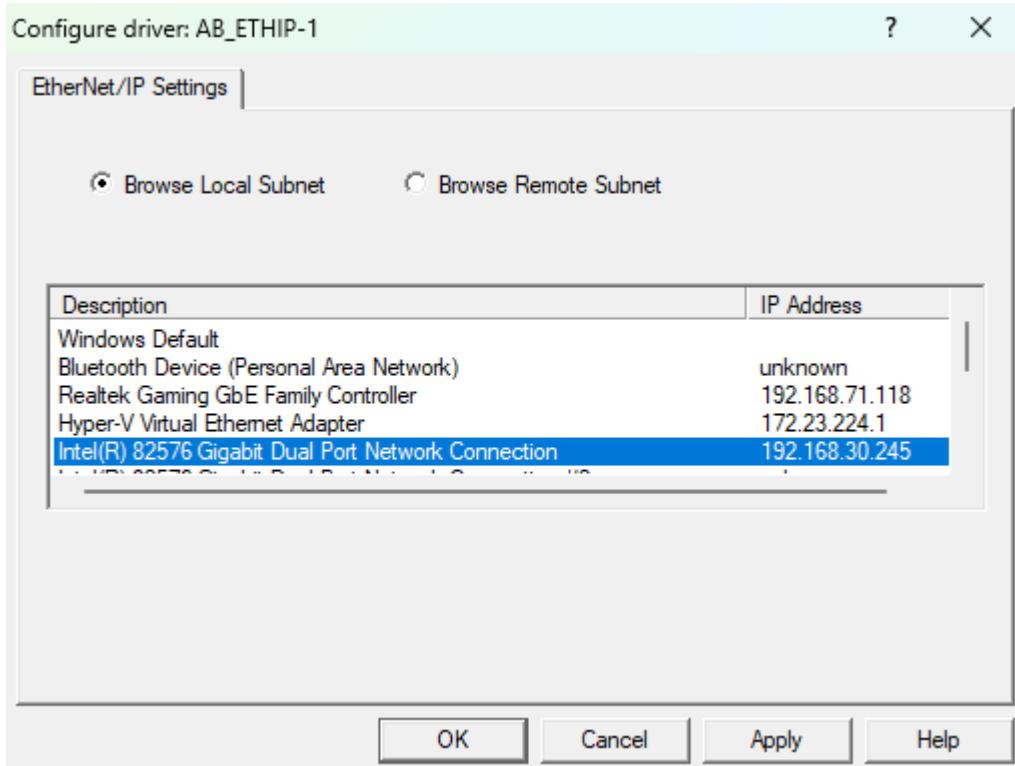
4. Select **EtherNet/IP Driver** and click **Add New**:



5. Click **OK** to add the driver:

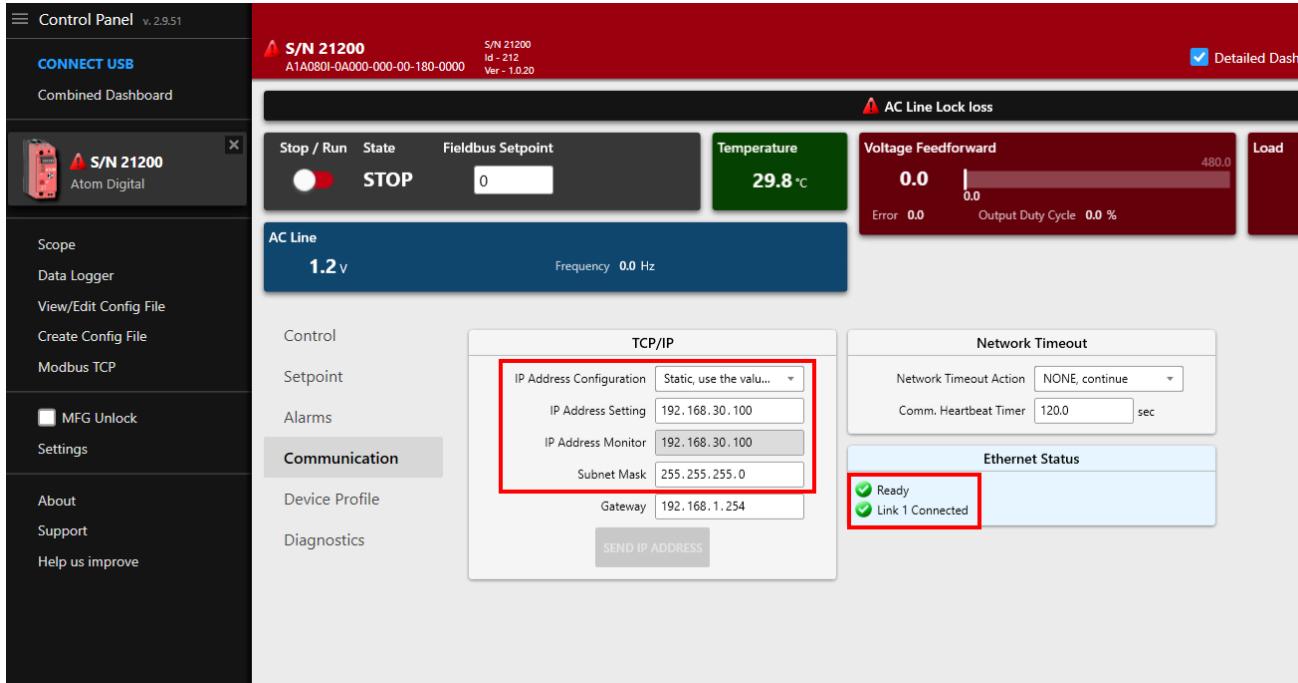


6. Select the adapter with IP address **192.168.30.245**, then hit **Apply** and **OK**:



# ATOM Configuration

1. Connect ATOM to your PC using a USB-C cable. Launch **Control Panel** and connect to your ATOM. In the **Network** tab, set the following:
  - **IP Address Configuration:** **Static**
  - **IP Address:** **192.168.30.100**
  - **Subnet Mask:** **255.255.255.0**

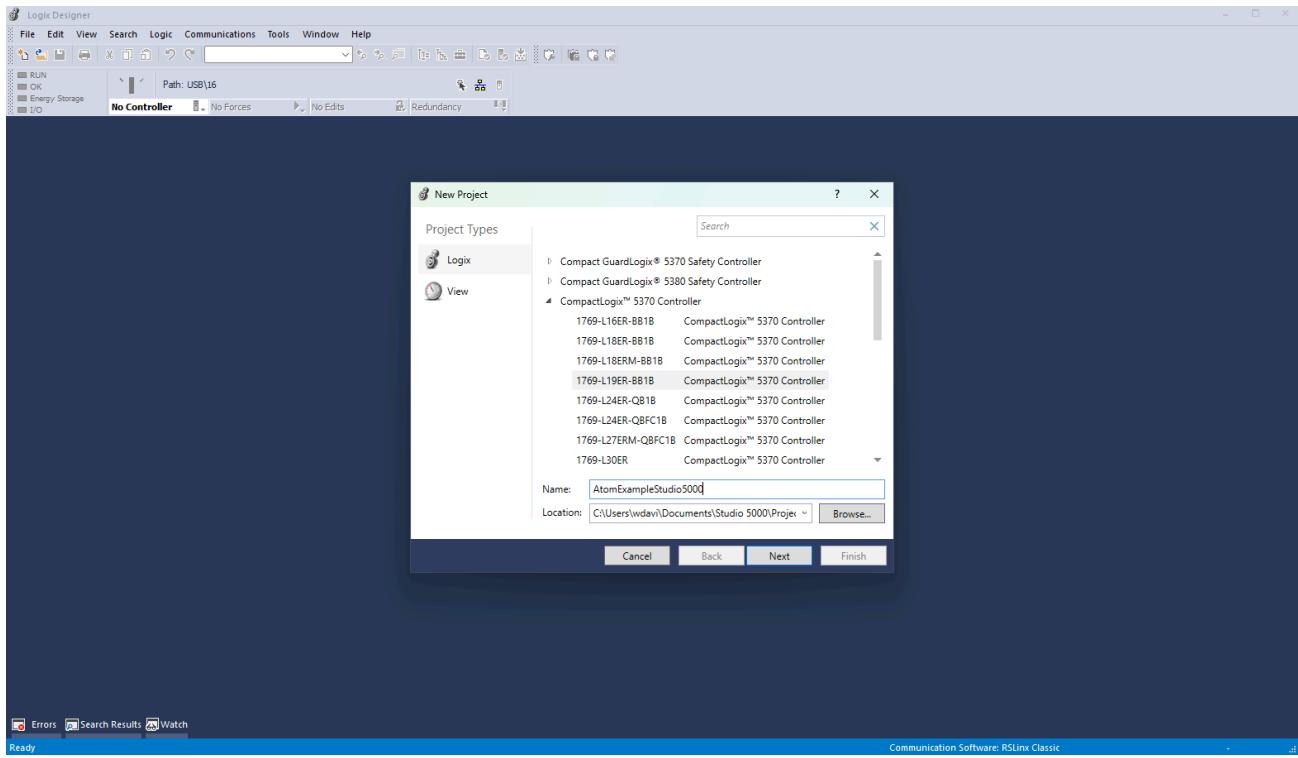


## Create a Studio 5000 project and connect to your PLC

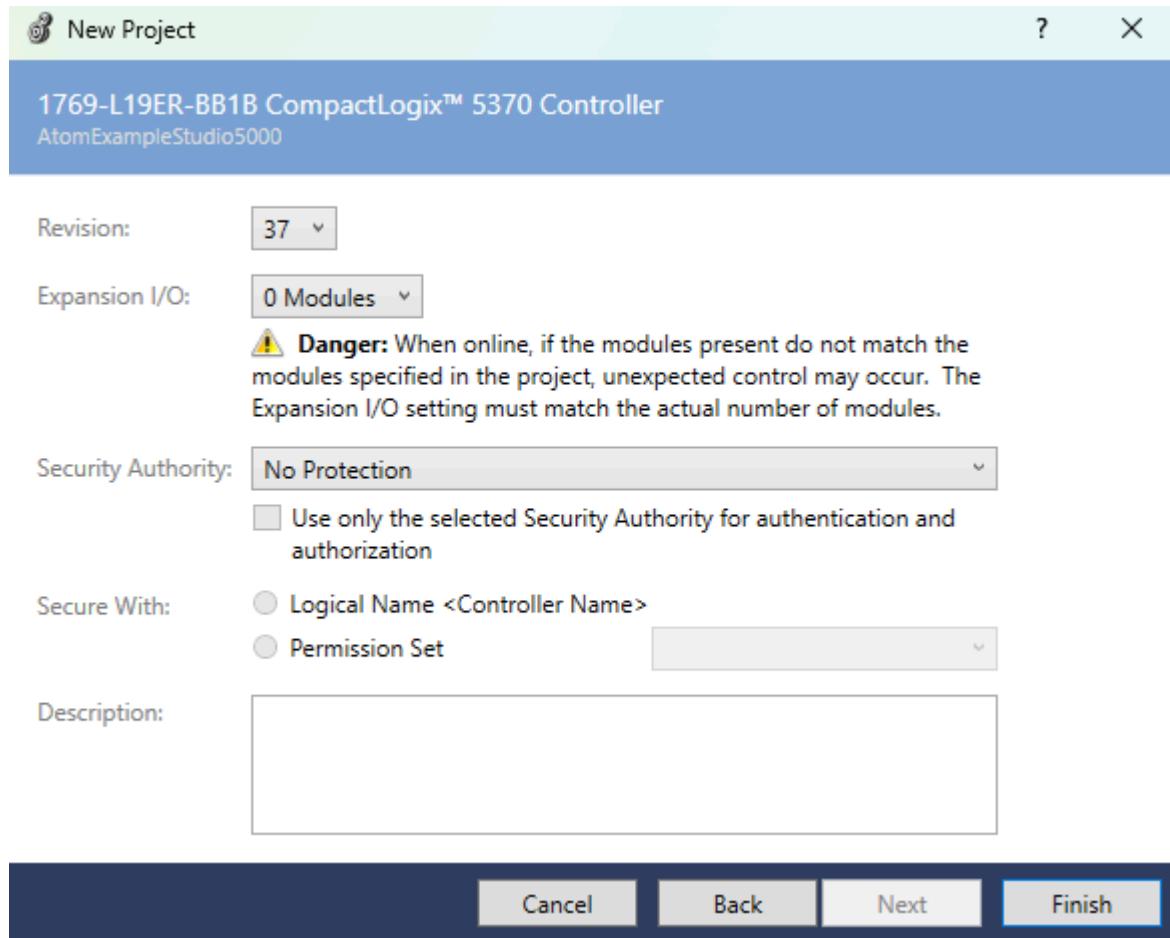
1. Launch Studio 5000, select **File > New Project**. Name the project

AtomExampleStudio5000 and select 1769-L19ER-BB1B (CompactLogix 5370). Click

**OK:**

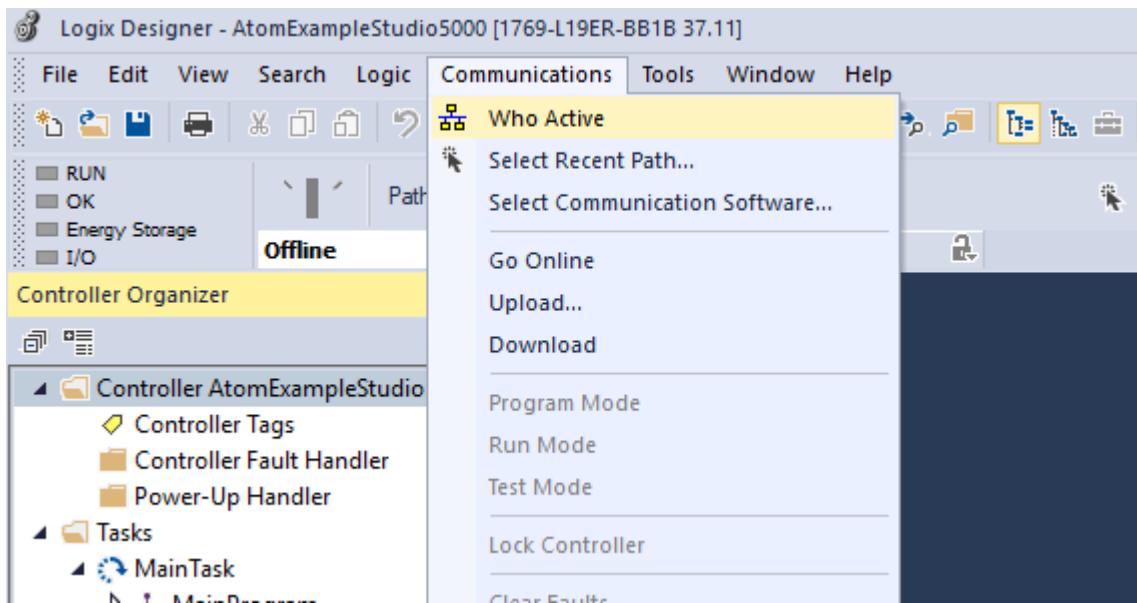


2. Select **0 Modules** under Expansion I/O, then click **Finish**:

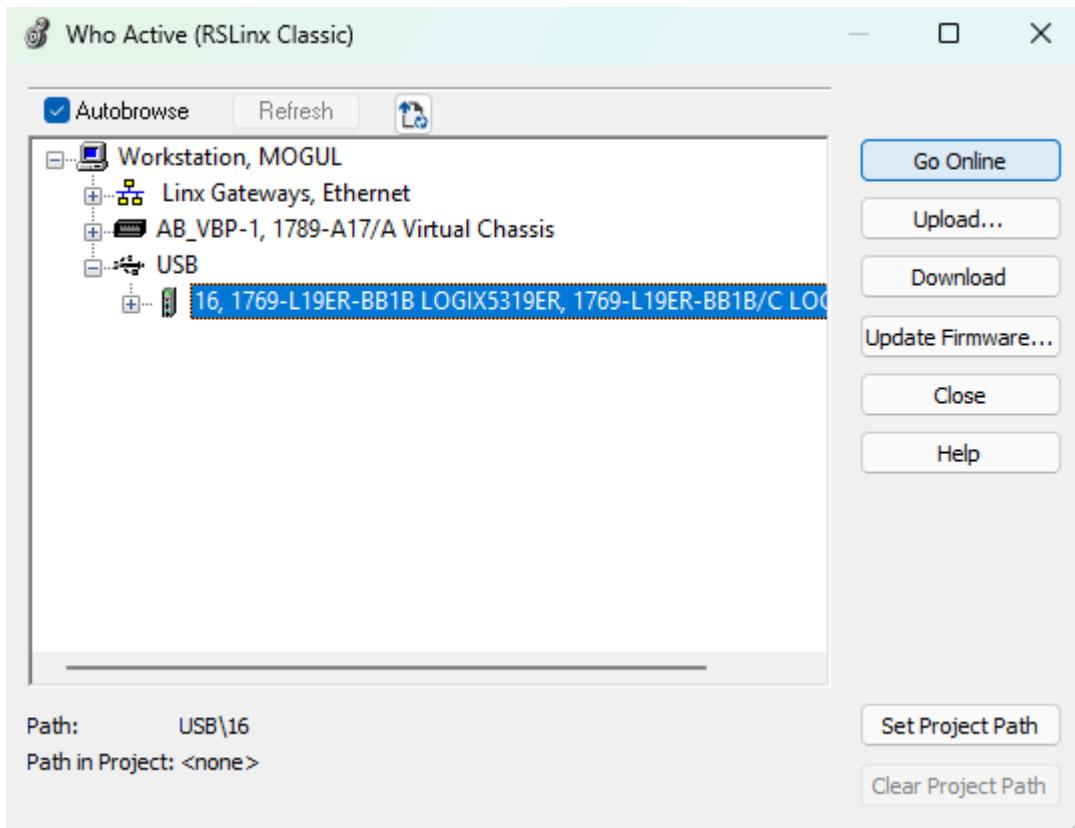


3. Connect your PLC to your PC with a USB-B cable. In Studio 5000, select

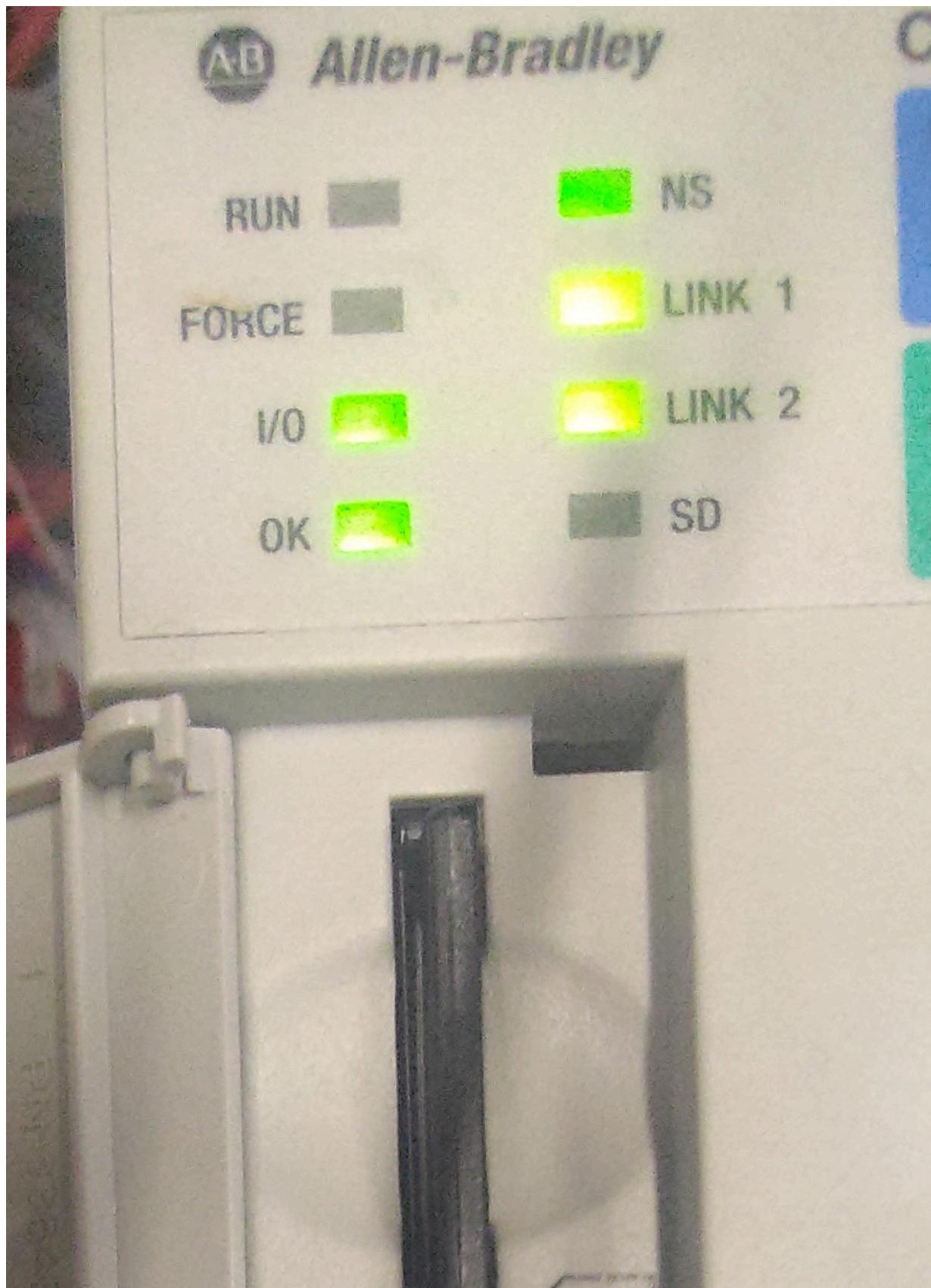
**Communications > Who Active:**



4. Select your PLC under the USB category and click **Go Online**:

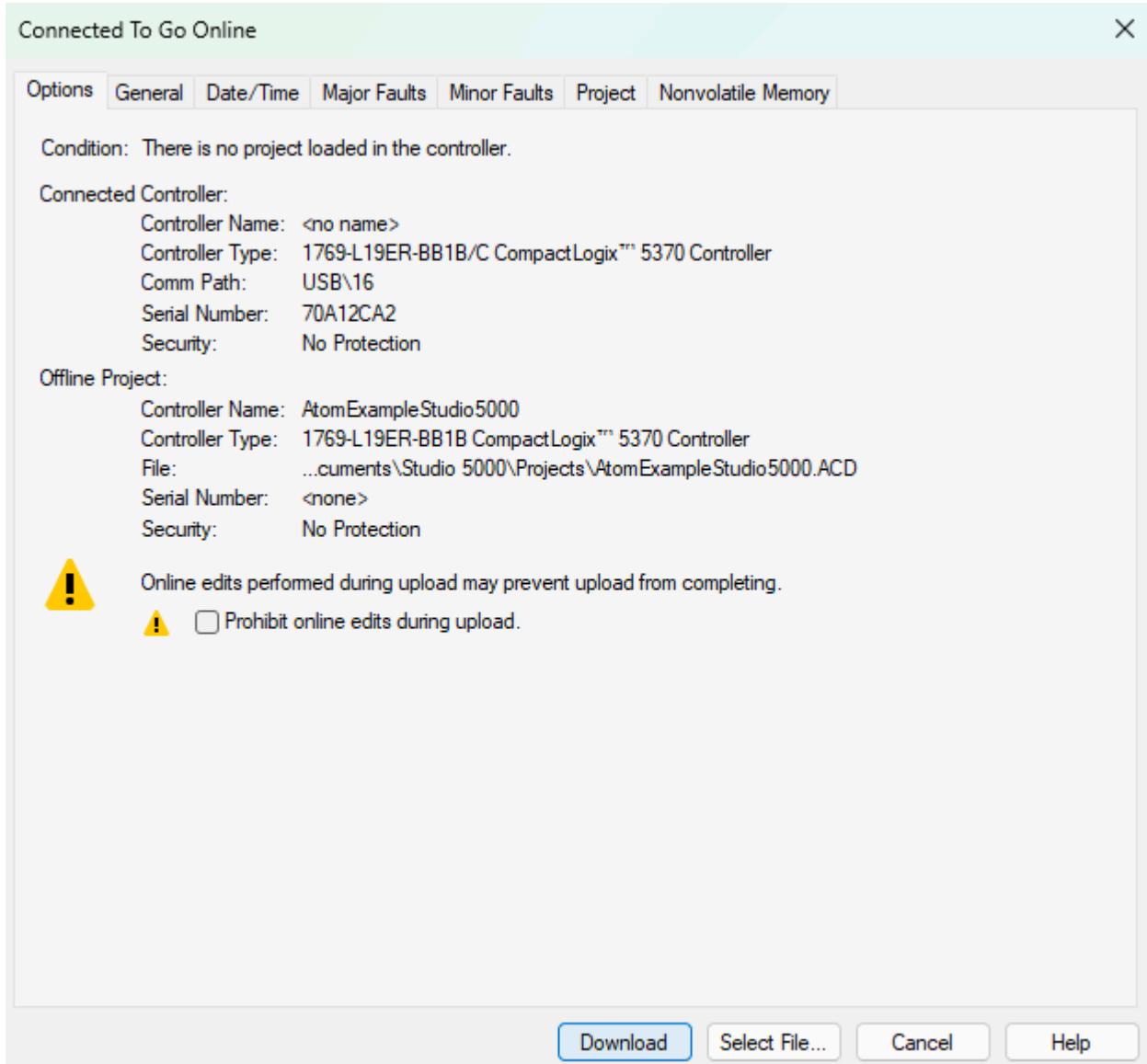


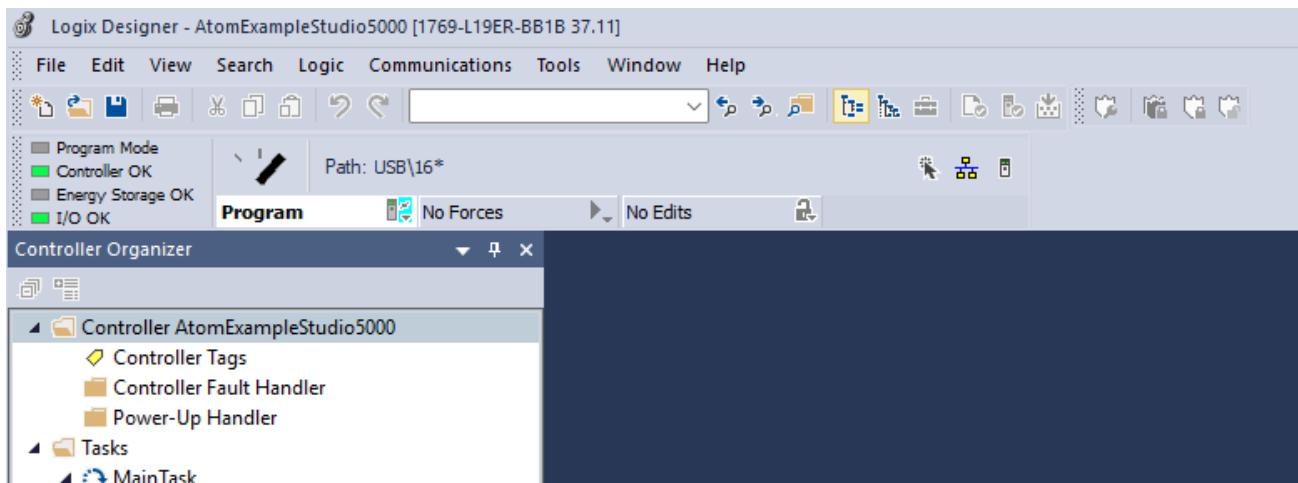
Ensure the switch on your PLC is set to PROG mode before downloading.



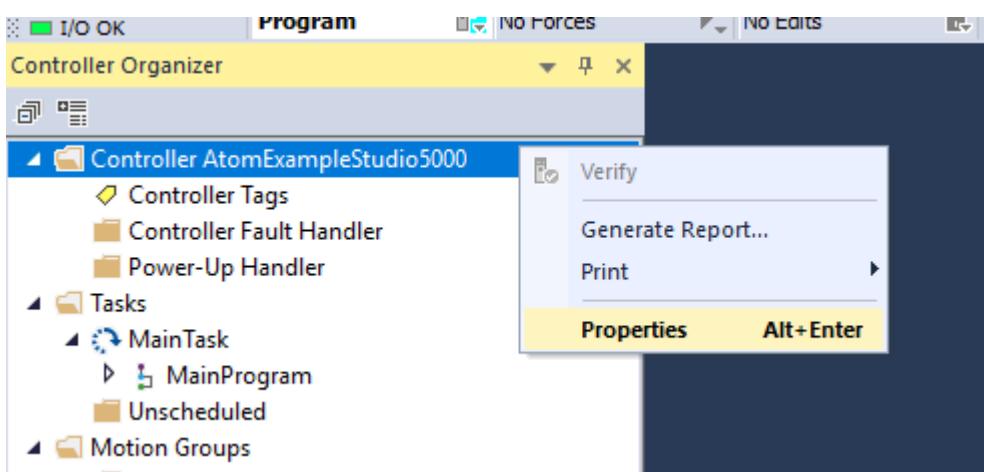


5. Select **Download** and double check that the **Controller OK** indicator light turns green:



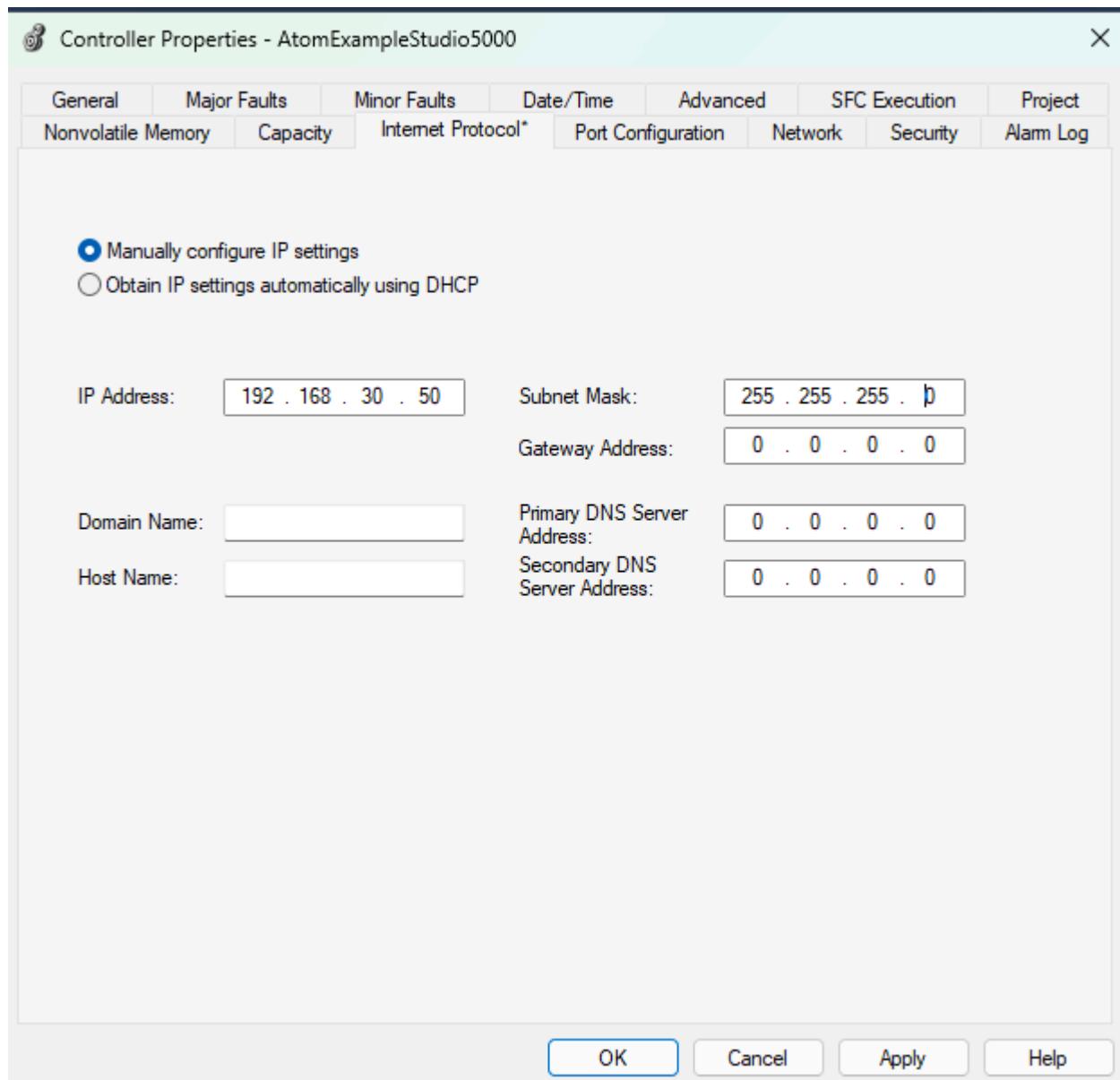


6. Right click **Controller AtomExampleStudio5000** and select **Properties**:

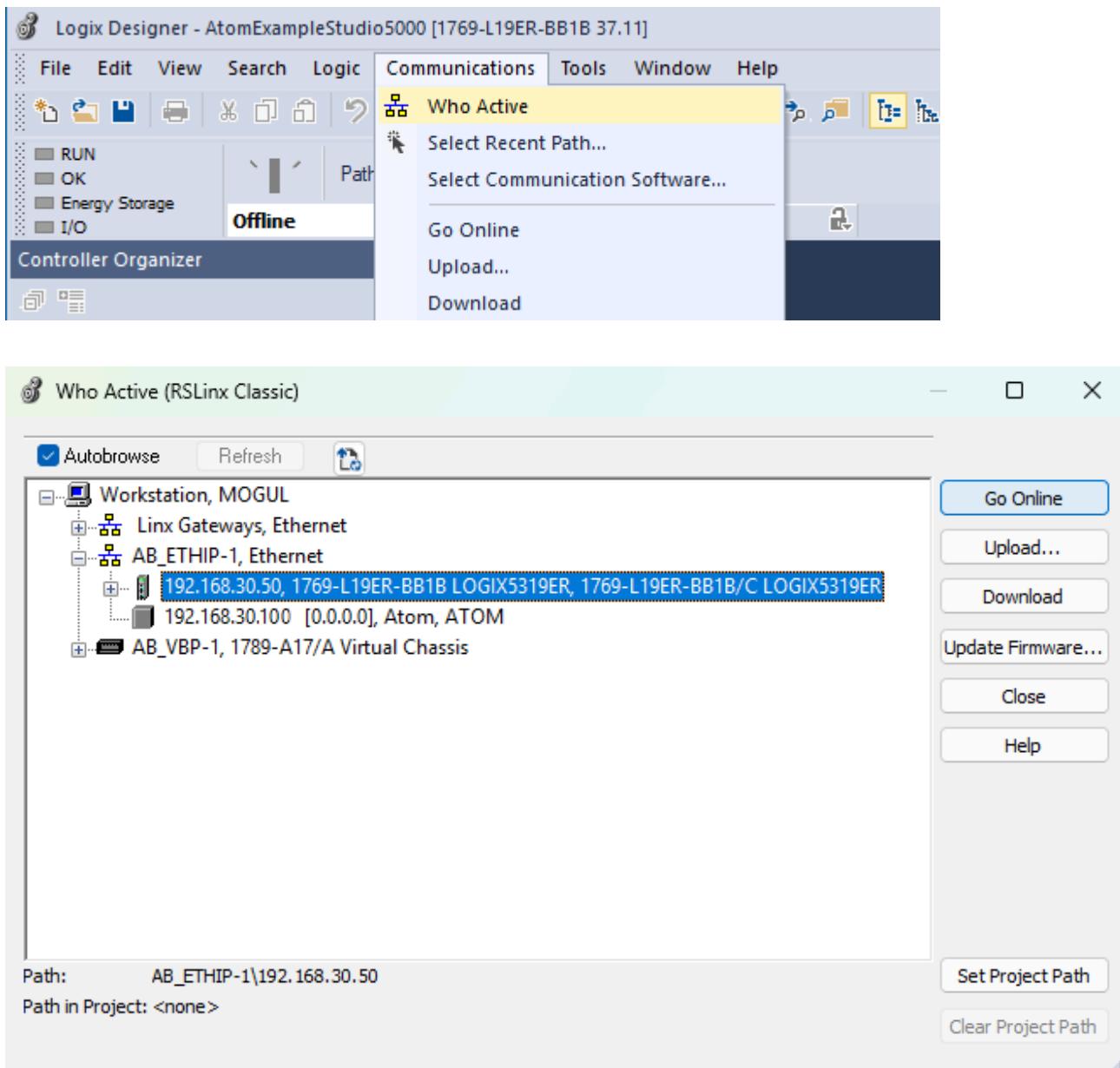


7. In the **Internet Protocol** tab, set the following and hit **Apply** and **OK**:

- Manually configure IP settings checked
- **IP Address:** 192.168.30.50
- **Subnet Mask:** 255.255.255.0



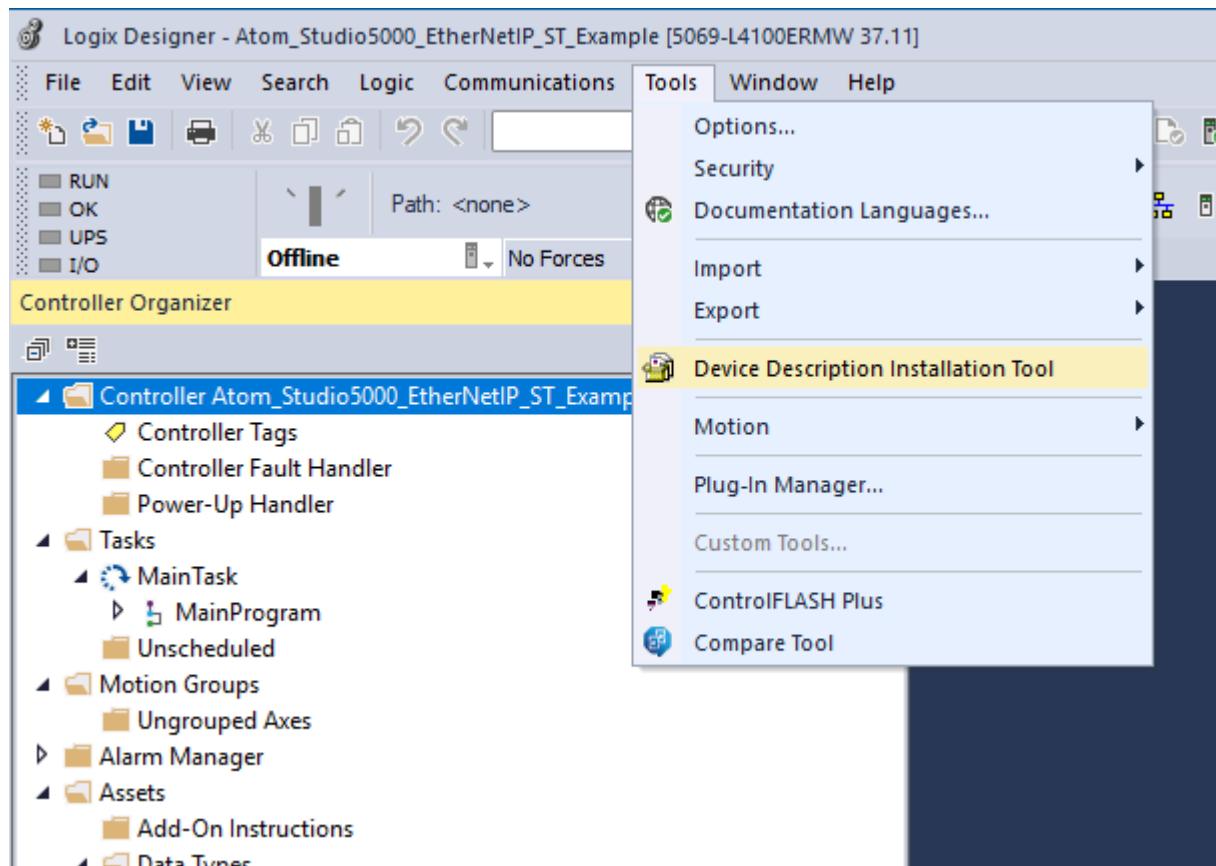
8. Disconnect the USB cable from your PLC. In Studio 5000, select **Communications > Who Active** again, then select your PLC under the Ethernet category and click **Go Online**:

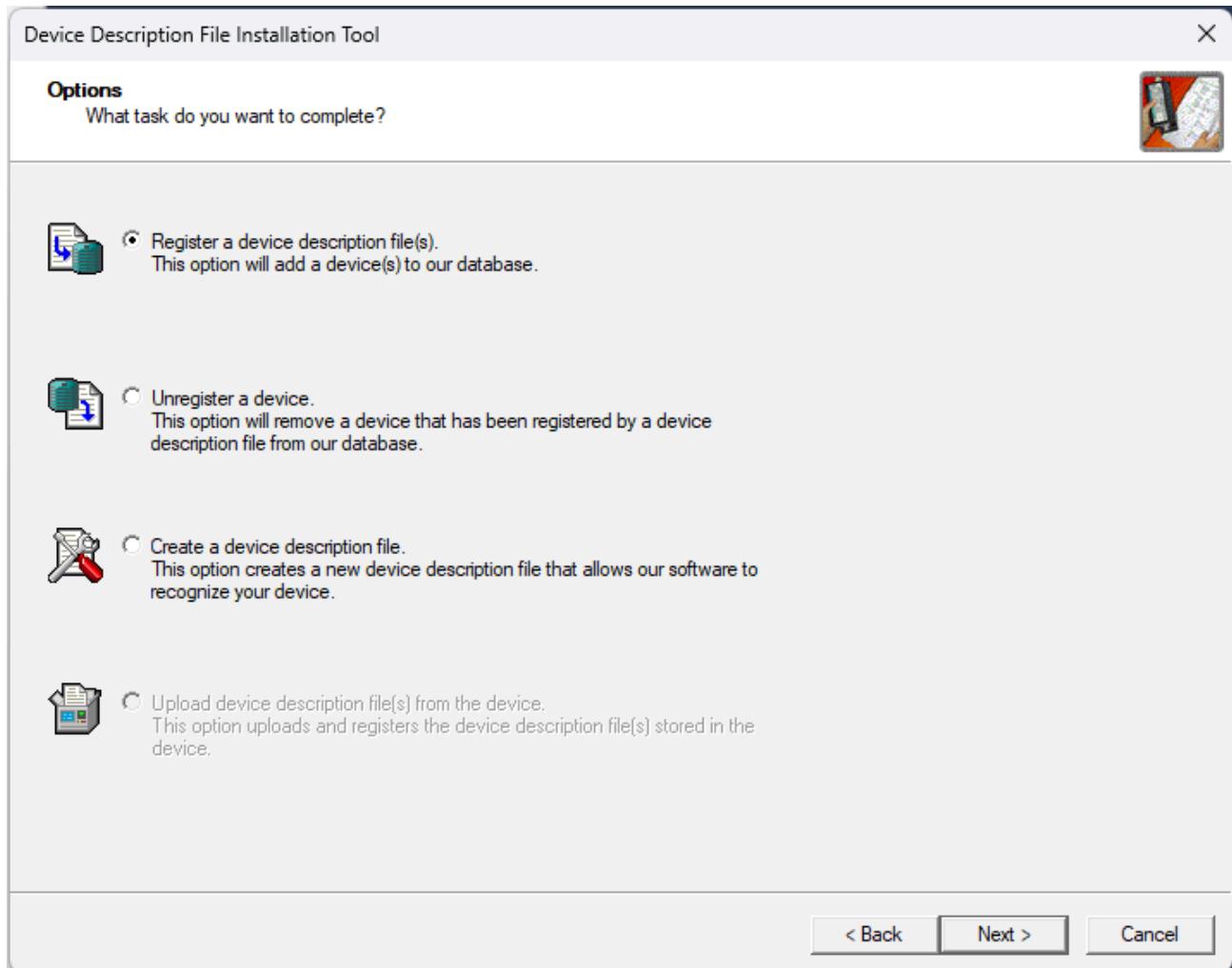


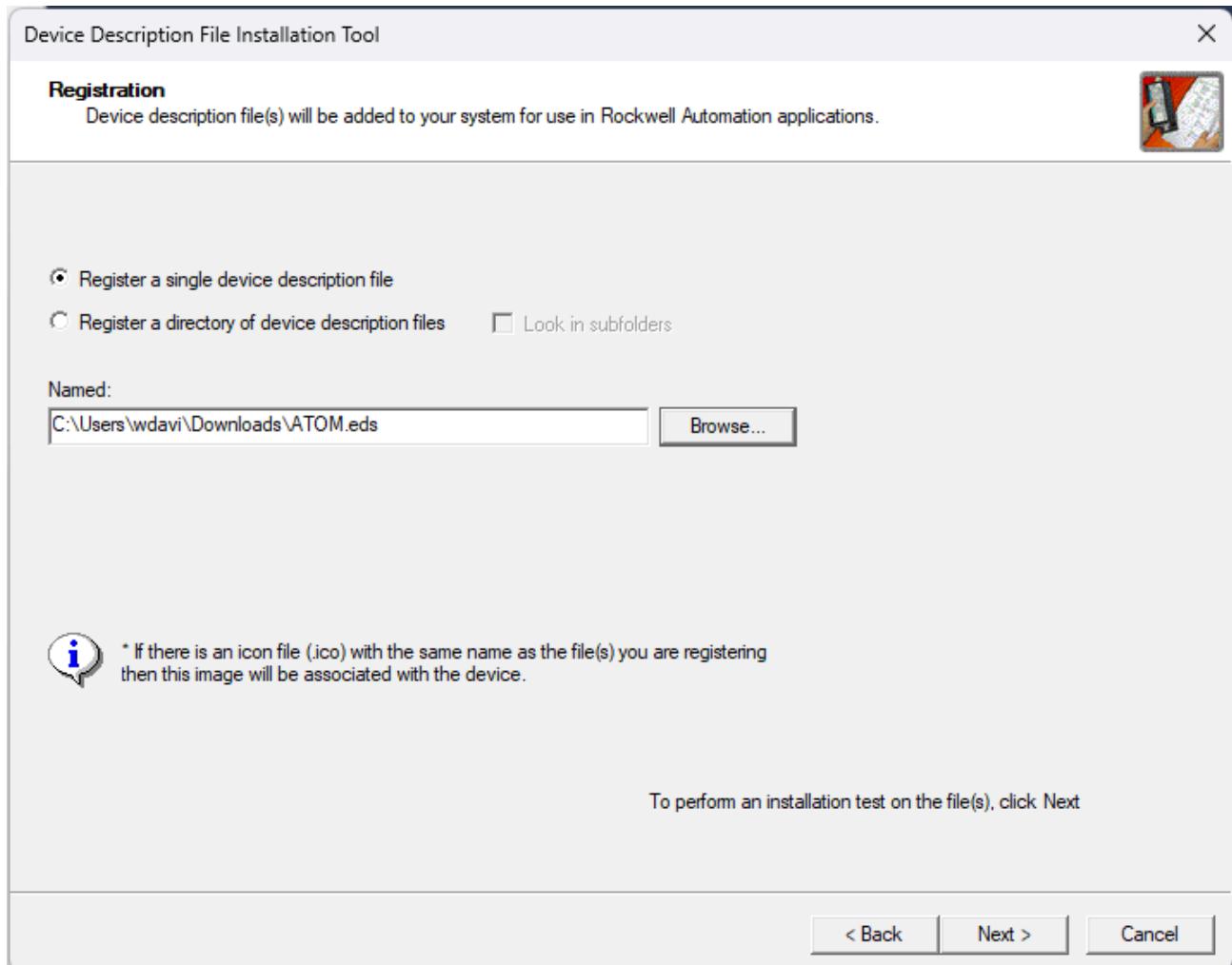
You should also see ATOM (with IP address [192.168.30.100](#)) under the [AB\\_ETHIP-1](#) category.

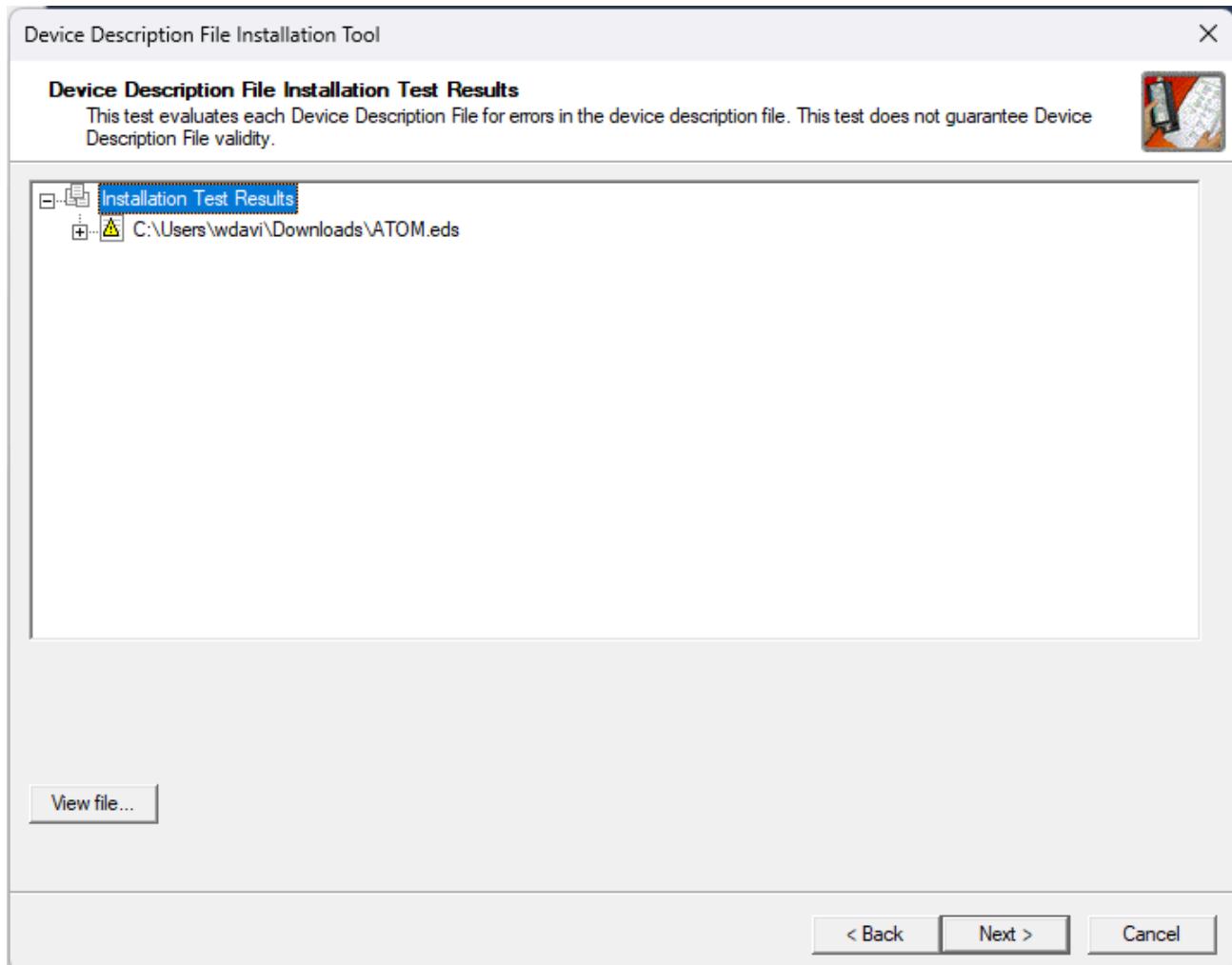
## Import EDS file

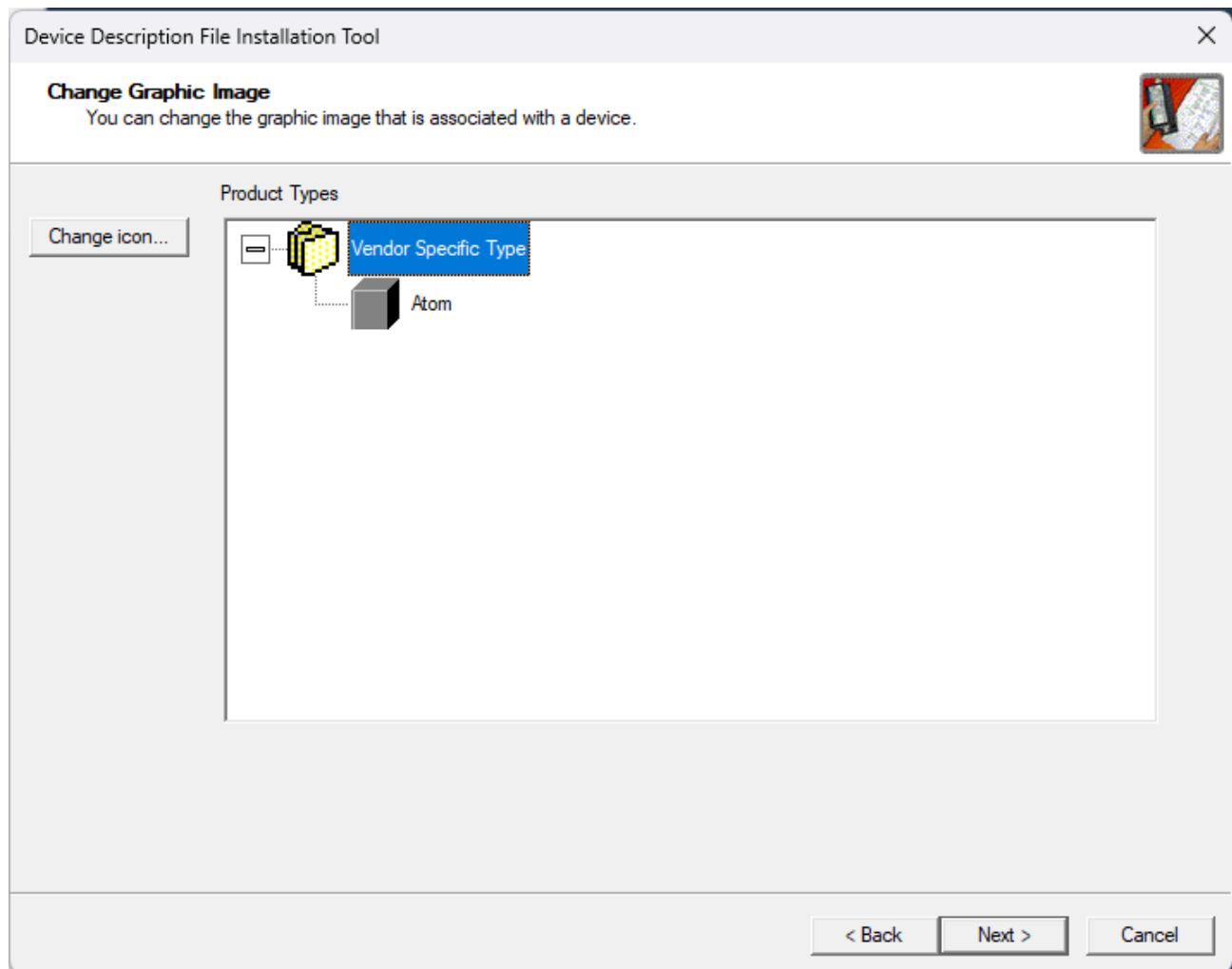
Select **Tools > Device Description Installation Tool** (some versions call it **EDS Hardware Installation Tool**)

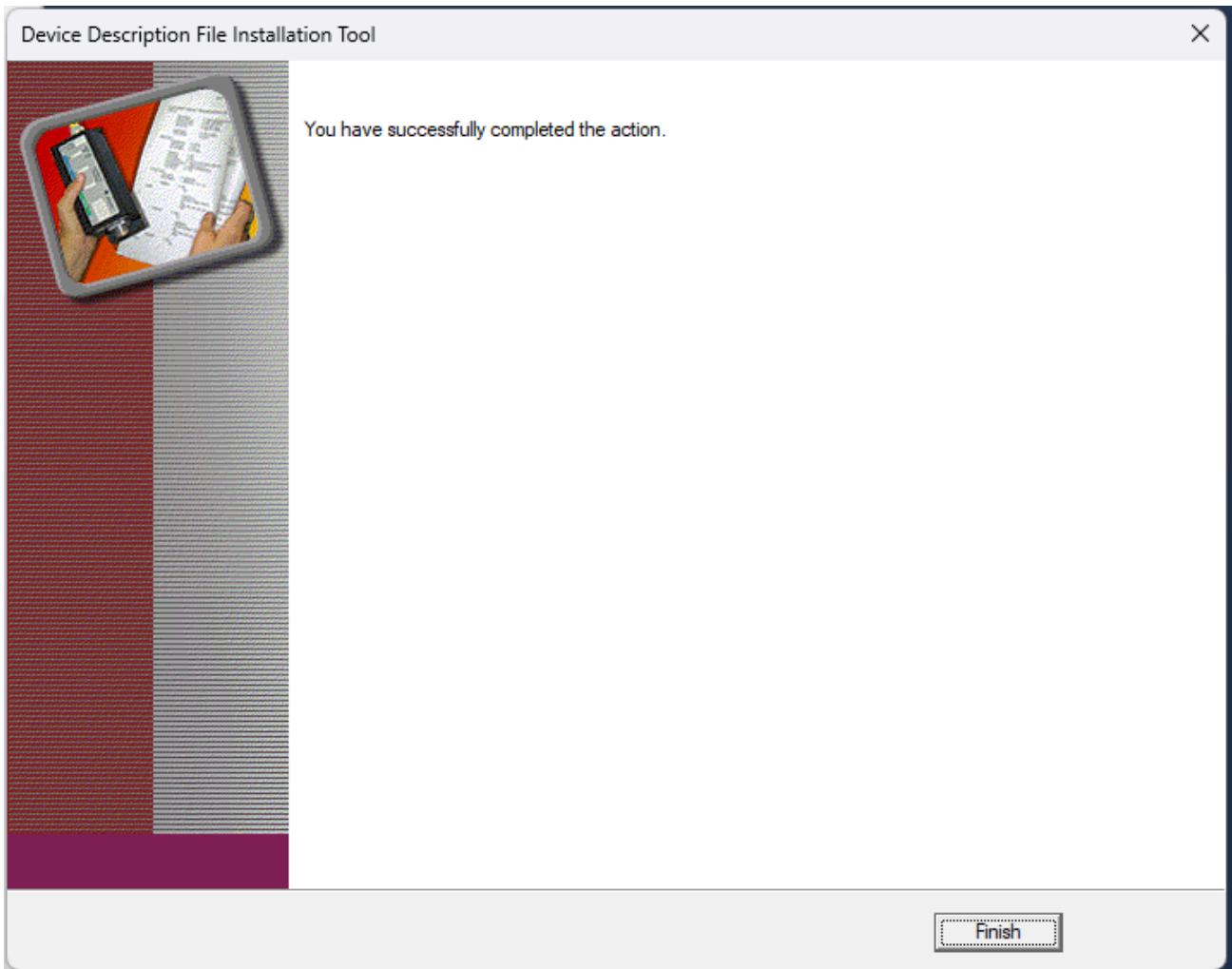






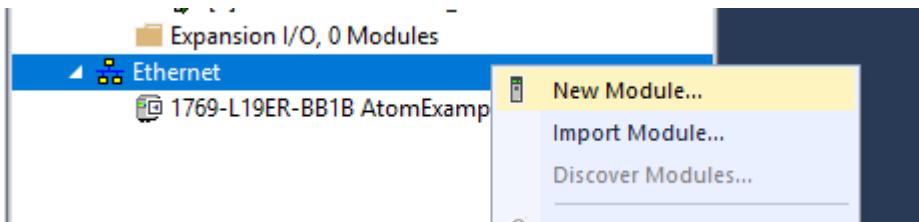






## Add Atom to the project

1. Right-click **Ethernet** and select **New Module**:



2. In the **Catalog** tab, search for **Atom**, select it, and click **Create**:

Select Module Type

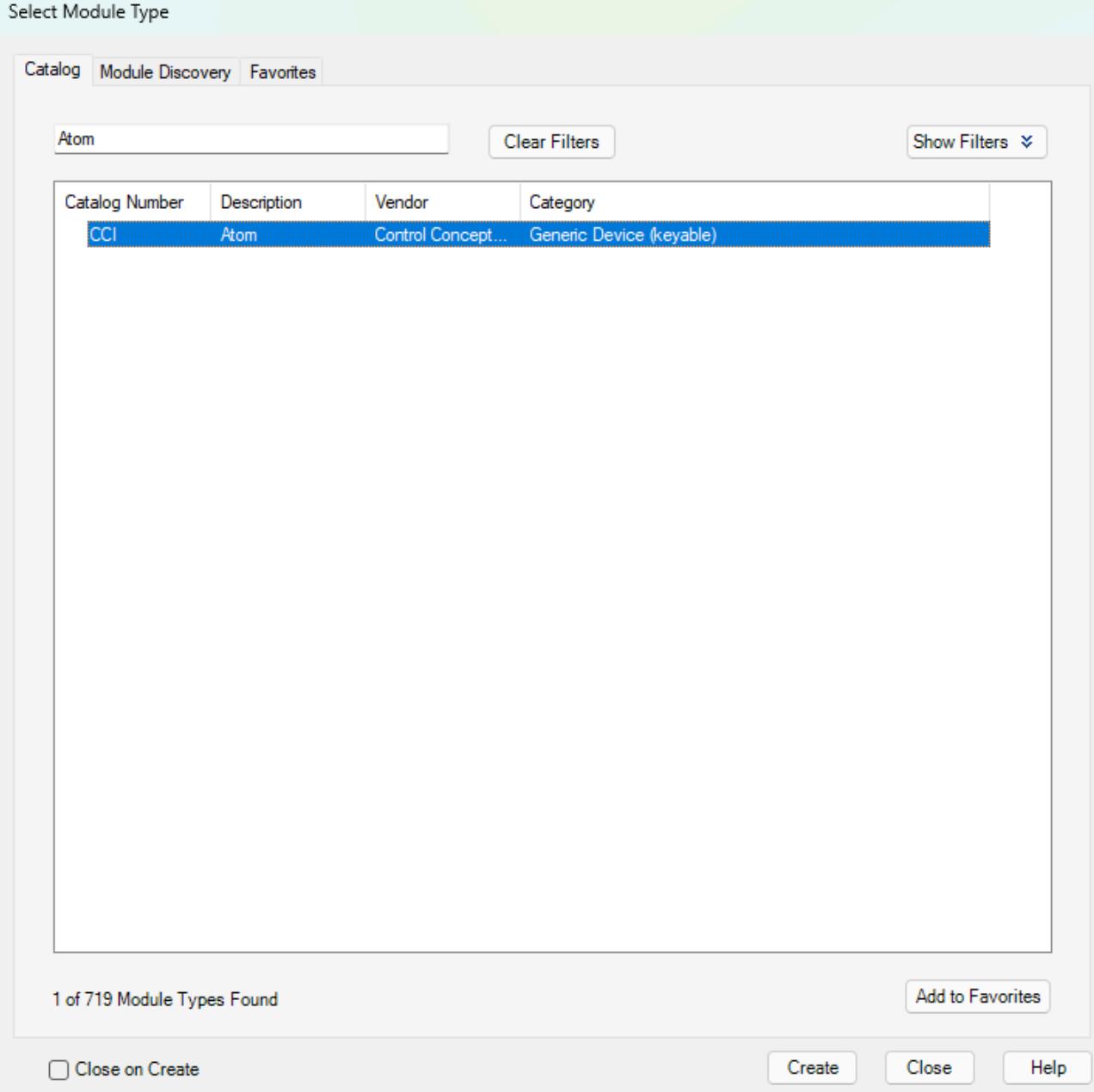
Catalog    Module Discovery    Favorites

Atom    Clear Filters    Show Filters

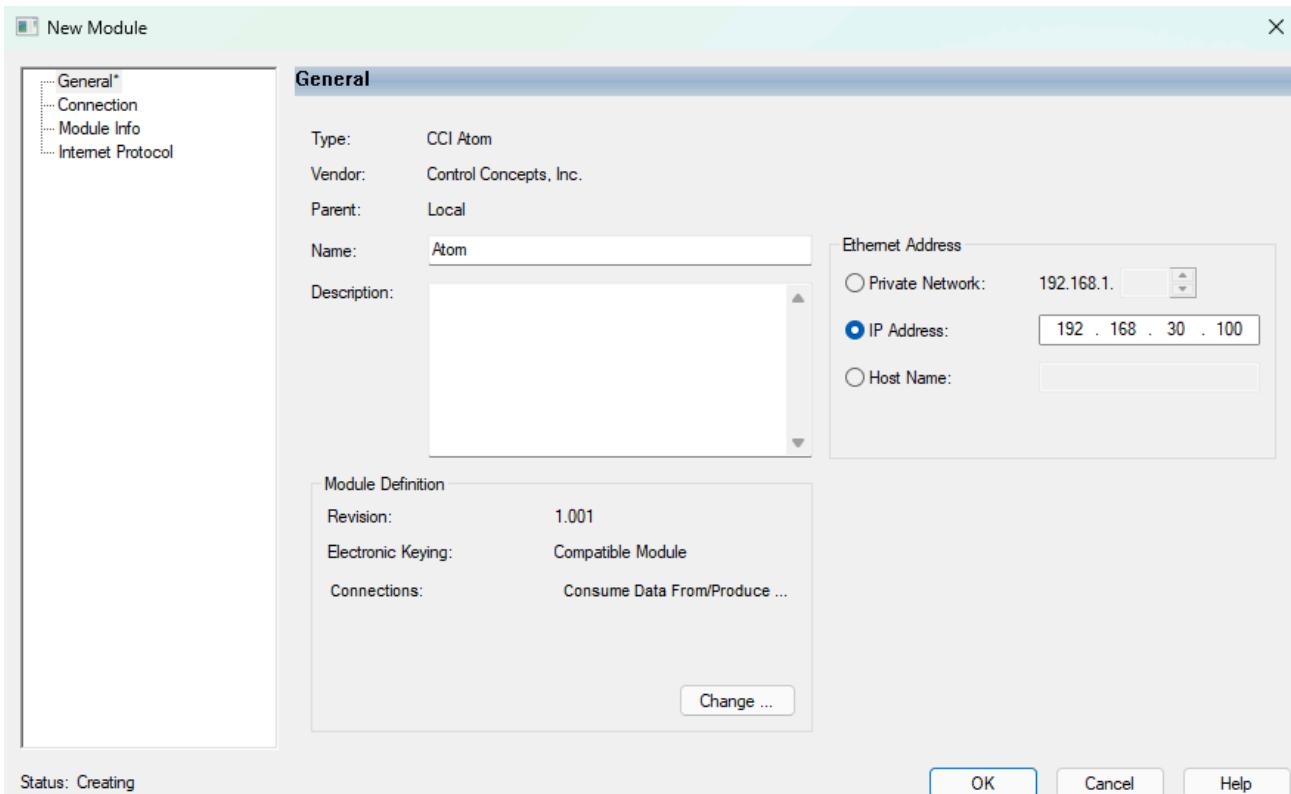
Catalog Number	Description	Vendor	Category
CCI	Atom	Control Concept...	Generic Device (keyable)

1 of 719 Module Types Found    Add to Favorites

Close on Create    Create    Close    Help

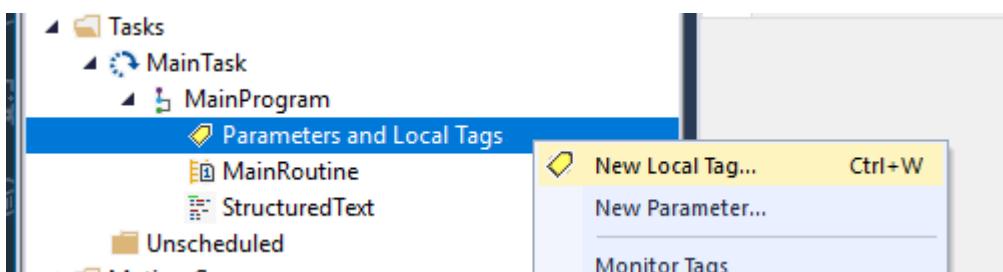


3. In the **General** tab, set the **IP Address** to **192.168.30.100** and click **OK**:



# A basic example program

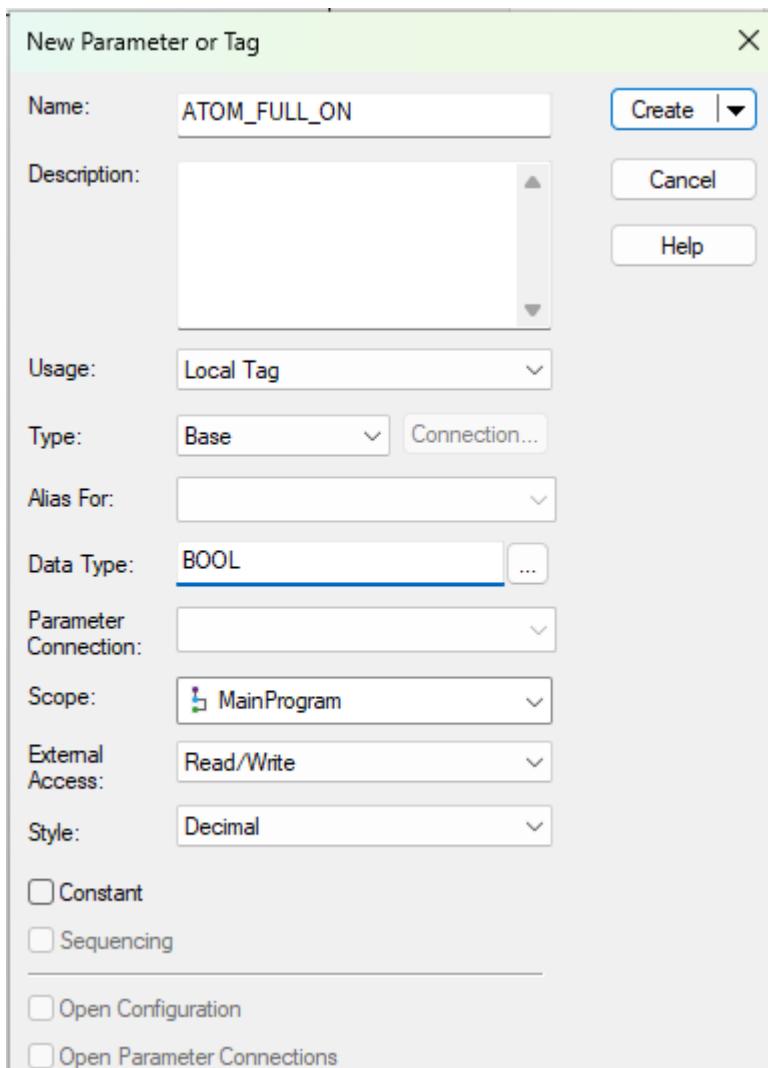
1. Right-click **Parameters and Local Tags** under **MainProgram** and select **New Tag** to create a tag:



2. Create two\_ new tags:

- o Tag 1
  - **Name:** ATOM\_FULL\_ON
  - **Data Type:** BOOL

- Tag 2
  - **Name:** ATOM\_LINE\_VOLTAGE
  - **Data Type:** DINT

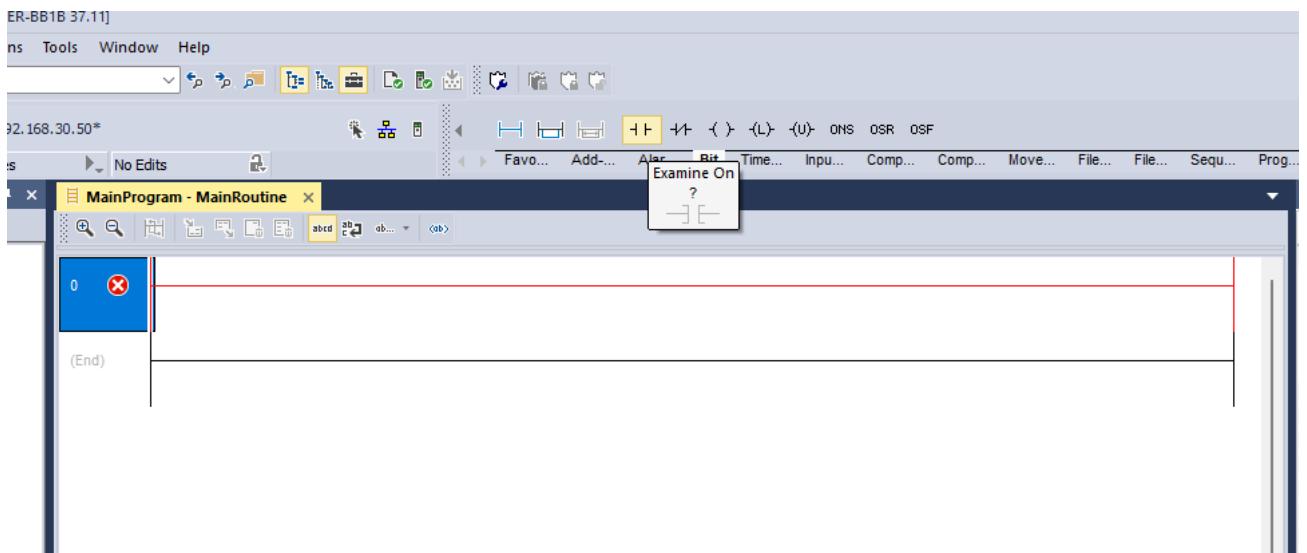


Name	Usage	Value	Force Mask	Style	Data Type	Description	Constant
ATOM_FULL_ON	Local	0	0	Decimal	BOOL		<input type="checkbox"/>
ATOM_LINE_VOLTAGE	Local	1	0	Decimal	DINT		<input type="checkbox"/>

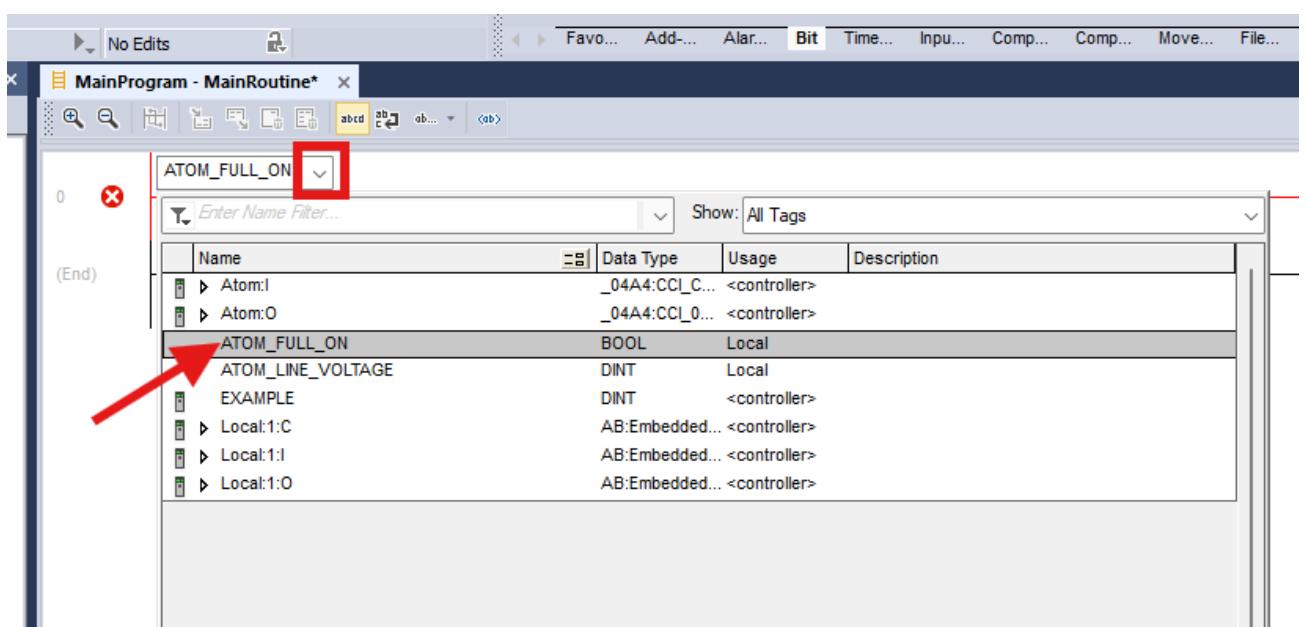
You can follow along with either the **Structured Text** or **Ladder Logic** examples below.

## Ladder Logic

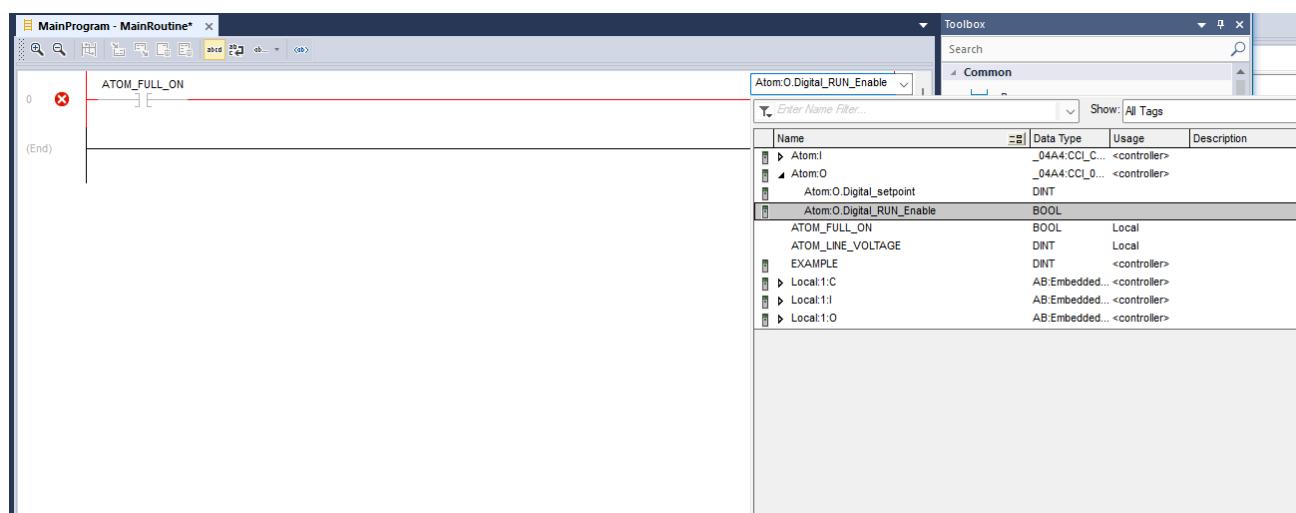
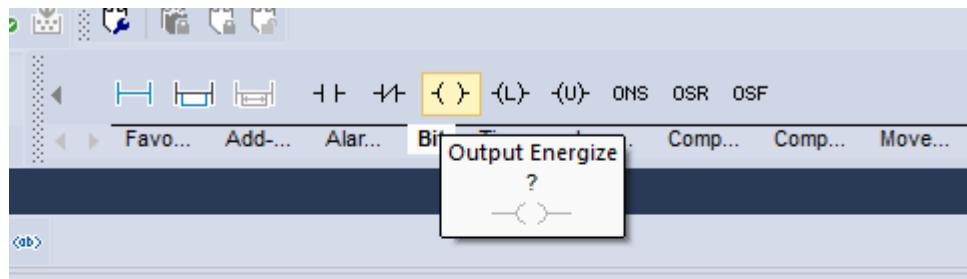
1. In the **MainRoutine** file, select **Ring 0** and add an **Examine On** instruction:



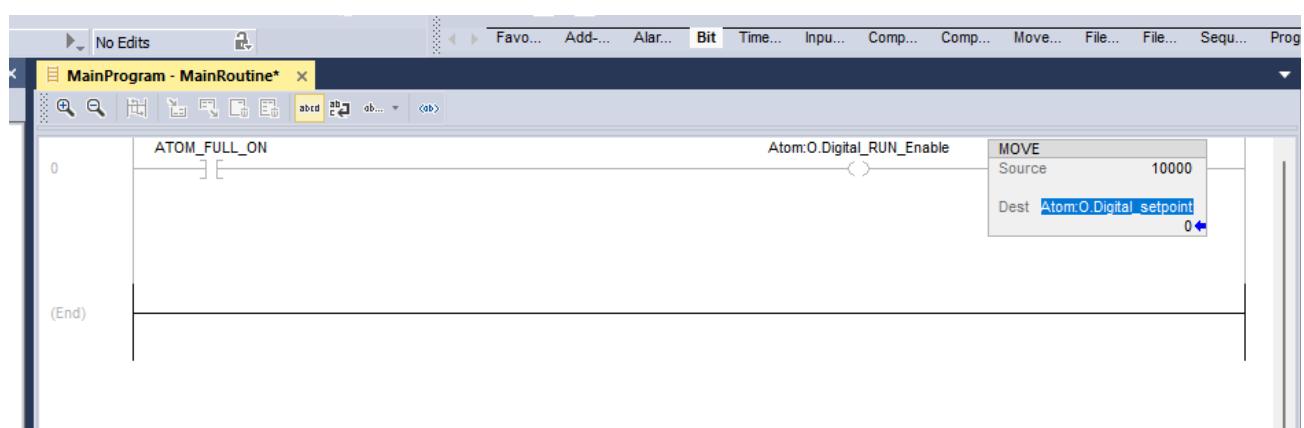
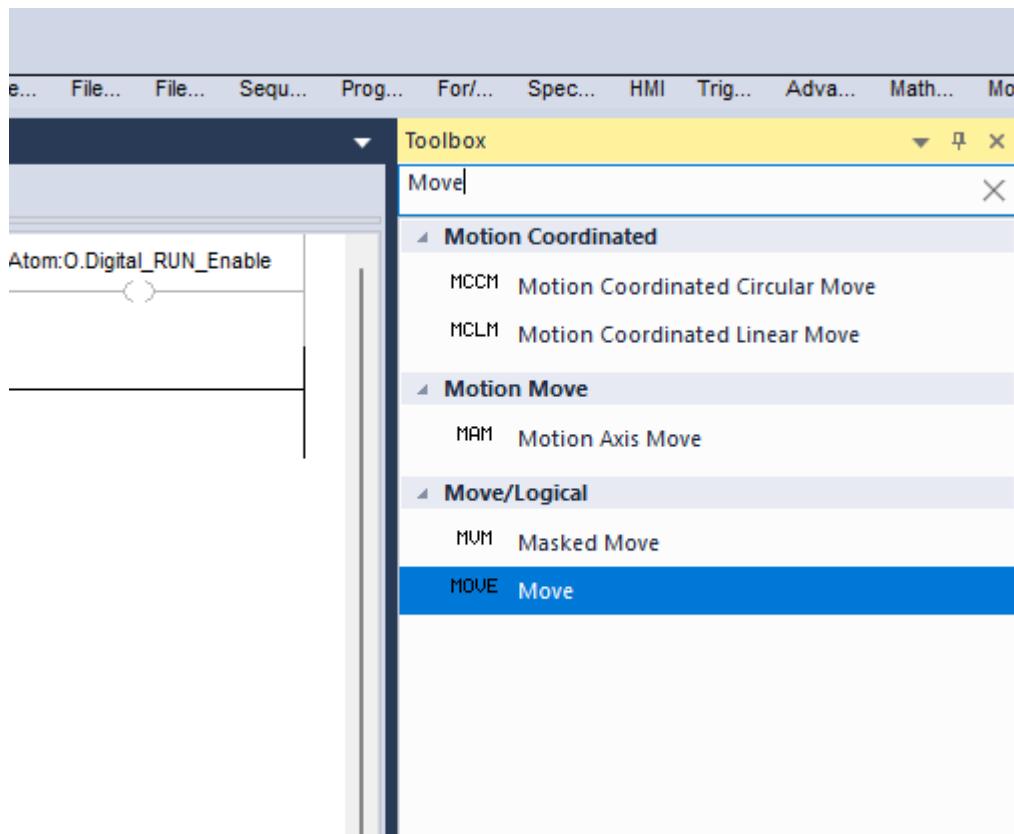
2. Configure this instruction to examine the **ATOM\_FULL\_ON** tag:



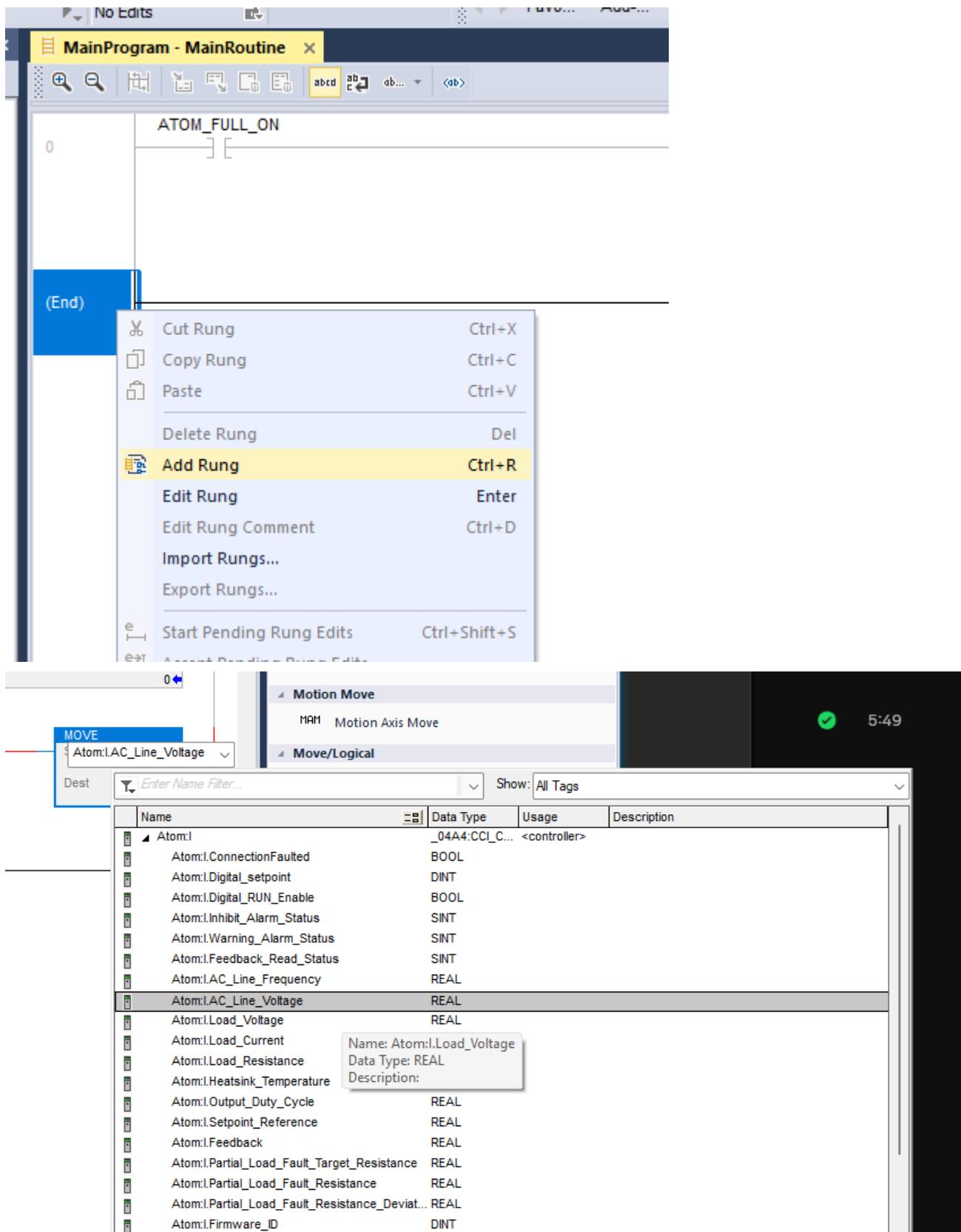
3. Add an **Output Energize** instruction and select **Atom:O.Digital\_RUN\_Enable**:



4. Add a **Move** instruction and set *source* to **10000** and *dest* to **Atom:0.Digital\_setpoint**.

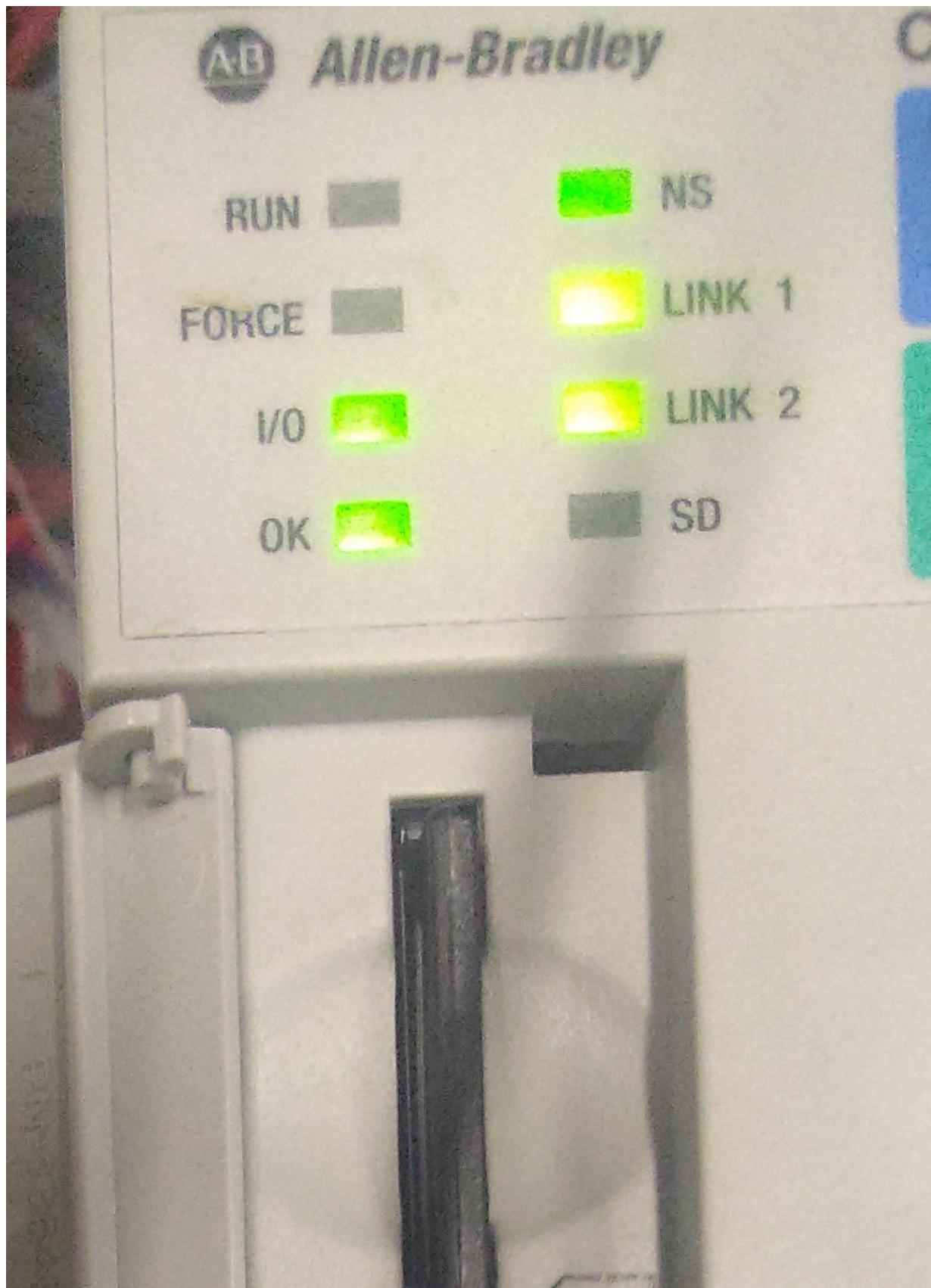


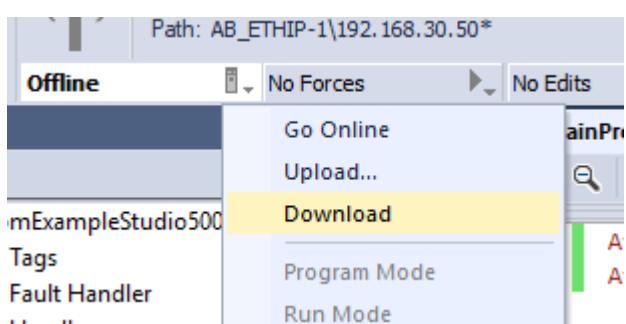
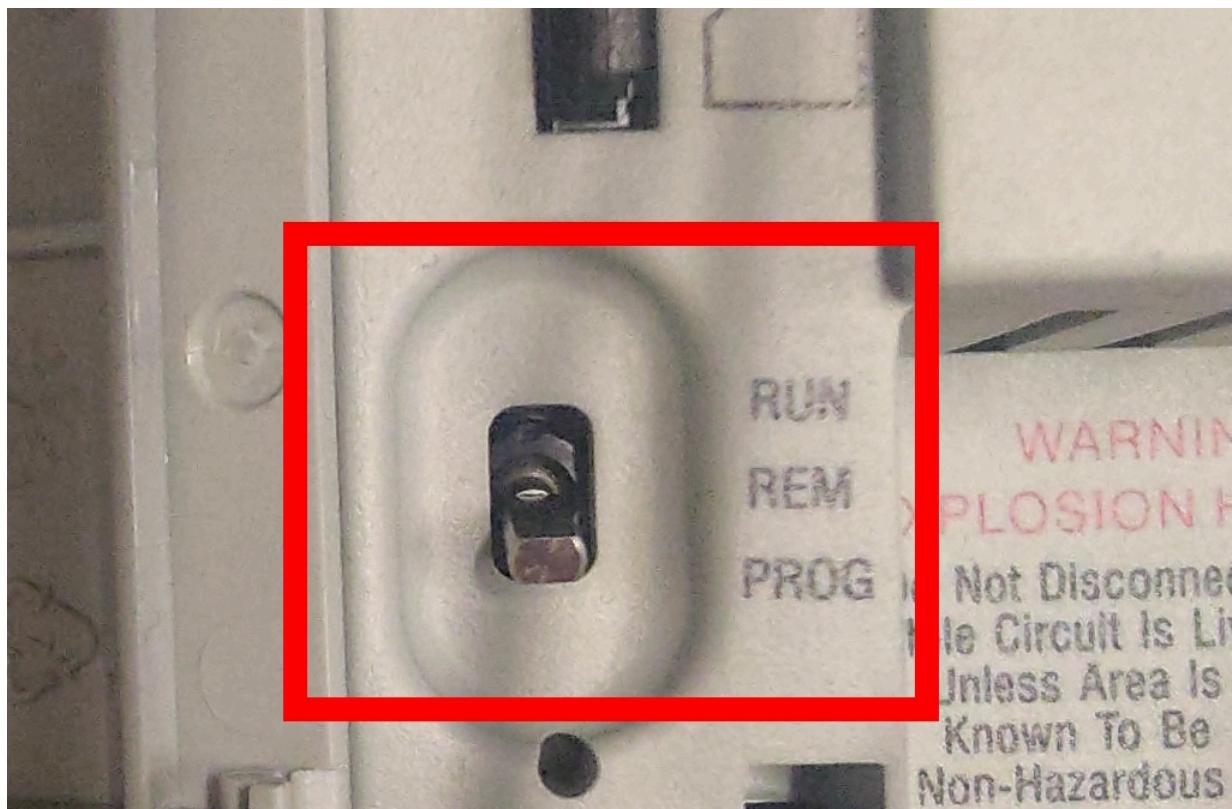
5. Right-click and select **Add rung**. In this new rung, add a **MOVE** instruction and set **source** to **Atom:I.AC\_Line\_Voltage** and **dest** to **ATOM\_LINE\_VOLTAGE**:

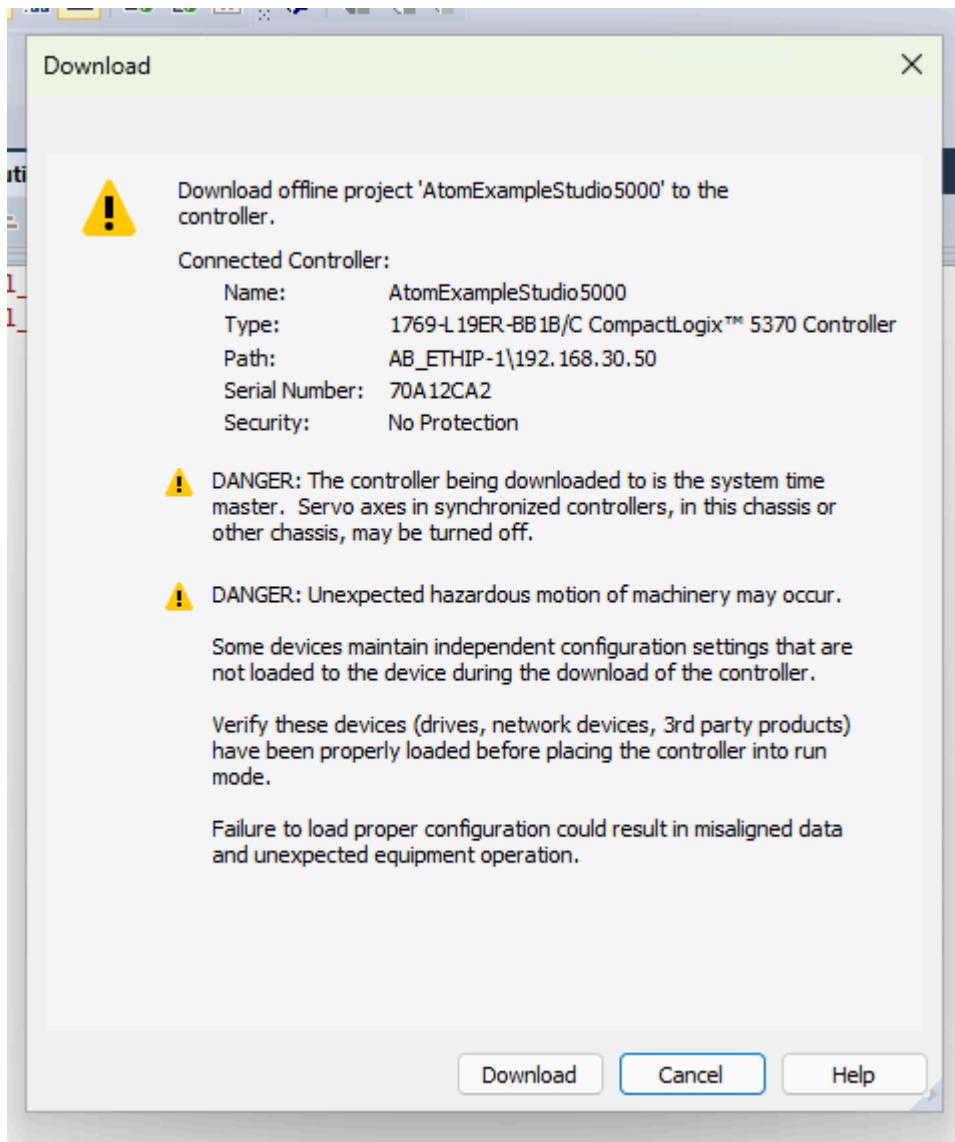


6. Select the PLC dropdown and click **Download** to download the program to your PLC:

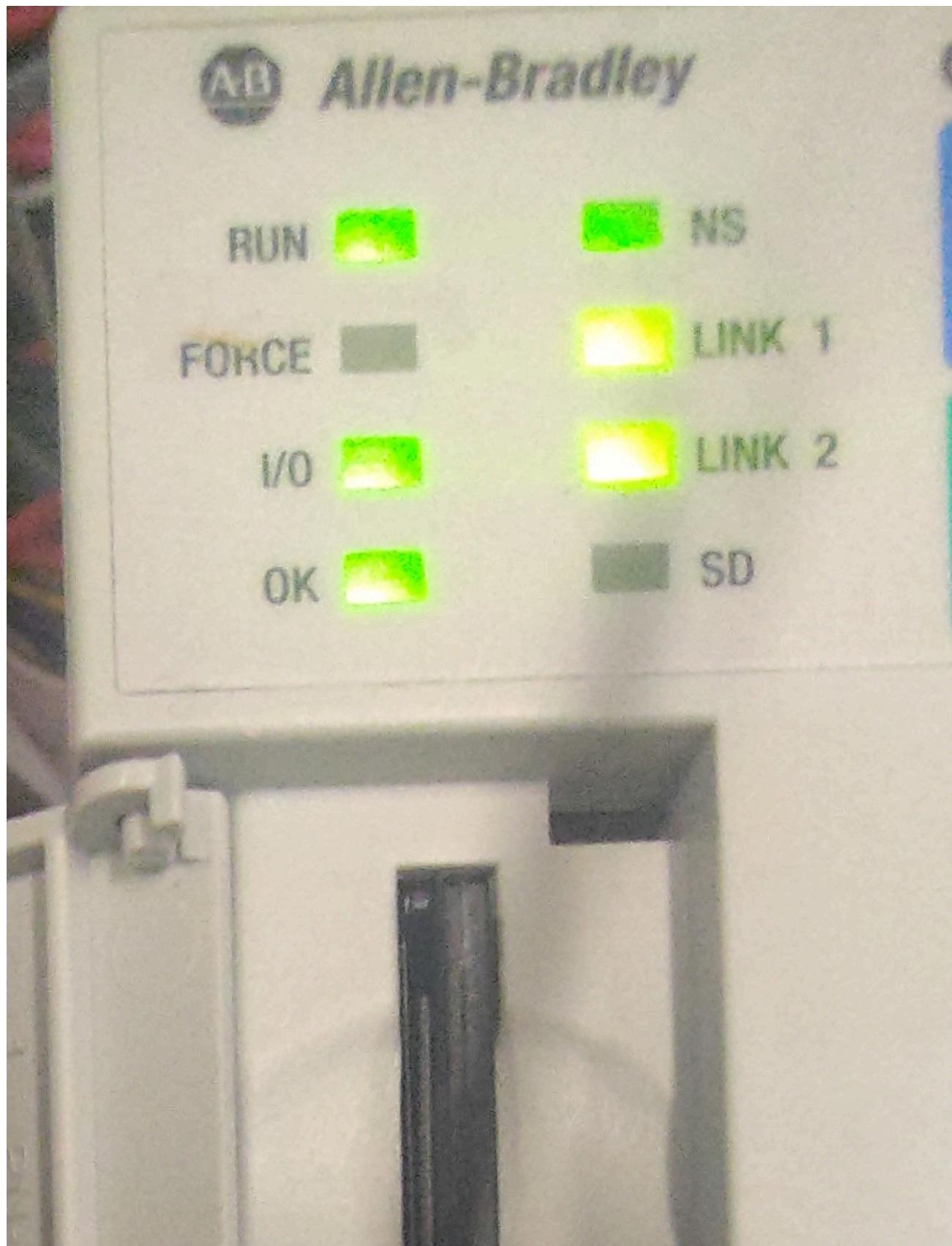
Ensure the switch on your PLC is set to **PROG** mode before downloading.





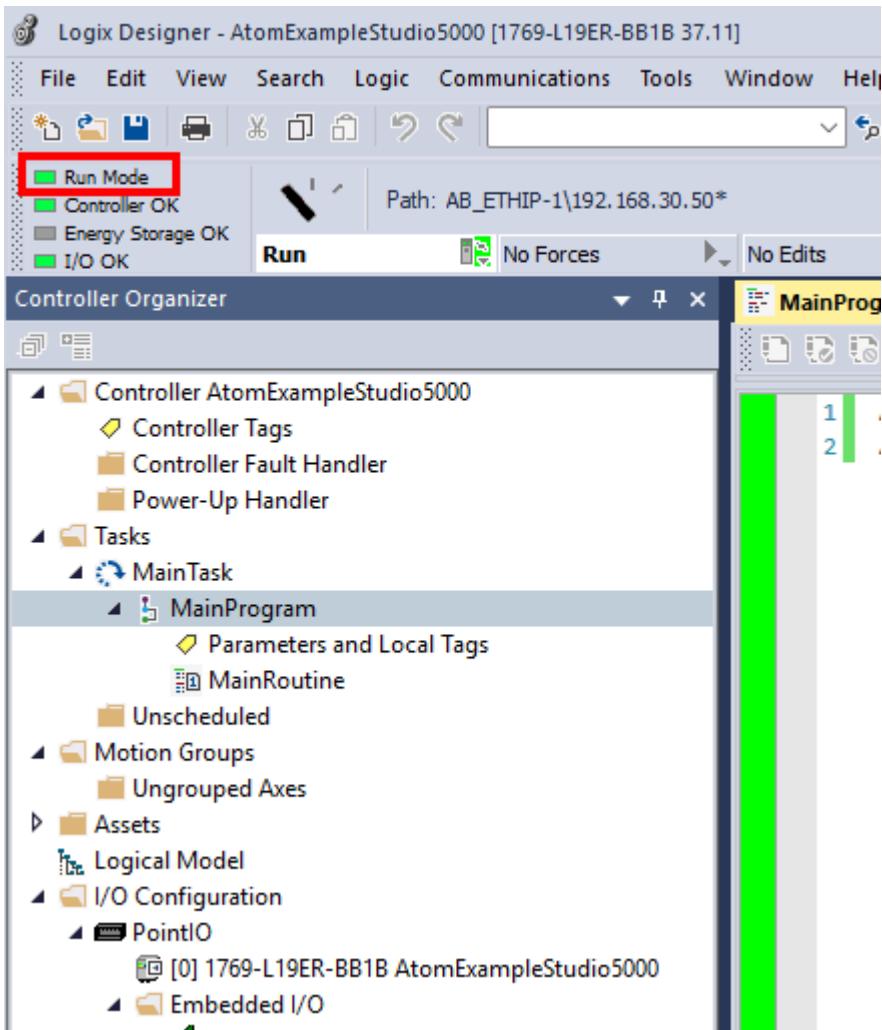


7. Flip the switch on your PLC to **RUN** mode.





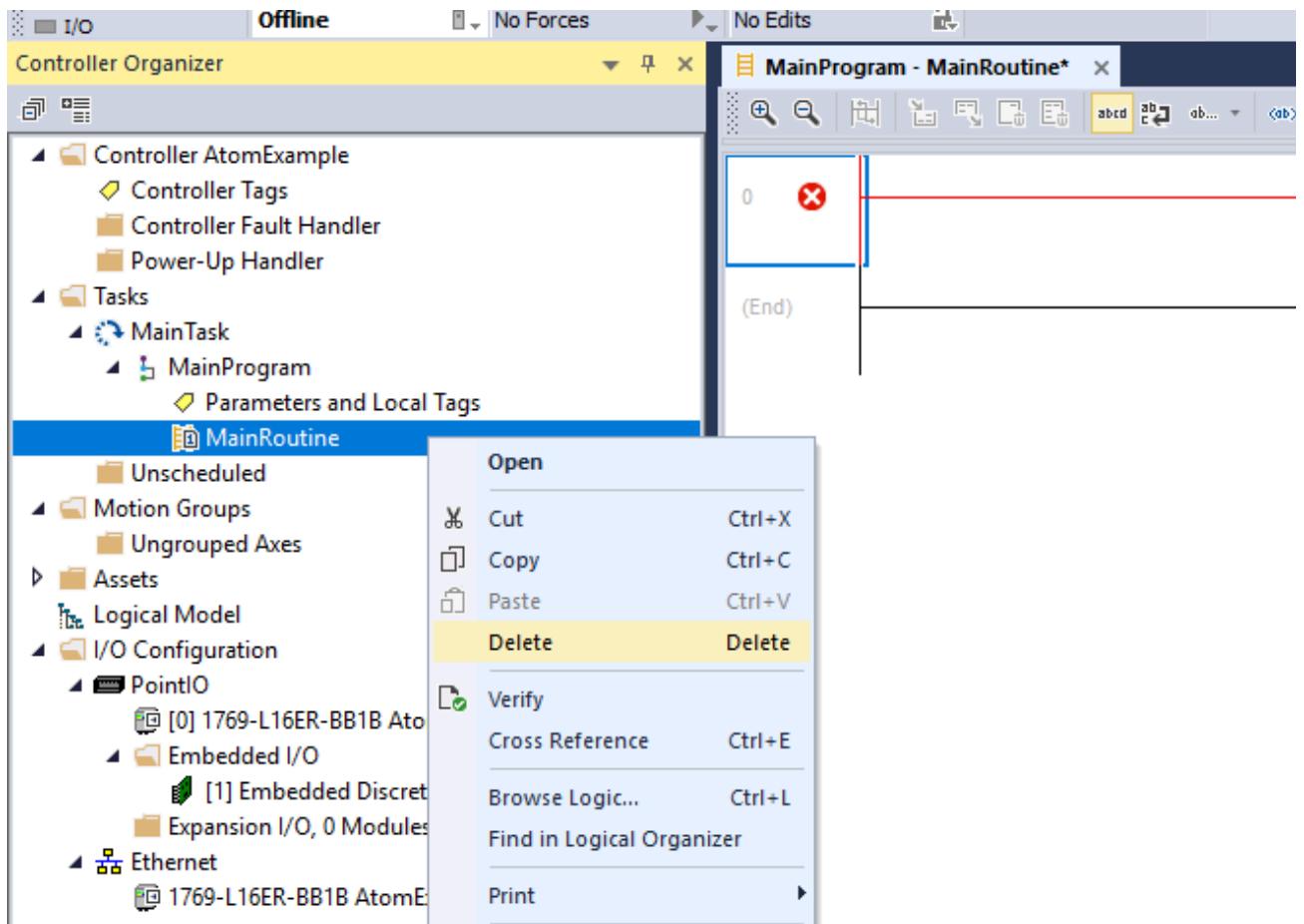
8. If everything worked properly, the controller **Run Mode** indicator light should turn green:



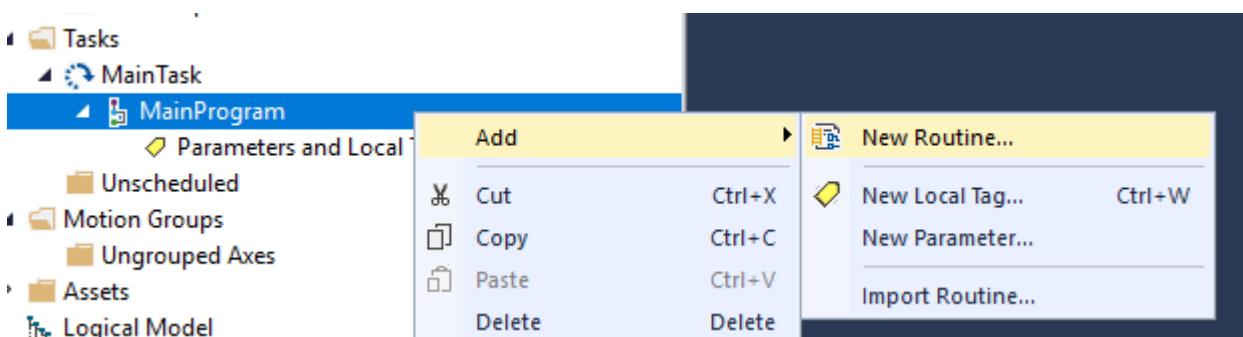
Next, jump to the [Creating a user interface](#) section.

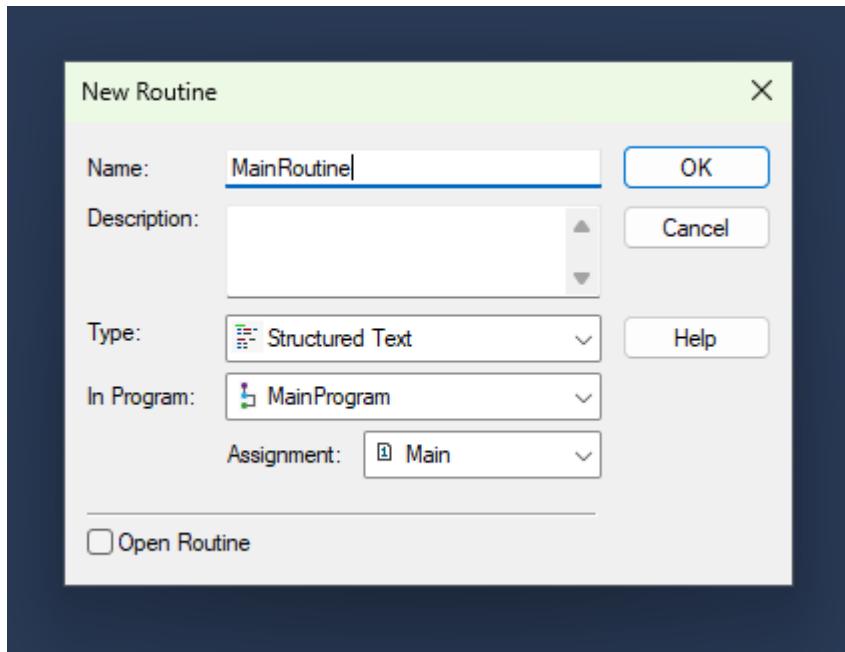
## Structured Text

1. Delete the default `MainRoutine`:

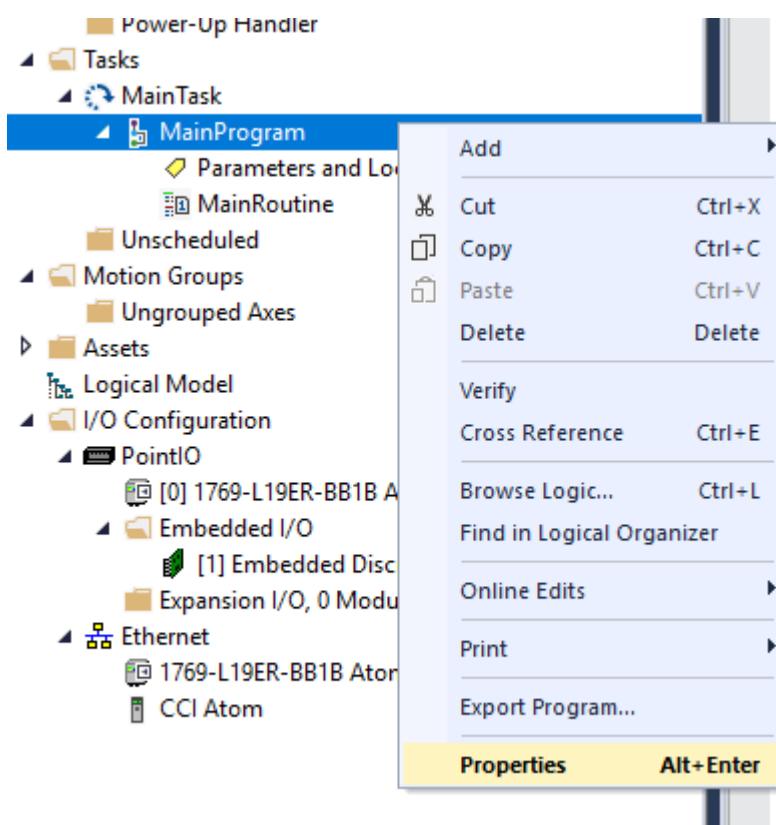


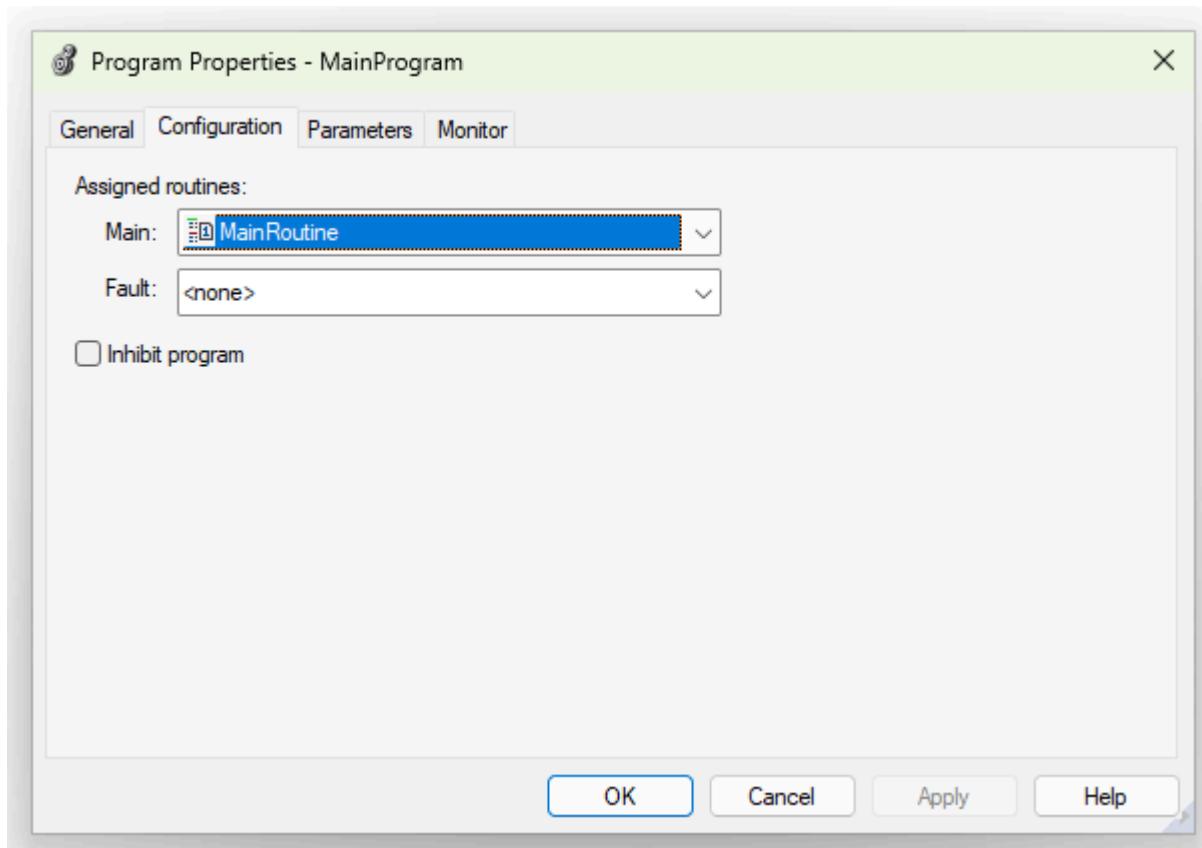
2. Right-click **MainProgram** and select **Add Routine**. Name it **MainRoutine**, set the **Type** to **Structured Text**, and click **OK**:



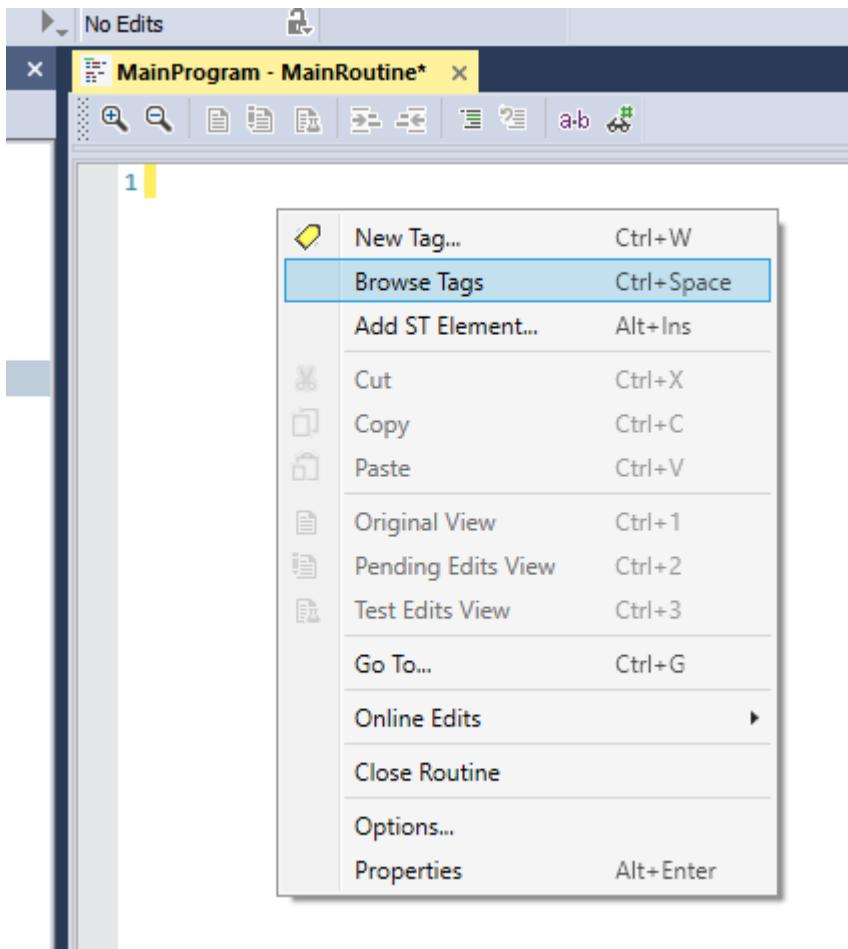


3. Right-click **MainRoutine**, select **Properties**, and ensure **MainRoutine** is set as the **Main Routine** in the **Configuration** tab:





4. Insert tags by right-clicking in `MainRoutine` and selecting **Browse Tags**.



5. You can insert Atom:I (input) and Atom:O (output) tags to control ATOM:

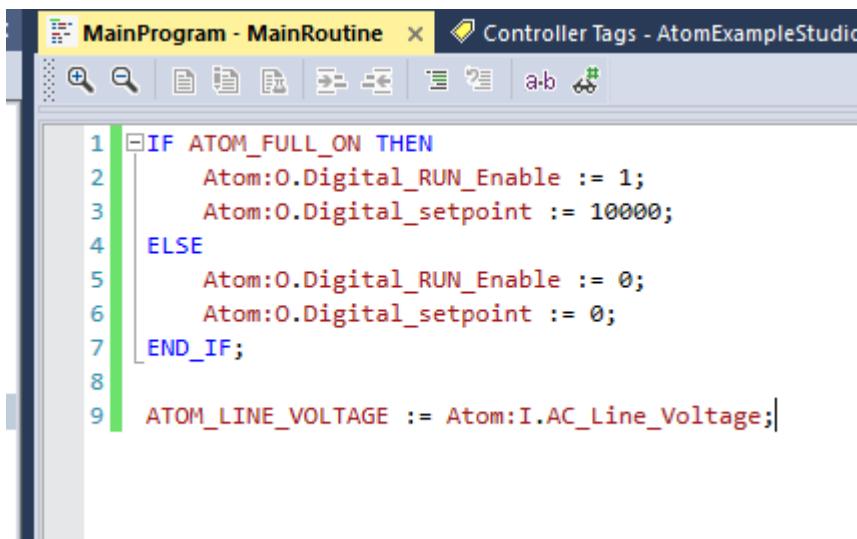
A screenshot of the "Tag Browser" window. The search bar shows "Atom:0.Digital\_setpoint". The table lists the following tags:

Name	Type	Data Type	Usage	Description
Atom:I		_04A4:CCI_C...	<controller>	
Atom:O		_04A4:CCI_O...	<controller>	
Atom:0.Digital_setpoint		DINT		
Atom:0.Digital_RUN_Enable		BOOL		
Local:1:C		AB:Embedded...	<controller>	
Local:1:I		AB:Embedded...	<controller>	
Local:1:O		AB:Embedded...	<controller>	

6. Add the following code to `MainRoutine`:

```
IF ATOM_FULL_ON THEN
    Atom:0.Digital_RUN_Enable := 1;
    Atom:0.Digital_setpoint := 10000;
ELSE
    Atom:0.Digital_RUN_Enable := 0;
    Atom:0.Digital_setpoint := 0;
END_IF;

ATOM_LINE_VOLTAGE := Atom:I.AC_Line_Voltage;
```



```
1 IF ATOM_FULL_ON THEN
2     Atom:0.Digital_RUN_Enable := 1;
3     Atom:0.Digital_setpoint := 10000;
4 ELSE
5     Atom:0.Digital_RUN_Enable := 0;
6     Atom:0.Digital_setpoint := 0;
7 END_IF;
8
9 ATOM_LINE_VOLTAGE := Atom:I.AC_Line_Voltage;
```

Next, jump to the [Creating a user interface](#) section.

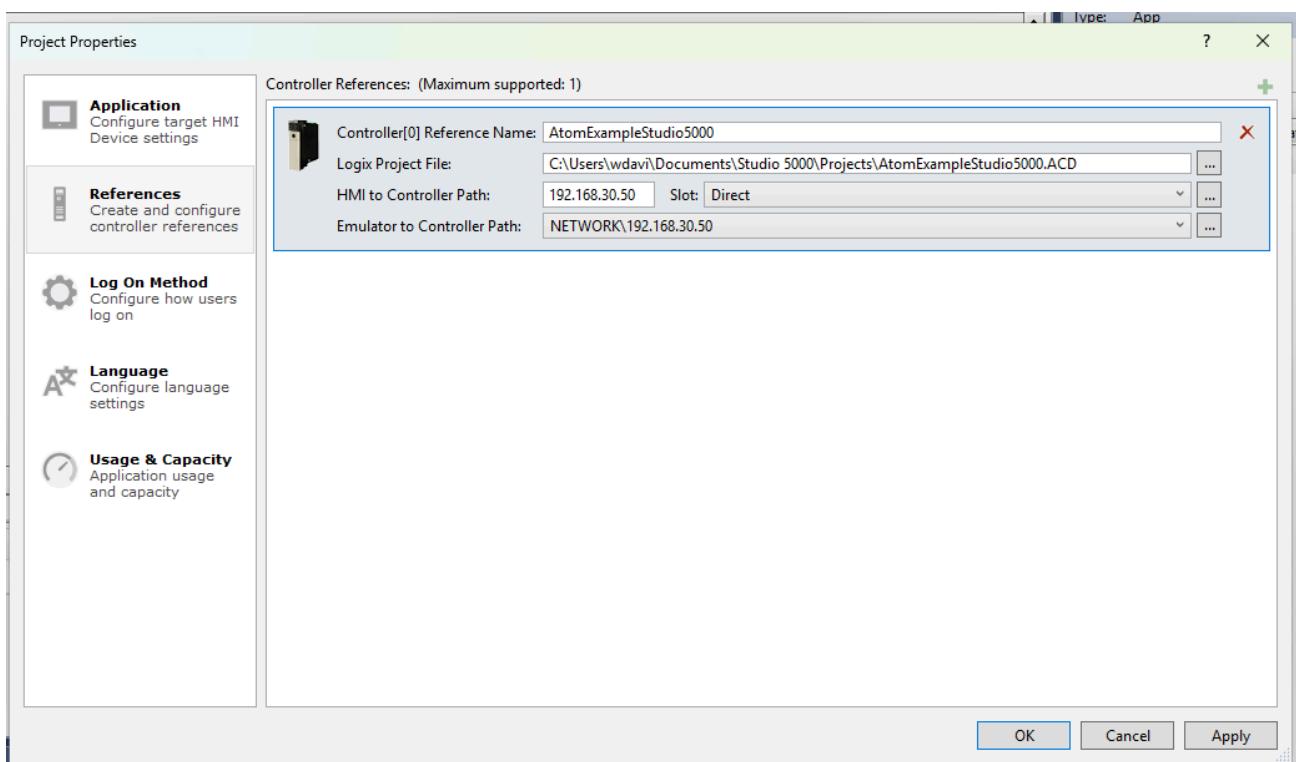
## Creating a user interface

### INFO

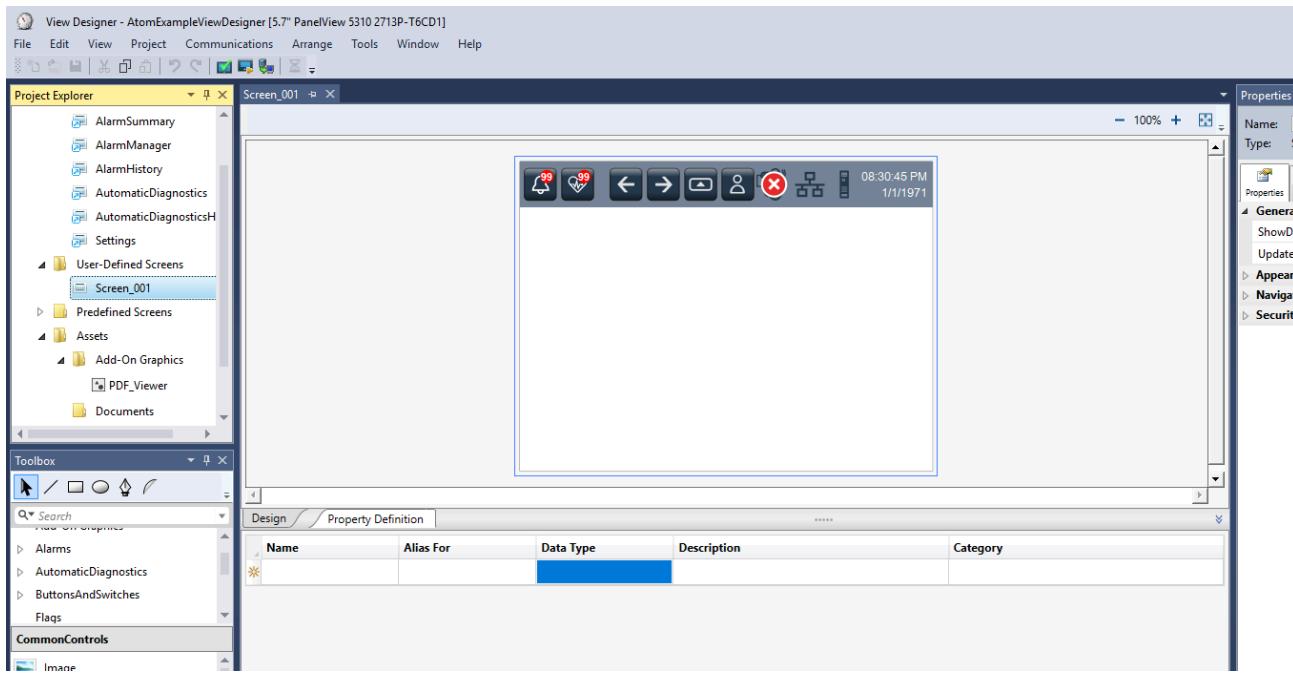
Studio 5000 comes with a separate program called **View Designer** for creating user interfaces. It's usually installed at `C:\Program Files (x86)\Rockwell Software\Studio 5000\View Designer\ENU\V10\ViewDesigner.exe`

1. Launch View Designer and create a new project with the following settings:

- **Controller[0] Reference Name:** AtomExampleStudio5000
- **Logix Project File:** path-to-your-project\AtomExampleStudio5000.ACD
- **HMI to Controller Path:** 192.168.30.50
- **Emulator to Controller Path:** NETWORK\192.168.30.50

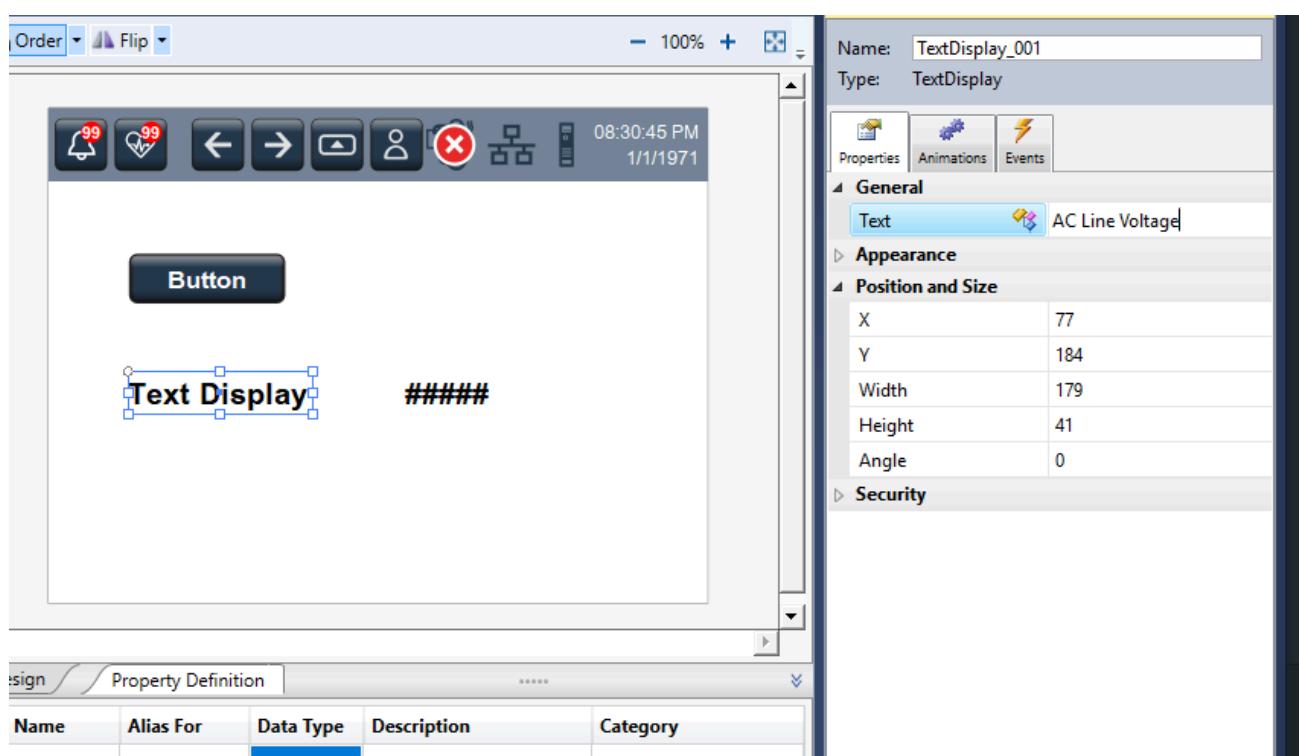
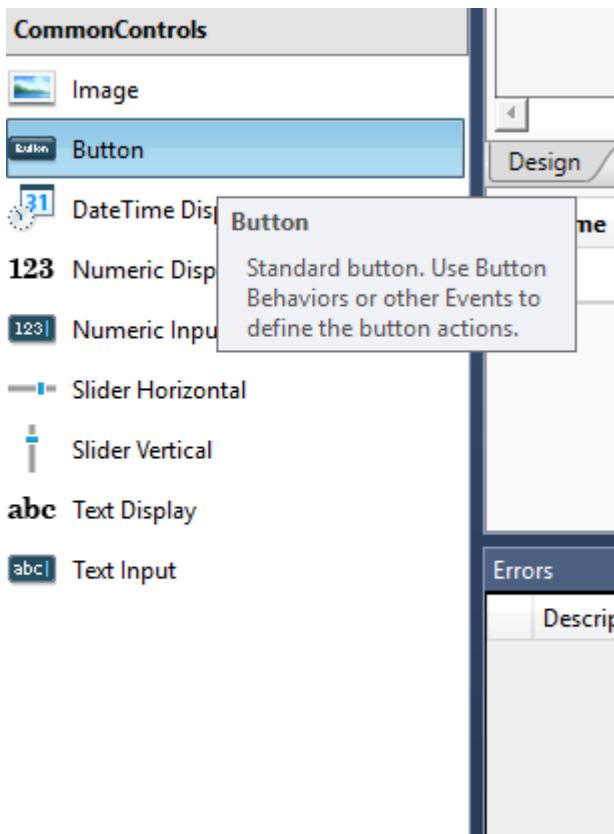


2. Open Screen\_001:

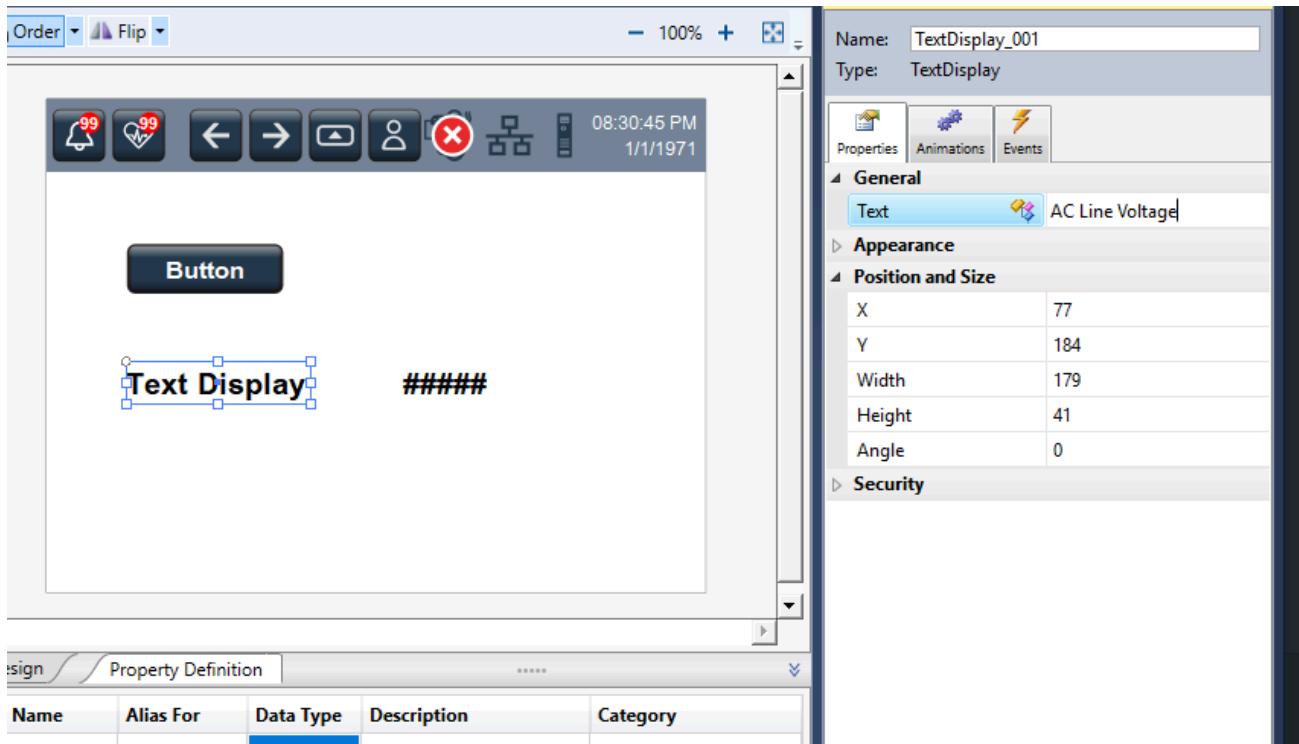


3. In the **CommonControls** toolbox, drag three components onto the screen:

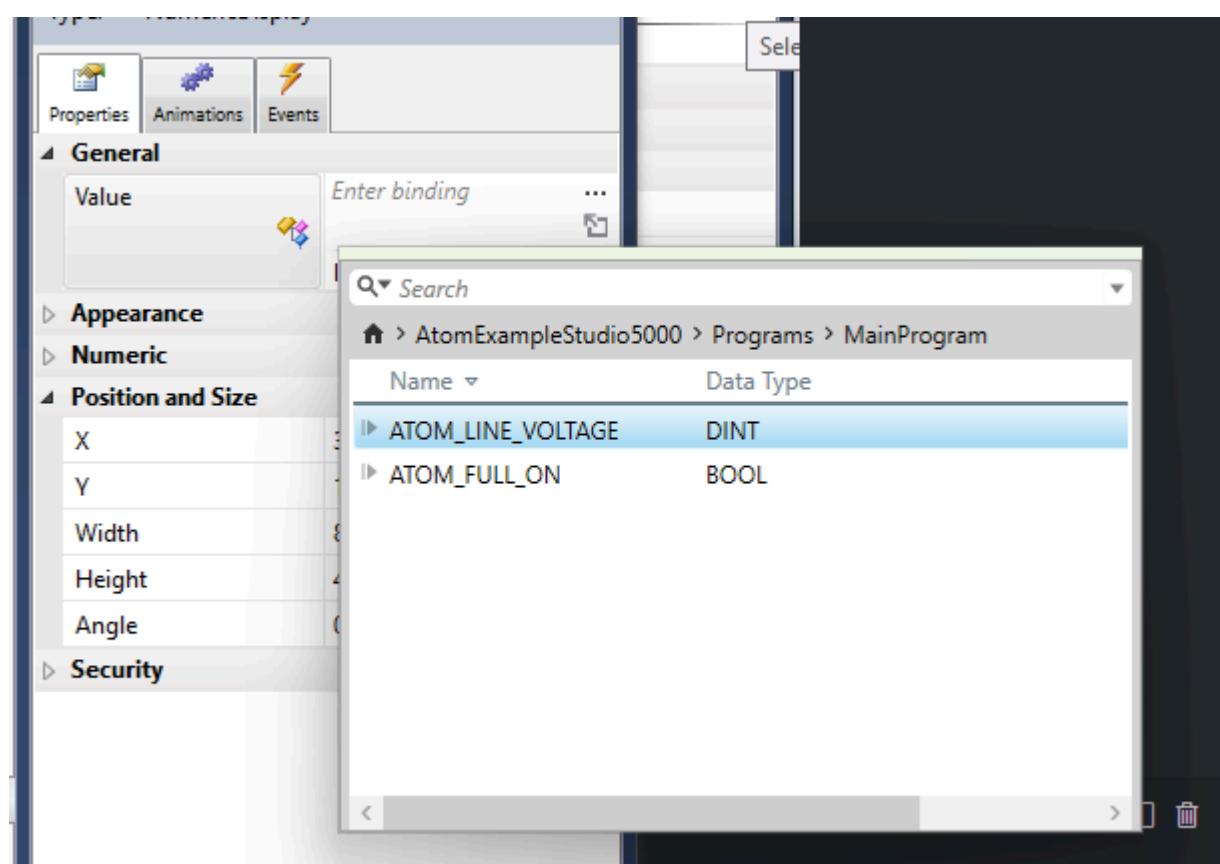
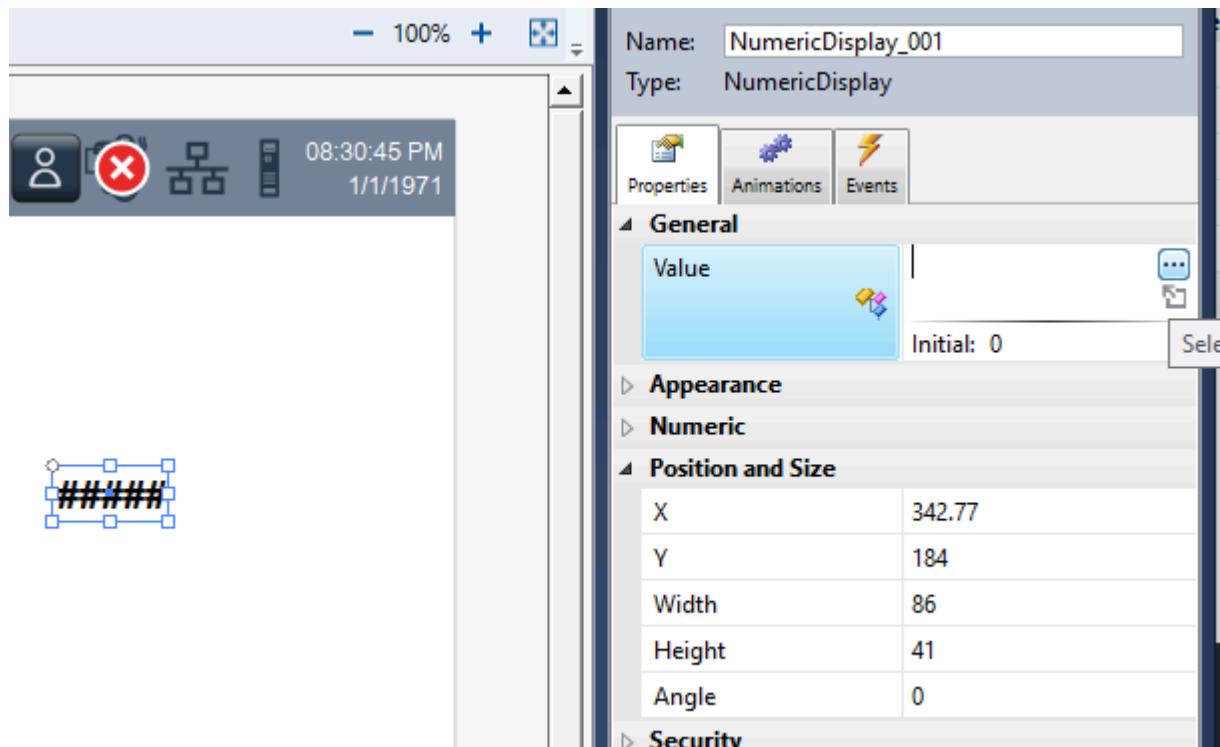
- **Button**
- **Numeric Display**
- **Text Display**

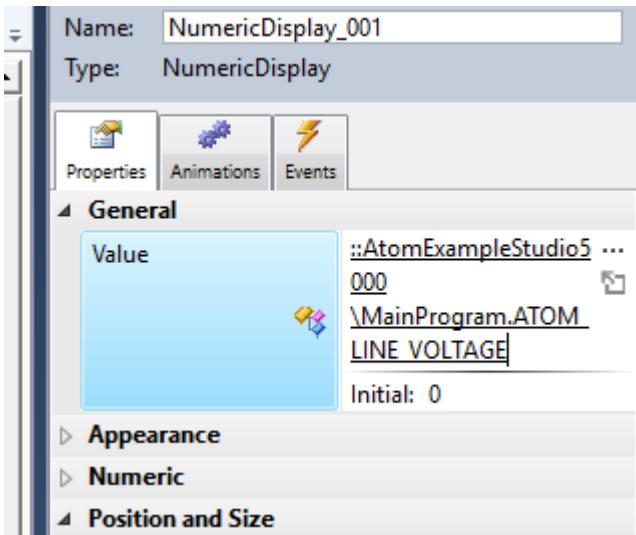


4. Select the **Text Display** component and set the text to **AC Line Voltage**:

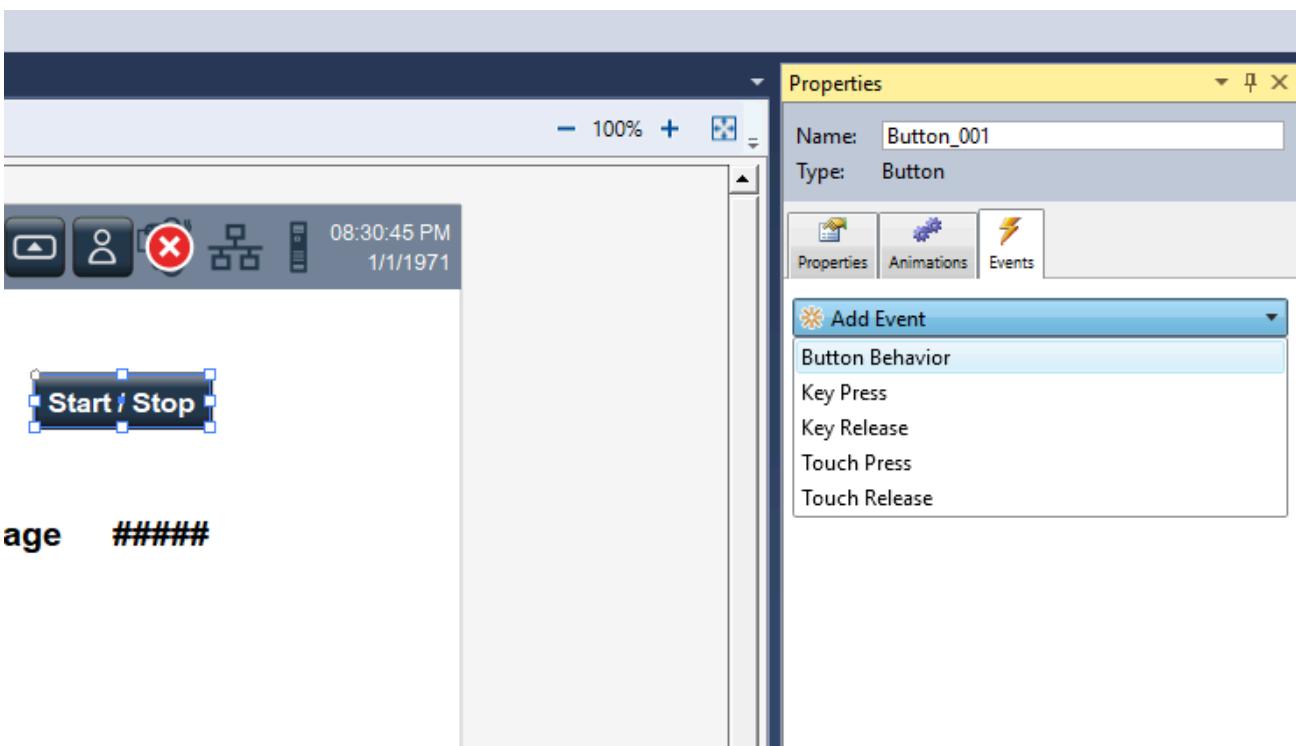


5. Select the **Numeric Display** component and set the **Value** (in the **Properties** panel) to **ATOM\_LINE\_VOLTAGE**:

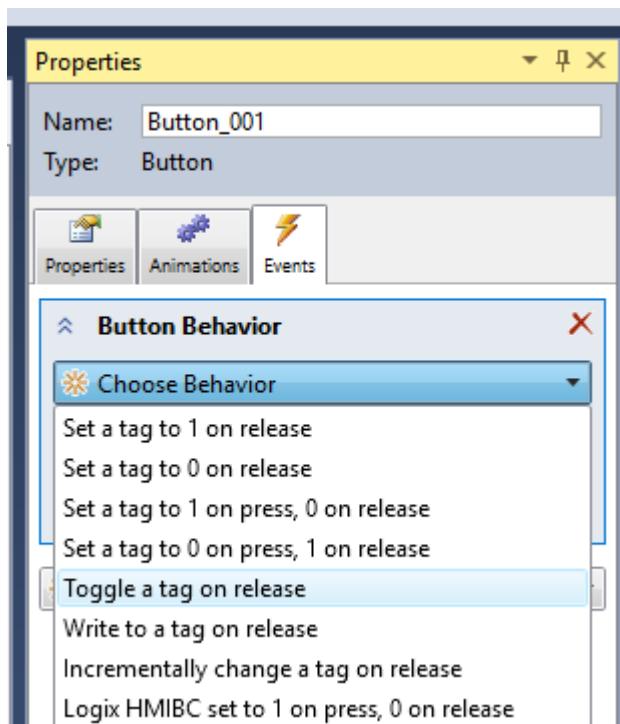


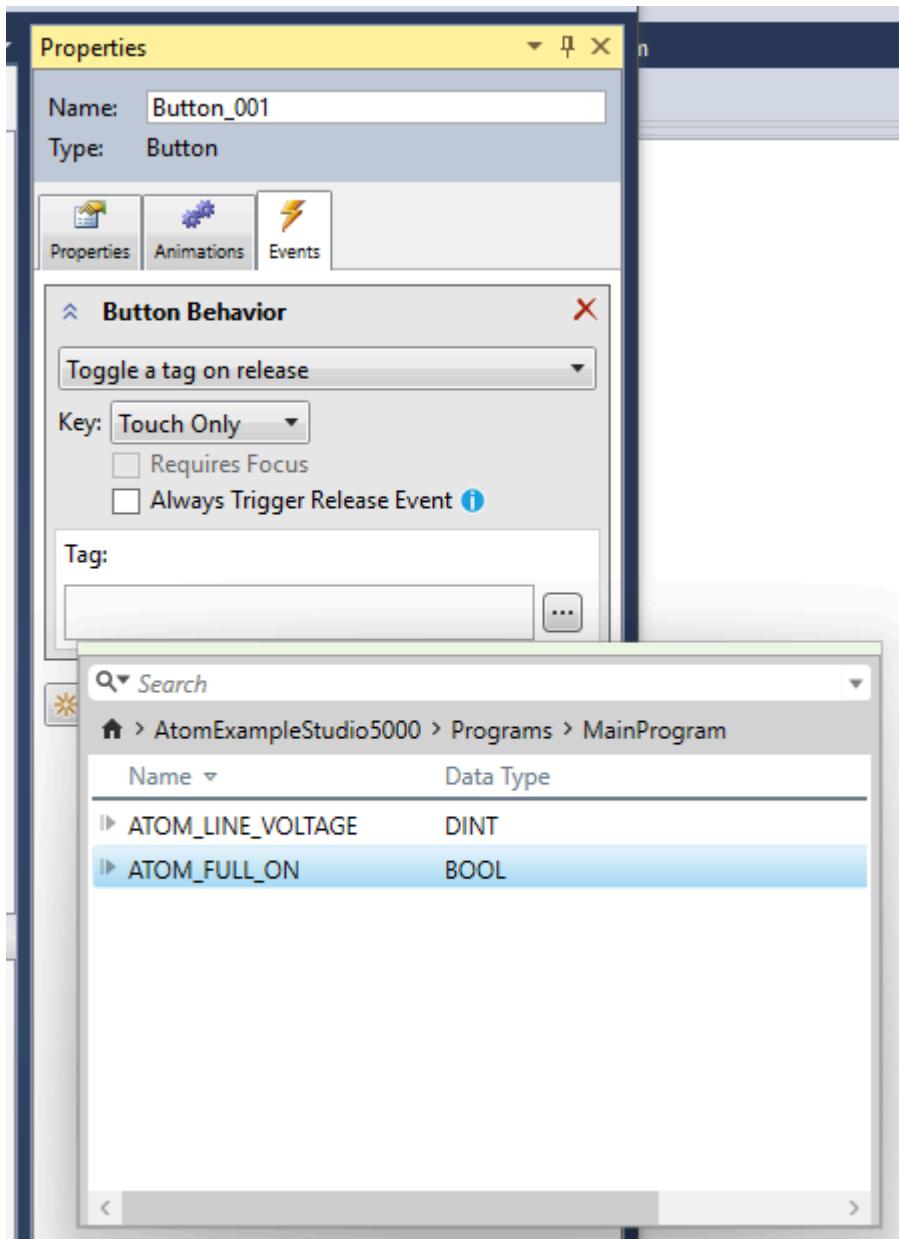


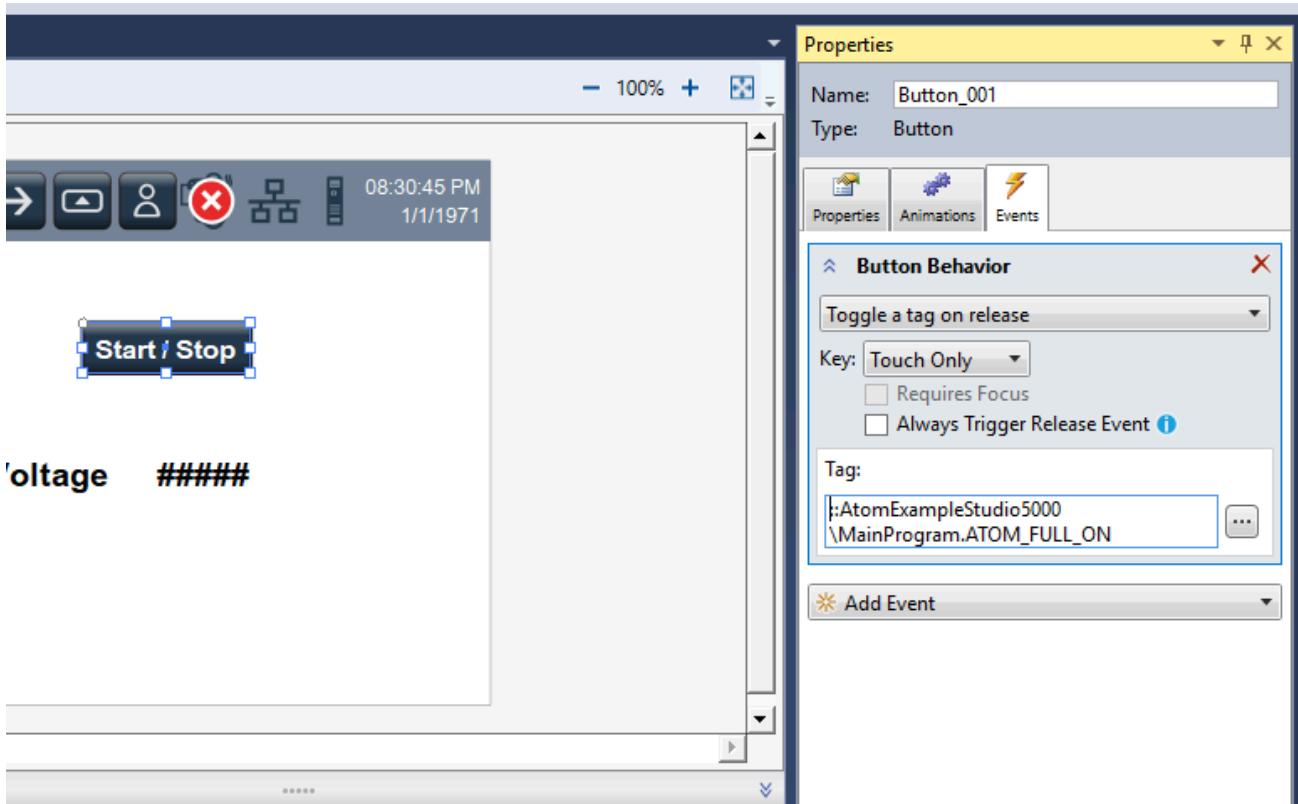
6. Select the \*Button component and set the text to Start / Stop. In the Events panel, click Add Event, Button Behavior:



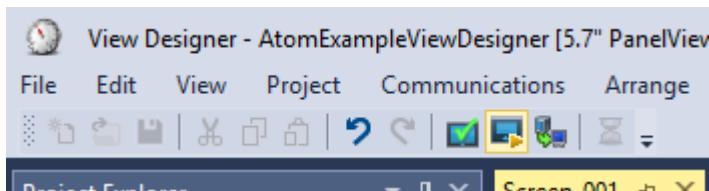
7. Select Toggle a tag on release and set the tag to ATOM\_FULL\_ON:





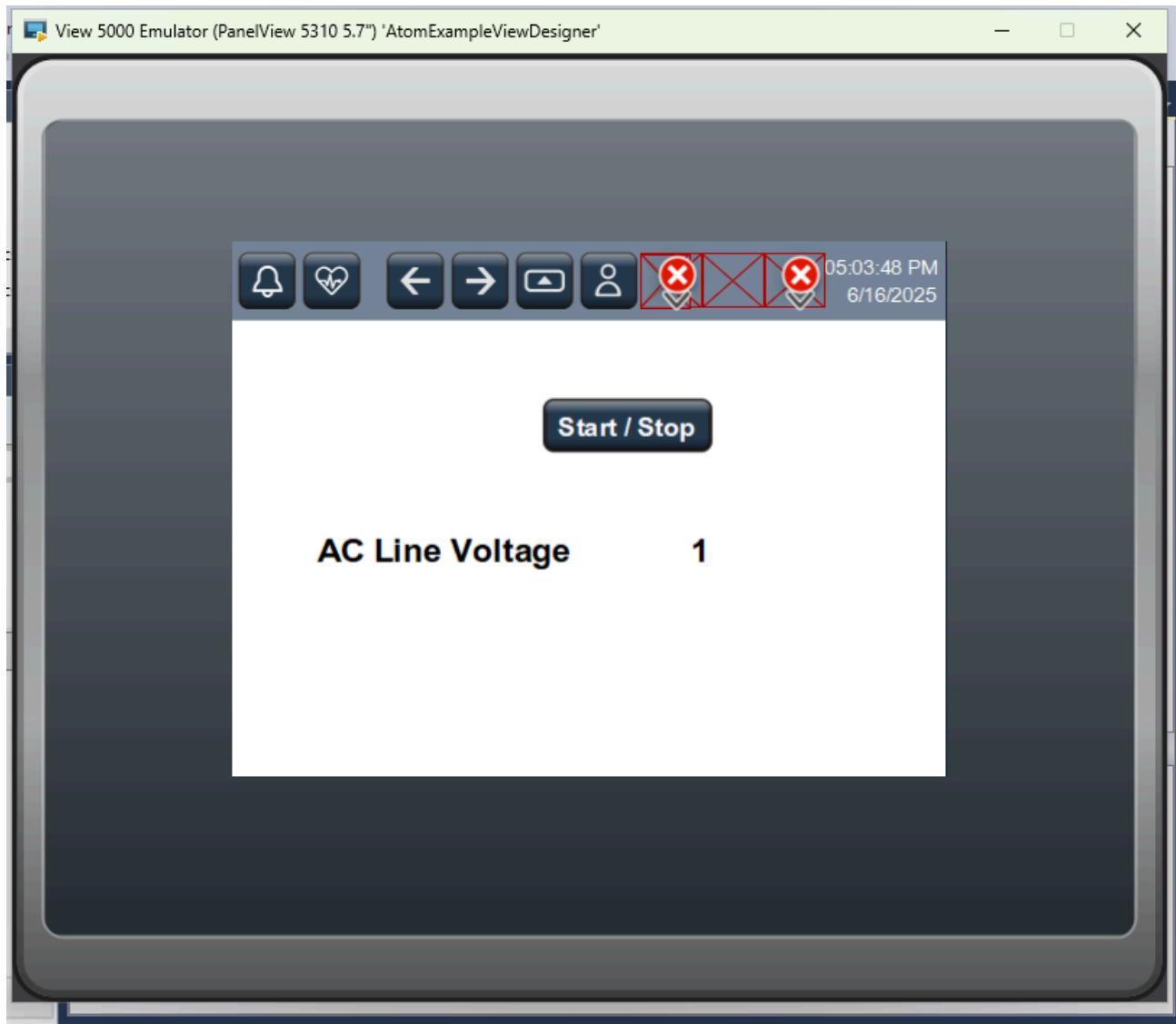


8. Select the **Emulate** button to launch the HMI emulator:

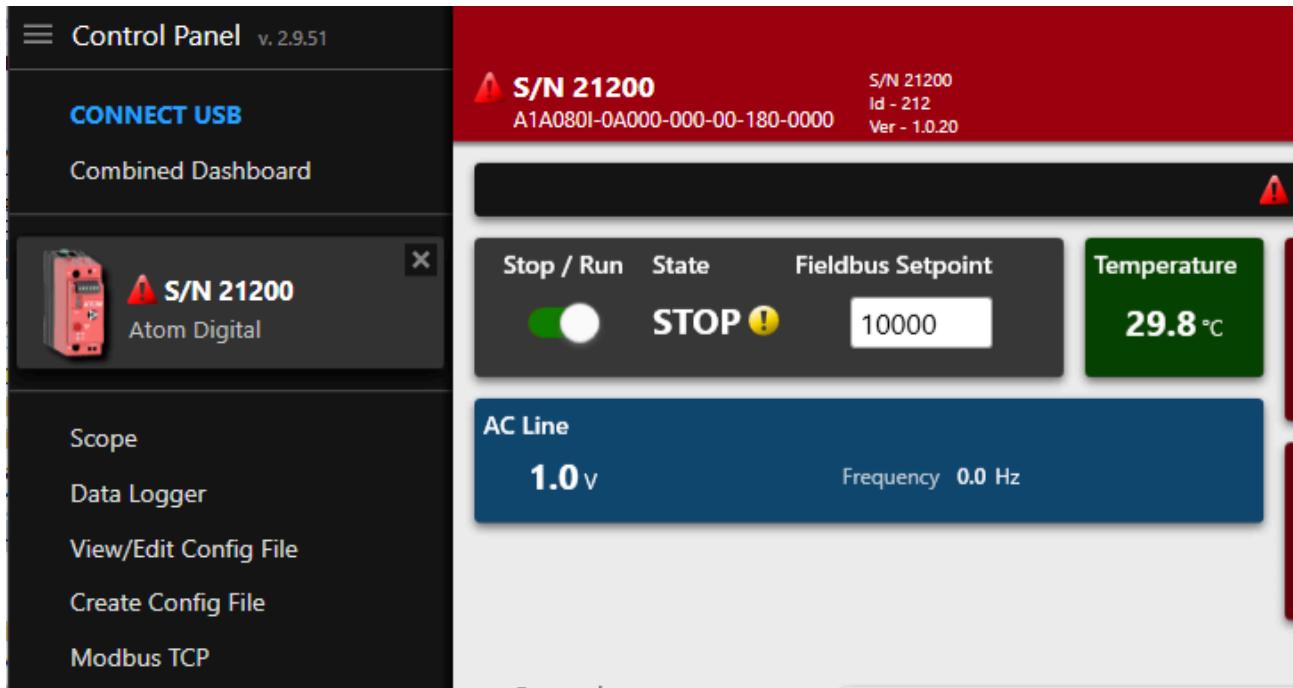


9. Ensure your PLC is in **RUN** if it is not already.

10. In the emulator, you can click **Start / Stop** to toggle ATOM's operation. The **AC Line Voltage** display should show the current line voltage (in tenths of volts (e.g., **2300** for **230.0V**)):



If you are connected to ATOM with Control Panel, you can watch the **Stop / Run** and **Fieldbus setpoint** controls change as you toggle the button in the Rockwell emulator.



# Troubleshooting

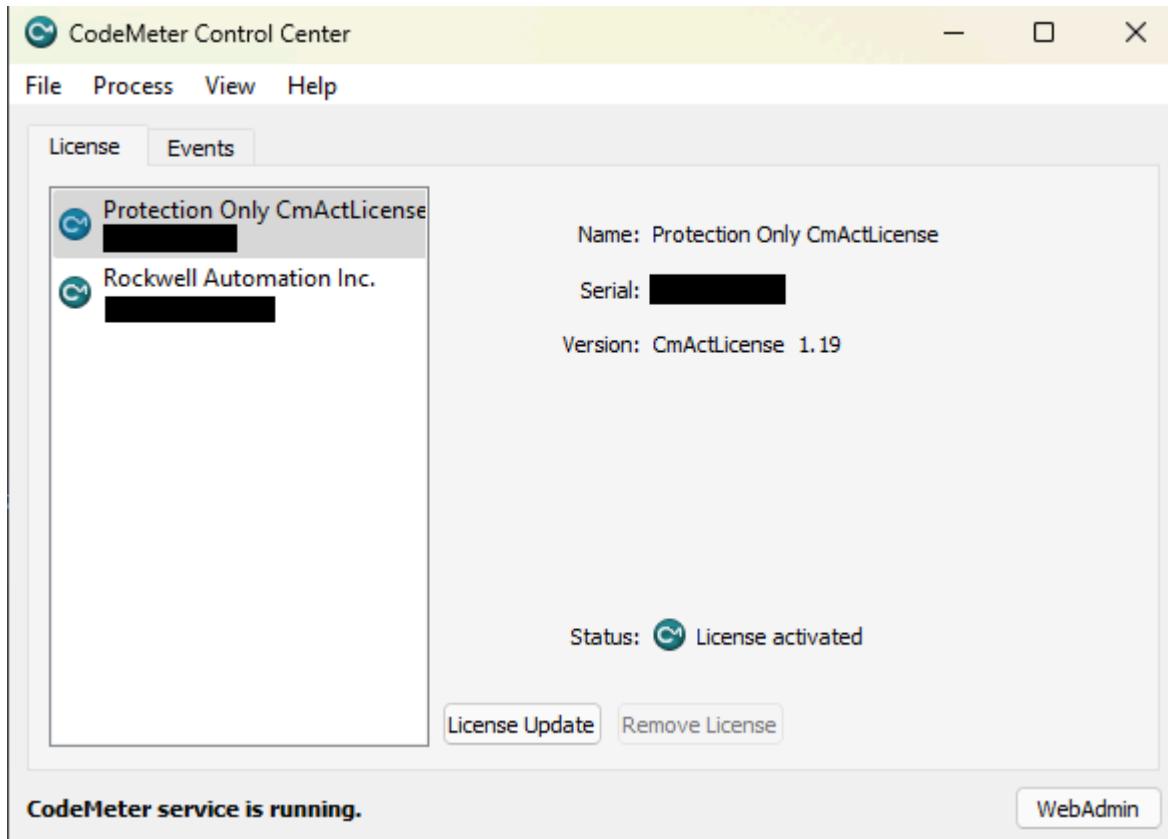
## Installation troubleshooting

### Activation issues

If you use your PC for multiple PLC environments (like Siemens TIA, Codesys, etc.) you may run into activation issues caused by CodeMeter licenses.

Follow [this guide](#) to delete other CodeMeter licenses as Studio 5000 requires exclusive access to the CodeMeter license manager.

Your CodeMeter should look like this:



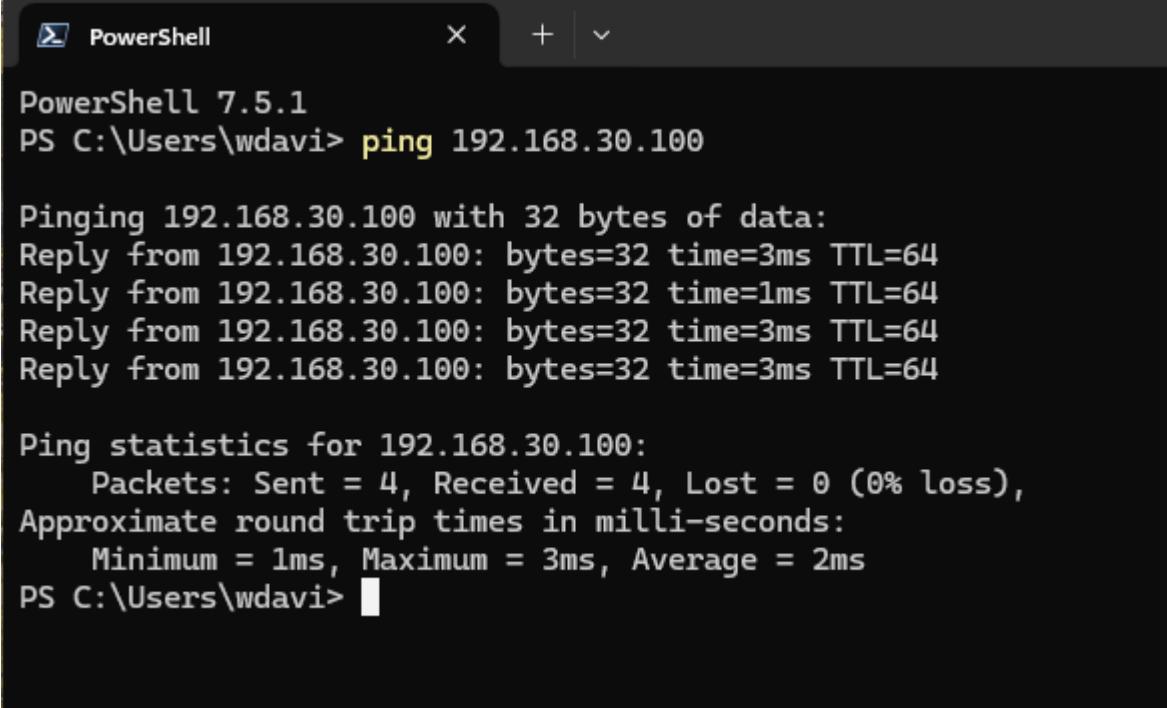
## Factory Talk activation

Use **Factory Talk Activation Manager** to ensure you have a valid Studio 5000 license.

The screenshot shows the FactoryTalk Activation Manager application. On the left, there is a sidebar with options: Find Available Activations, Get New Activations, Borrow Activations, Return Activations, Rehost Activations, Renew Activations, and Learn more... At the top, there is a search bar labeled "Select the location that will provide your activations or add a new activation location:" with a "Path to Activations" field containing "C:\Users\Public\Documents\Rockwell Automation\Activations". Below the search bar, there is a table titled "Available activations:" with columns: Product, Serial #, Expires, Support Expires, Activation, Feature Version, Location, Total, In Use, Borrowed, Product Version, and [REDACTED]. The table contains three rows: "FactoryTalk Logix Echo Node" (status: 1.00), "RSLogix 5000 Mini" (status: 1.00), and "RSLogix 5000 MLP Option" (status: 1.00). At the bottom of the sidebar, there is a "Refresh Activations" button.

## Can't connect to PLC or ATOM

Use the `ping` utility on Windows to check if your PC can reach the PLC/ATOM:



```
PowerShell 7.5.1
PS C:\Users\wdavi> ping 192.168.30.100

Pinging 192.168.30.100 with 32 bytes of data:
Reply from 192.168.30.100: bytes=32 time=3ms TTL=64
Reply from 192.168.30.100: bytes=32 time=1ms TTL=64
Reply from 192.168.30.100: bytes=32 time=3ms TTL=64
Reply from 192.168.30.100: bytes=32 time=3ms TTL=64

Ping statistics for 192.168.30.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 3ms, Average = 2ms
PS C:\Users\wdavi>
```

If:

- Ping is successful - you have a configuration problem with your PC
- Ping is unsuccessful - you have a hardware configuration, PLC configuration, or ATOM configuration problem.

# ATOM / Fieldbus / EtherNet/IP / Codesys

In this tutorial, you'll learn how to use Codesys with the SoftPLC emulator to connect to ATOM using EtherNet/IP and perform some basic operations and monitor data. You can follow along using the SoftPLC emulator or your own PLC.

We provide examples for both ladder logic and structured text.

If you haven't yet, please review ATOM's [EtherNet/IP Profile](#).

If you'd like to skip the tutorial, you can download a completed example project:

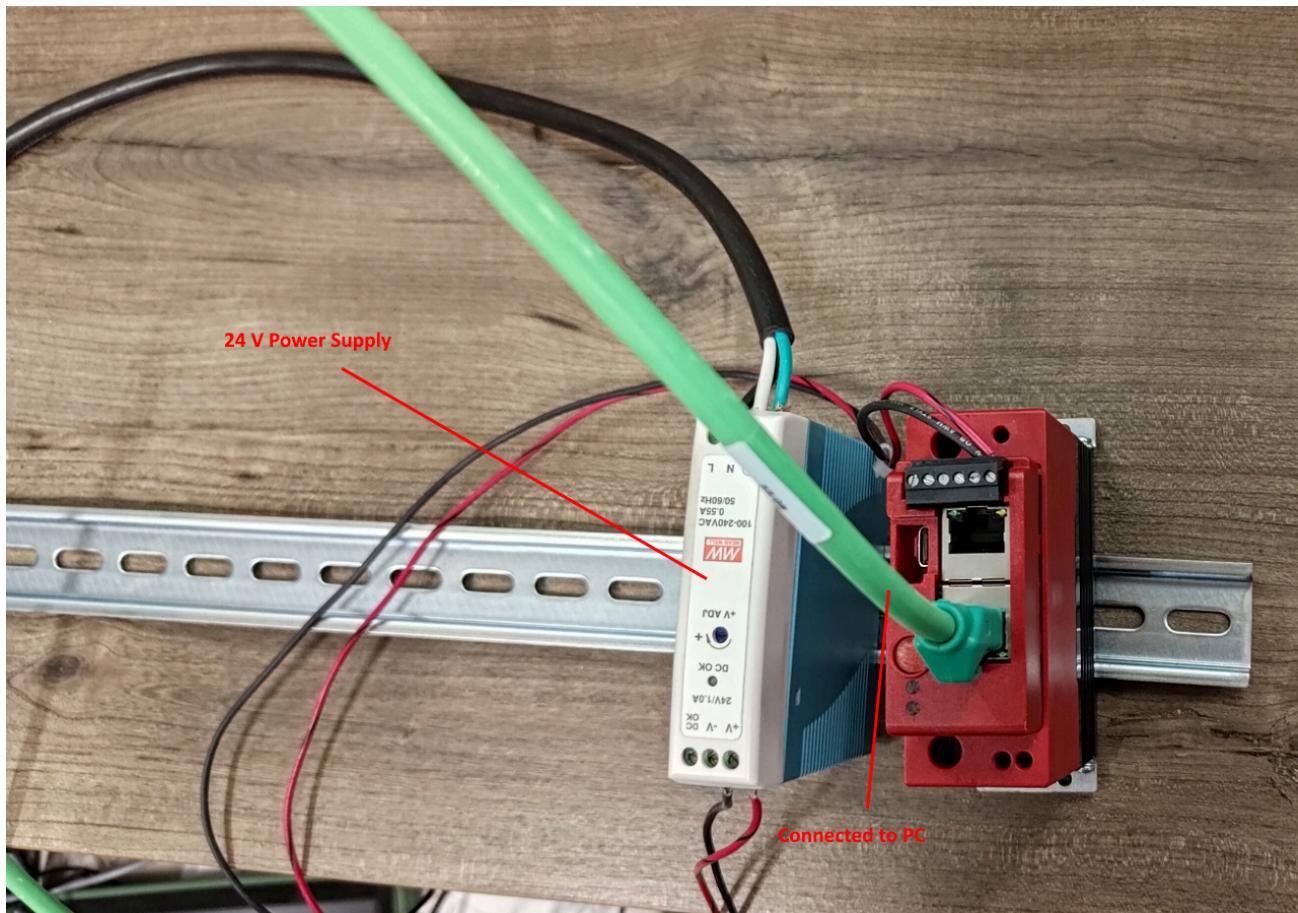
- Download [ATOM\\_Codesys\\_LadderLogic\\_Example.zip](#)
- Download [ATOM\\_Codesys\\_StructuredText\\_Example.zip](#)

## Prerequisites

1. Install [Codesys](#)
2. Download ATOM's [EDS file](#)

## Hardware setup

Connect 24V to your PLC and Atom unit with the provided power cable. Connect Atom to your PC with an Ethernet cable.

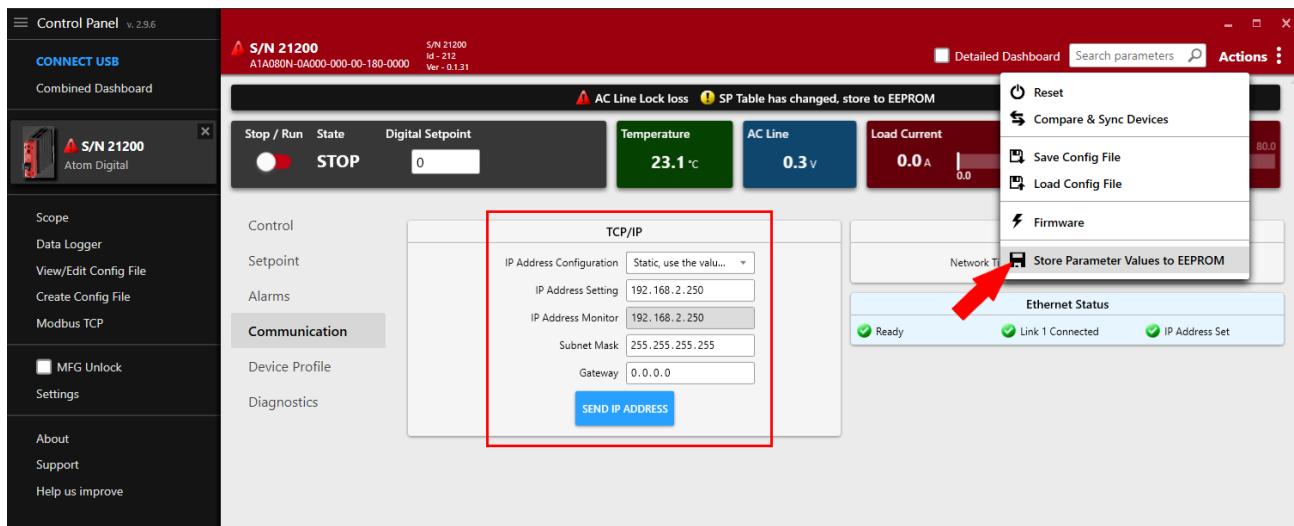
**!** **INFO**

To simplify this diagram, we have not connected a load to Atom. You may connect a load or leave it disconnected, either way is fine for the purposes of this tutorial.

If you do not connect a load, you can still verify your PLC is working by connecting a USB cable to Atom and using Control Panel to watch the parameters change/verify the PLC is receiving the correct monitor data.

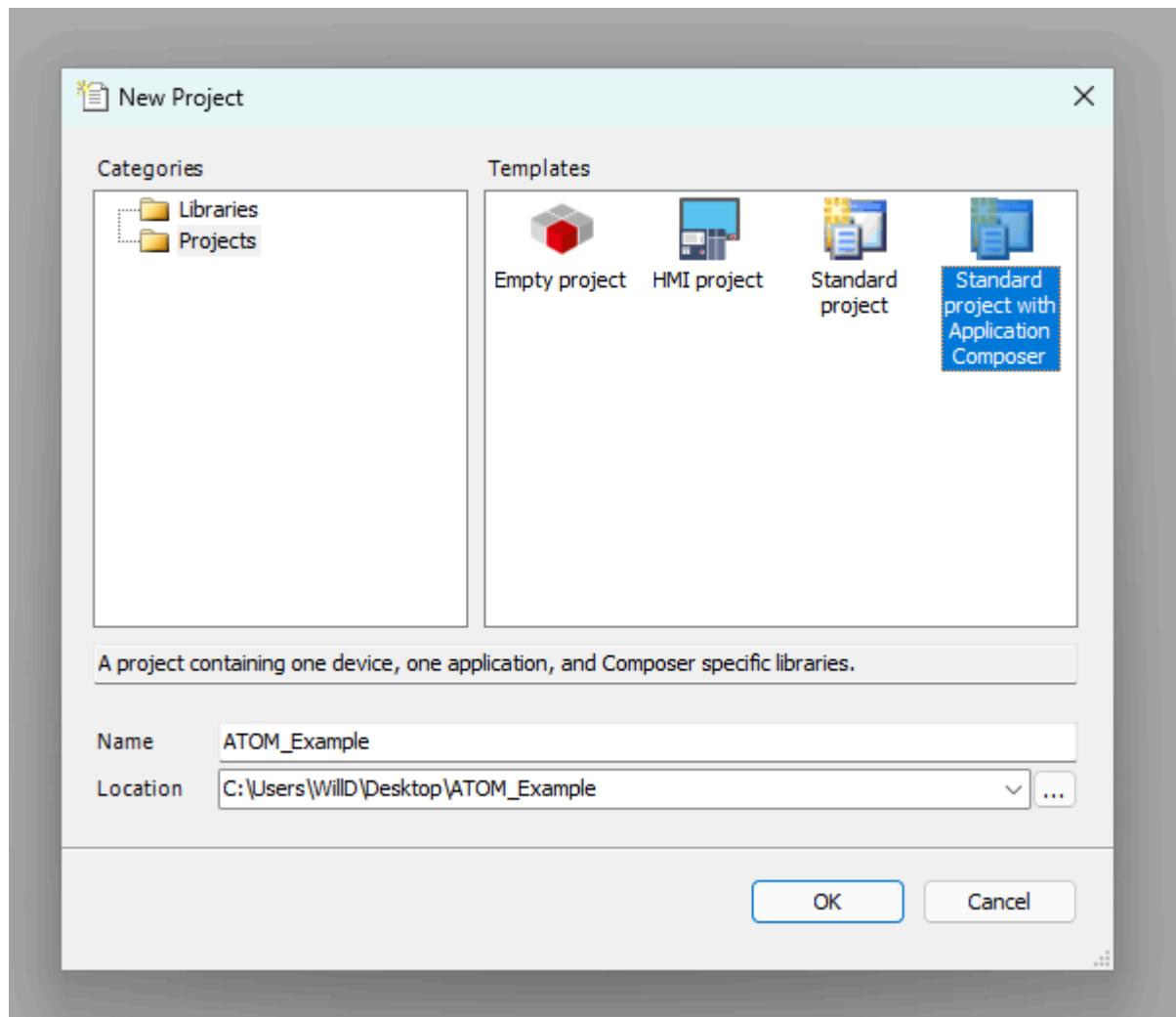
## Configuring Atom network settings

Connect your Atom unit to your PC using a USB cable. Open Control Panel and update your Atom's communication parameters. When you're finished, click **Send IP Address**, then go to **Actions** in the upper right and select **Store Parameter Values to EEPROM**:

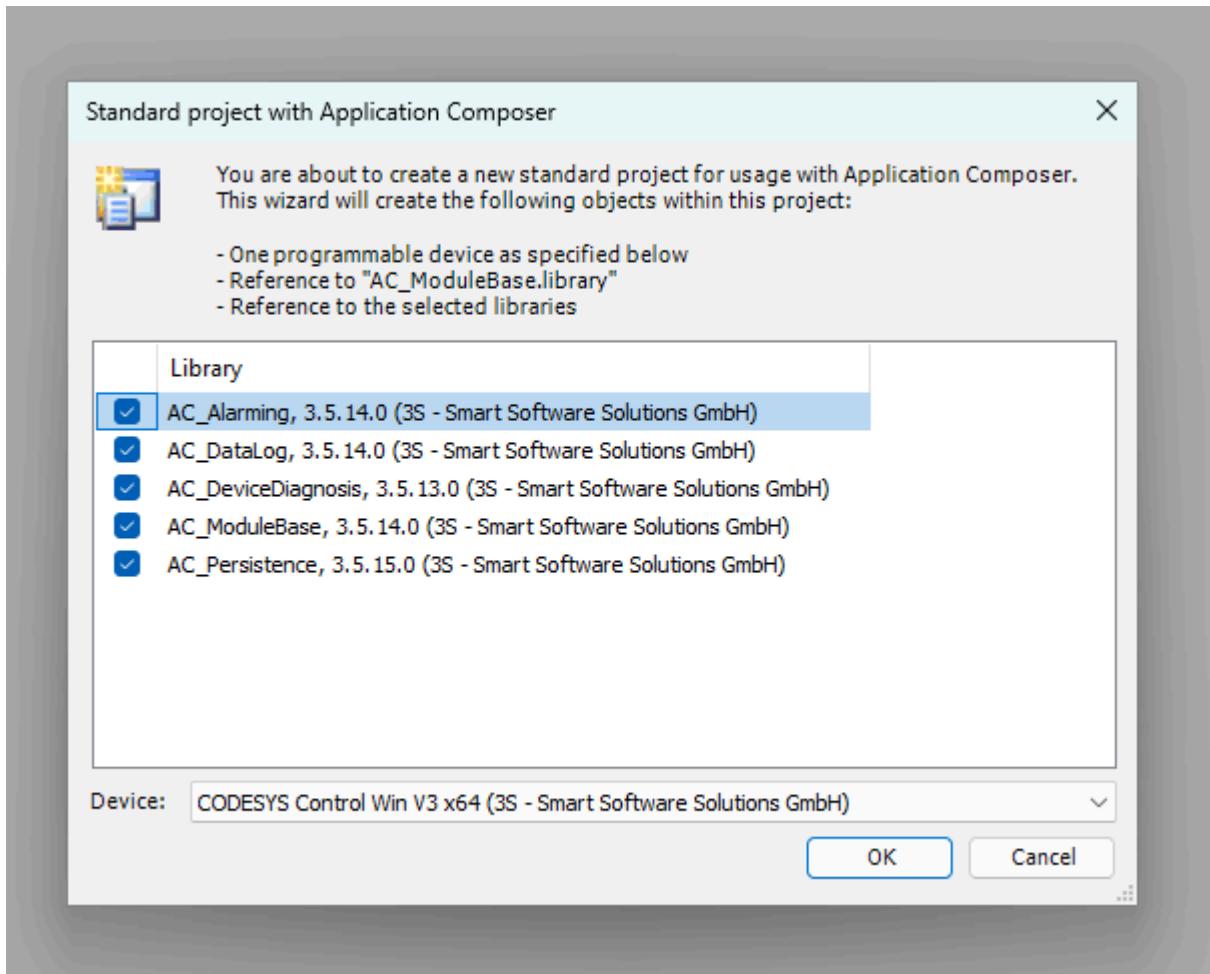


## Create a Codesys project

Create a new Codesys project using the **Standard project with Application Composer** template:



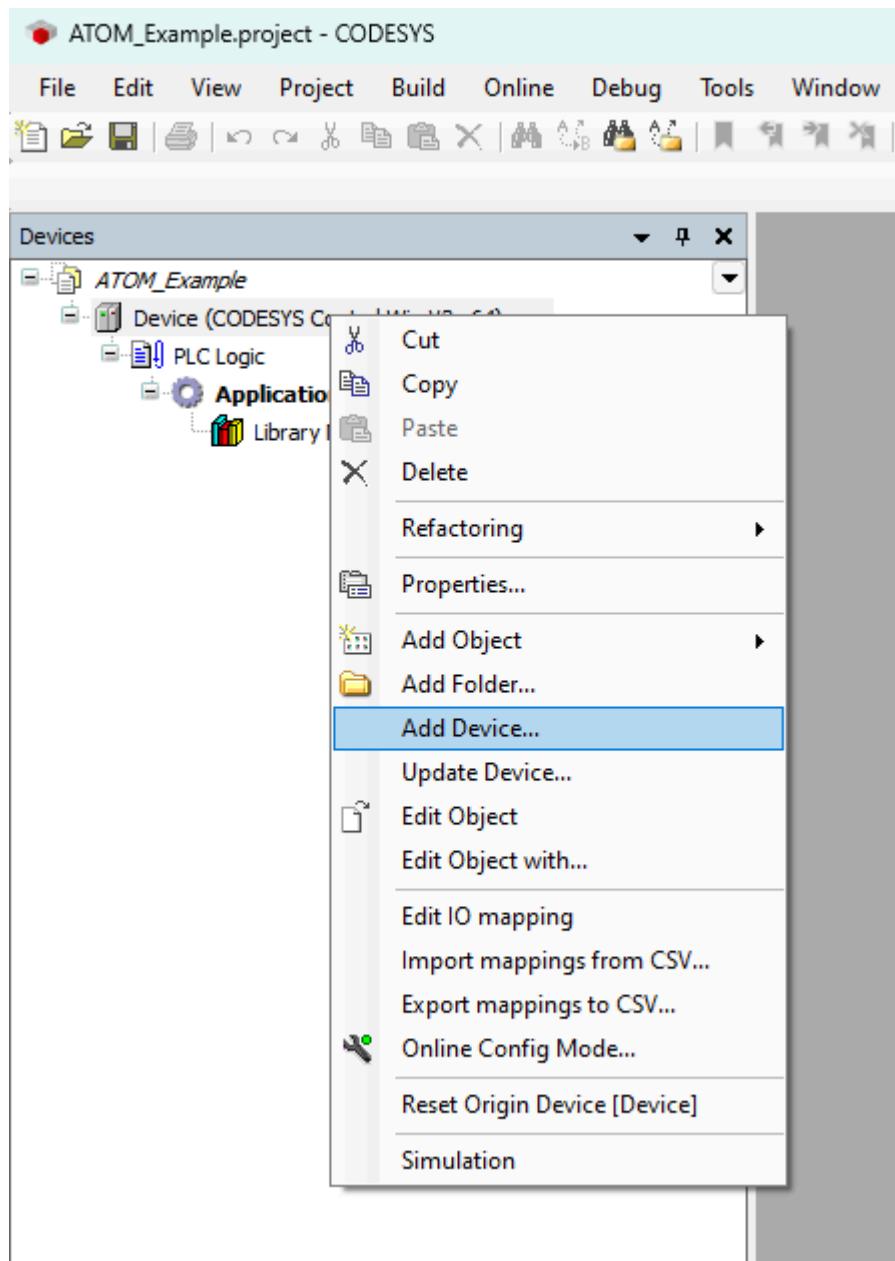
Check each library to include it in the project and select **CODESYS Control WIN V3 x64** as the device:



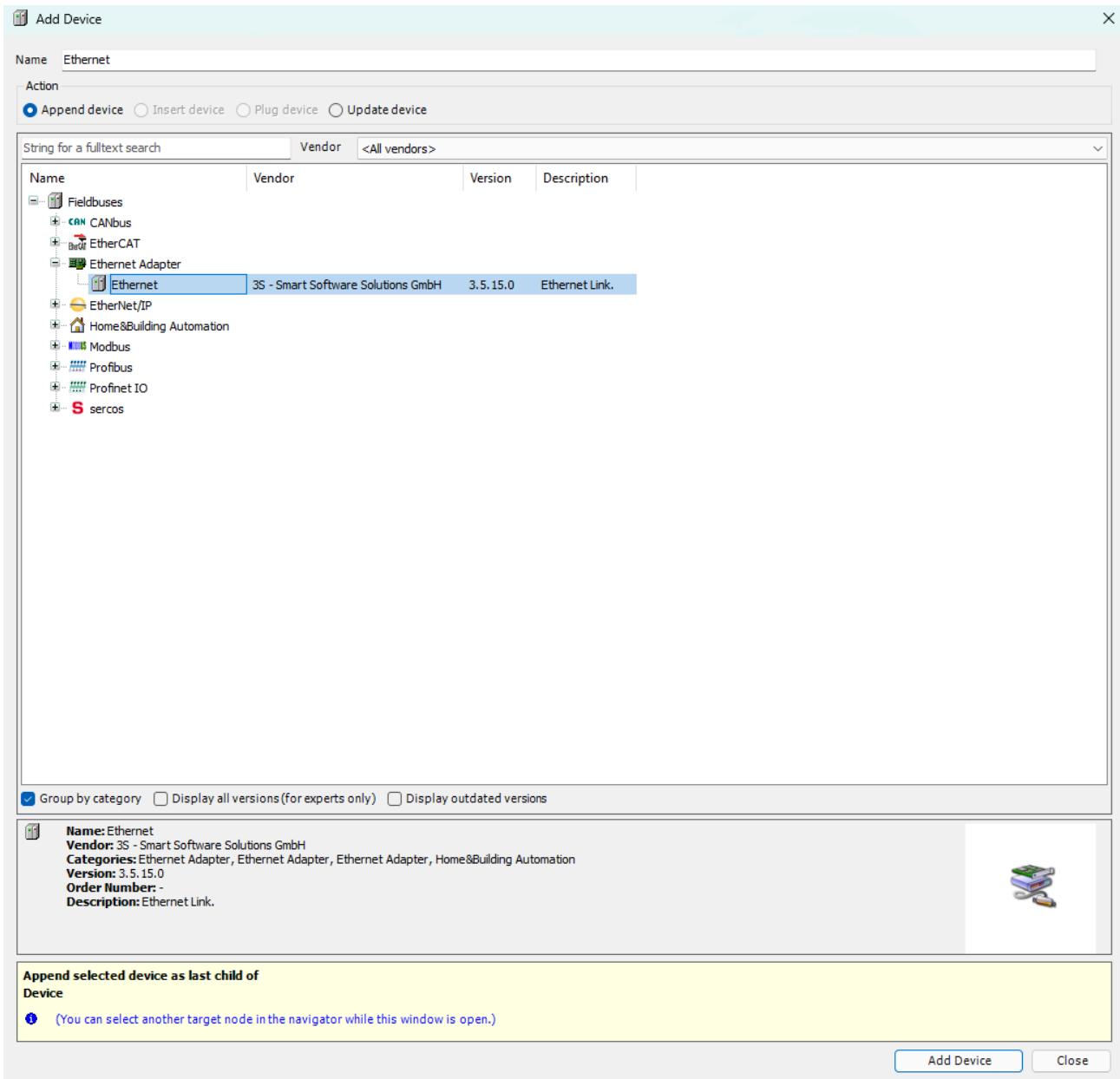
## Adding an EtherNet/IP Scanner

Next we'll add an EtherNet/IP Scanner module. This allows the PLC to discover EtherNet/IP devices on the network (in our case, ATOM) and establish a connection with them.

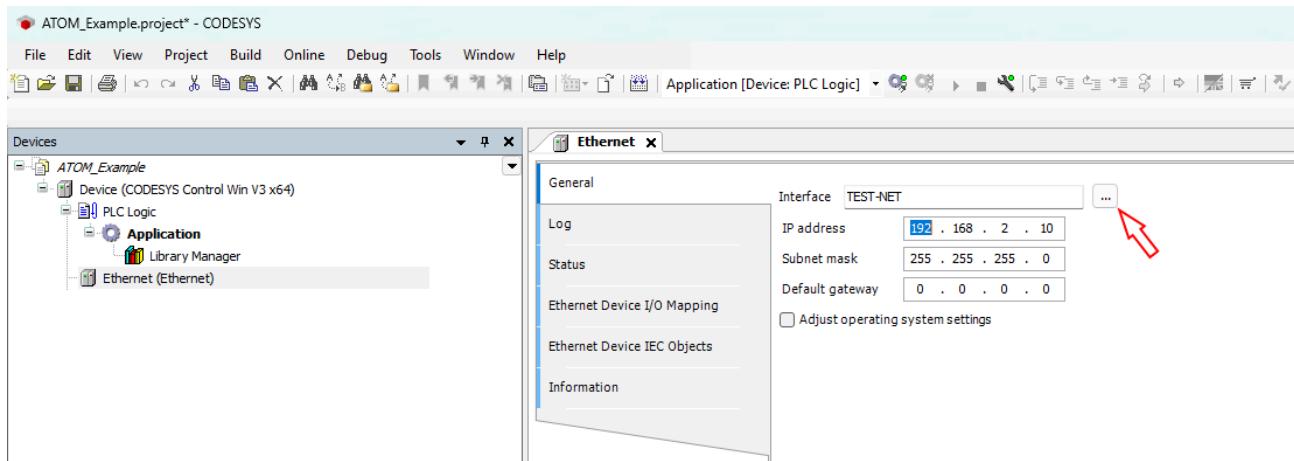
First, right click **Device** and select **Add Device**:



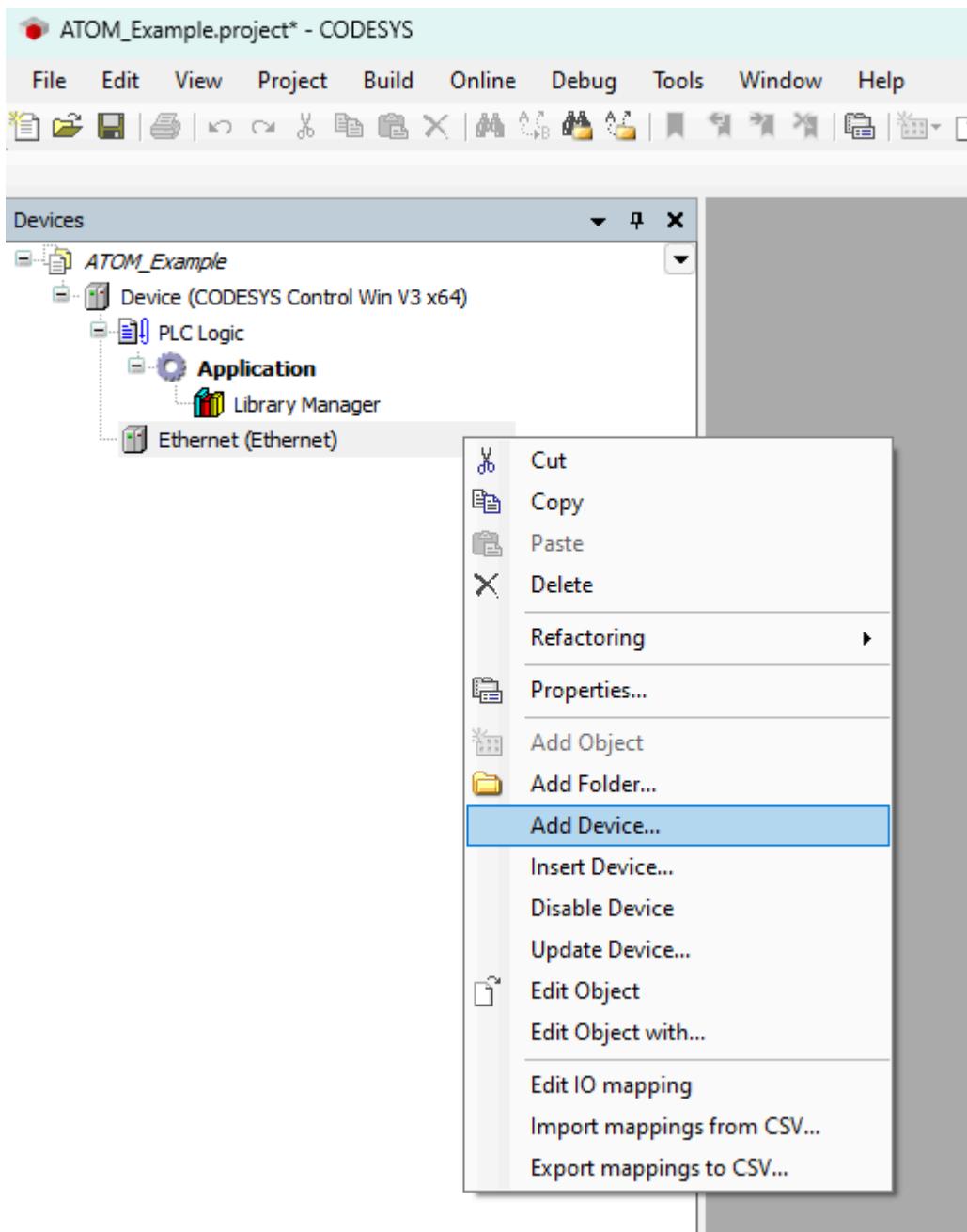
Next, expand **Ethernet Adapter** and select **Ethernet**, then click **Add Device**:



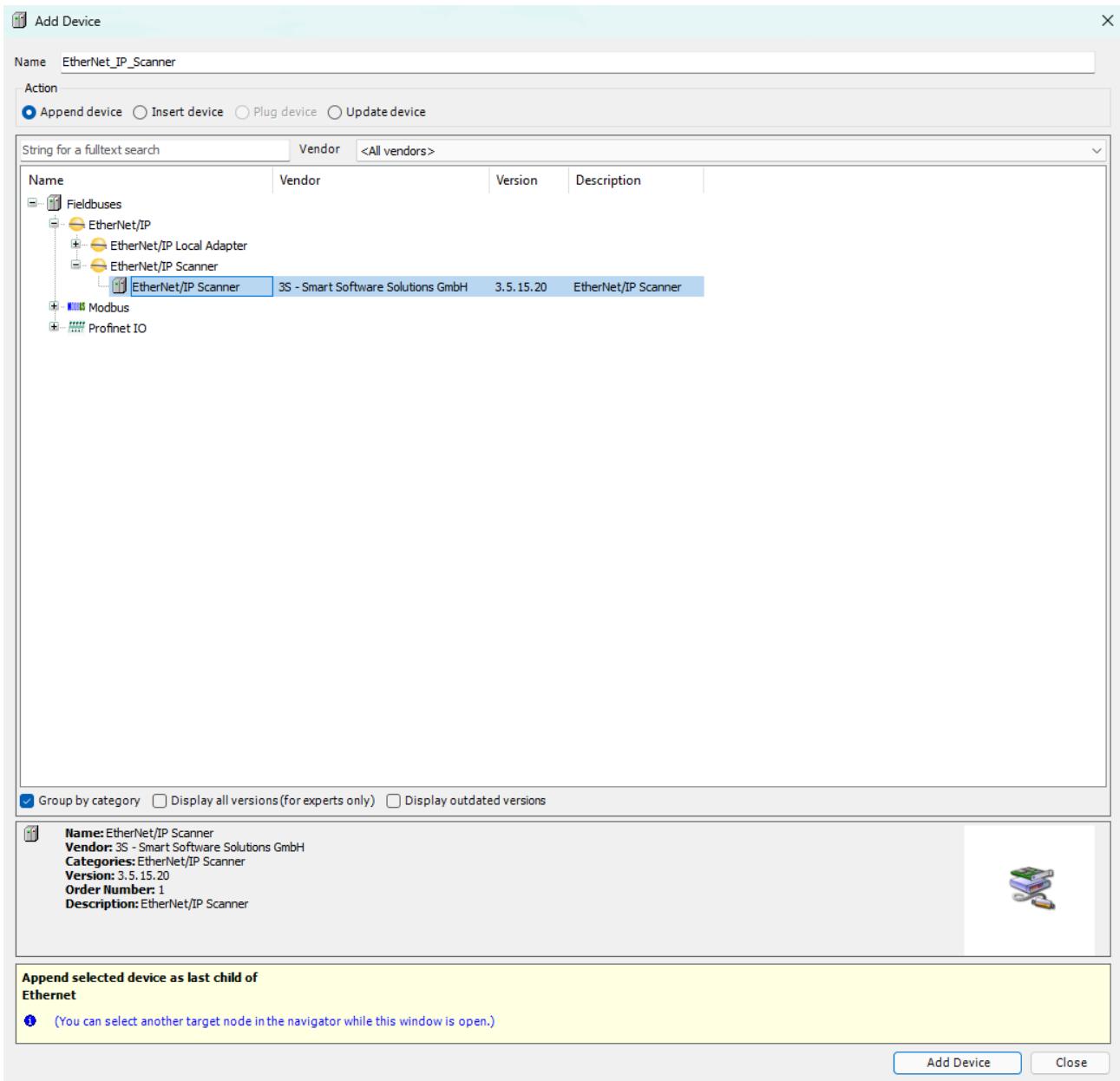
The newly added **Ethernet** device will now appear in the device tree. Double click **Ethernet (Ethernet)** to open its configuration tab. Within the **General** configuration tab, use the button indicated by the red arrow to select the network interface of the host machine that will be used to communicate with ATOM. In our case, we have a **TEST-NET** interface but this will be different for you.



Next, right click **Ethernet (Ethernet)** and select **Add Device**:



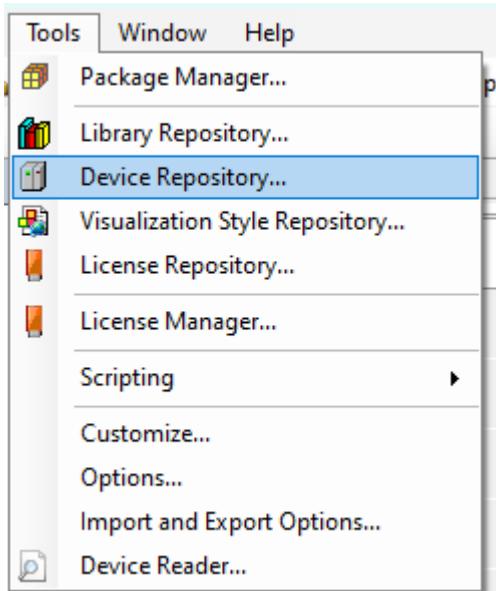
Expand **EtherNet/IP Scanner**, select **EtherNet/IP Scanner**, then click **Add Device**:



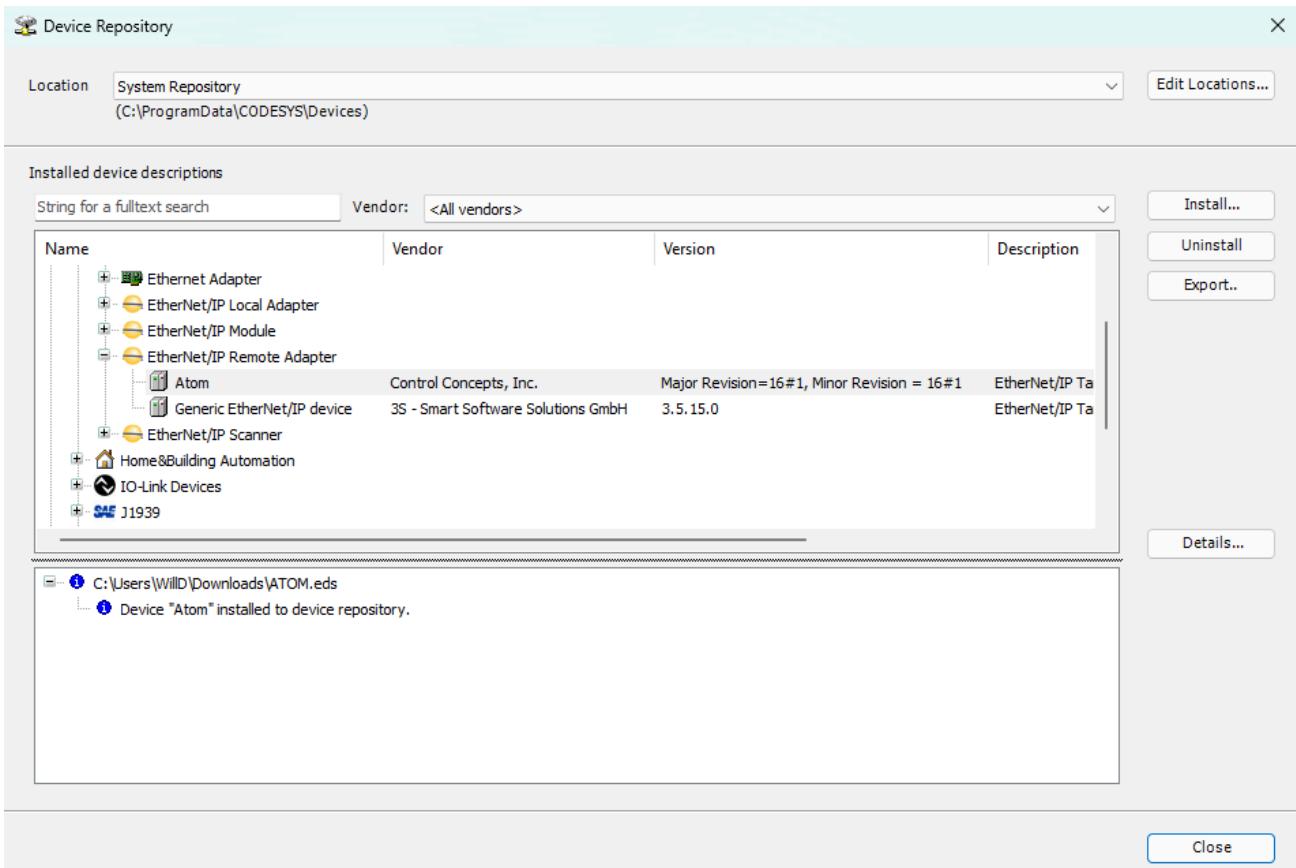
Your device tree should update to include the **EtherNet/IP Scanner** device.

## Adding ATOM to the scanner

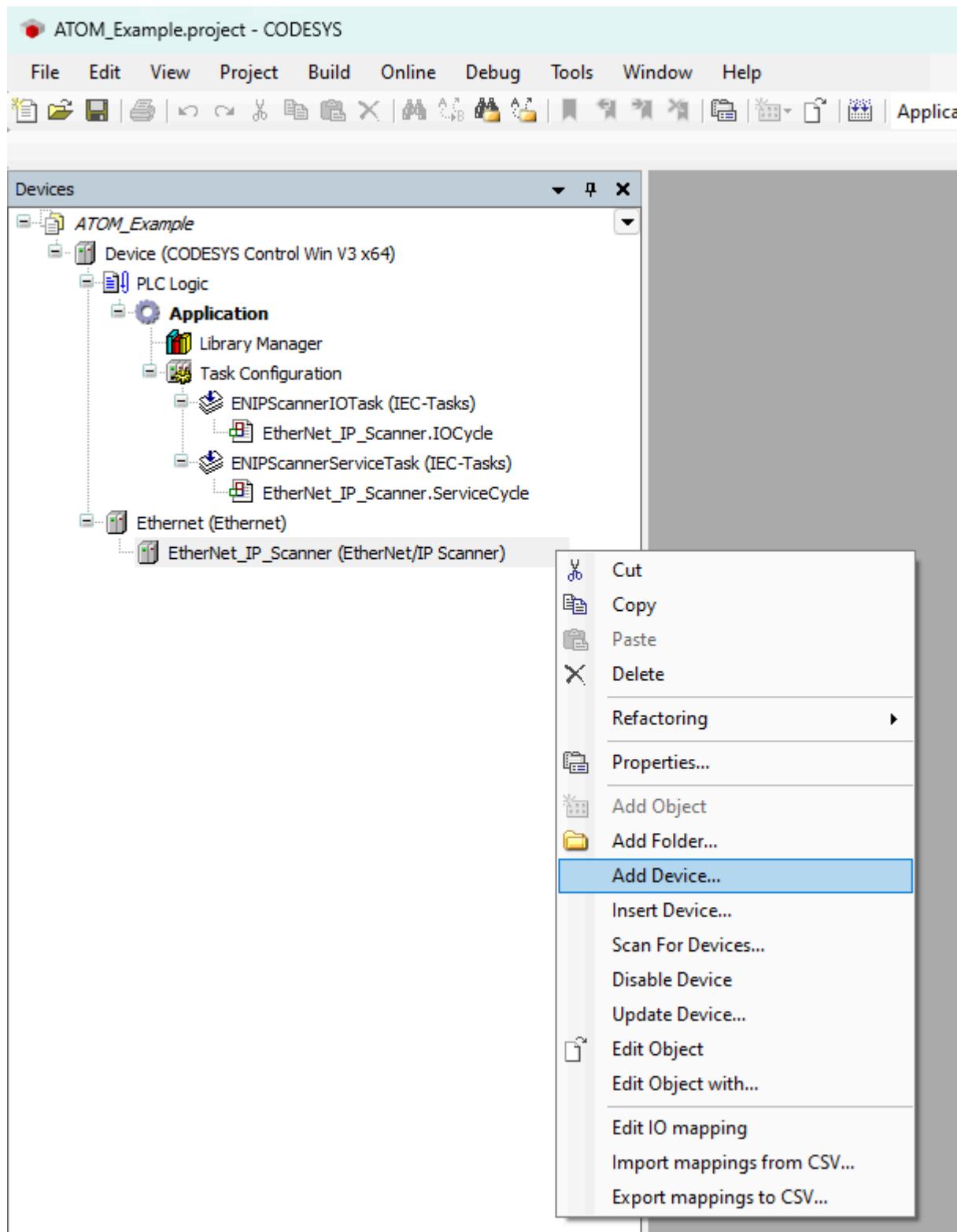
First, we'll import ATOM's EDS file you downloaded [earlier](#) into our Codesys device library. Open the tools menu and select **Device repository**:



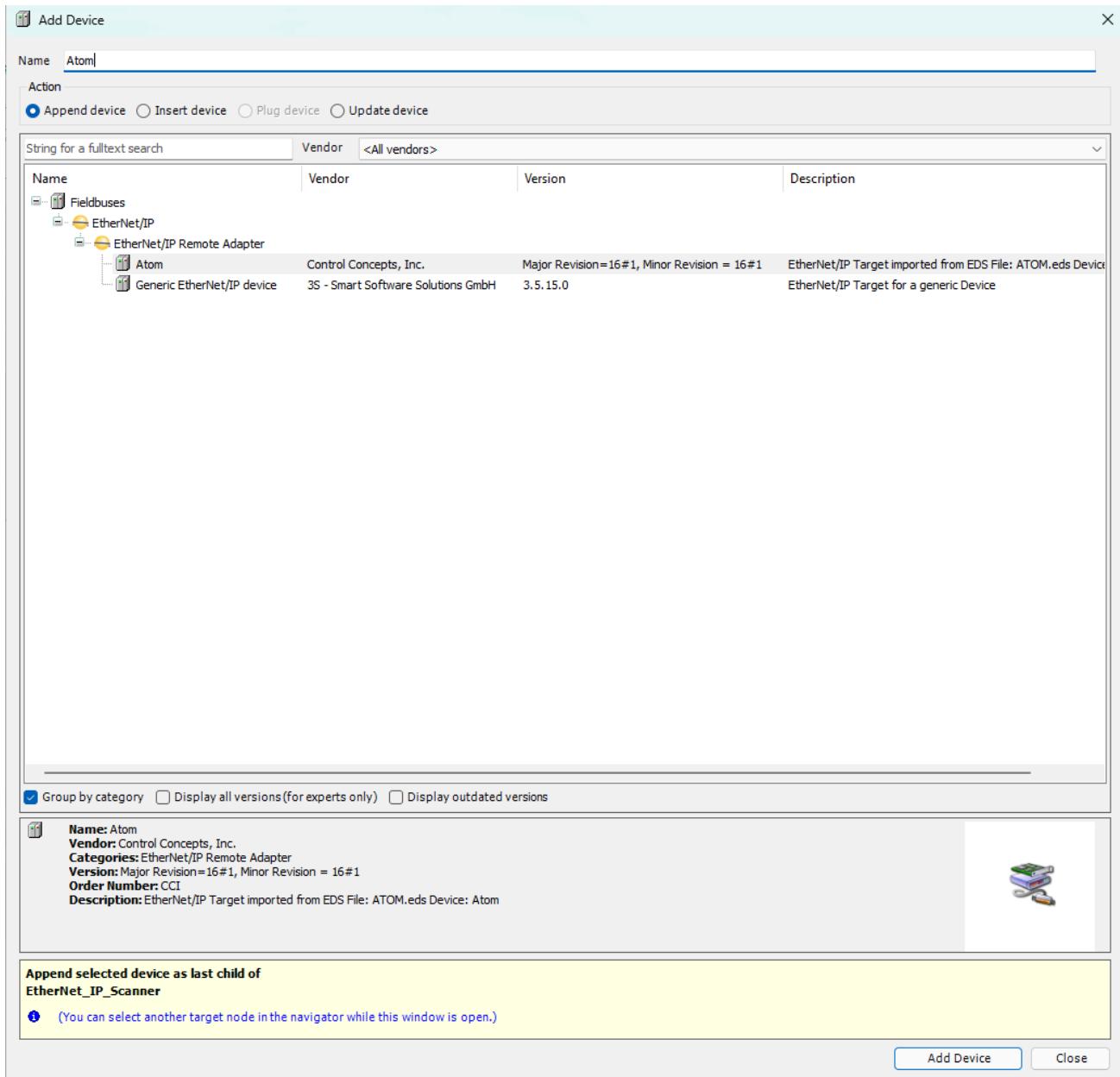
Next, click **Install** and select the `ATOM.eds` file. After you click install, **Atom** will appear under the **EtherNet/IP Remote Adapter** category. Click **Close** to dismiss the dialog:



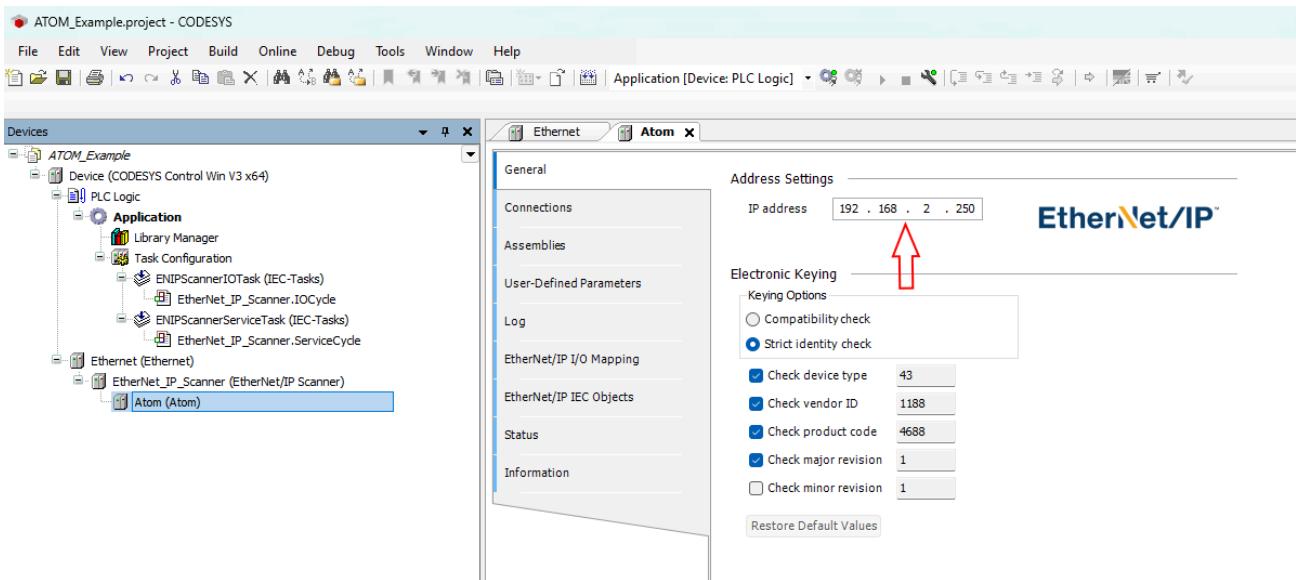
Now, we'll add ATOM to the scanner. Right click **EtherNet/IP Scanner (EtherNet/IP Scanner)** and select **Add Device**:



Expand **EtherNet/IP Remote Adapter** and select **Atom**, then click **Add Device**:



Finally, double click **Atom (Atom)** to open its configuration tab. In the **General** tab, set the **IP Address** to the IP address of your ATOM device:



# Create a program

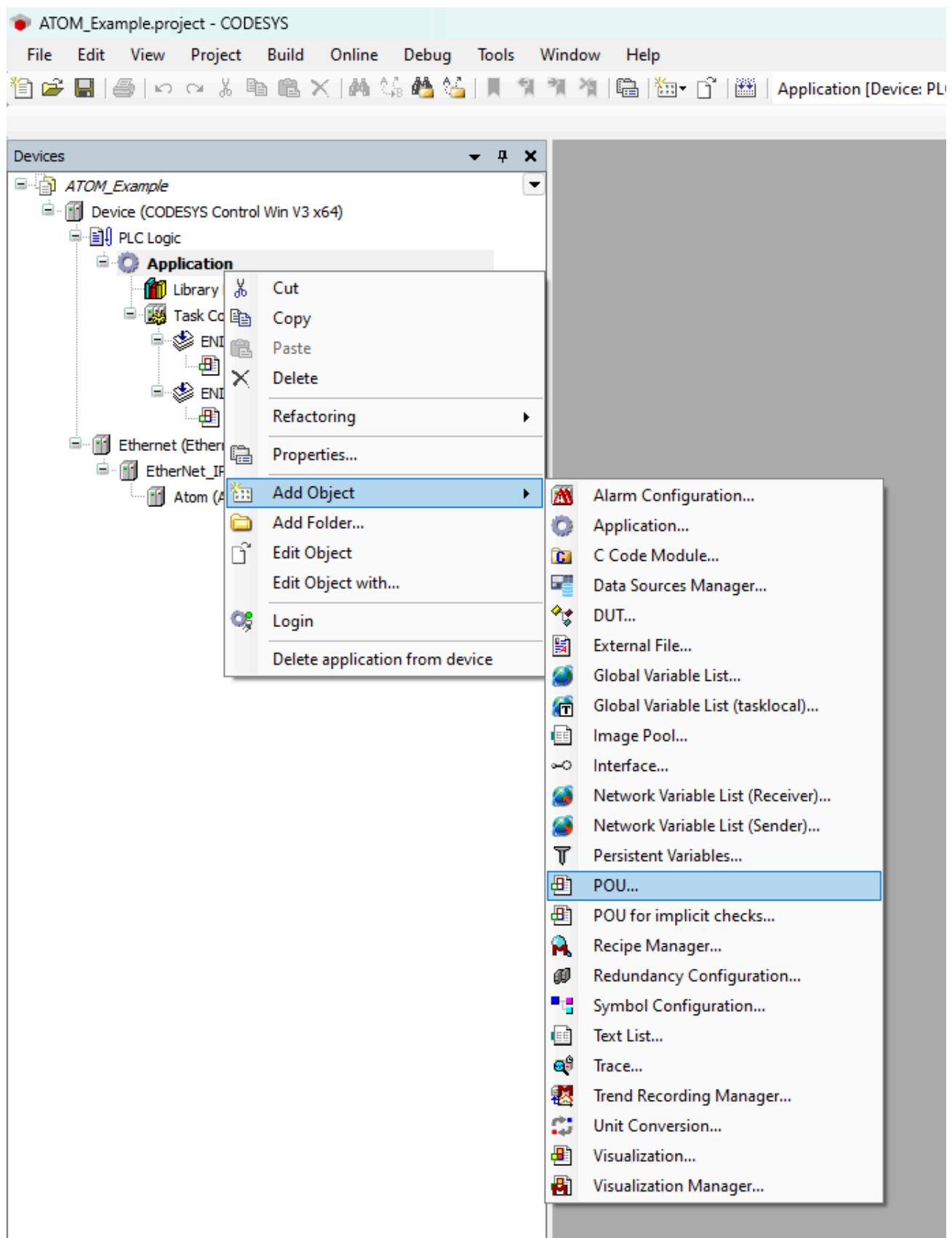
Next, we'll create a PLC program. We provide examples for both ladder logic and structured text:

- Program with ladder logic
- Program with structured text

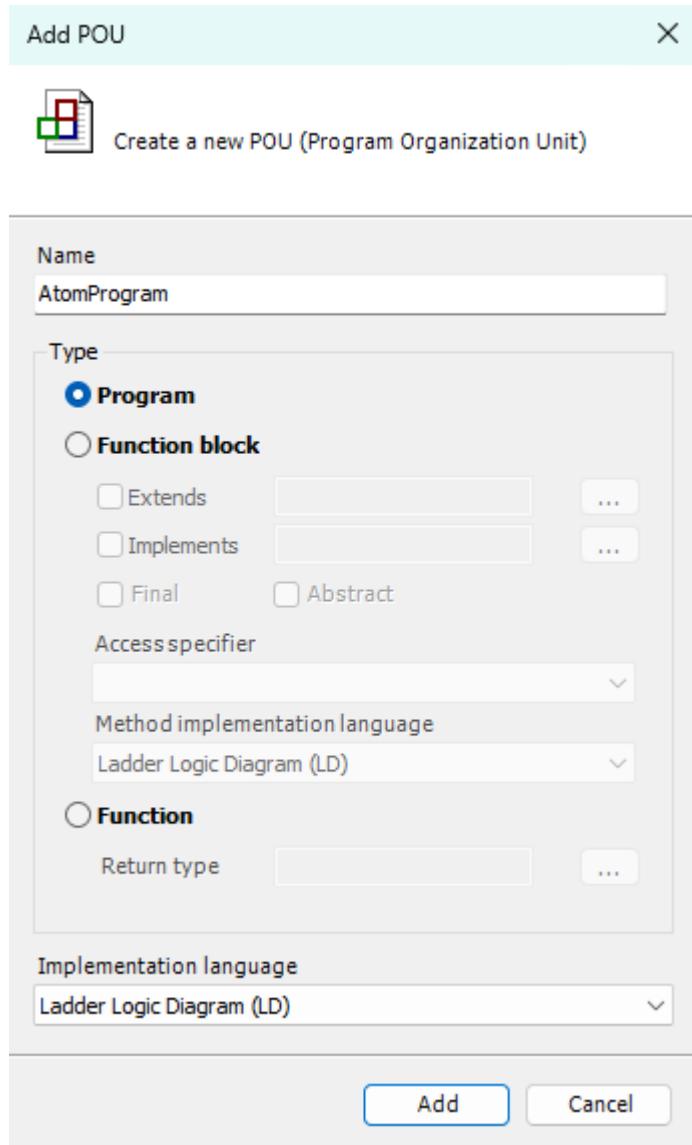
## Example: Ladder logic

### Creating the program

Right click **Application** and select **Add Object > POU**:



Set the name to **AtomProgram** and select **Ladder Diagram (LD)** as the Implementation language:



Copy the following code into the top panel of the **AtomProgram** editor:

```
PROGRAM AtomProgram
```

```
VAR
```

```
RUN_SWITCH: BOOL;
```

```
SETPOINT: DINT;
```

```
TEMP: REAL;
```

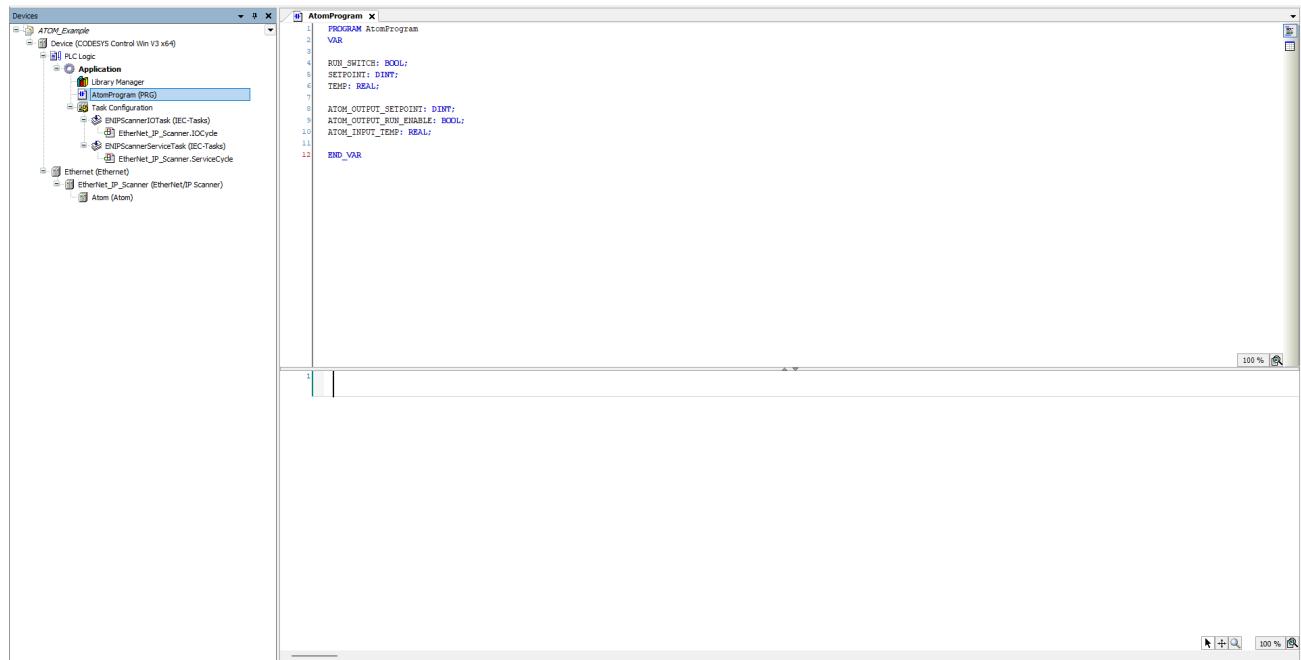
```
ATOM_OUTPUT_SETPOINT: DINT;
```

```
ATOM_OUTPUT_RUN_ENABLE: BOOL;
```

```
ATOM_INPUT_TEMP: REAL;
```

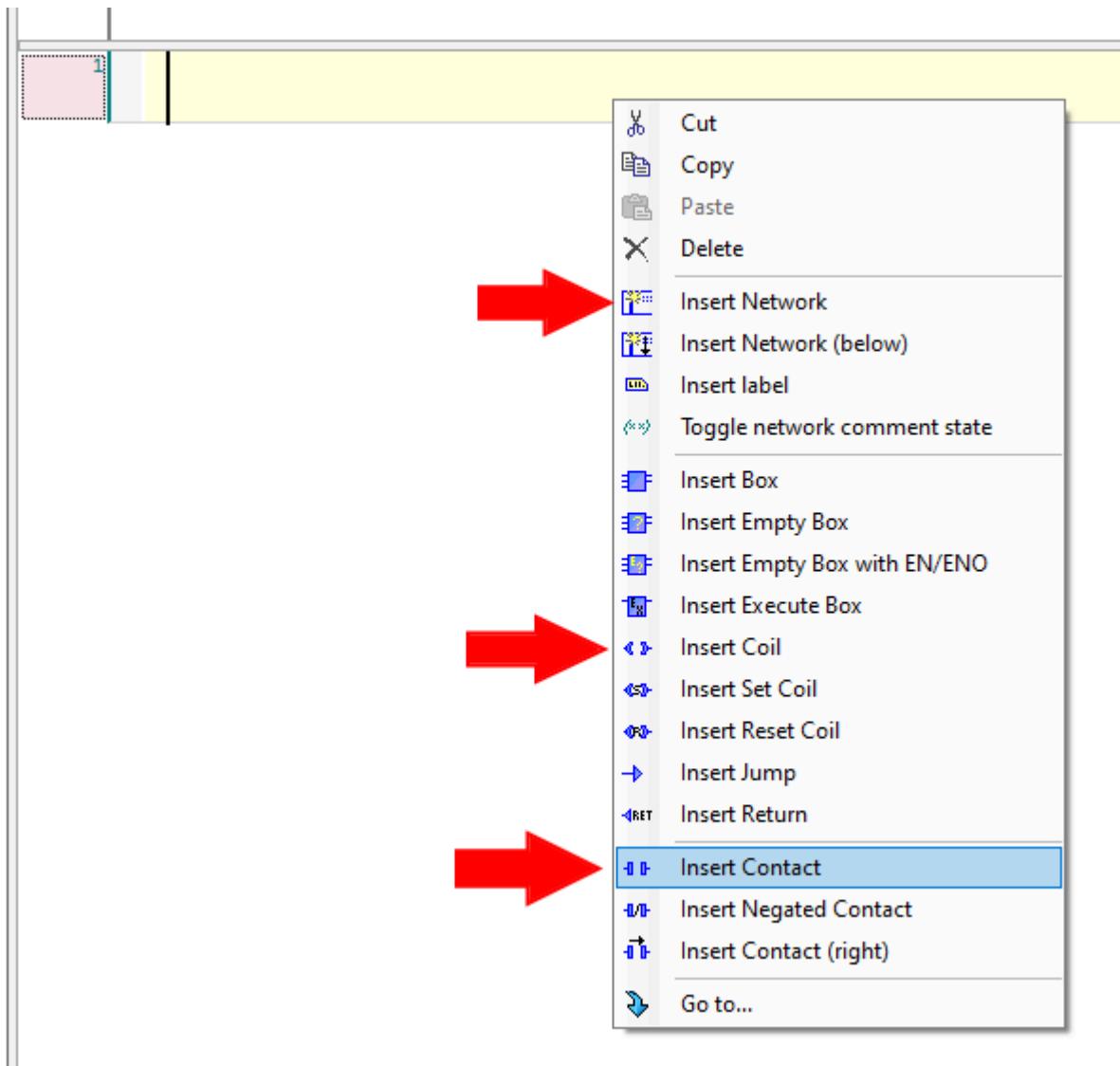
```
END_VAR
```

After you've copied the code over, the editor for **AtomProgram** should look like this:

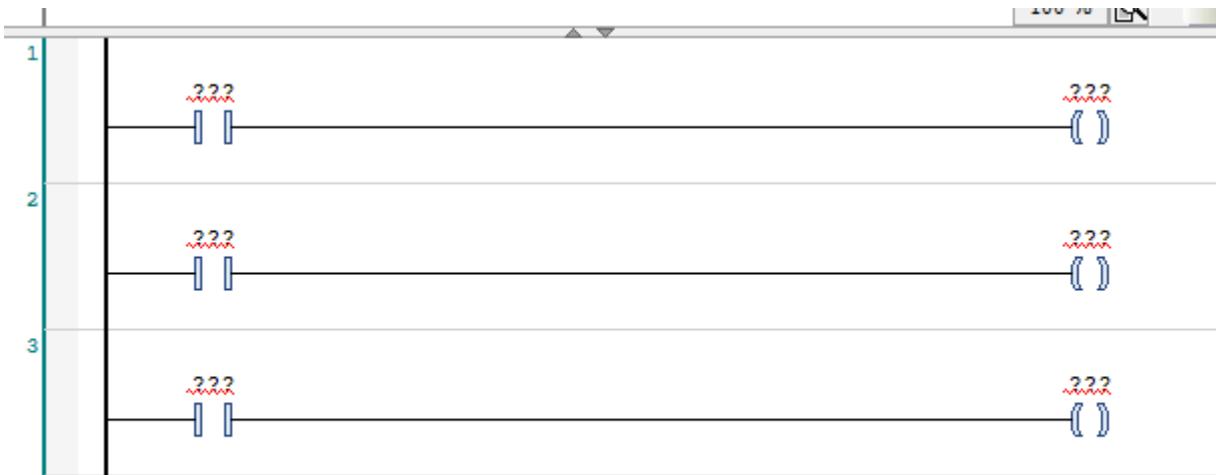


In the bottom panel of the editor, we'll create a simple ladder logic program using the variables we just added above.

1. Create **3** networks total by right-clicking and selecting **Insert Network**
2. For each network, right click and insert **one** contact and **one** coil



After you're finished, your ladder logic program should look like:



For each rung, replace the **???** with the corresponding variables:

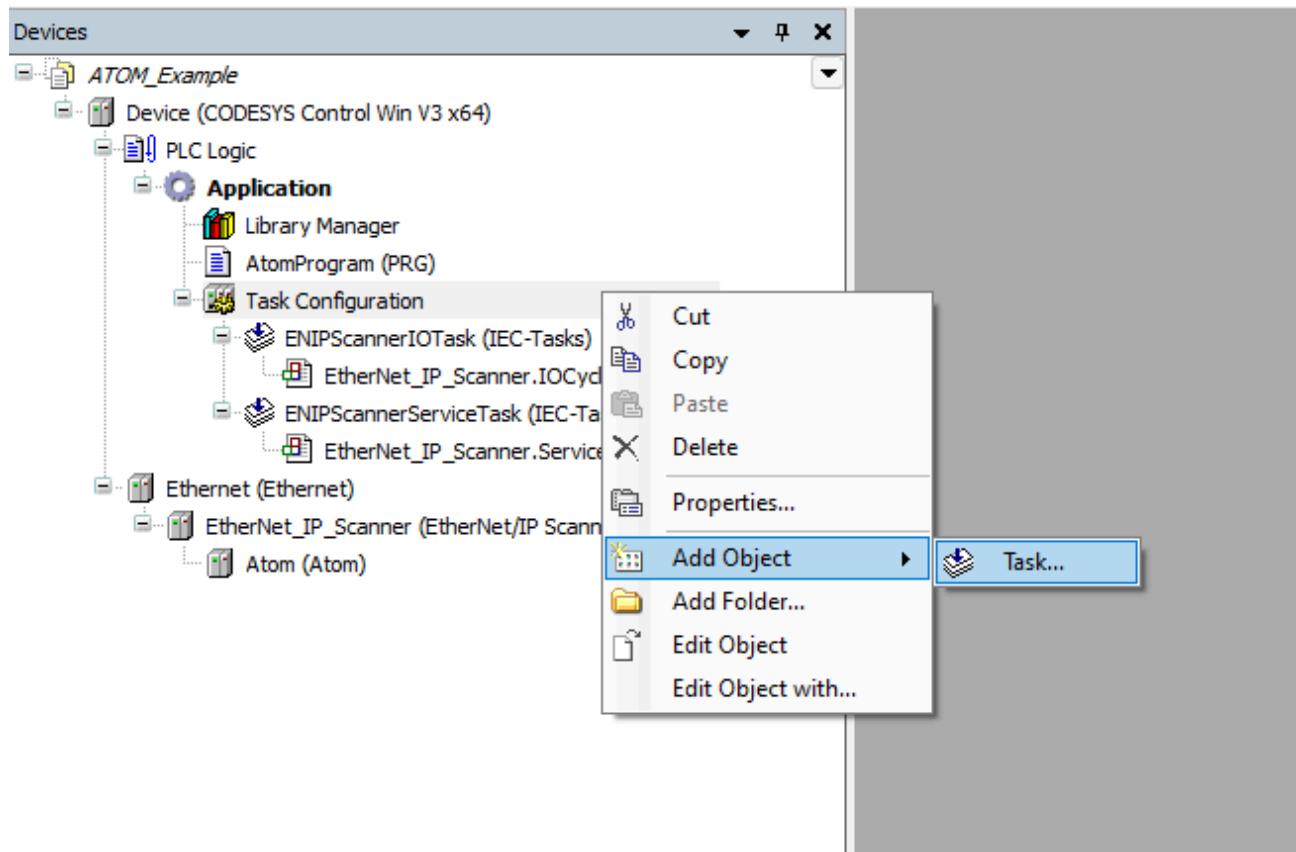
1. **Rung #1** - `RUN_SWITCH` and `ATOM_OUTPUT_RUN_ENABLE`
2. **Rung #2** - `SETPOINT` and `ATOM_OUTPUT_SETPOINT`
3. **Rung #3** - `ATOM_INPUT_TEMP` and `TEMP`

After you're finished, your ladder logic program should look like:

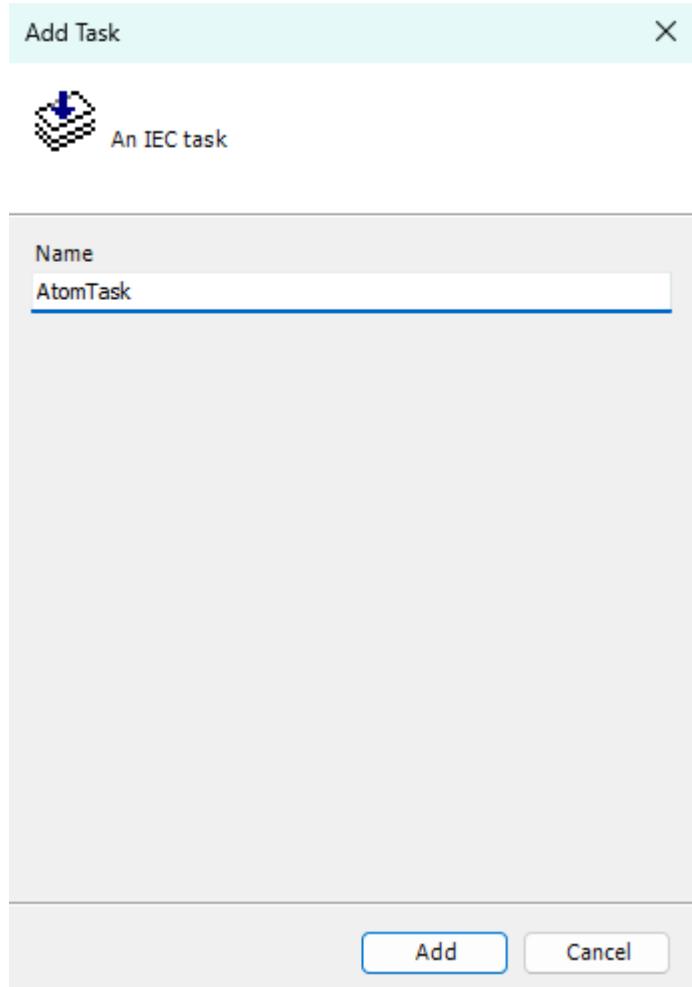


Finally, we'll add a task to call **AtomProgram** from the PLC's control loop:

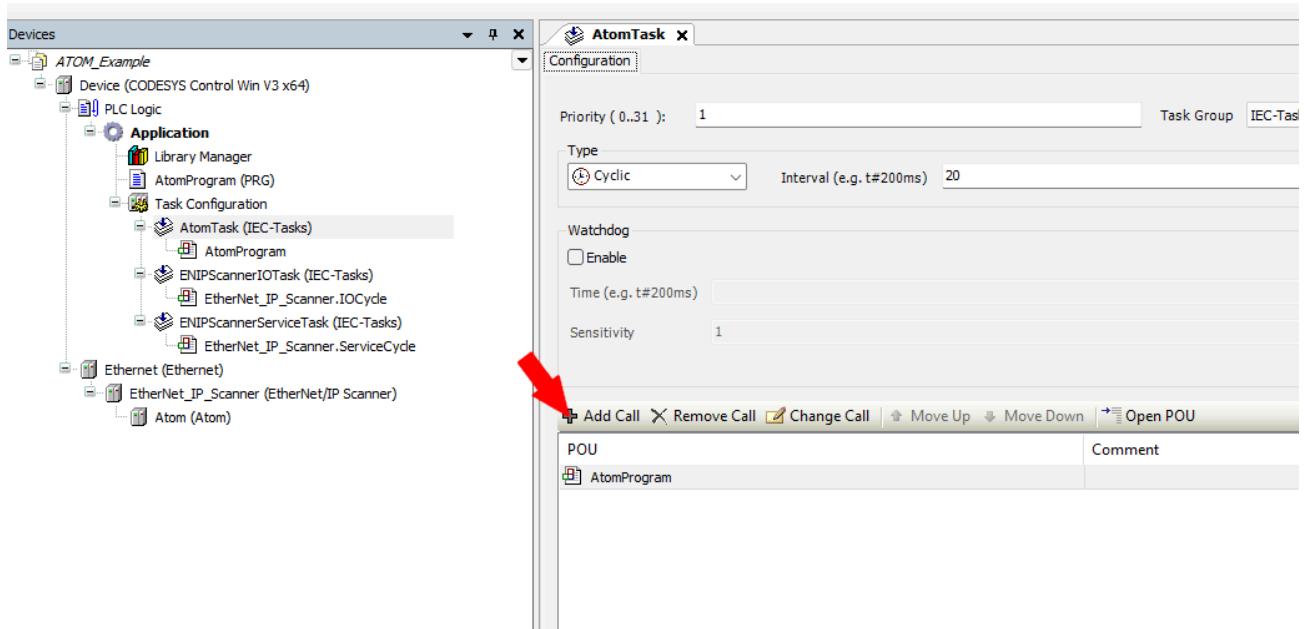
Right click **Task Configuration** and select **Add Object > Task**:



Name your task **AtomTask** and click **OK**:



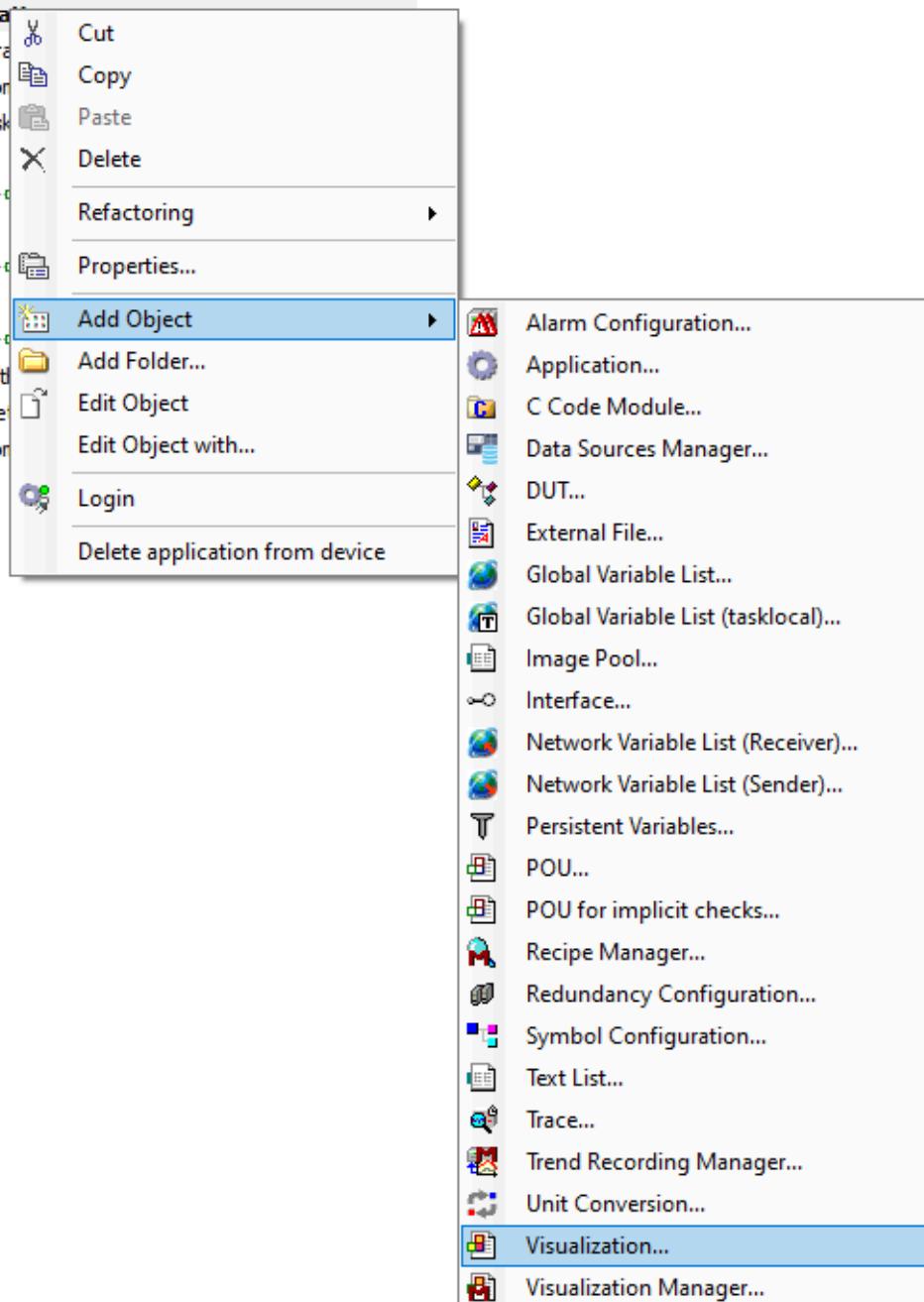
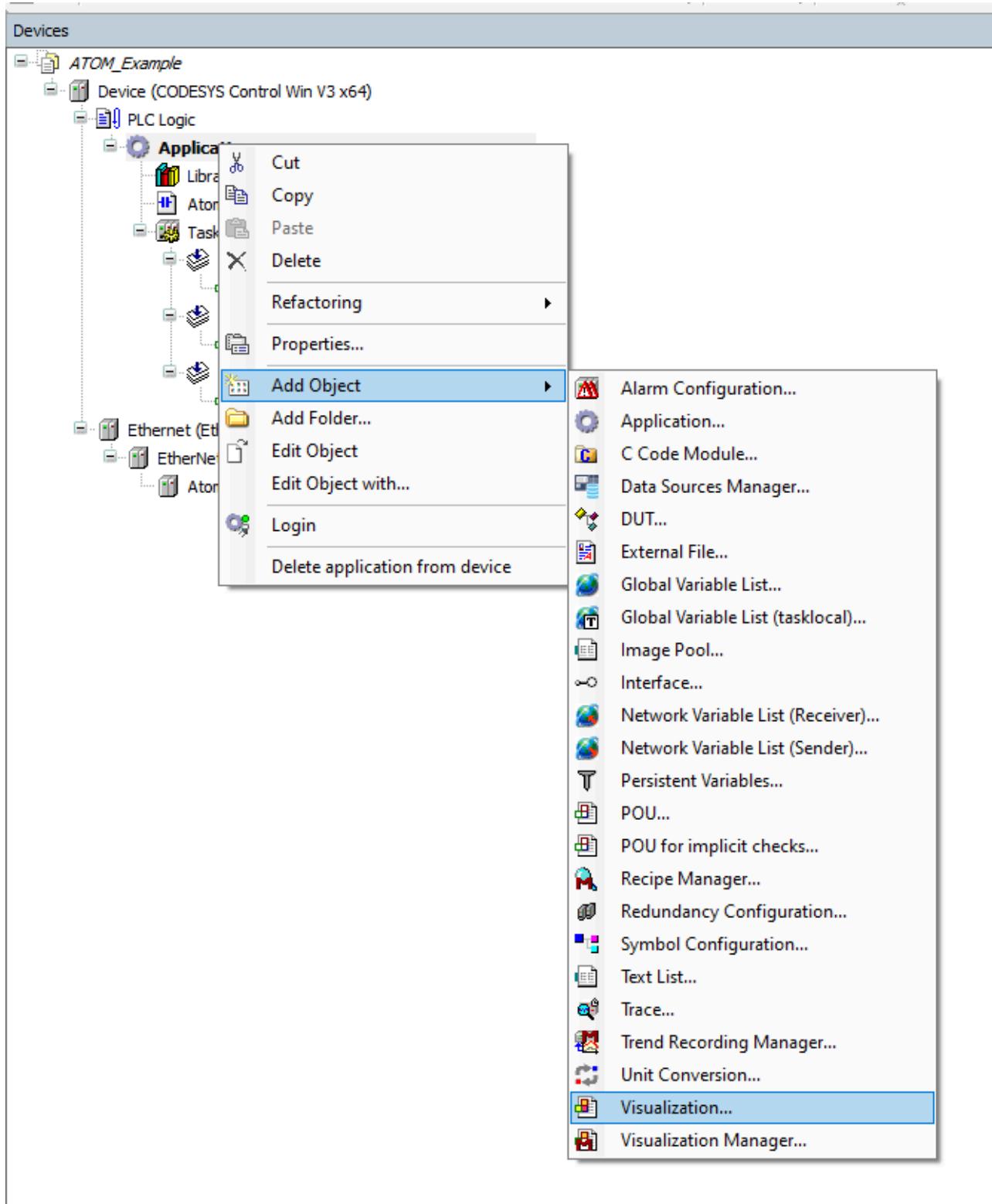
Next, double click **AtomTask (IEC-Tasks)** to open its configuration tab. Click **Add Call** and select **Application > AtomProgram**. After doing so, AtomTask's configuration should look like:



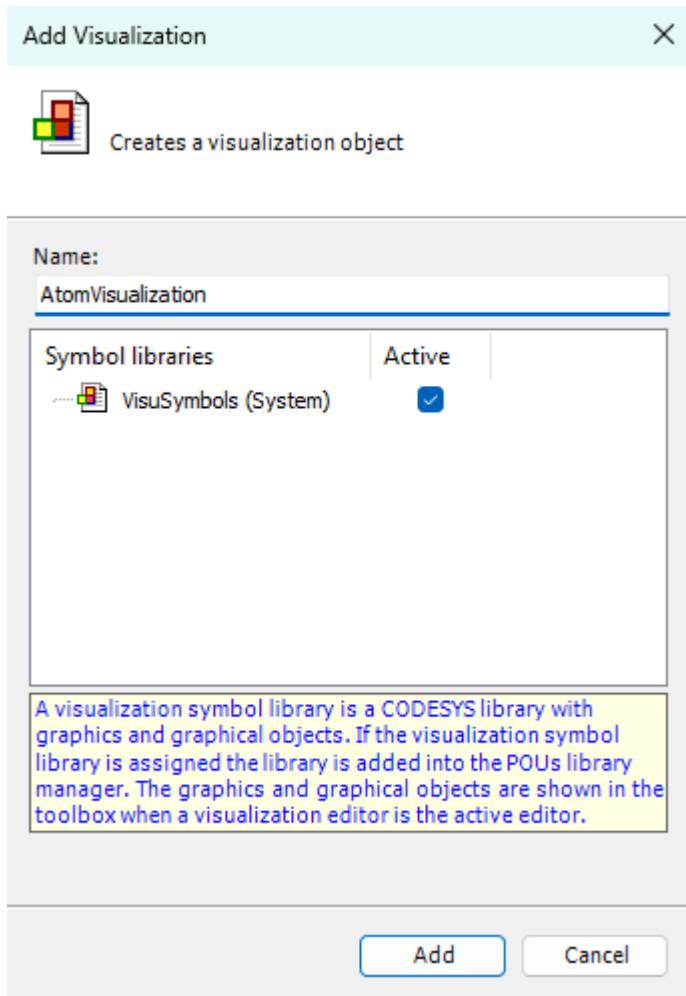
## Setting up visualization

Next, we'll set up a simple visualization display to control and monitor ATOM.

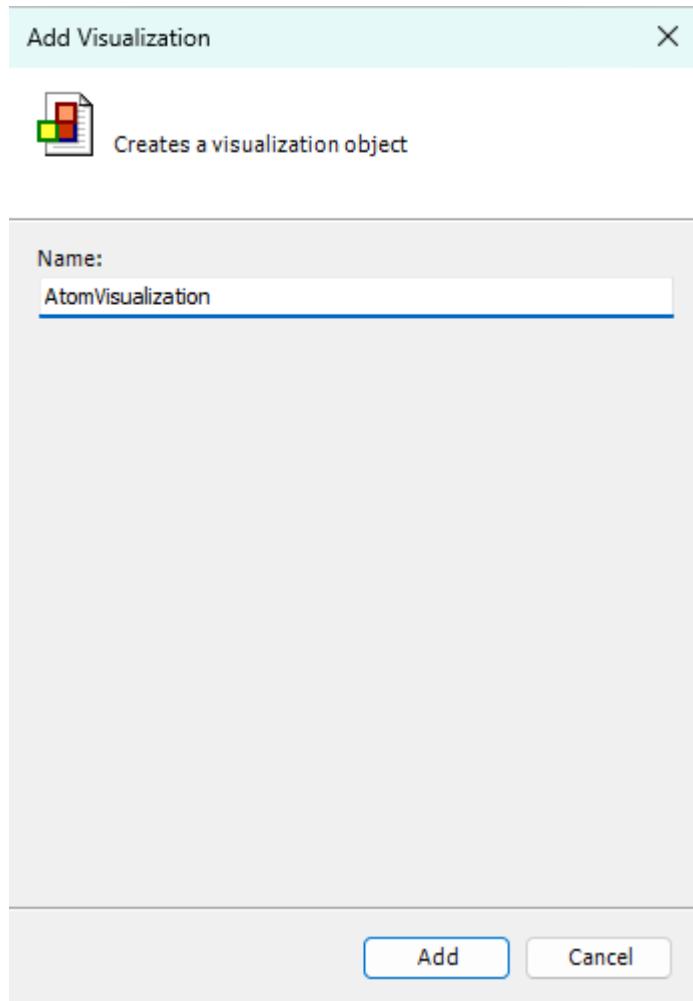
Right click **Application** and select **Add Object > Visualization**:



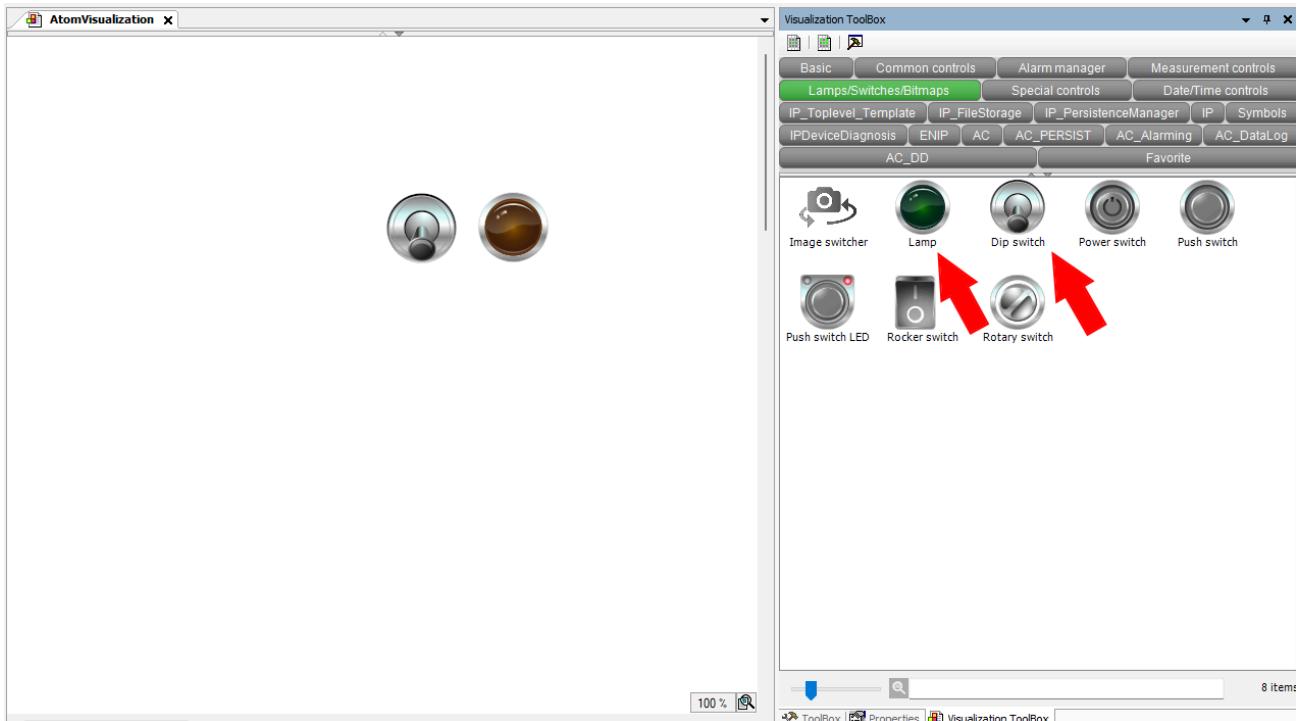
Make sure to check **Active** for **VisuSymbols (System)**, then click **Add**:



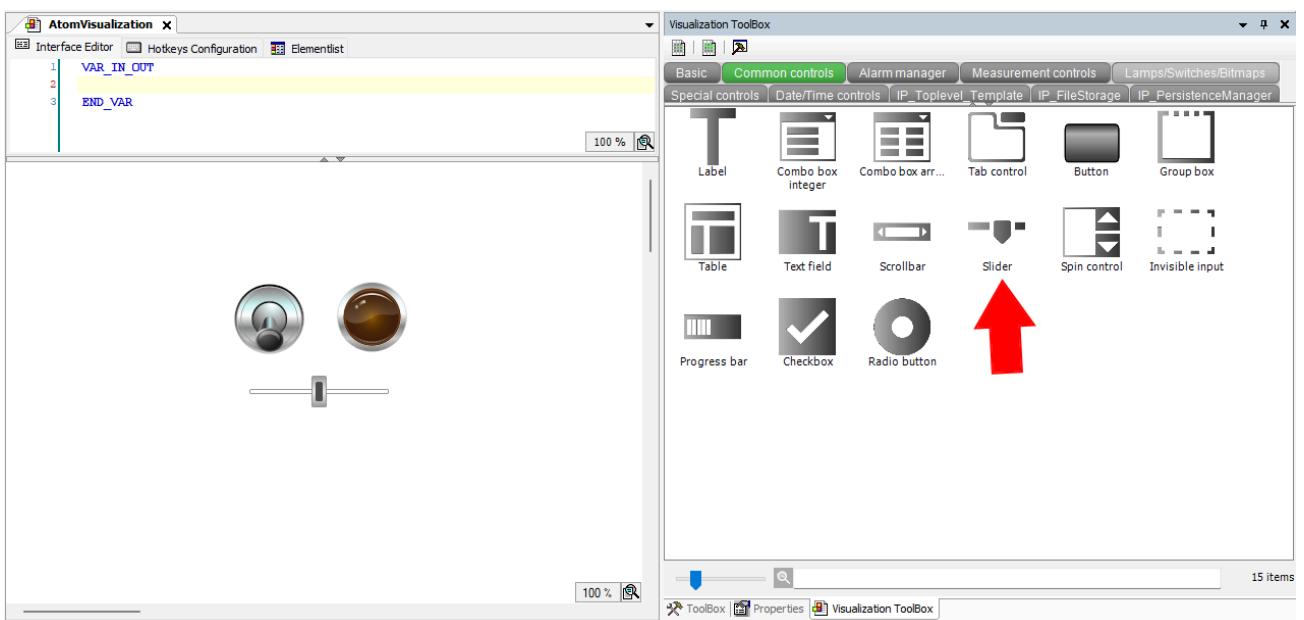
Name your visualization **AtomVisualization** and click **Add**:



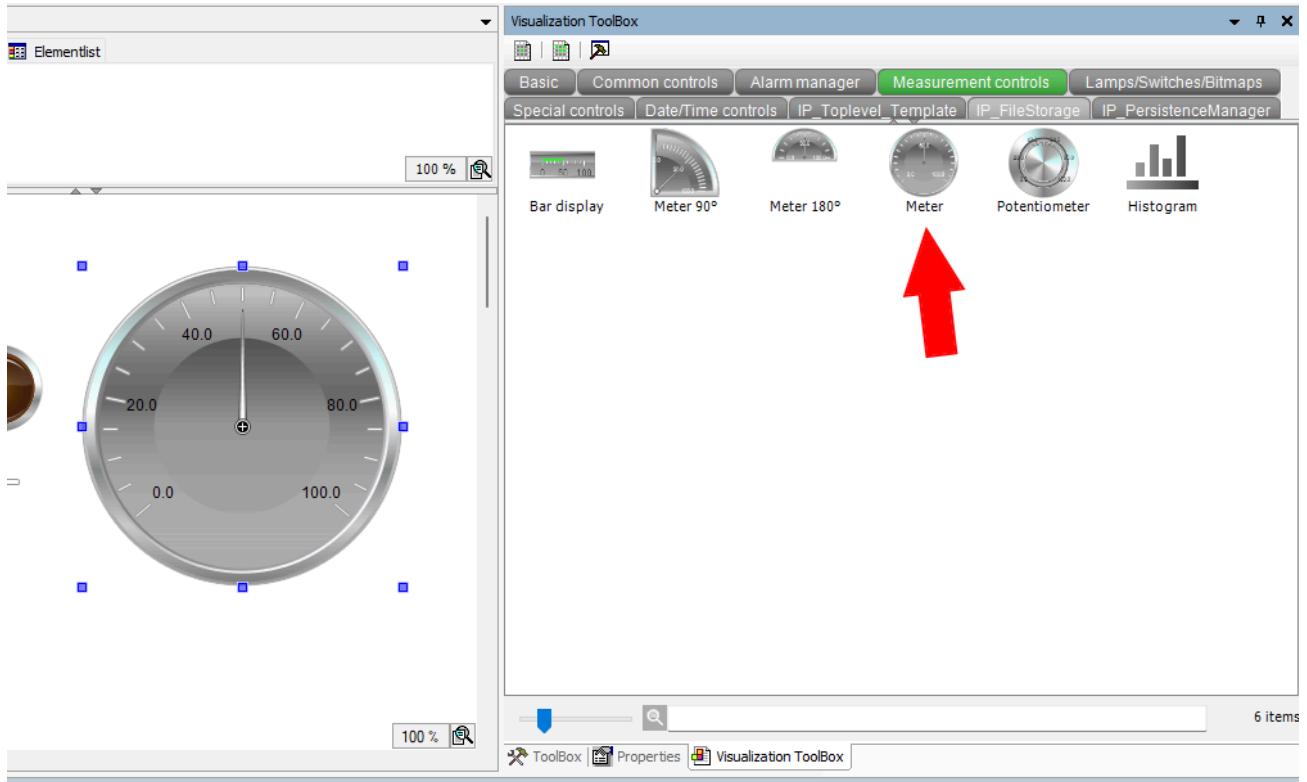
Double click **AtomVisualization** to open its configuration editor. From the **Visualization ToolBox** panel on the right, select the **Lamps/Switches/Bitmaps** category and add a lamp and a dip switch:



Next, in the **Common controls** category, add a slider:

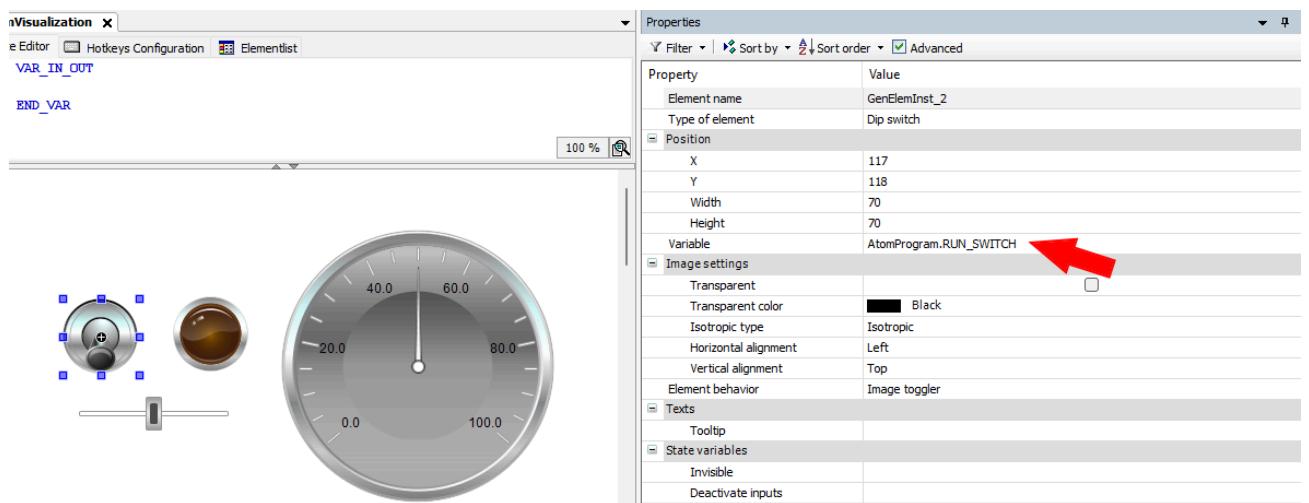


Finally, in the **Measurement controls** category, add a meter:

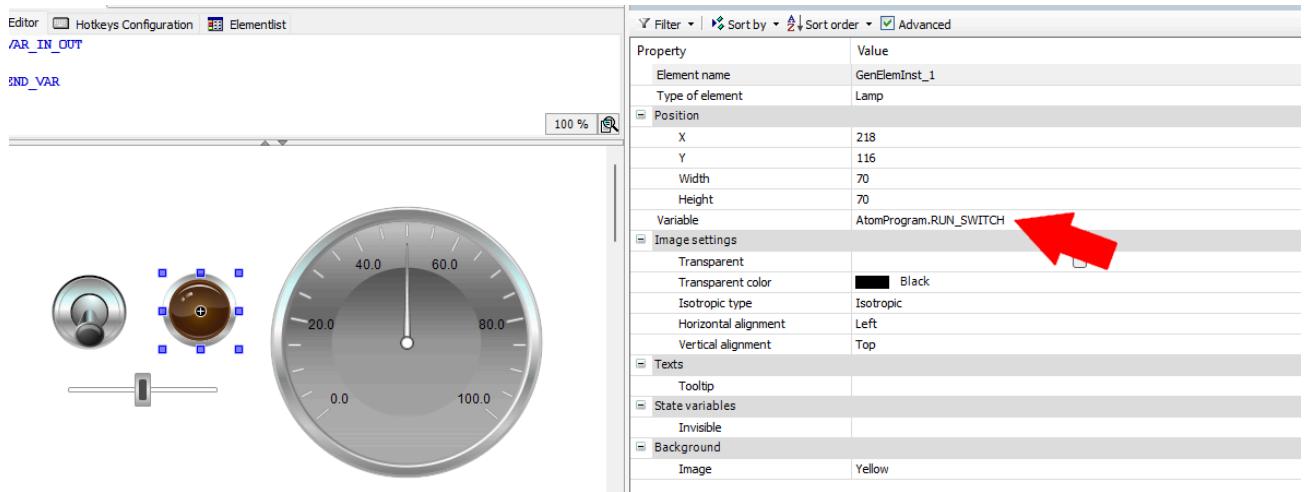


## Wiring up the controls

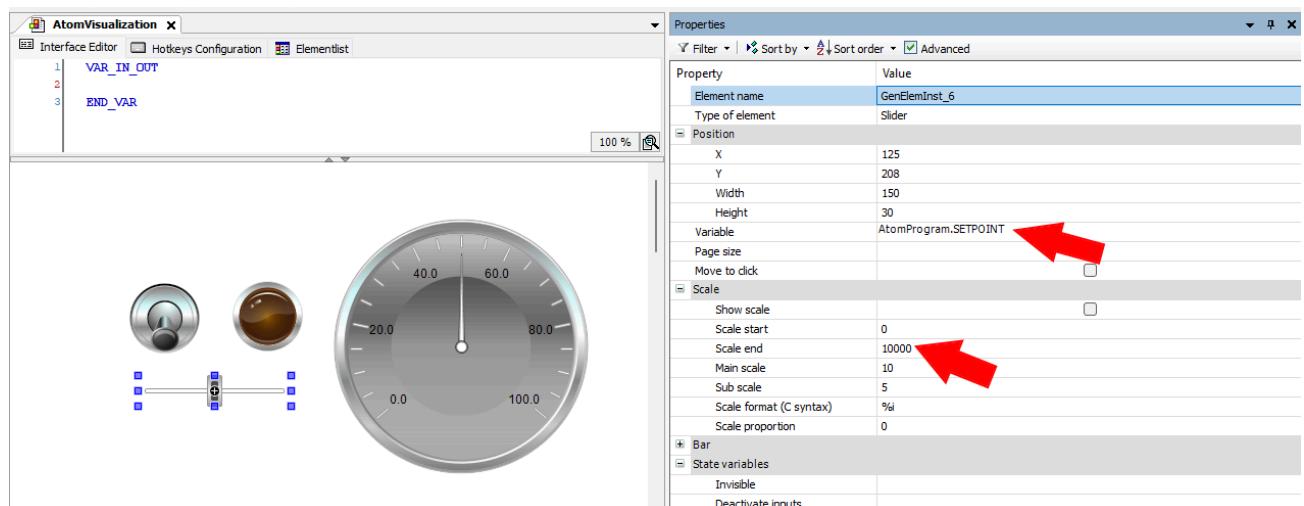
Next, we'll connect the controls to our PLC program. Select the dip switch and set the **Variable** field to `AtomProgram.RUN_SWITCH` as indicated by the red arrow:



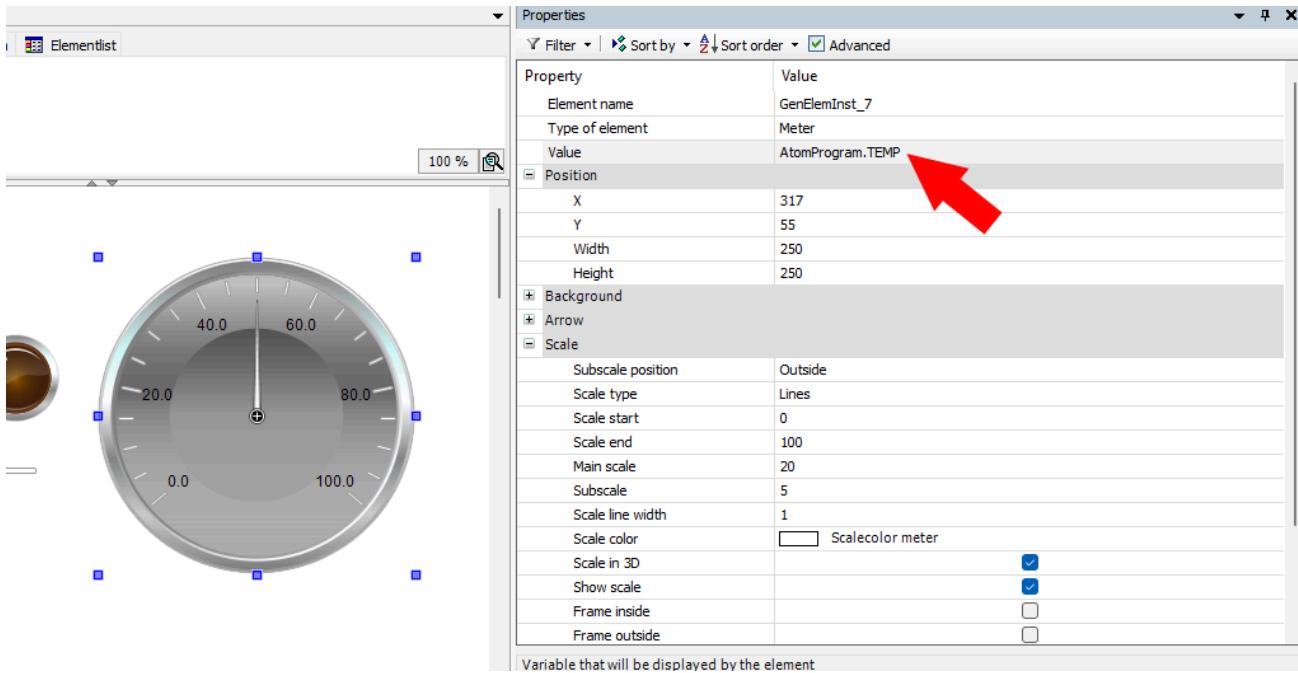
Select the lamp and set the **Variable** field to `AtomProgram.RUN_SWITCH` as indicated by the red arrow:



Select the slider and set the **Variable** field to `AtomProgram.SETPOINT` and set **Scale end** to `10000`:

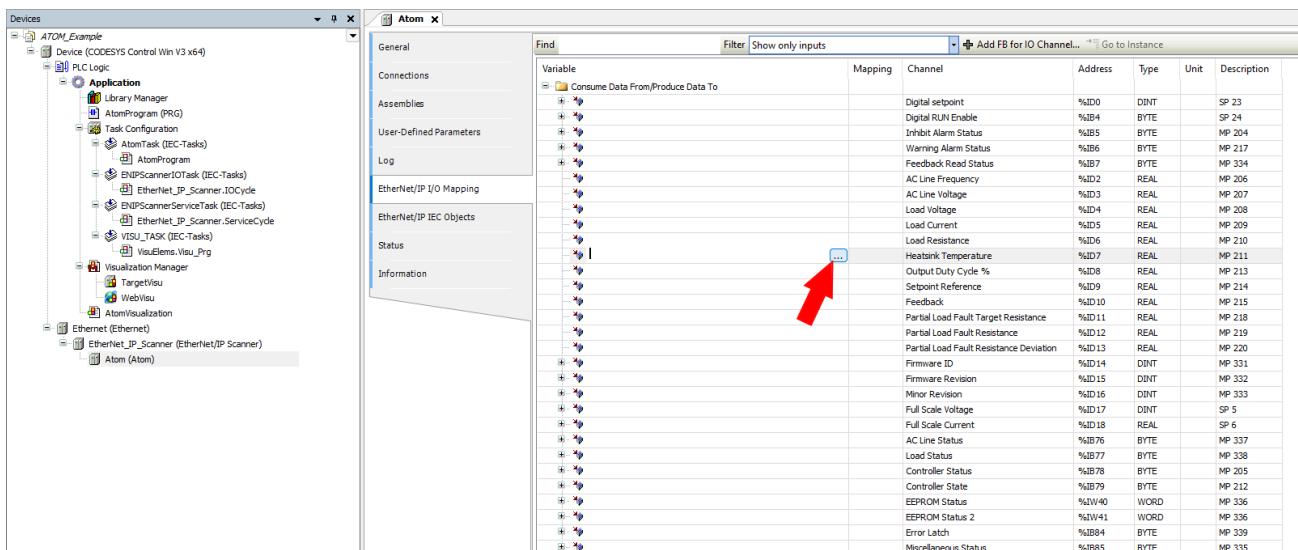


Select the meter and set the **Variable** field to `AtomProgram.TEMP`:

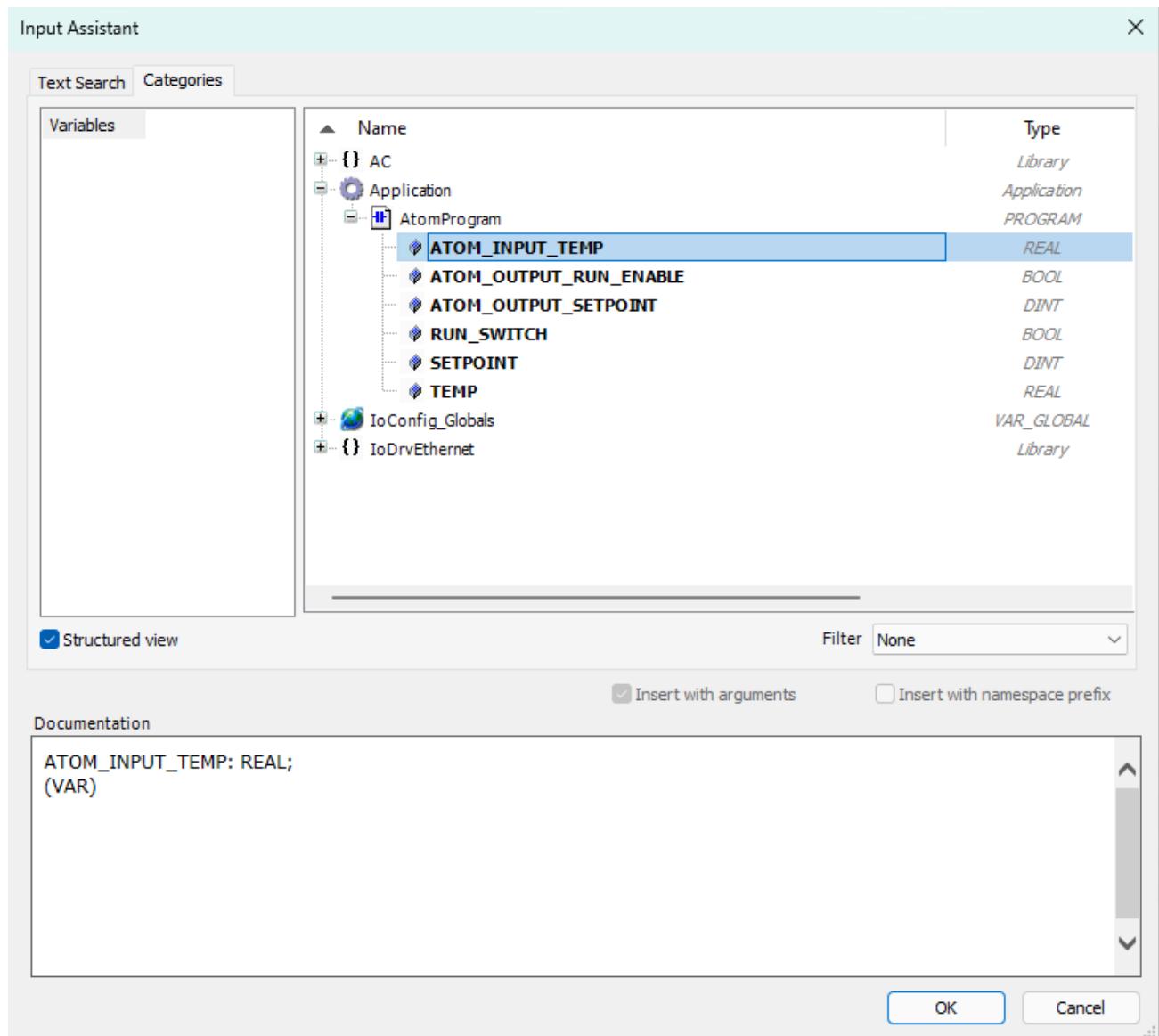


## Mapping variables

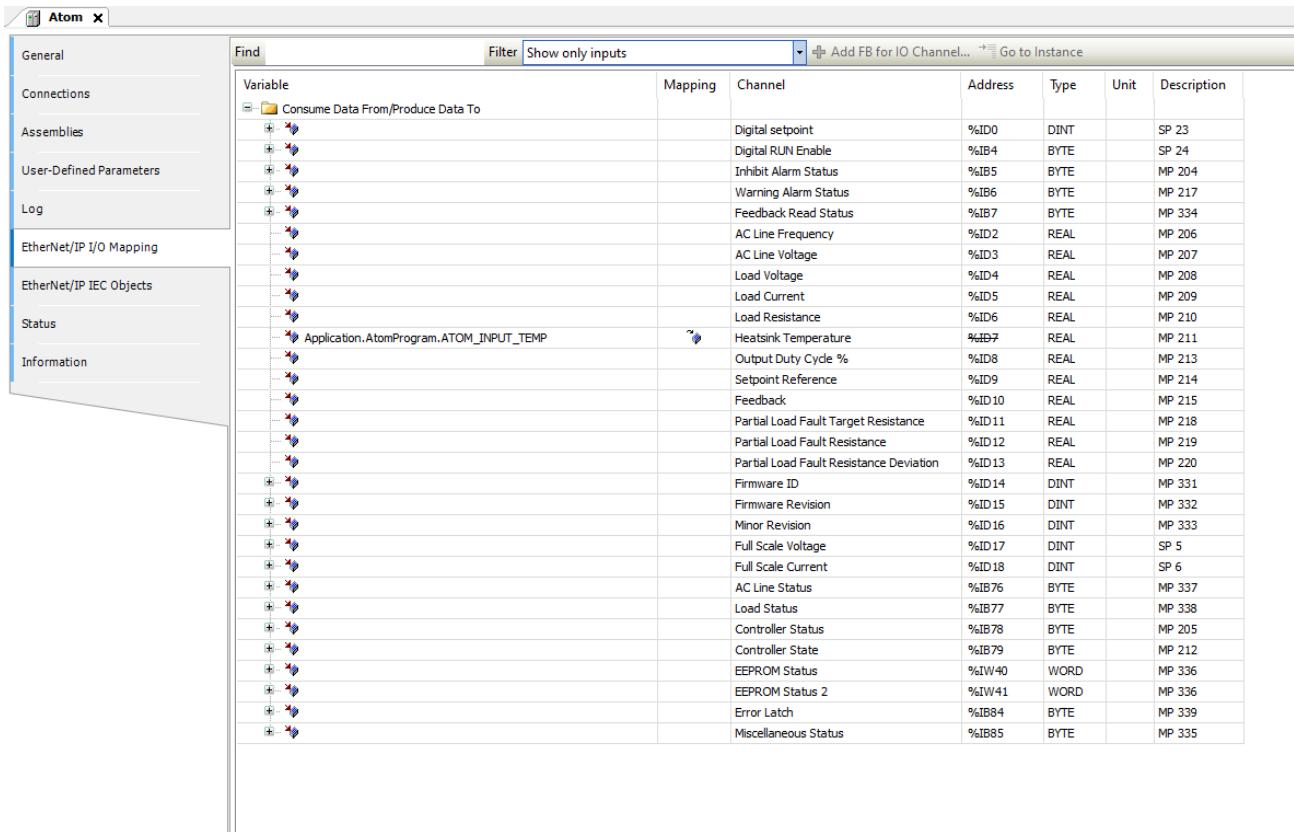
Finally, we'll map our PLC variables to ATOM. Double click **Atom** in the device tree to open its configuration window. Select the **EtherNet/IP I/O Mapping** tab and set **Filter** to **Show only inputs**:



Above, select the button indicated by the red arrow. This will open the **Input Assistant** dialog. Select **Application > AtomProgram > ATOM\_INPUT\_TEMP** and click **Add**:



After doing so, your input I/O mappings should look like:

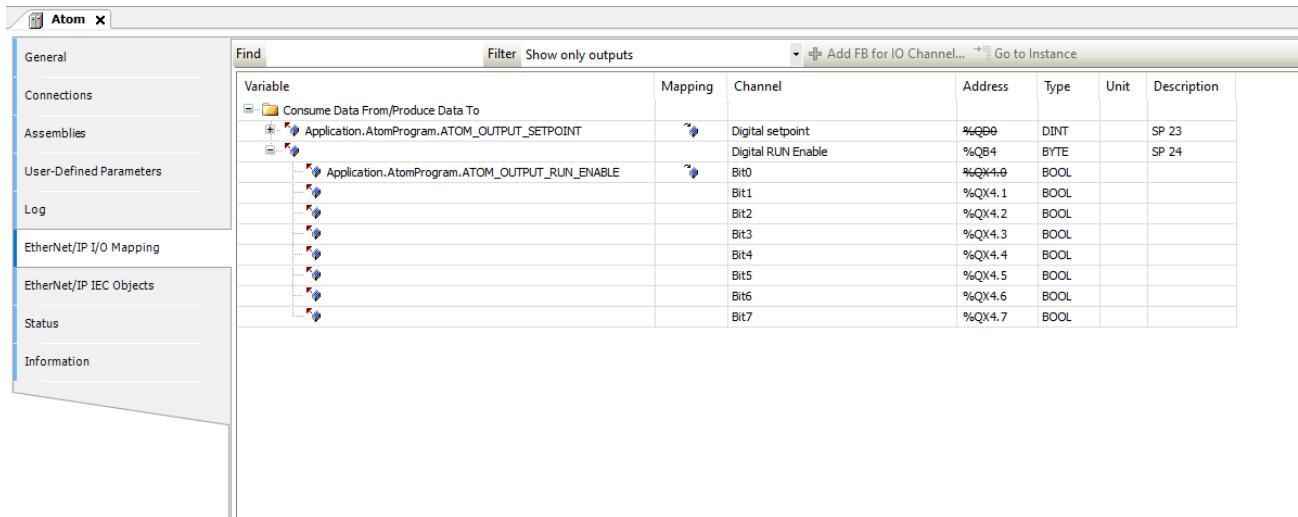


The screenshot shows the Atom software interface with the title bar "Atom X". On the left, there is a navigation pane with the following items: General, Connections, Assemblies, User-Defined Parameters, Log, EtherNet/IP I/O Mapping (which is selected), EtherNet/IP IEC Objects, Status, and Information. The main area is a table titled "Find" with columns: Variable, Mapping, Channel, Address, Type, Unit, and Description. The table lists various I/O points, many of which are grouped under a folder named "Consume Data From/Produce Data To". The table includes rows for Digital setpoint, Digital RUN Enable, Inhibit Alarm Status, Warning Alarm Status, Feedback Read Status, AC Line Frequency, AC Line Voltage, Load Voltage, Load Current, Load Resistance, Heatsink Temperature, Output Duty Cycle %, Setpoint Reference, Feedback, Partial Load Fault Target Resistance, Partial Load Fault Resistance, Partial Load Fault Resistance Deviation, Firmware ID, Firmware Revision, Minor Revision, Full Scale Voltage, Full Scale Current, AC Line Status, Load Status, Controller Status, Controller State, EEPROM Status, EEPROM Status 2, Error Latch, and Miscellaneous Status. The "Address" column contains addresses like %ID0, %IB4, %IB5, %IB6, %IB7, %ID2, %ID3, %ID4, %ID5, %ID6, %ID7, %ID8, %ID9, %ID10, %ID11, %ID12, %ID13, %ID14, %ID15, %ID16, %ID17, %ID18, %IB76, %IB77, %IB78, %IB79, %IW40, %IW41, %IB84, and %IB85. The "Type" column includes DINT, BYTE, MP, REAL, WORD, and SP types. The "Unit" column contains values like 23, 24, 204, 217, 334, 206, 207, 208, 209, 210, 211, 213, 214, 215, 218, 219, 220, 331, 332, 333, 5, 6, 337, 338, 205, 212, 336, 336, 339, and 335. The "Description" column provides a brief description for each variable.

Change the **Filter** to **Show only outputs** and repeat the process for the outputs. Map **Digital setpoint** to `Application.AtomProgram.ATOM_OUTPUT_SETPOINT` and **Digital RUN Enable** to `Application.AtomProgram.ATOM_OUTPUT_RUN_ENABLE`.

### **⚠ TAKE CARE**

Make sure you map **Bit0** of **Digital RUN Enable** to **ATOM\_OUTPUT\_RUN\_ENABLE**, NOT **Digital RUN Enable** itself.



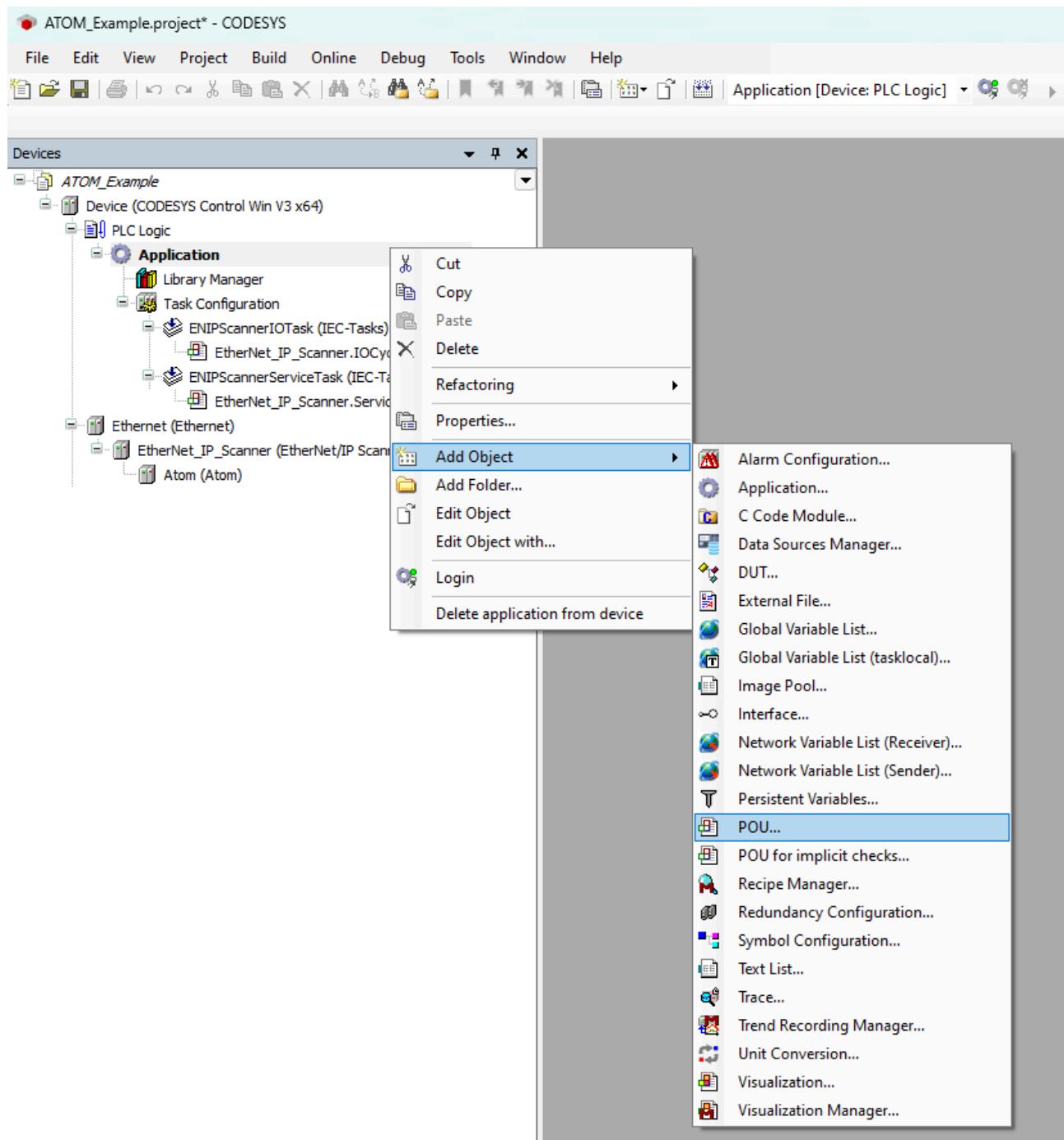
The screenshot shows the Atom software interface with the title bar "Atom". On the left, there is a navigation sidebar with the following items: General, Connections, Assemblies, User-Defined Parameters, Log, EtherNet/IP I/O Mapping (which is selected), EtherNet/IP IEC Objects, Status, and Information. The main area is titled "Find" and contains a table for "EtherNet/IP I/O Mapping". The table has columns: Variable, Mapping, Channel, Address, Type, Unit, and Description. The data in the table is as follows:

Variable	Mapping	Channel	Address	Type	Unit	Description
Application.AtomProgram.ATOM_OUTPUT_SETPOINT	Digital setpoint	%Q00	DINT	SP 23		
Application.AtomProgram.ATOM_OUTPUT_RUN_ENABLE	Digital RUN Enable	%Q84	BYTE	SP 24		
	Bit0	%QX4.0	BOOL			
	Bit1	%QX4.1	BOOL			
	Bit2	%QX4.2	BOOL			
	Bit3	%QX4.3	BOOL			
	Bit4	%QX4.4	BOOL			
	Bit5	%QX4.5	BOOL			
	Bit6	%QX4.6	BOOL			
	Bit7	%QX4.7	BOOL			

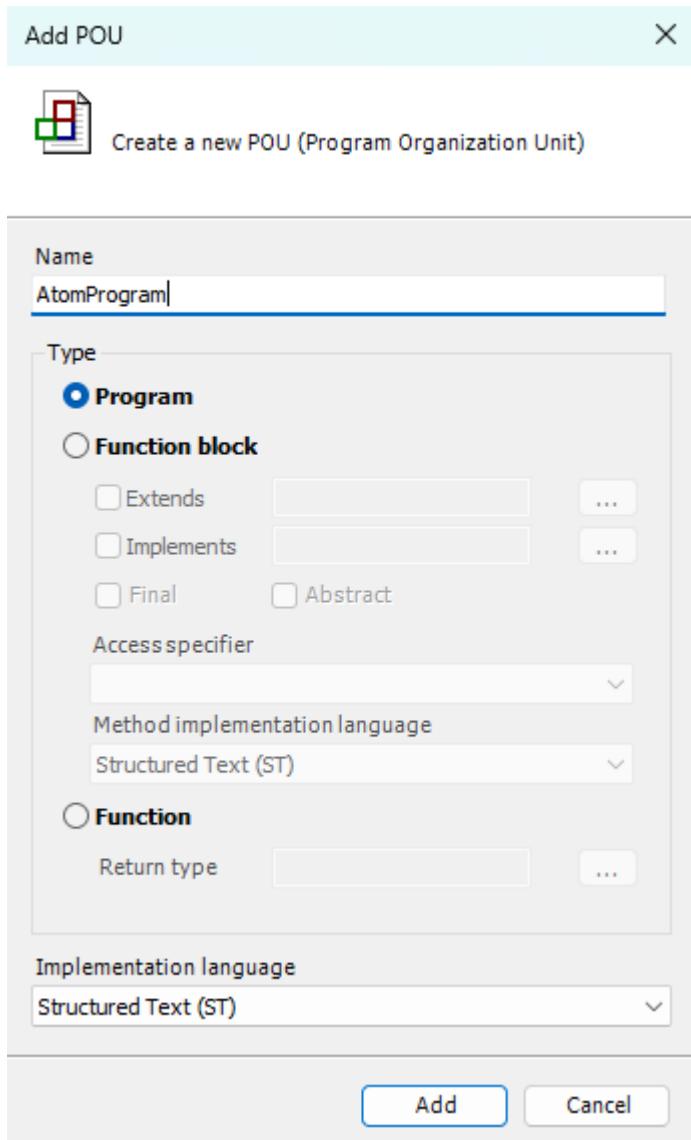
## Example: Structured text

### Creating the program

Right click **Application** and select **Add Object > POU**:



Name your **POU** AtomProgram and select **Structured Text (ST)** as the language:



Next, let's create a basic program. We'll check to make sure no alarms are active and then write a setpoint value of `8000` and set run enable to `true`.

Copy the following code into the top panel of the **AtomProgram** editor:

```
PROGRAM AtomProgram
VAR

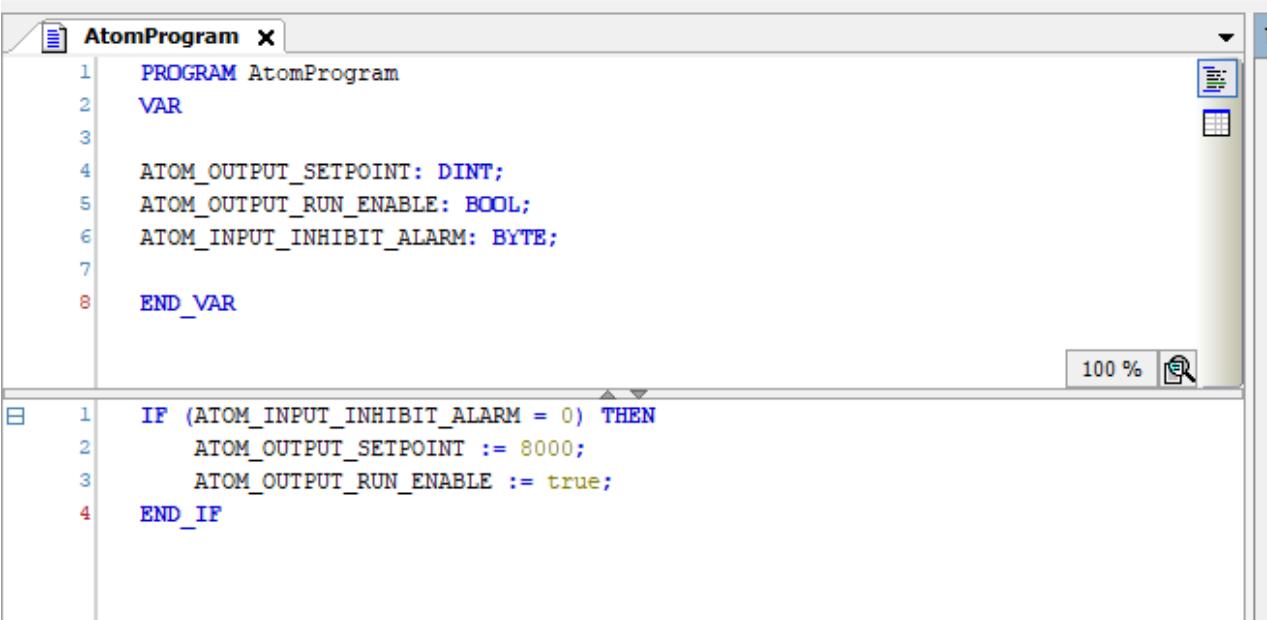
ATOM_OUTPUT_SETPOINT: BOOL;
ATOM_OUTPUT_RUN_ENABLE: BYTE;
ATOM_INPUT_INHIBIT_ALARM: BYTE;

END_VAR
```

Copy the following code into the main program section:

```
IF (ATOM_INPUT_INHIBIT_ALARM = 0) THEN
    ATOM_OUTPUT_SETPOINT := 8000;
    ATOM_OUTPUT_RUN_ENABLE := true;
END_IF
```

Your editor should look like:



The screenshot shows a software editor window titled "AtomProgram". The code is displayed in a syntax-highlighted text area. The main part of the program defines variables, and an IF block is inserted at the bottom. The code is as follows:

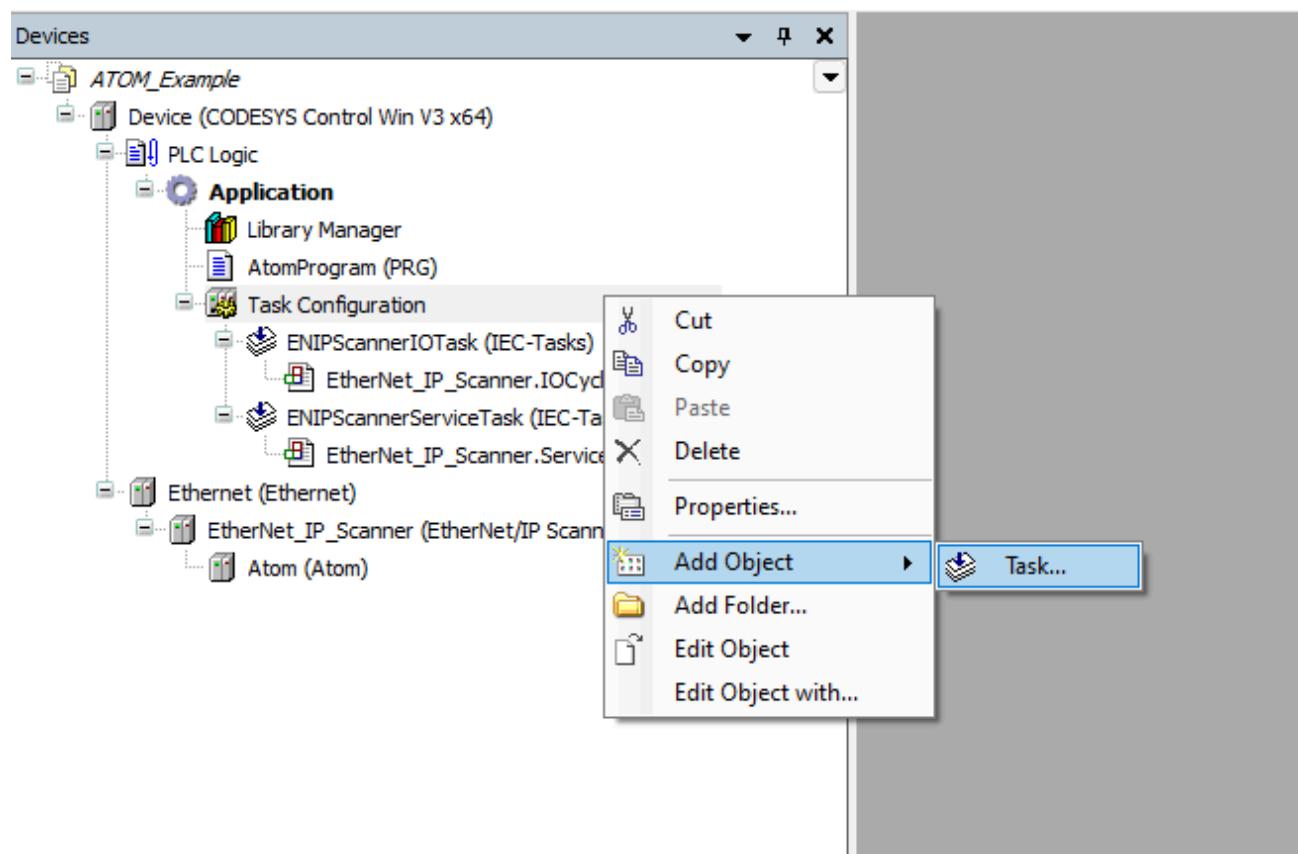
```
PROGRAM AtomProgram
VAR

ATOM_OUTPUT_SETPOINT: DINT;
ATOM_OUTPUT_RUN_ENABLE: BOOL;
ATOM_INPUT_INHIBIT_ALARM: BYTE;

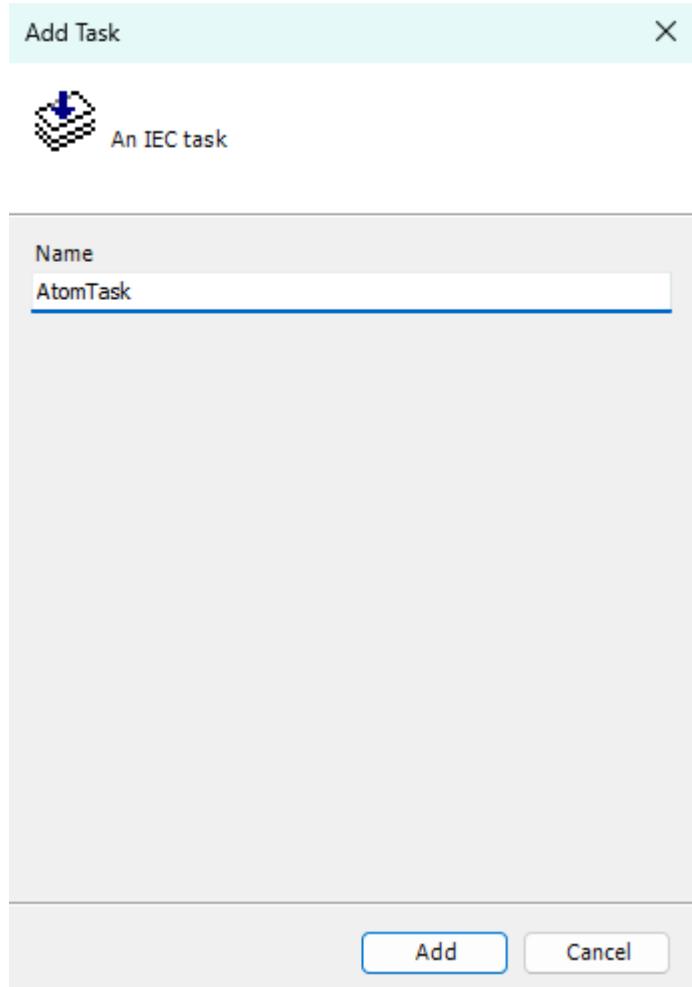
END_VAR

IF (ATOM_INPUT_INHIBIT_ALARM = 0) THEN
    ATOM_OUTPUT_SETPOINT := 8000;
    ATOM_OUTPUT_RUN_ENABLE := true;
END_IF
```

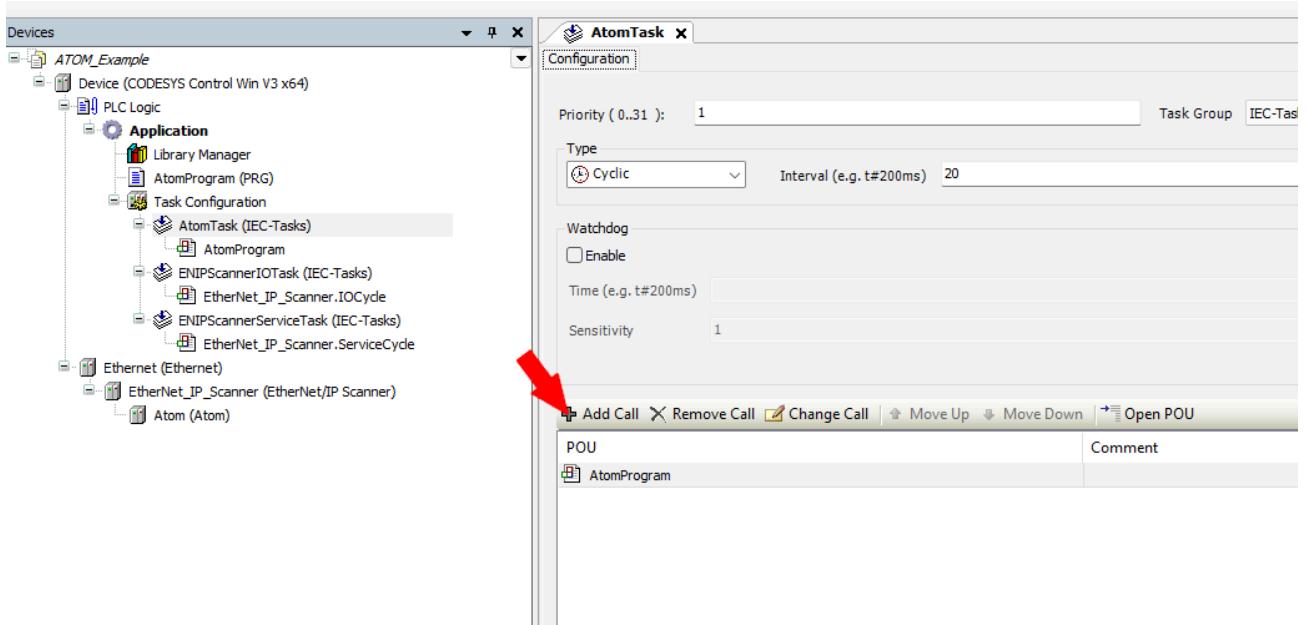
Next, we'll add a new task to call our program. Right click **Task Configuration** and Select **Add Object > Task**:



Name your task **AtomTask** and click **Add**:

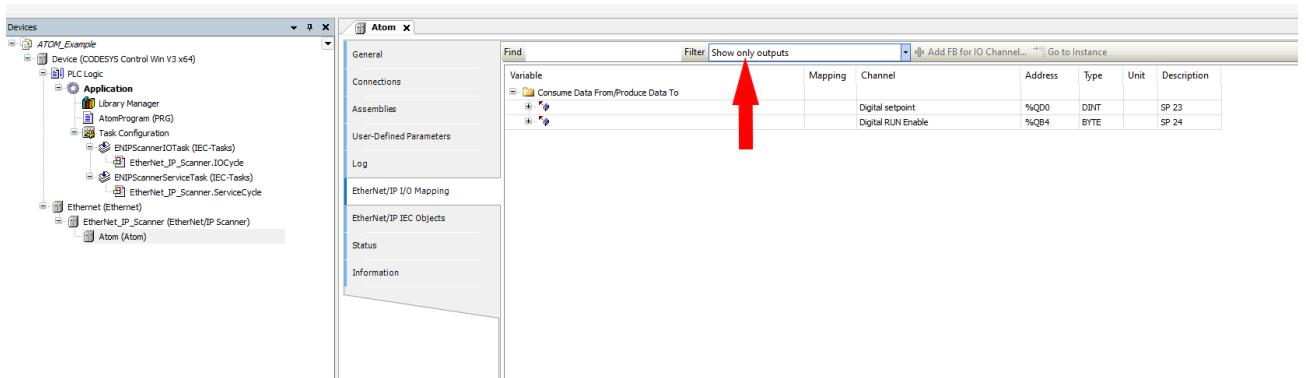


Next, double click **AtomTask (IEC-Tasks)** to open its configuration tab. Click **Add Call** and select **Application > AtomProgram**. After doing so, **AtomTask**'s configuration should look like:

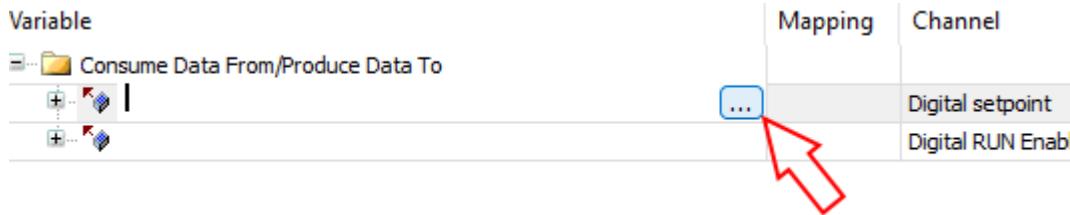


## Mapping variables

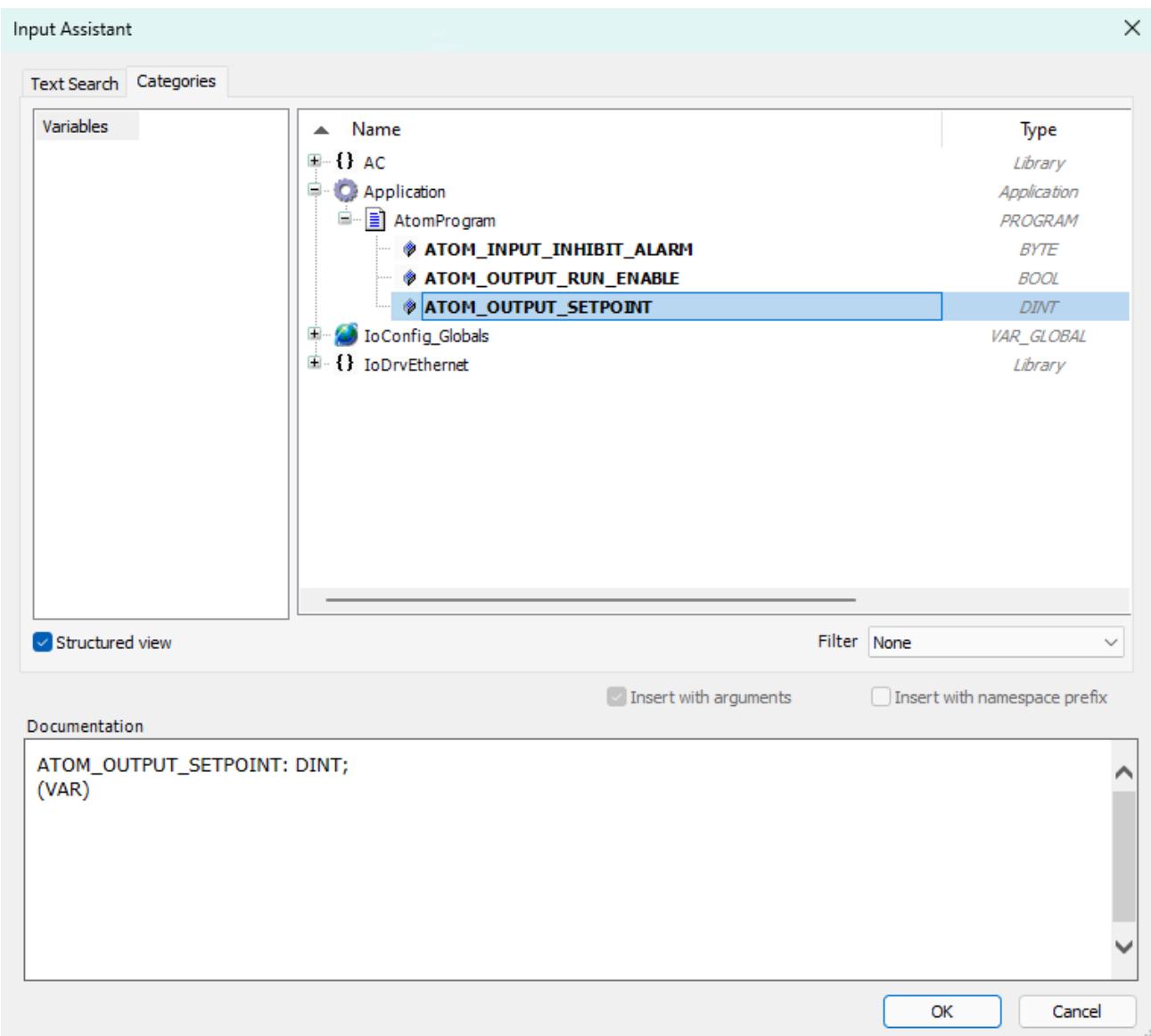
Next, we'll map our ATOM's I/O configuration to our program variables. Double click **Atom (Atom)** to open its configuration window, then select the **EtherNet/IP I/O Configuration** tab. On the **Filter** dropdown indicated by the red arrow, select **Show only outputs**:



Click the button indicated by the red arrow to map the **Digital setpoint** value:



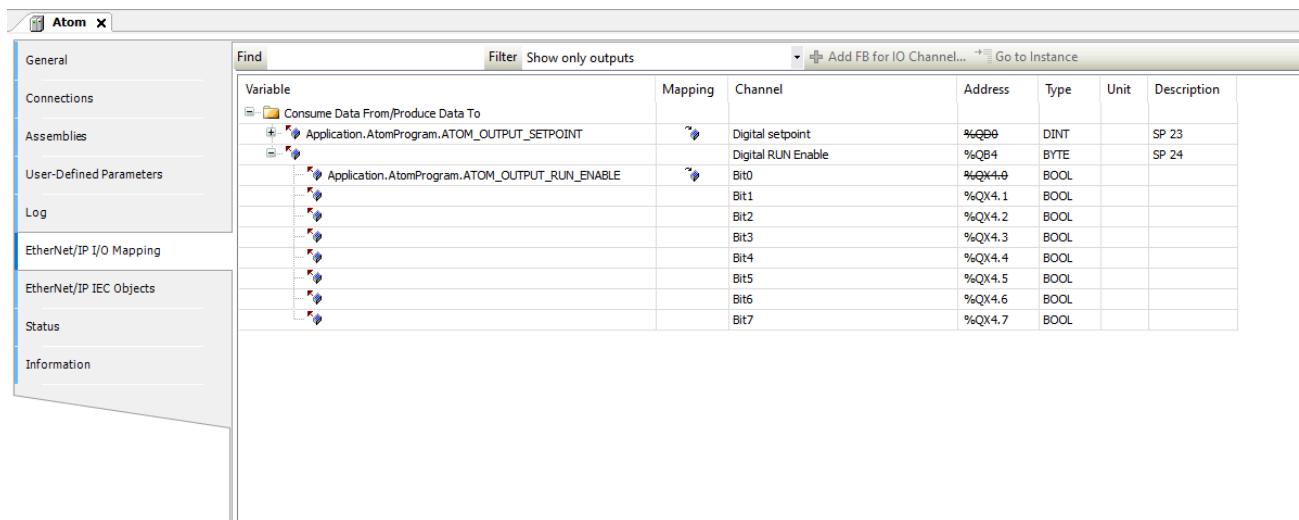
This button will open the **Input Assistant** dialog. Select the corresponding variable from your program and click **Ok**:



Repeat this process so that your output variables are mapped like so:

### TAKE CARE

Make sure you map **Bit0** of **Digital RUN Enable** to **ATOM\_OUTPUT\_RUN\_ENABLE**,  
NOT **Digital RUN Enable** itself.



Switch the filter to **Show only inputs** and then map the **Inhibit alarm status** variable:

Variable	Mapping	Channel	Address	Type	Unit	Description
Consume Data From/Produce Data To		Digital setpoint	%ID0	DINT		SP 23
		Digital RUN Enable	%IB4	BYTE		SP 24
Application.AtomProgram.ATOM_INPUT_INHIBIT_ALARM		Inhibit Alarm Status	%IB5	BYTE		MP 204
		Warning Alarm Status	%IB6	BYTE		MP 217
		Feedback Read Status	%IB7	BYTE		MP 334
		AC Line Frequency	%ID2	REAL		MP 206
		AC Line Voltage	%ID3	REAL		MP 207
		Load Voltage	%ID4	REAL		MP 208
		Load Current	%ID5	REAL		MP 209
		Load Resistance	%ID6	REAL		MP 210
		Heatsink Temperature	%ID7	REAL		MP 211
		Output Duty Cycle %	%ID8	REAL		MP 213
		Setpoint Reference	%ID9	REAL		MP 214
		Feedback	%ID10	REAL		MP 215
		Partial Load Fault Target Resistance	%ID11	REAL		MP 218
		Partial Load Fault Resistance	%ID12	REAL		MP 219
		Partial Load Fault Resistance Deviation	%ID13	REAL		MP 220
		Firmware ID	%ID14	DINT		MP 331
		Firmware Revision	%ID15	DINT		MP 332
		Minor Revision	%ID16	DINT		MP 333
		Full Scale Voltage	%ID17	DINT		SP 5
		Full Scale Current	%ID18	REAL		SP 6
		AC Line Status	%IB76	BYTE		MP 337
		Load Status	%IB77	BYTE		MP 338
		Controller Status	%IB78	BYTE		MP 205
		Controller State	%IB79	BYTE		MP 212
		EEPROM Status	%IW40	WORD		MP 336
		EEPROM Status 2	%IW41	WORD		MP 336
		Error Latch	%IB84	BYTE		MP 339
		Miscellaneous Status	%IB85	BYTE		MP 335

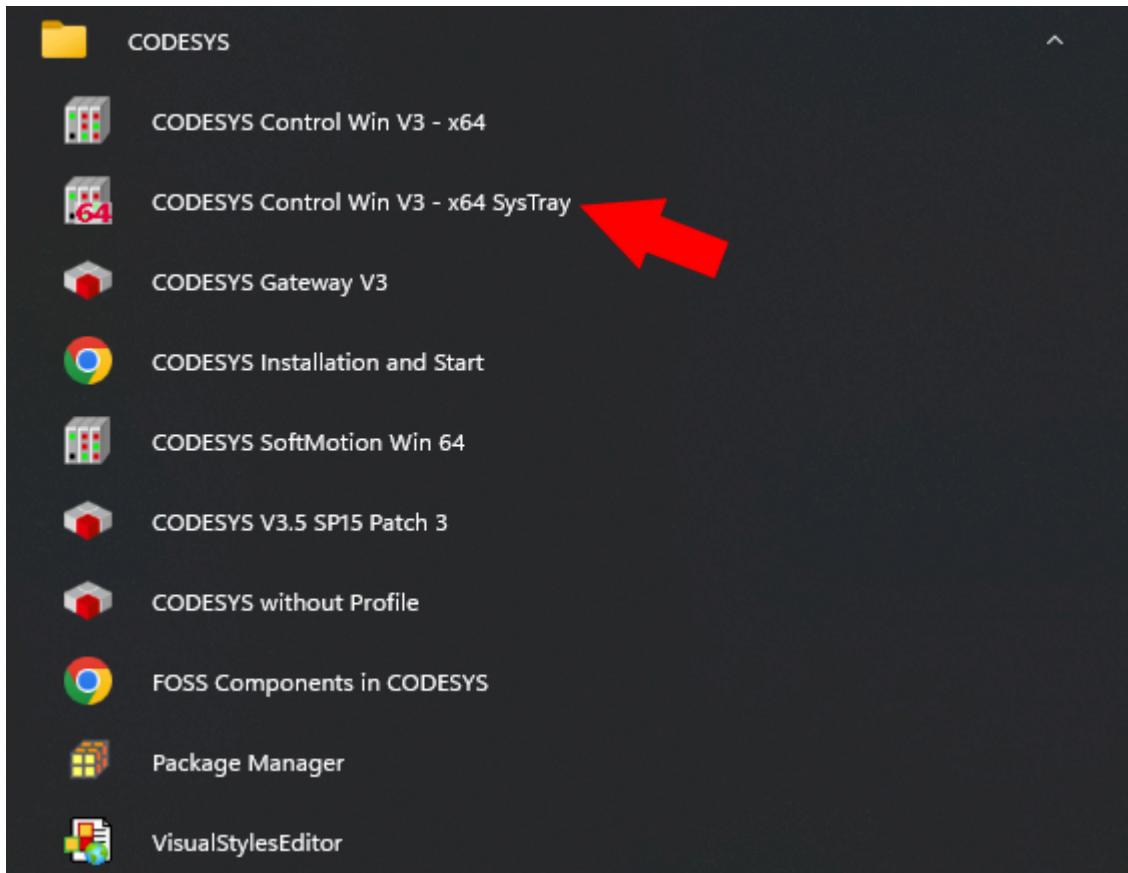
## Running the program with SoftPLC

### INFO

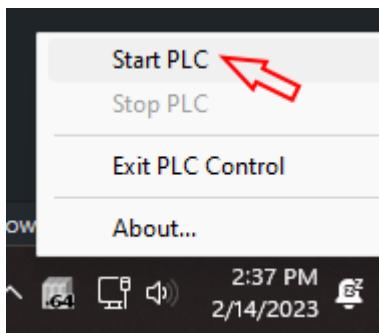
The instructions to run your program are the same regardless of whether you are using ladder logic or structured text.

The only difference is that in the ladder logic example, a visualization window will open that allows you to control ATOM.

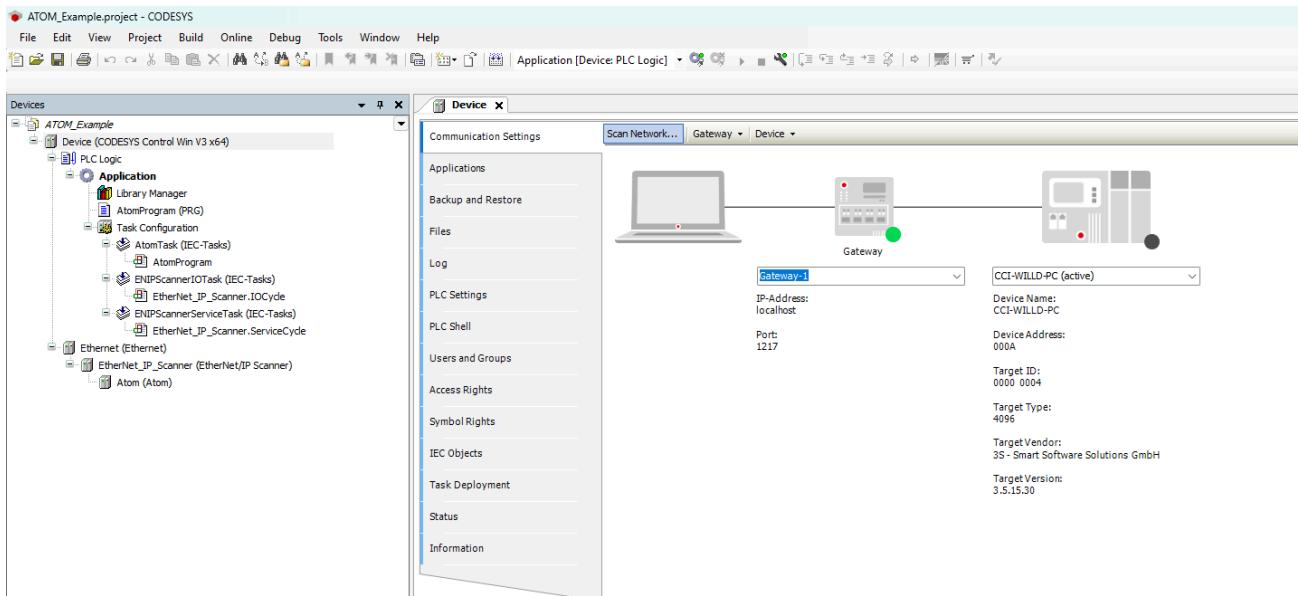
To debug the program, first make sure you start **Codesys WIN Control V3 - x64 SysTray**



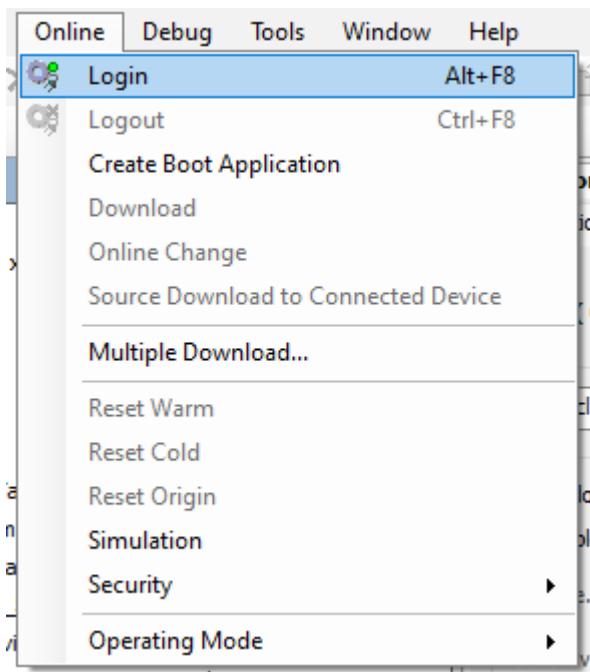
This will launch the Codesys SoftPLC. You should see an icon appear in your systray and you can right click it and select **Start PLC** to start the SoftPLC:



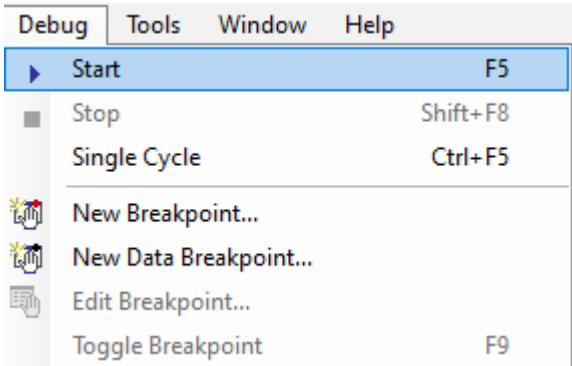
Next, in Codesys double click **Application** to open its configuration window. Here you can select **Scan Network** to discover your SoftPLC:



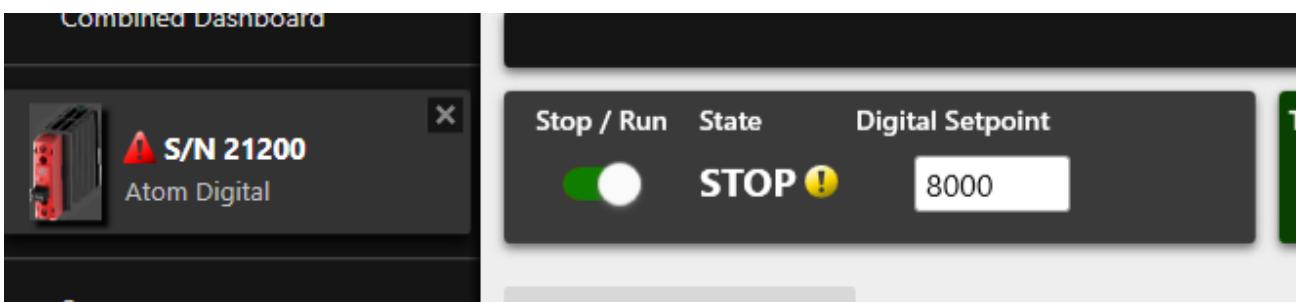
Finally, **Login** to your SoftPLC:



Then you can start debugging the program:



If you use Control Panel to monitor ATOM, you should see the **Stop / Run** state and the **Digital Setpoint** values change to reflect the PLC program's instructions. If you followed the structured text example, the values will change once and remain fixed. If you followed the ladder logic example, a visualization control panel will appear. Flipping the dip switch or adjusting the slider will immediately update ATOM and the changes should reflect in real-time:



# ATOM / Fieldbus / EtherNet/IP / Labview

## ⚠ NOTE

You do NOT need to purchase the [NI-Industrial Communications for EtherNet/IP add-on](#).

This is only used if you want your Labview application to operate as an EtherNet/IP adapter device. In our case, Labview will operate as a scanner that connects to ATOM to control it. This functionality is included in the default version of Labview.

## ⚠ NOTE

We use **explicit messaging** to connect to ATOM from Labview because Labview does not support I/O connections.

## Using our pre-built VI

Download our ATOM control panel VI to quickly control and monitor ATOM from Labview.

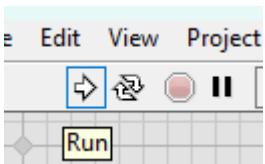
Most of the parameters listed in our [EtherNet/IP Profile](#) are available through the VI controls, although you can easily extend or alter the VI to suite your needs.

[Download ATOM.vi](#)

To setup the VI, enter the IP address of your ATOM unit in the **ATOM IP Address** box. Below, we've entered `192.168.2.250` as the IP address. You can check or change your ATOM's IP address by using [Control Panel](#).



After you've set the IP address, you can run the VI by clicking the run icon:



After the VI starts, you can adjust the Digital setpoint and RUN Enable controls. All the other indicators will update every 500 ms to reflect the current state of the ATOM unit.

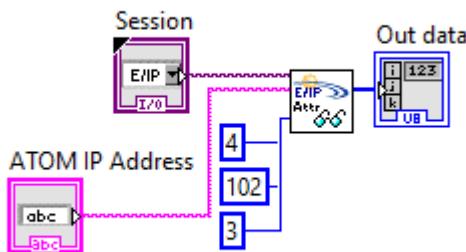
## Advanced

## Reading and parsing data from ATOM

If you need to modify or extend the VI that we provide, this section is provided to help make it easier.

The main way to pull data from ATOM is by fetching the *producing* assembly object (class 4, instance 102, attribute 3) using the Get Attribute Single service (0x0E).

Below is a simple example of fetching ATOM's assembly object. After this block diagram executes, `Out data` will be a byte array of length `86` containing the 30 parameters listed in ATOM's [EtherNet/IP Profile](#):



To pull a parameter out of this byte array, you can calculate its index within `Out data` by finding the sum of the parameter data type sizes before it.

## ⓘ EXAMPLE

To pull out the AC Line Voltage parameter, we can calculate the sum of the parameter data type sizes before it. AC Line Voltage is parameter #7, so we sum the size of the first 6 parameters, which each have sizes of:

```
Digital setpoint = DINT = 4 bytes  
Digital run enable = BOOL = 1 byte  
Inhibit alarm status = BYTE = 1 byte  
Warning alarm status = BYTE = 1 byte  
Feedback read setatus = BOOL = 1 byte  
AC Line Frequency = REAL = 4 bytes
```

Summing these up, we get:

$$4 \text{ (DINT)} + 1 \text{ (BOOL)} + 1 \text{ (BYTE)} + 1 \text{ (BYTE)} + 1 \text{ (BYTE)} + 4 \text{ (REAL)} = 12$$

AC Line Voltage itself is a **REAL**, so AC Line Voltage resides at index **12** within **Out data** and extends for **4** bytes.

To properly display this within your VI, you will need to reverse the order of these four bytes before interpreting them as a single precision decimal in Labview. This is because Labview is by default big-endian, while ATOM is little-endian.

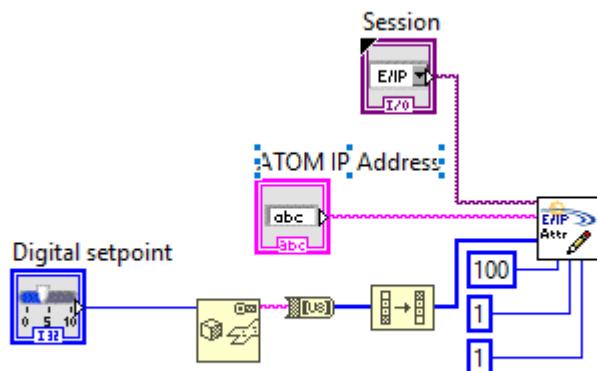
## Writing data to ATOM

Below is a simple diagram that updates the digital setpoint parameter on ATOM.

An alternative method to this one is to compile together an assembly object and use the Set Attribute Single service (0x10) to write to the consuming assembly object (class 4,

instance 101, attribute 3). The one downside to this is that it requires you to send all parameters within the consuming assembly object together.

Instead, we provide the custom ParameterLink object (class 100, instance  $i$ , attribute 1), where  $i$  is the parameter number you wish to interact with. Below, we write to ParameterLink instance  $i$ , attribute 1. Consult the [EtherNet/IP Profile](#) to determine the data type of the parameter you wish to write. Here, we're writing digital setpoint, which is a DINT, so we'll make sure that we use an i32 in Labview. Note that before we write the data, we have to reverse the bytes as Labview is by default big-endian, while ATOM is little-endian:



# ATOM / Fieldbus / EtherNet/IP / Other

## Unilogic PLCs

For Unilogic PLCs, ensure that:

- Use Run Idle for T2O = UNCHECKED
- Use Run Idle for O2T = CHECKED

