PowerXL DG1 Configuration to Siemens PLC

Introduction

The purpose of this application note is to demonstrate how to operate a PowerXL DG1 drive via a Profibus DP network and a Siemens Simatic PLC with a Profibus master module. The PowerXL drive has a Profibus Option Card that can be added to either of two option board slots. A GSD file is available for the drive and it may be downloaded from the Eaton website at www.eaton.com/dg1. The Profibus parameters such as address and baud rate can be configured from the keypad on the drive. This will be described in more detail later in this document.

While this application example uses a Siemens Simatic S7-1200 controller with a Profibus DP master module to control and monitor the PowerXL drive over Profibus, any Profibus master may be used for this purpose. Siemens Simatic Step 7 Basic, V13 programming software was used for this application example. The Simatic S7 PLC will be configured to poll the PowerXL DG1 drive to operate the drive and monitor drive parameters.

The DG1 drive supports Telegram 1 for its I/O data, which consists of 4 input bytes and 4 output bytes. The input data includes status bits and Actual Motor Speed. The output data includes control bits and Motor Speed Reference.

Configuring the PowerXL DG1 Drive

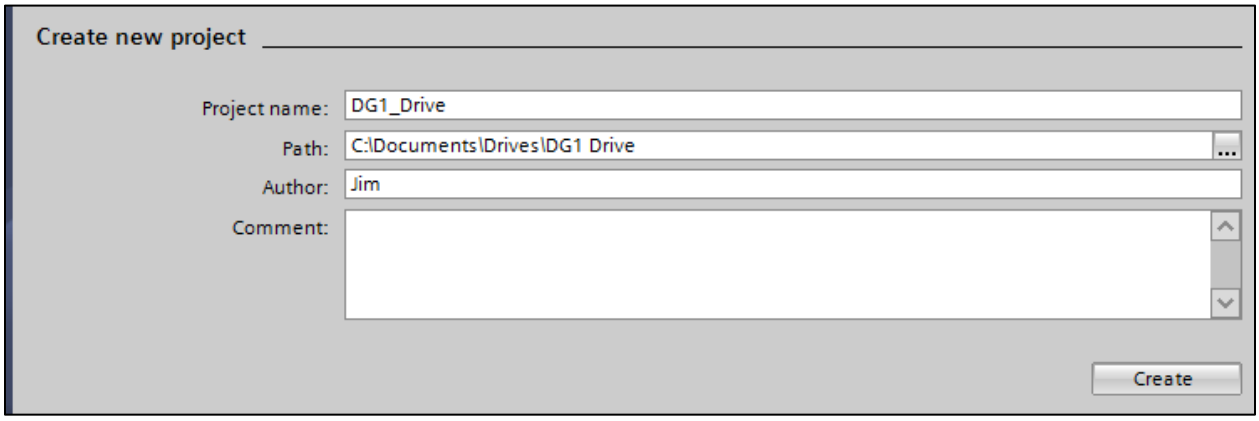
To install and configure the Profibus option board parameters from the drives keypad/display:

1. With the power off to the drive, insert the Profibus option board into slot A. Power the drive.
2. Then press the *up* arrow key until “Option Boards” is encountered.
3. Press the *right* arrow key which will display and highlight “Slot A: Profibus”. Press the OK button.
4. Press the *down* arrow key to highlight “Parameters”. Press *OK*.
5. “Slave Address” should now be highlighted. Press *OK* again and the default address will be displayed.
6. To change the slave address, press the *right* arrow key and when the address number starts blinking, press the *up/down* arrow keys to change the address. Press *OK* when finished.
7. Press the *down* arrow key to view the baud rate selection. “Automatic” is the default and the recommended setting.
8. Press the *down* arrow key to view the I/O Data. “Standard Telegram 1” is the only selection.
9. Press the *down* arrow key to view the Operate Mode. ProfiDrive is what is used for this example.
10. The Profibus option board configuration is complete. Return to the main menu by pressing the *left* arrow key four times, then the *down* arrow key five times to highlight “Parameters”.
11. Press the *right* arrow key to highlight “Basic Parameters” then the *right* arrow key again to view the Basic Parameters.
12. Scroll down with the *down* arrow key until the following parameters are encountered. Configure these two parameters as follows:
    a. Remote 1 Control Place: Fieldbus
    b. Remote 1 Reference: Fieldbus Ref

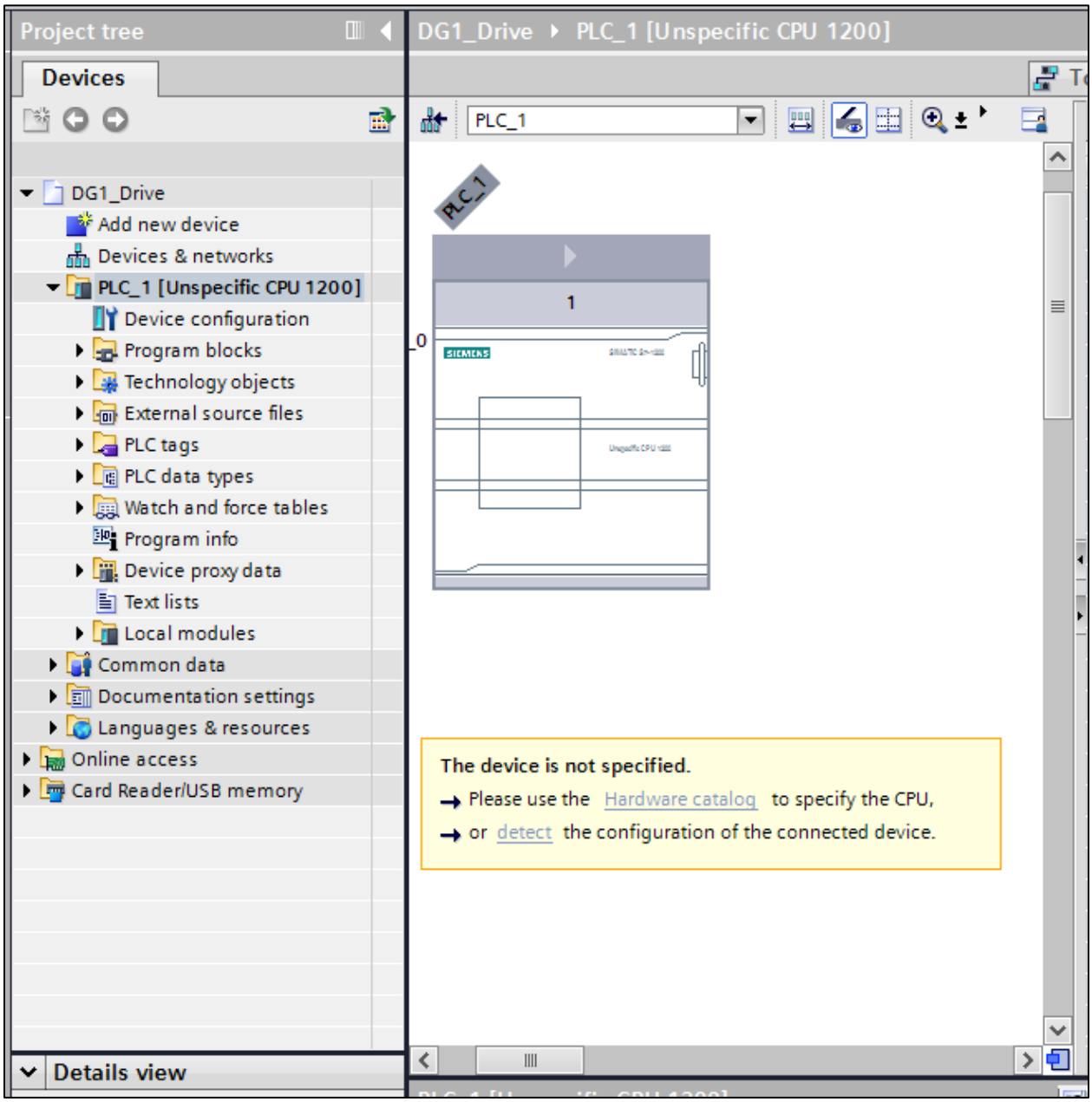
Power cycle the drive to activate these new configuration parameters. Refer to the Communication manual for this drive for additional details. Publication MN040010EN.

Creating a Project in Siemens Simatic Software

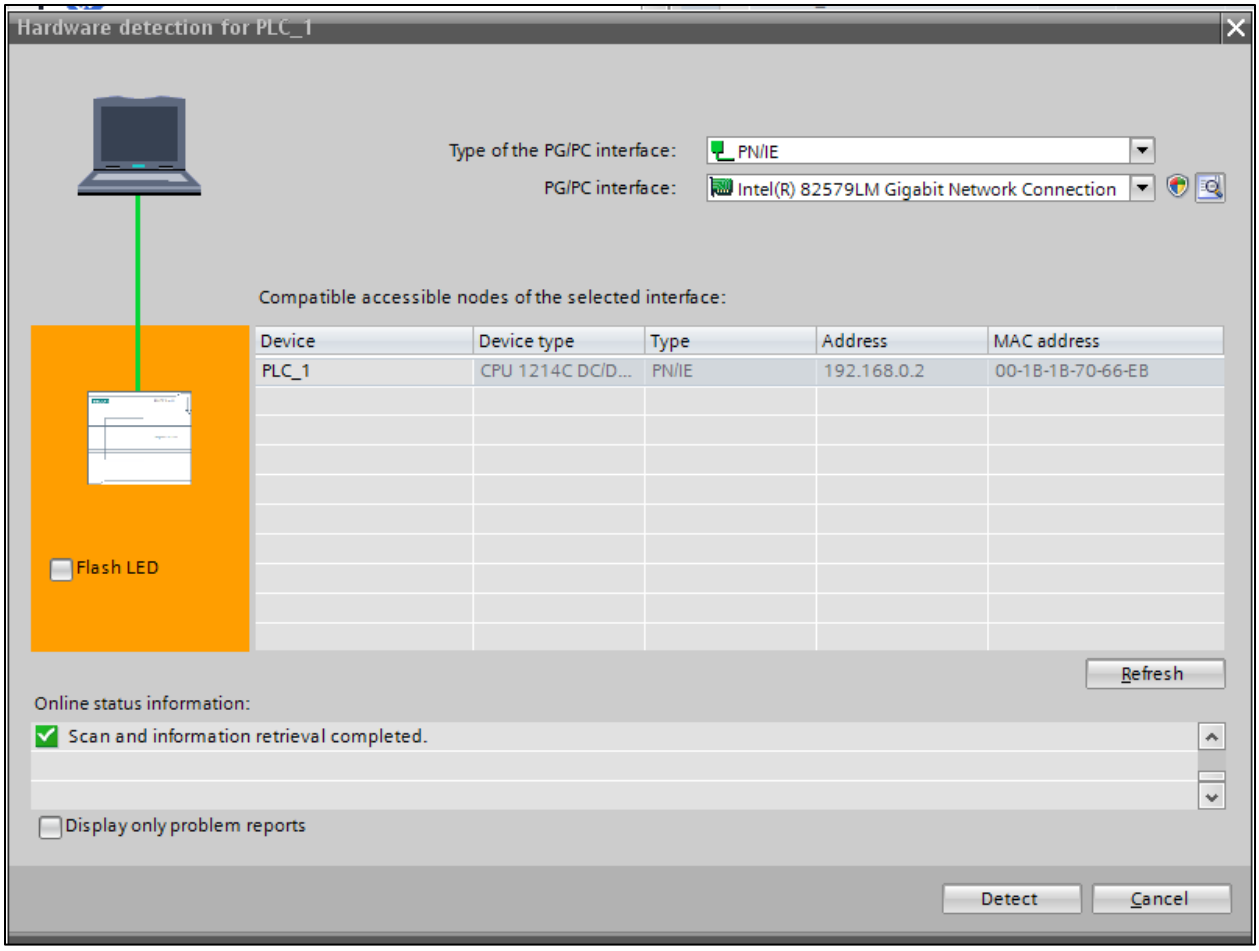
Create a project in Simatic software by starting the software and selecting *Create New Project*. Enter a Project name and Path where the project will be stored, then select the *Create* button per the following:



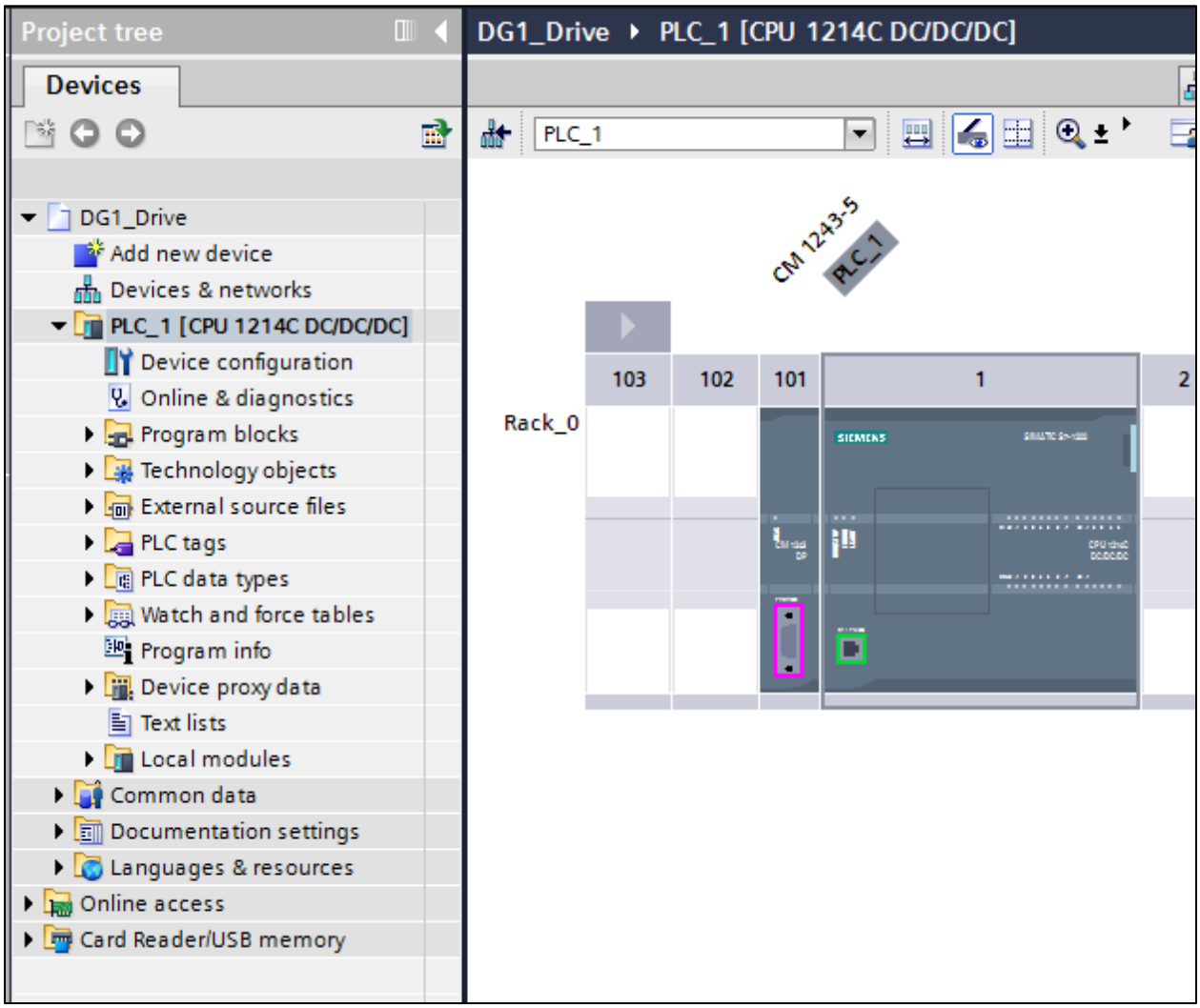
From the next screen, select *Configure* a device, then select Add new device. An S7-1200 PLC is being used for this application. Select the CPU under Unspecified CPU 1200. Choose the correct version (V3.0 for this example) and select the *ADD* button. The following Project View will be displayed, showing a generic CPU.



Click the *CPU* box to select it, then select ***detect*** in the yellow area below it. The Hardware Detection screen will be displayed as follows:

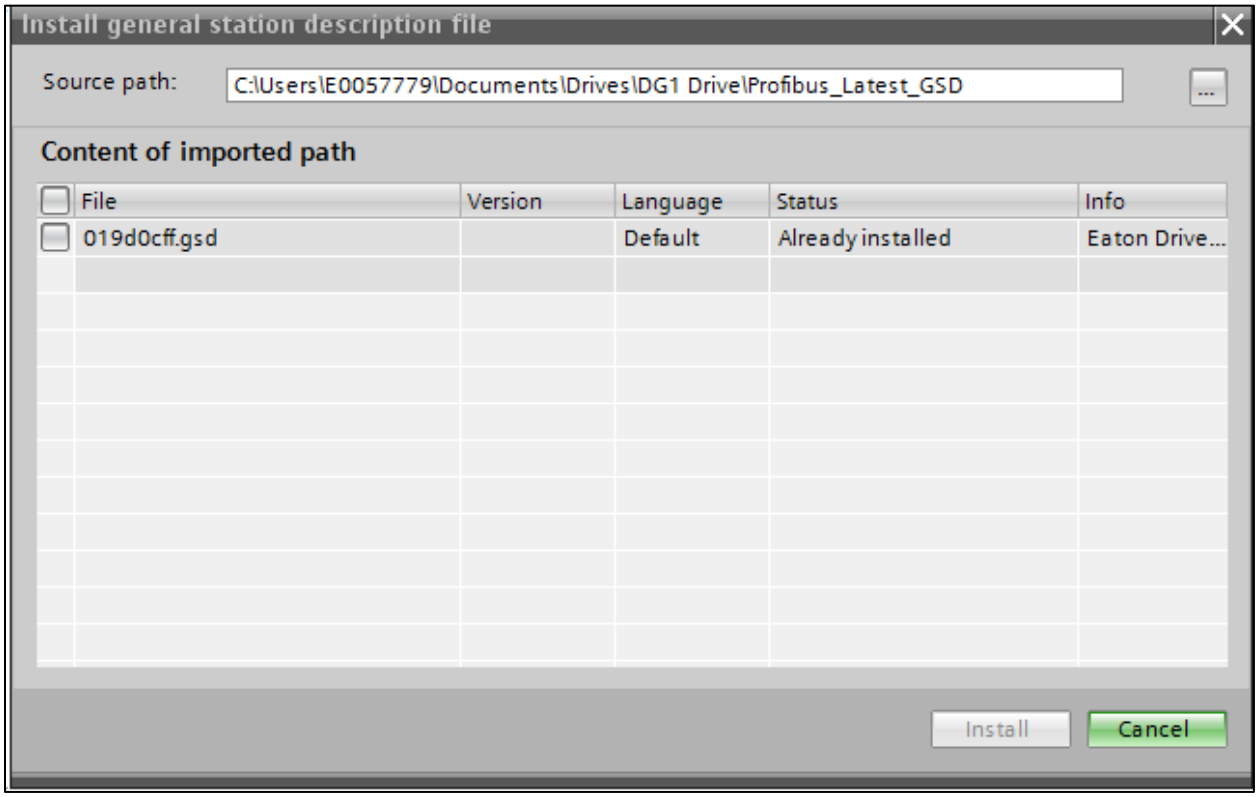


For this example, the Ethernet port on the PLC is being used to communicate with the PLC. It will also be used to upload/download the project later. Set up your software to communicate to your PLC. Once communications is properly set up, select the *Detect* button and the software will detect the actual controller type and the Profibus master module connected to it as follows:



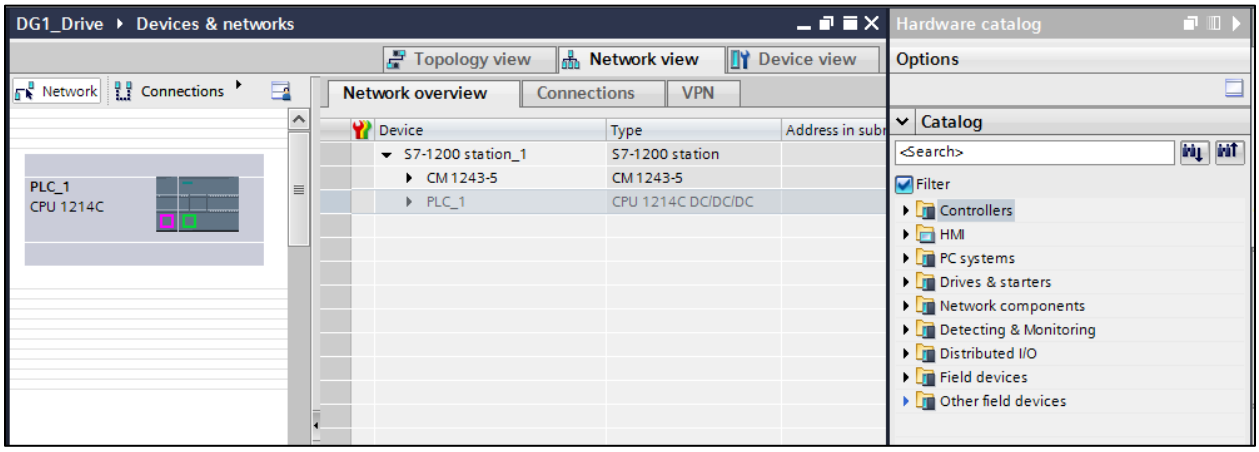
Connect a standard Profibus cable between the Profibus master and the DG1 drive's Profibus Option Card. Use the standard Profibus connectors and turn on the termination on one or both ends.

Then in the Simatic software, select the *Options* drop down menu and choose: “Install general station description file (gsd)”. Download the GSD file from the Eaton website, then search for it on your hard drive by selecting the ellipses in the upper right hand corner of the following screen:

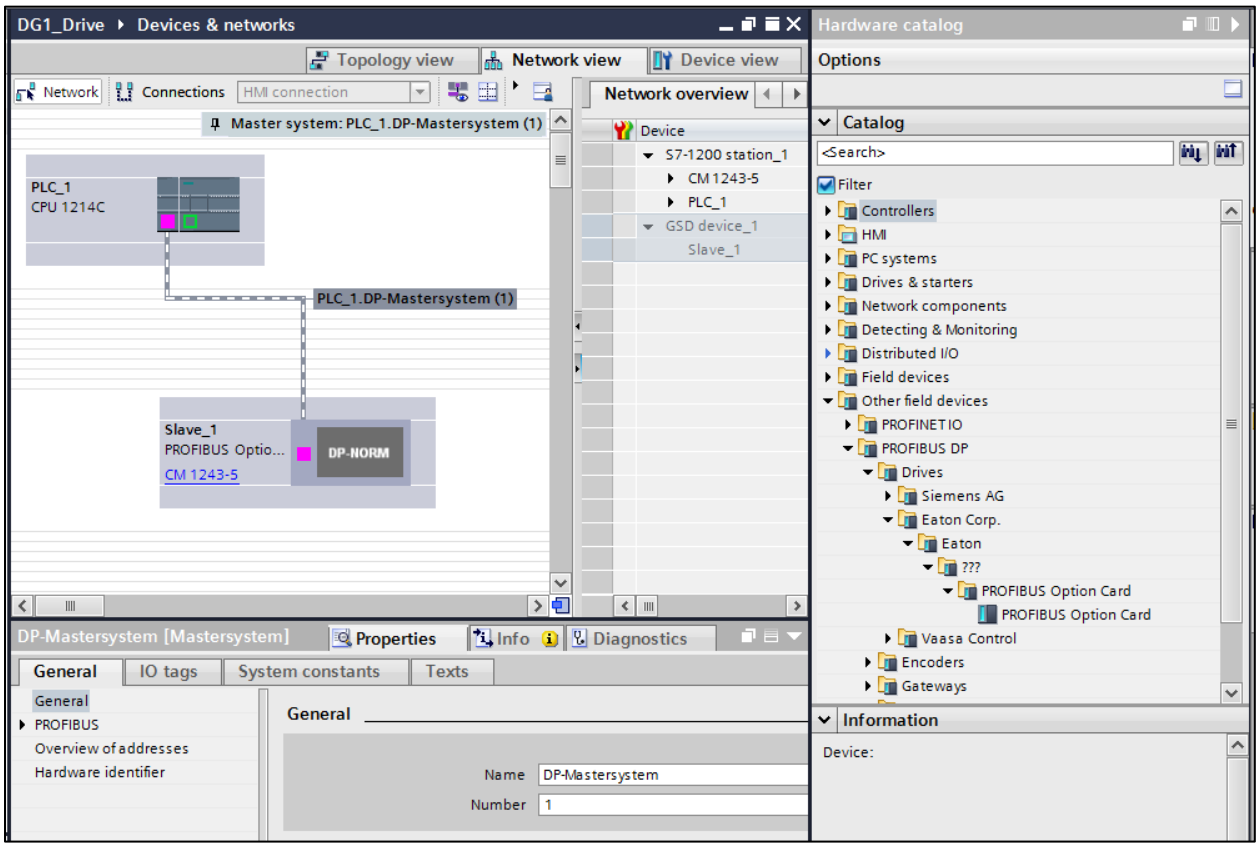


Select the two boxes by selecting the box next to File, then select *Install* and follow the directions to install the GSD file for the PowerXL DG1 Drive.

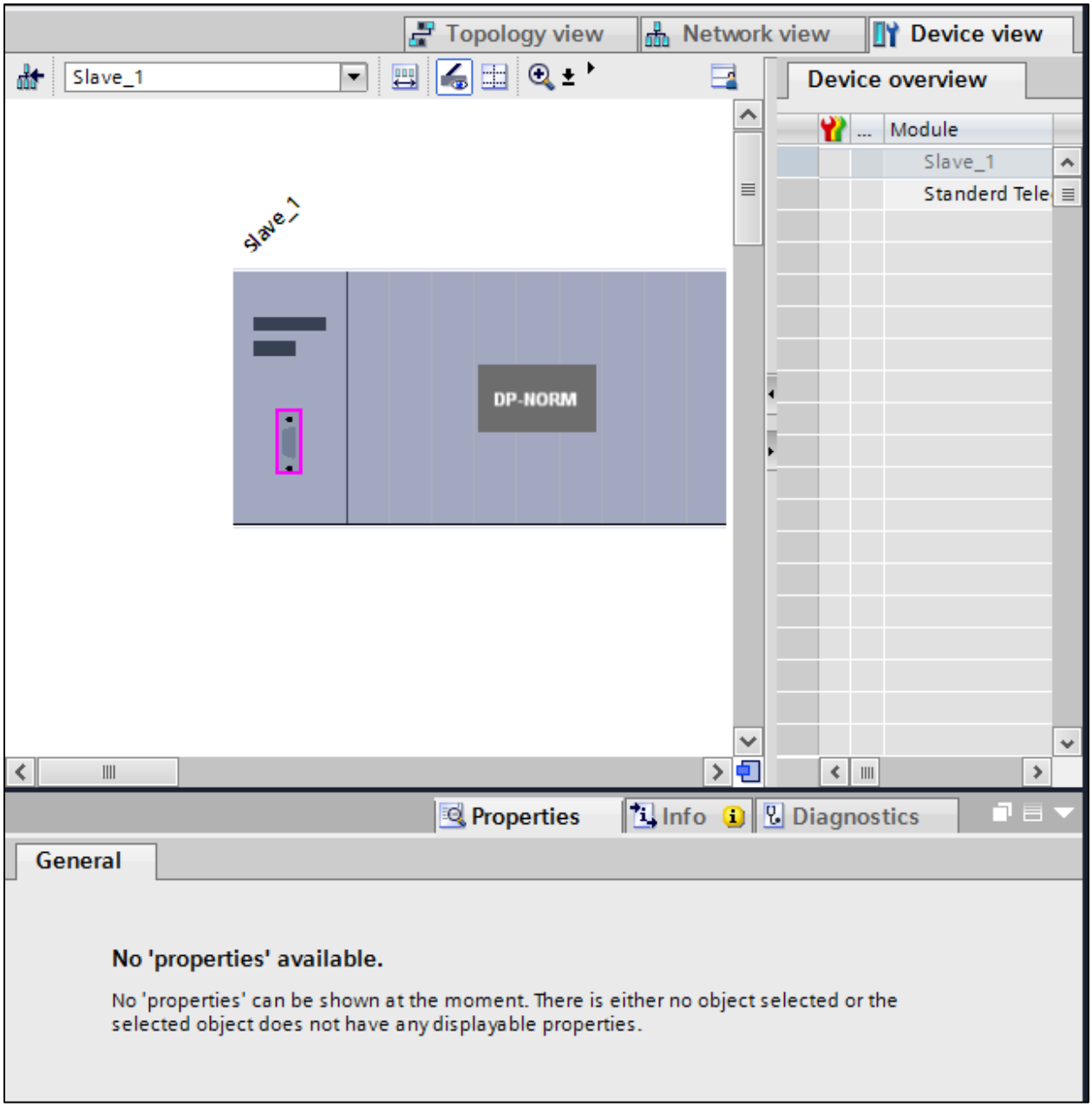
Per the following, select the *Network View* tab.



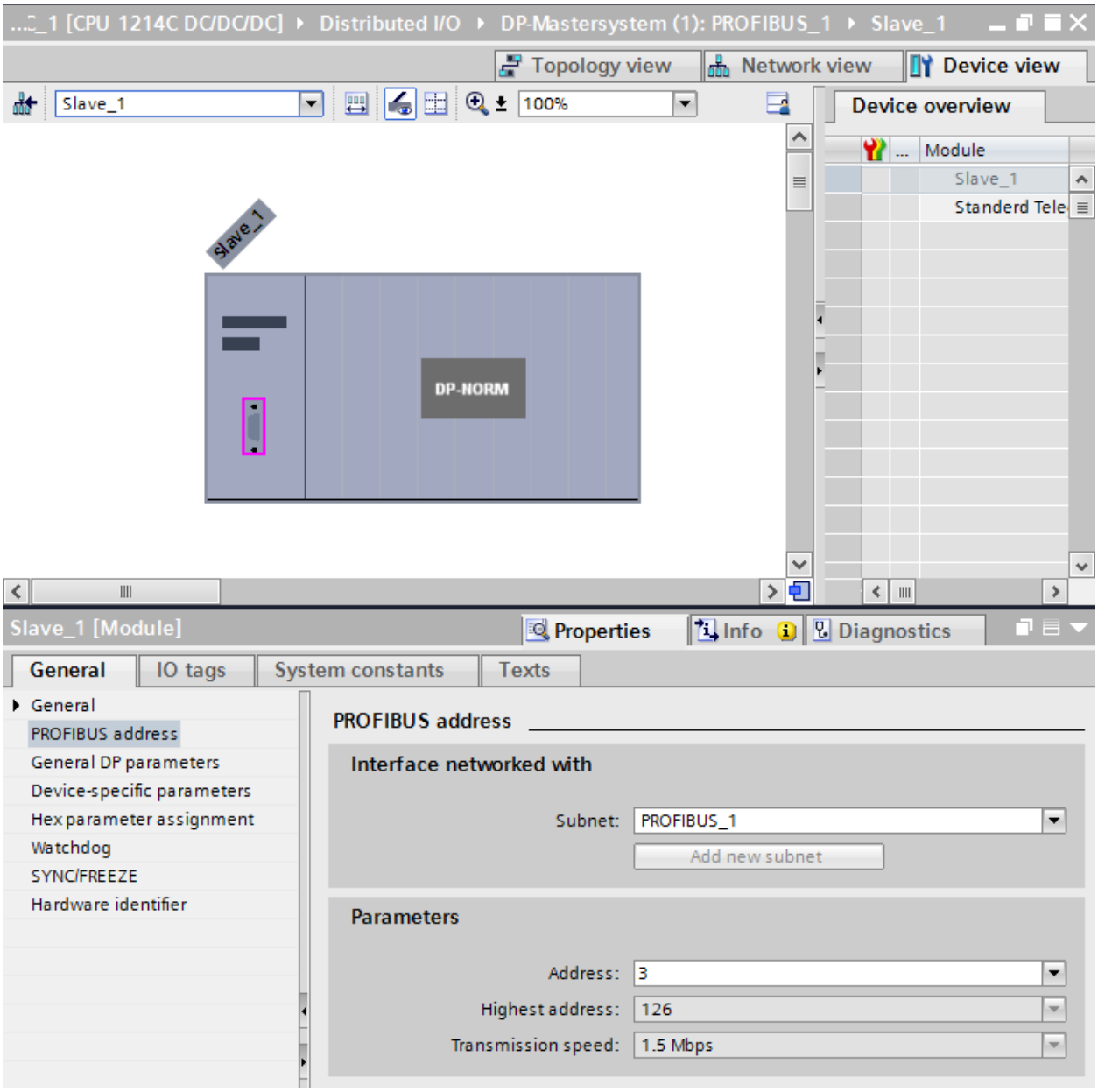
The PLC will be displayed. In the *Catalog* at the far right, select the arrow next to “Other field device”, then next to Profibus DP / Drives / Eaton Corp / Eaton / ??? / Profibus Option Card. Drag and drop the device called Profibus Option Card below the category Profibus Option Card and drop it below the controller/Profibus master on the Network View screen. Then select the pink square on the controller/Profibus master and drag it to the pink square on the Profibus Option Board and release the mouse button. The following should now be displayed:



The Profibus network has been created in the offline project. Double click the *Slave_1 Profibus Option Card* and the following will be displayed:



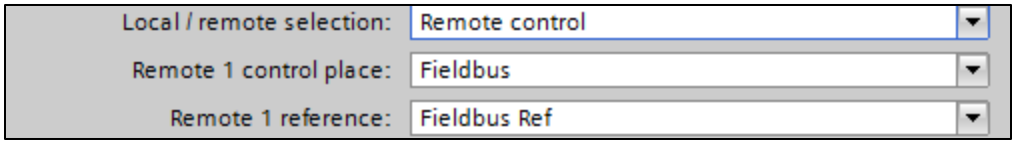
Double click the *Slave_1* box and its Properties will open below it as follows:



Change the *Address* to match what you configured on the DG1 keypad for the Profibus Option Card earlier. For this example, the DG1 Profibus address being used is 3. The Transmission speed will default to 1.5 Mbps, which is fine. Any speed will work here because the drive's option card is set to Auto. The data rate is dependent on the overall network cable length.

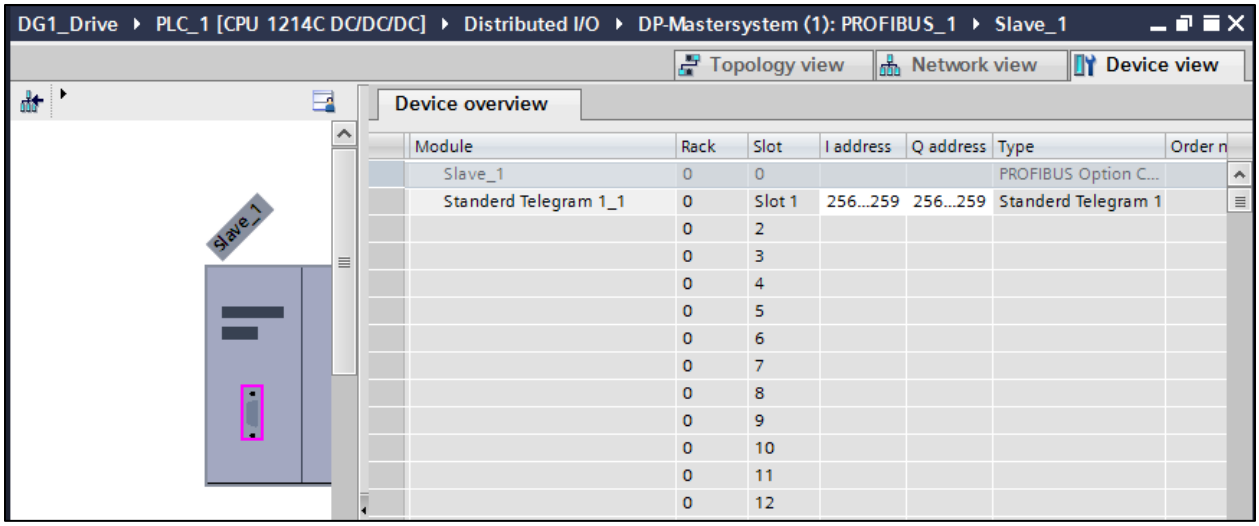
DPV1 under General DP Parameters is correct.

There are a handful of Device-specific parameters. The following three parameters must be set to the following:

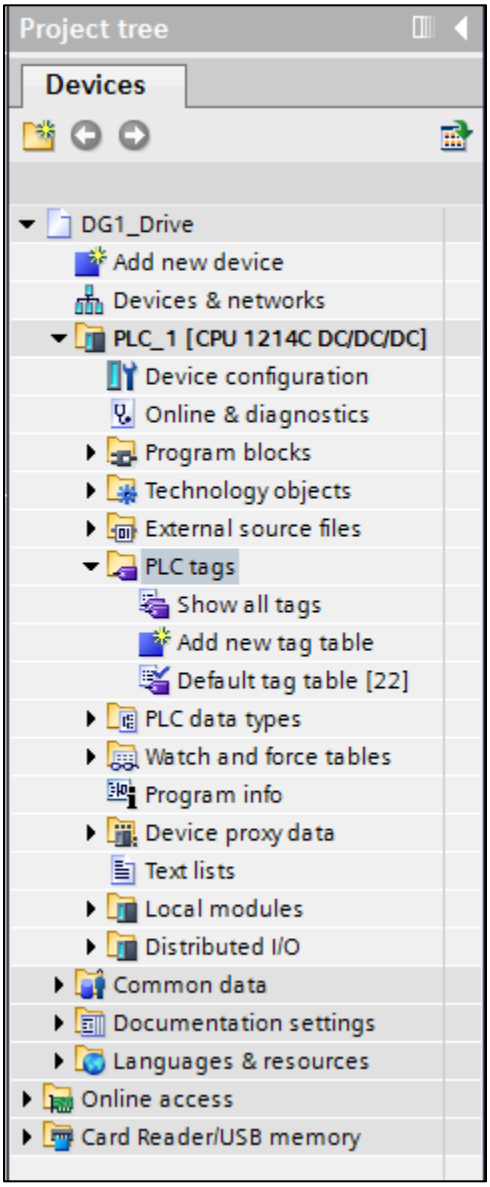


The other parameters shown in this category may also be modified at this time. This file is sent to the drive when the Profibus connection is initialized. None of the other categories are significant.

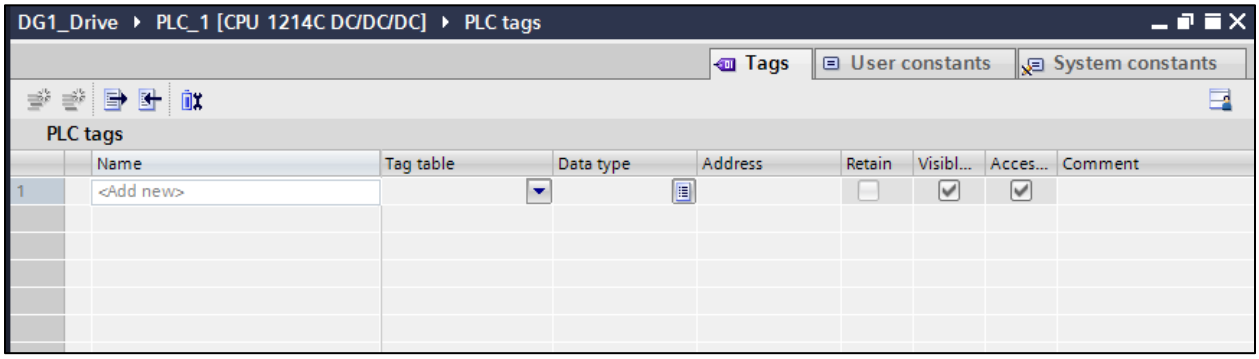
With the Slave_1 (DG1 drive) selected, the Device overview tab looks like the following:



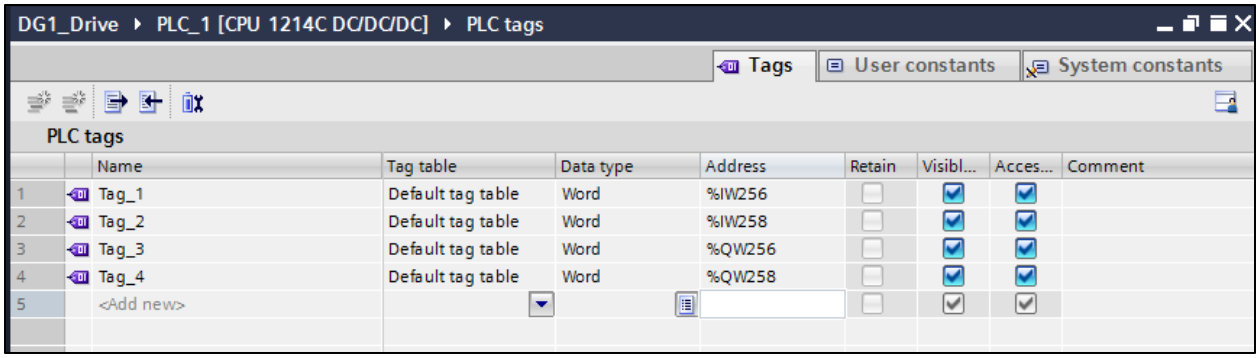
Standard Telegram 1 contains 4 input bytes and 4 output bytes. The addresses assigned for this I/O data for the DG1 drive by the Siemens software are displayed here. Input: 256-259 and Output: 256-259. These addresses must now be added to the PLC Tags area by selecting it from the Project tree on the left as follows:



Double click *Show all tags* under PLC Tags to display the following:



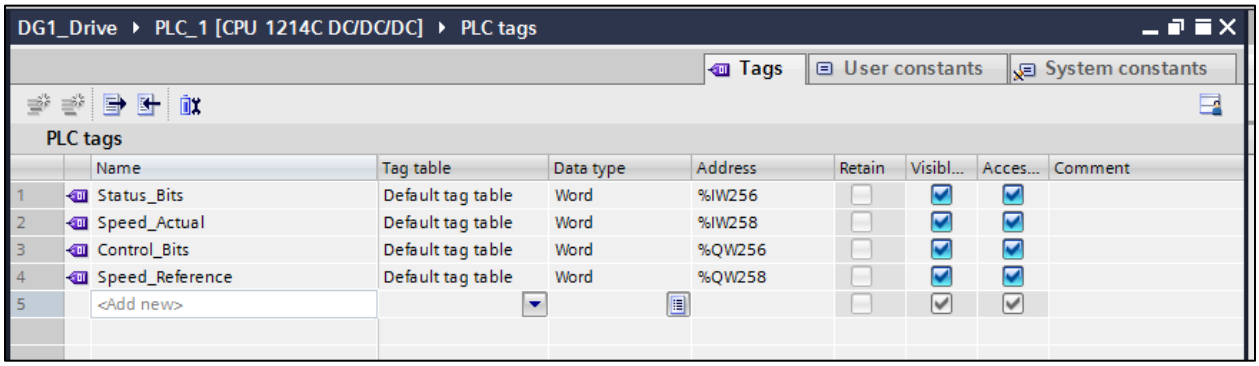
Double click in the top row under the *Address* column and enter IW256. Then enter IW258 in the row below it, QW256 in the next row and finally QW258 in the row below that as follows:



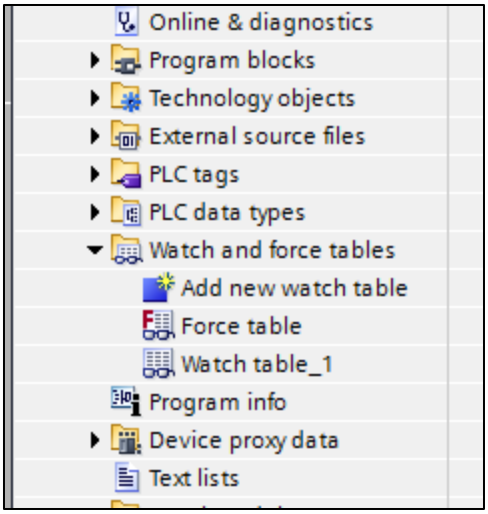
Note that the software puts % in front of these addresses. There is no need to enter it when entering the addresses.

Add the following in the Name column for the 4 rows:

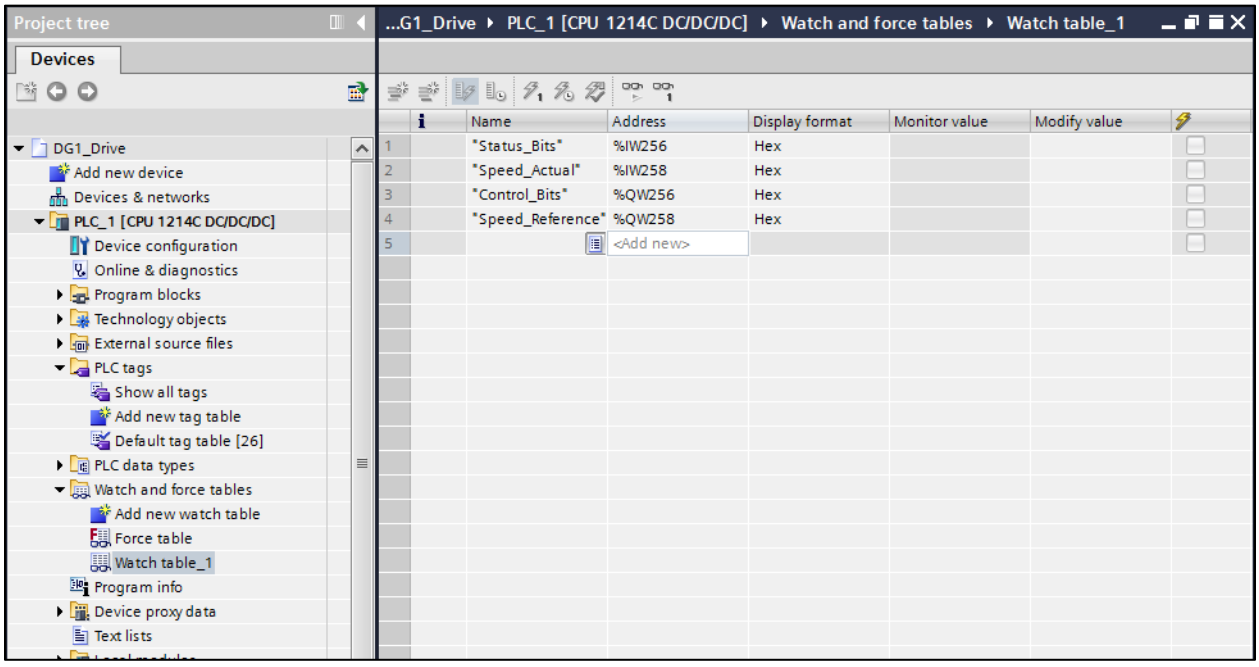
1. Status_Bits
2. Speed_Actual
3. Control_Bits
4. Speed_Reference



Next, double click “Add new watch table” under “Watch and Force tables” in the Project Tree on the left per the following:

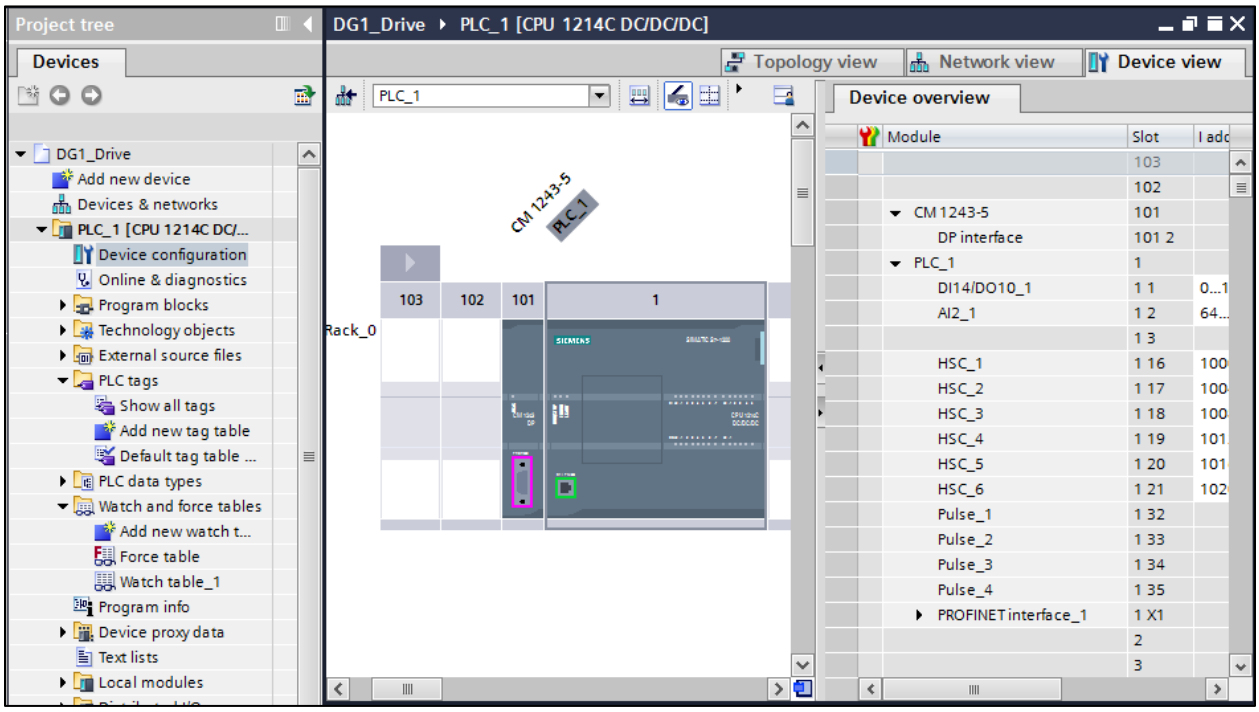


In the new watch table that should now be displayed, add the 4 I/O addresses. Note that the names for these addresses that you entered into the PLC Tags area are automatically populated as the addresses are entered. This watch table will allow testing the DG1 drive over Profibus without writing a program. This will allow monitoring the status bits and the actual speed, while controlling the drive to RUN and provide speed reference.

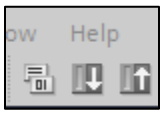


Downloading the program to the Siemens S7 PLC

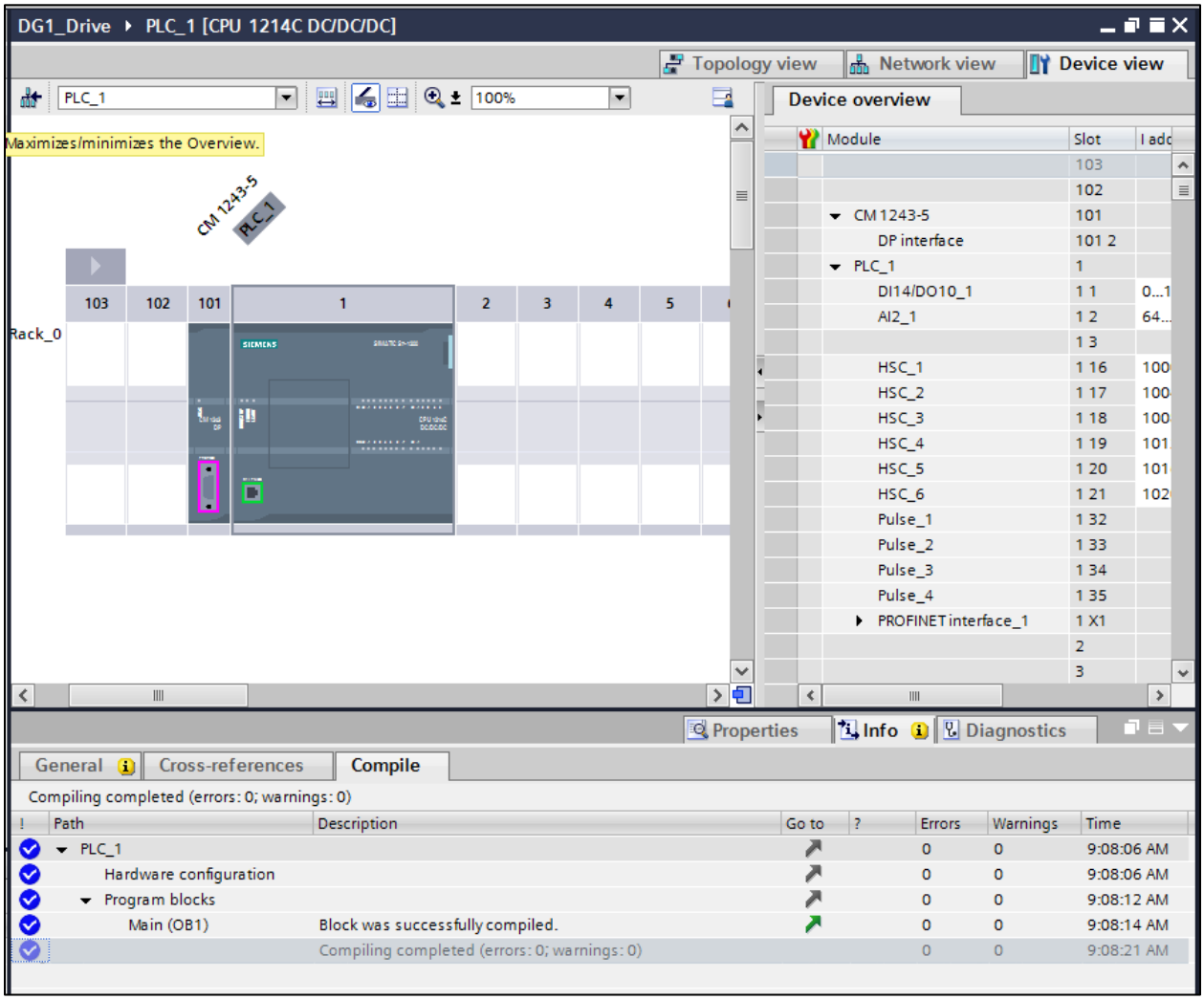
The project must first be compiled with no errors before it is downloaded to the PLC. In the Project Tree under PLC_1 [CPU….], double click *Device Configuration* as follows to display the Device View containing the PLC.



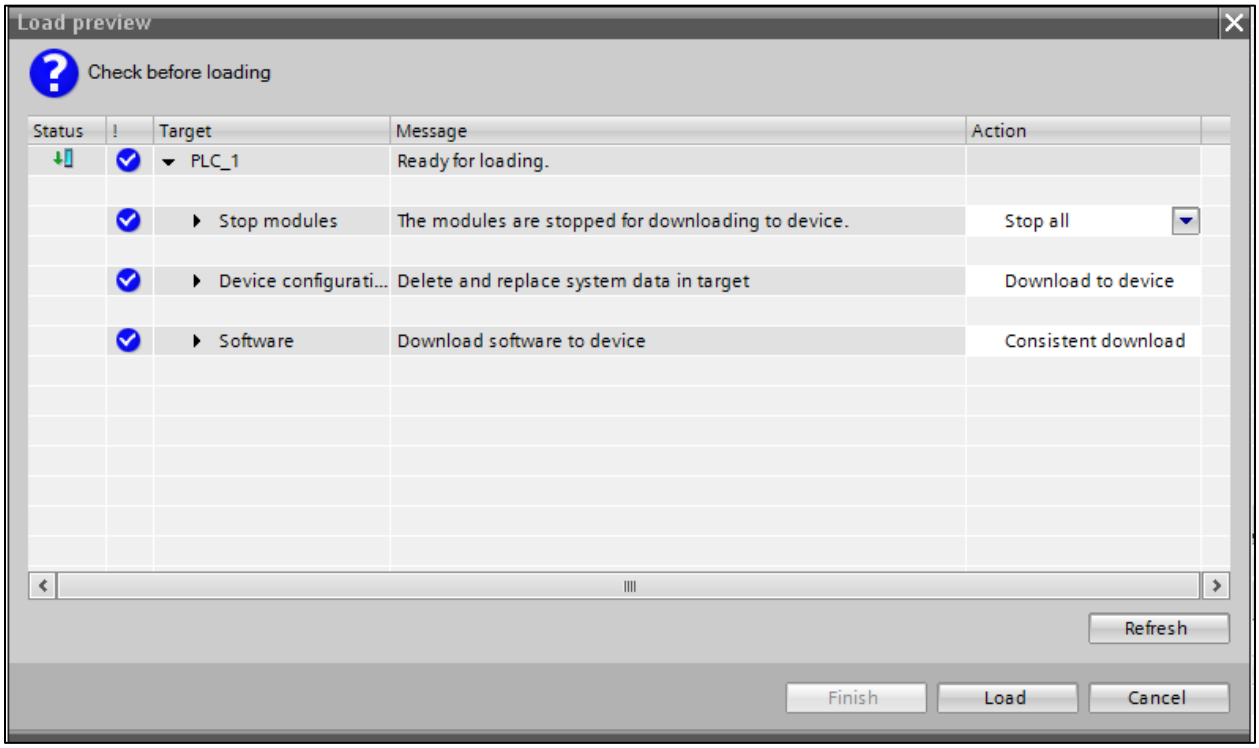
Select the *PLC* then click the *Compile* button. The compile button is just to the left of the *Download* button on the tool bar. Shown below are, from left to right: *Compile* button, *download* button and the *upload* button. As you hover over each of these buttons in the software, it will display its function.



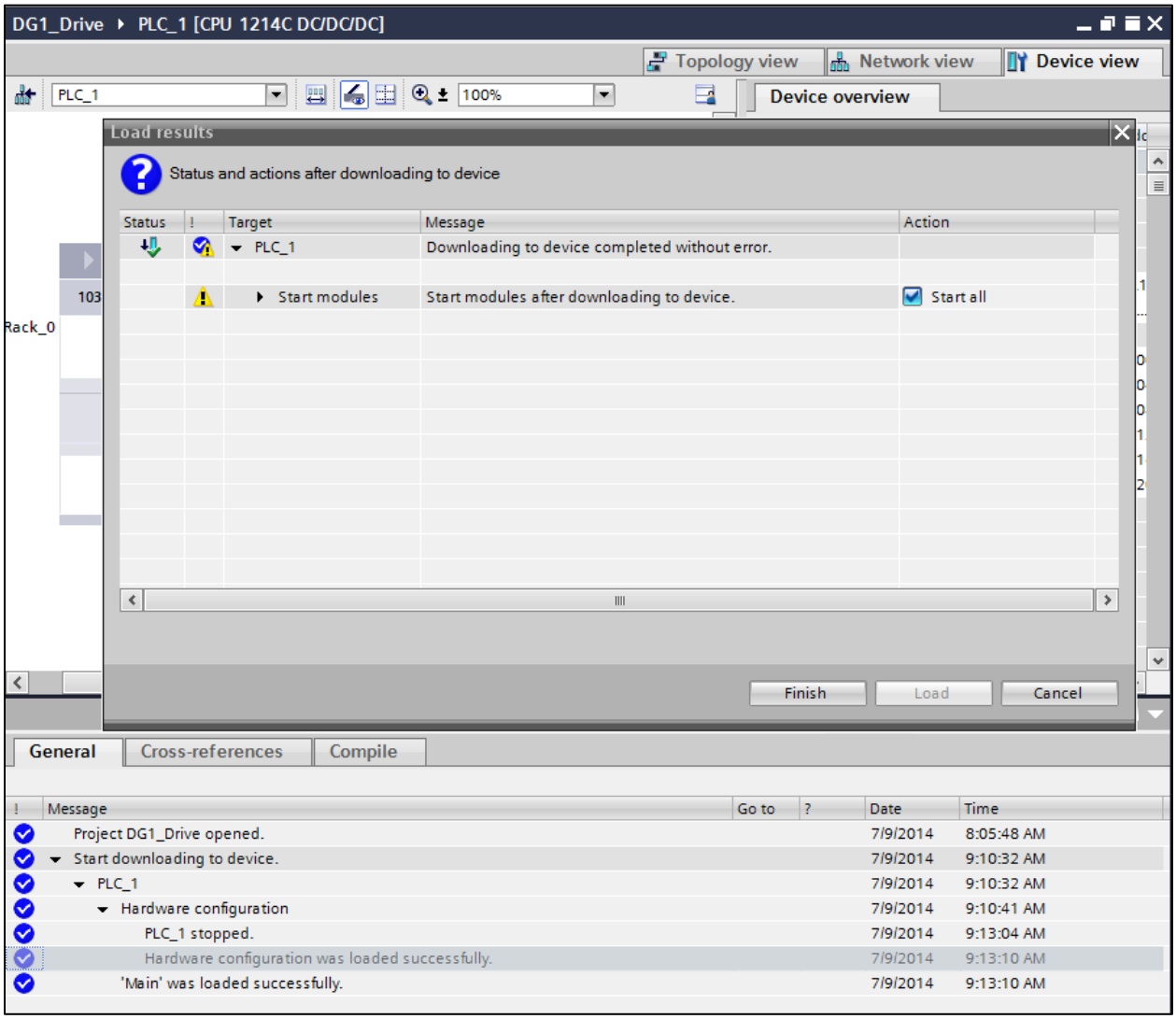
The results of the compile process will be displayed in the area below the PLC as follows:



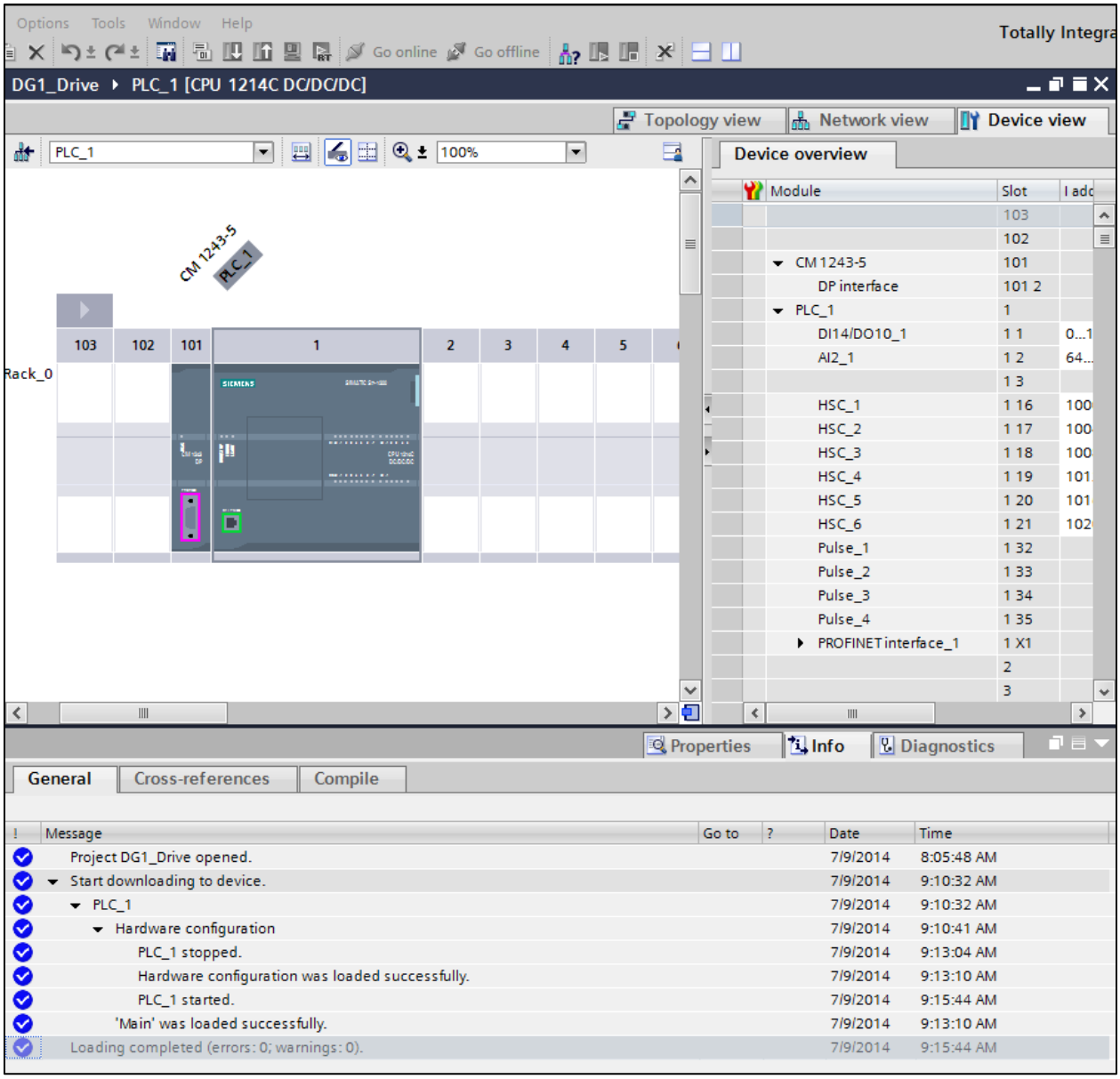
Next, select the *download* button to download the project to the PLC. The following window will be displayed. If the controller was in the Run mode, it must be stopped for the download. Select *Stop all* per the following, then select the *Load* button.



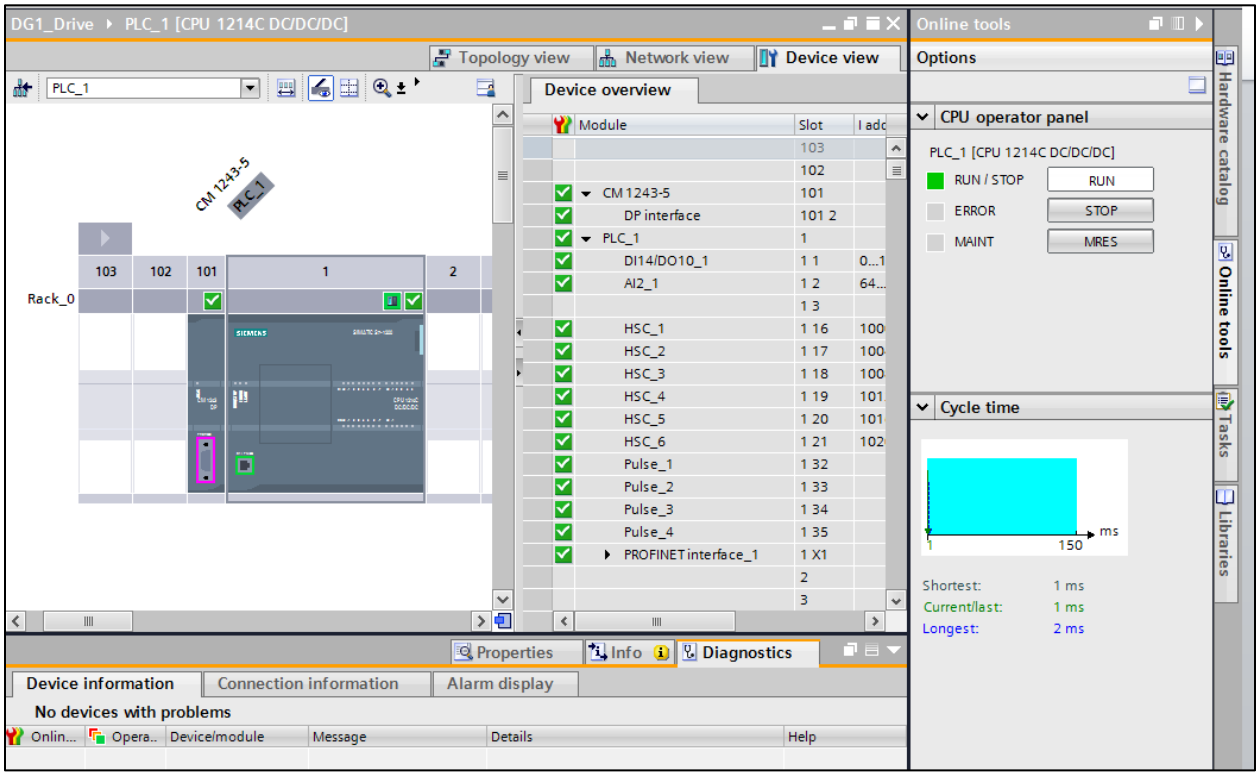
The results of the *Load* will be displayed in the lower portion of the project screen as shown below. *Start all* should be selected, then select the *Finish* button. This will complete the download and place the PLC into the Run mode per the following:



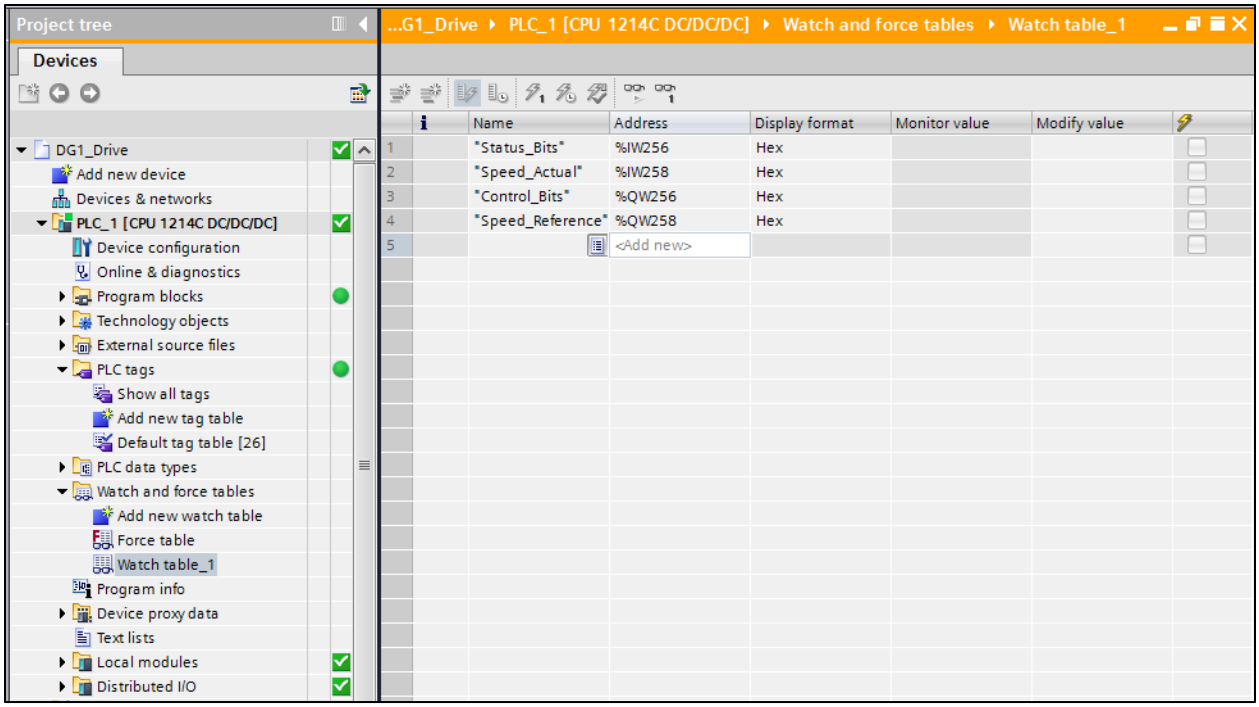
With the PLC selected, select *Go online* from the Tool Bar to go online with the project running in the PLC.


Options Tools Window Help
Go online Go offline
Totally Integra
DG1_Drive ▸ PLC_1 [CPU 1214C DC/DC/DC]
Topology view Network view Device view
PLC_1
100%
Device overview
Module Slot I adc
CM 1243-5 101
DP interface 101 2
PLC_1 1
DI14/DO10_1 1 1 0...1
AI2_1 1 2 64...
HSC_1 1 16 100
HSC_2 1 17 100
HSC_3 1 18 100
HSC_4 1 19 101
HSC_5 1 20 101
HSC_6 1 21 102
Pulse_1 1 32
Pulse_2 1 33
Pulse_3 1 34
Pulse_4 1 35
PROFINET interface_1 1 X1
CM 1243-5
PLC_1
103 102 101 1 2 3 4 5
Rack_0
Properties Info Diagnostics
General Cross-references Compile
! Message Go to ? Date Time
Project DG1_Drive opened. 7/9/2014 8:05:48 AM
Start downloading to device. 7/9/2014 9:10:32 AM
PLC_1 7/9/2014 9:10:32 AM
Hardware configuration 7/9/2014 9:10:41 AM
PLC_1 stopped. 7/9/2014 9:13:04 AM
Hardware configuration was loaded successfully. 7/9/2014 9:13:10 AM
PLC_1 started. 7/9/2014 9:15:44 AM
'Main' was loaded successfully. 7/9/2014 9:13:10 AM
Loading completed (errors: 0; warnings: 0). 7/9/2014 9:15:44 AM

When online, the Simatic software should look like the following:

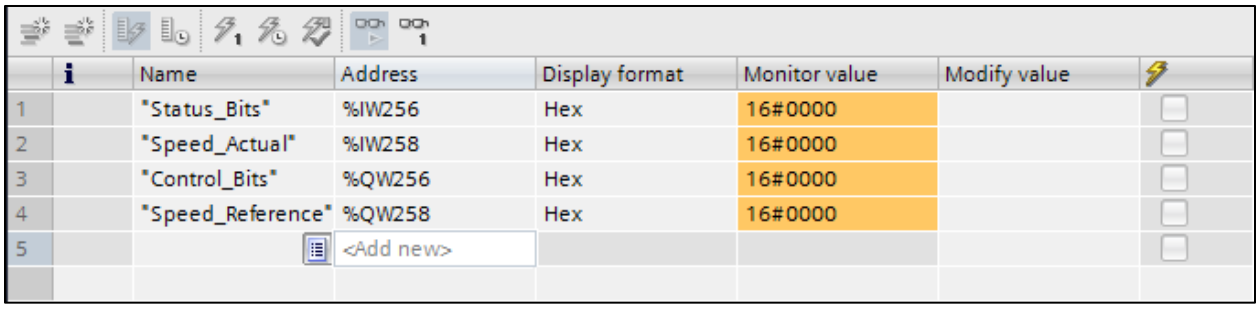


In the Project Tree on the left, double click *Watch table_1* under *Watch and force tables* to display the following:



Below is the Tool Bar above the Watch List.

If the second icon from the right is selected, the Watch List will begin monitoring and displaying the I/O data as follows:



	i	Name	Address	Display format	Monitor value	Modify value	
1		"Status_Bits"	%IW256	Hex	16#0000		
2		"Speed_Actual"	%IW258	Hex	16#0000		
3		"Control_Bits"	%QW256	Hex	16#0000		
4		"Speed_Reference"	%QW258	Hex	16#0000		
5			<Add new>				

In the *Modify value* column for QW256 the following 2 hexadecimal values may be used to start and stop the drive:

Start: 0x047F
Stop: 0x047E

Please refer to page 88 of the PowerXL DG1 Series VFD Communication Manual, publication MN040010EN for additional control word options. Page 89 shows the layout of the Status word. Page 90 shows the speed values per the following:

0 represents 0.00 Hz
4000 represents 100% Speed (CW) (60.00 Hz if the Maximum Speed is set to 60.00 Hz)
C000 represents -100% Speed (CCW) (-60.00 Hz if the Maximum Speed is set to 60.00 Hz)

The data can be entered/viewed in different formats by changing the Display Format for any value.

Each time values are entered or modified in the “Modify Value” column for the Control Word or the Speed Reference, the lightning bolt with a 1 under it shown below must be selected to instruct the software and the PLC to write the value or values to the drive.

References

PowerXL DG1 Series VFD Installation Manual, Publication MN040002EN
PowerXL DG1 Series VFD Application Manual, Publication MN040004EN
PowerXL DG1 Series Option Cards User Manual, Publication MN040007E

Additional Help

In the US or Canada: please contact the Technical Resource Center at 1-877-ETN-CARE or 1-877-326-2273 option 2, option 6.

All other supporting documentation is located on the Eaton web site at www.eaton.com/Drives

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