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SIMATIC®

S7 and Profibus-DP Configuration Guide

G1026

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Preface:

The manual is a short start-up guide for configuration of SIEMENS, SIMATIC S7 programmable controllers and Profibus-DP communication network based on TURCK Profibus-DP IO blocks. It provides the first time user of SIEMENS, SIMATIC S7 industrial automation technology brief insight into:

- Creating new project
- Configuring communication interface
- Configuring DP network
- On-line IO data monitoring

The manual is a supplement to SIEMENS STEP 7 V5.2 documentation library. Users are encouraged to refer, regarding different S7 architectures and configuration procedures, to the following documentation:

SIEMENS
Configuring Hardware and
Communication Connections
STEP 7 V5.2
Order #: 6ES7810-4CA06-8BA0

SIEMENS
SIMATIC
Working with STEP 7 V5.2
Getting Started
Order #: 6ES7810-4CA06-8BA0

Or to visit Siemens Industrial Automation Systems web site:

http://www2.automation.siemens.com/simatic/portal/index_76.htm

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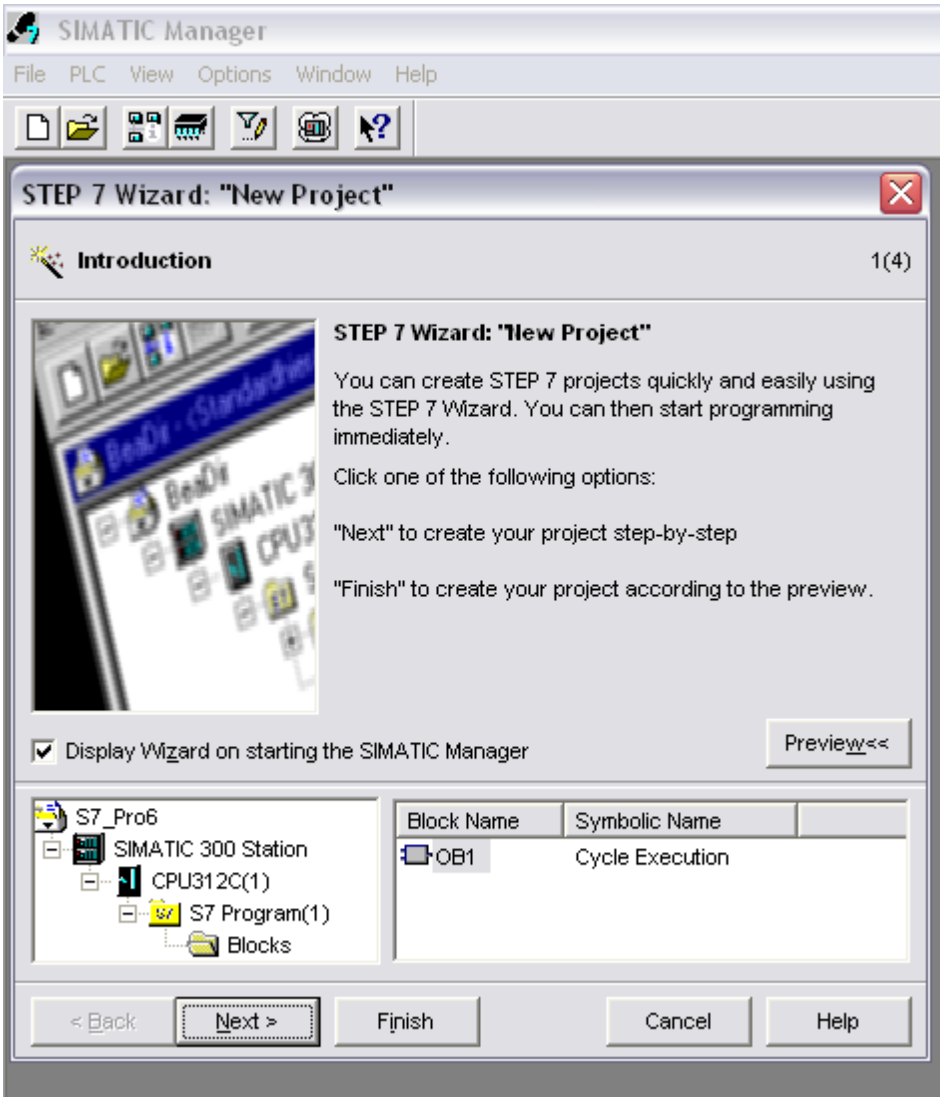
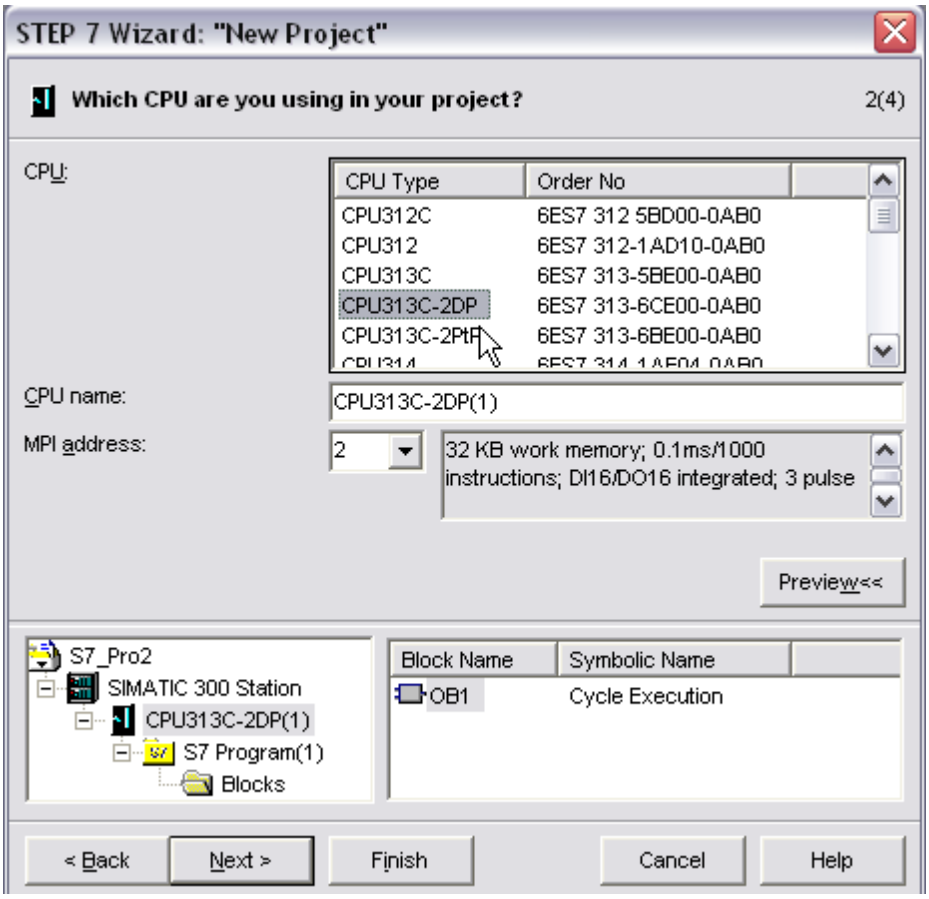
New Project Wizard

Start STEP 7 and follow new project setup wizard instructions using SIMATEC Manager Tool:



Select CPU type, set MPI address and press “***Next”***
Use default MPI address.



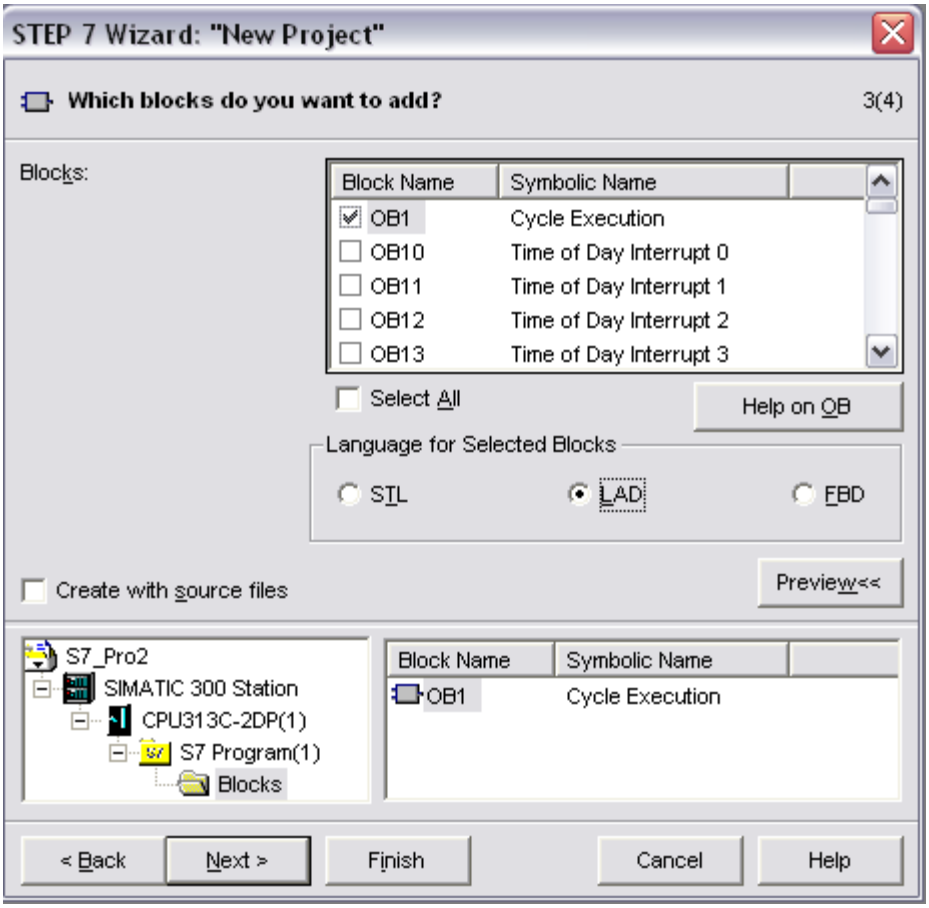
“There is a difference between assigning addresses to nodes and assigning IO addresses to input and output data.

Node addresses are addresses of programmable modules (MPI, PROFIBUS, Industrial Ethernet addresses); they are required in order to be able to address the various nodes in a subnet, for example, in order to download a user program to a CPU. You will find information on assigning node addresses in the subnet in the chapter on networking stations.

Input/output (I/O) addresses are required in order to read inputs and set outputs in the user program.”[1]

[1] STEP 7 – Help File

Select functional blocks to be used in the project and press "***Next***":

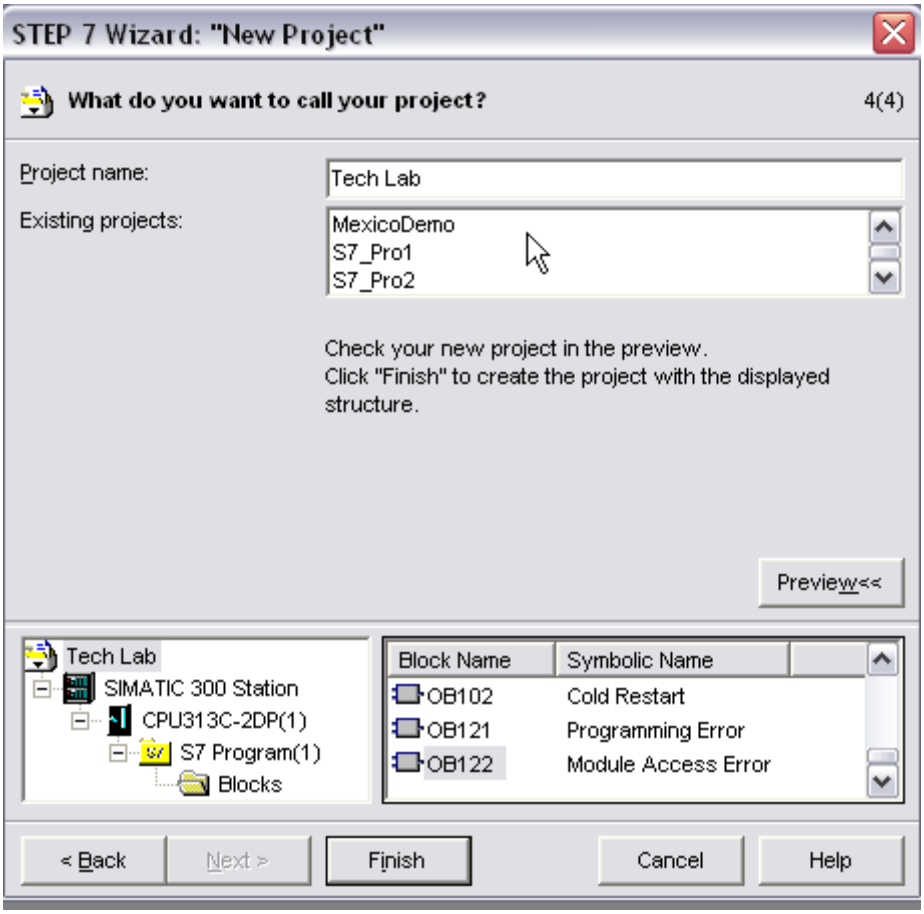


Select type of programming language to be used later:

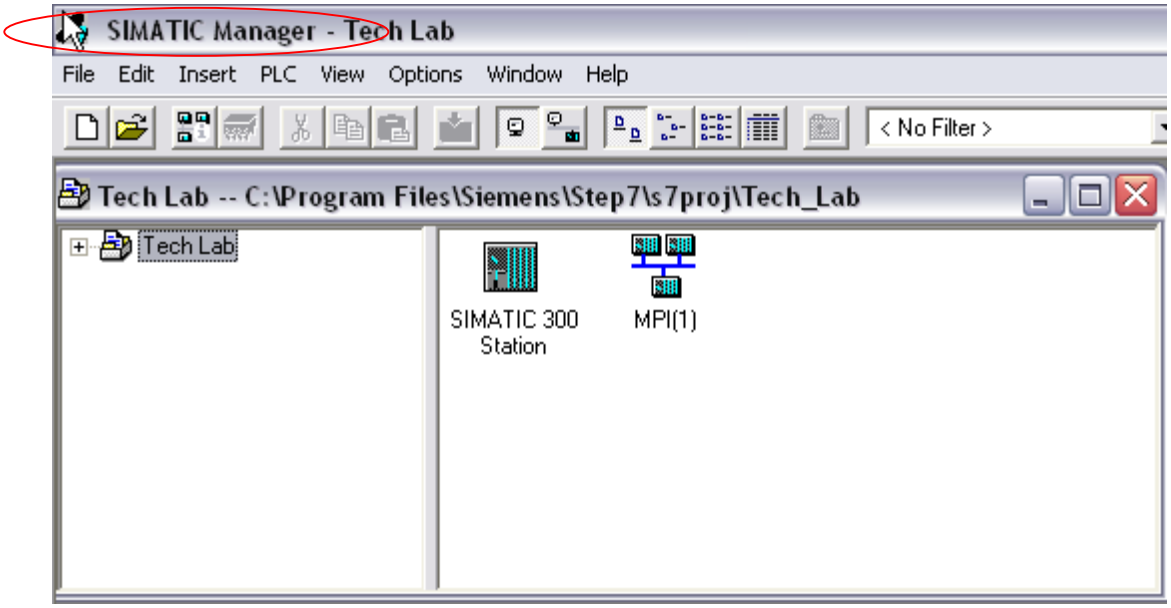
- STL - Statement List
- LAD - Ladder Logic
- FBD - Block Diagrams

OB1 represents the highest programming level and organizes the other blocks in the S7 program. You can change the programming language again at a later date.

Enter new project name and press ***Finish:***

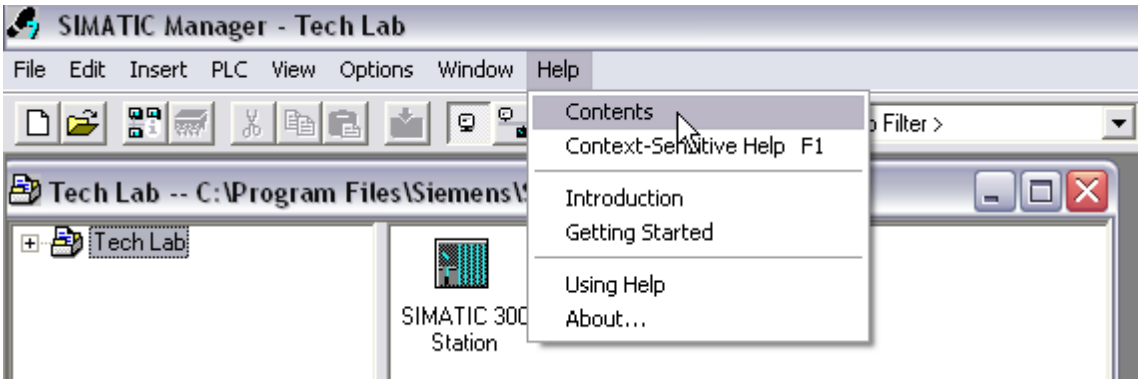


SIMATIC Manager will create a new **"Tech Lab"** project and open new project page:



HELP

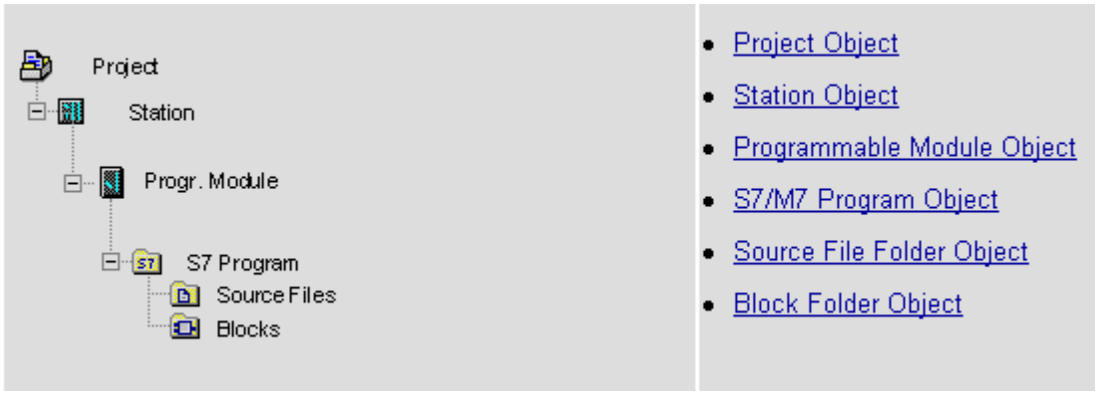
Extensive "***Help"*** support is available for information on SIMATIC MANAGER tool.



Terminology

SIMATIC MANAGER displays project structure in the Project Directory window on the left side pane.
Right side pane is an extension of the project directory and provides a content of the selected directory item.

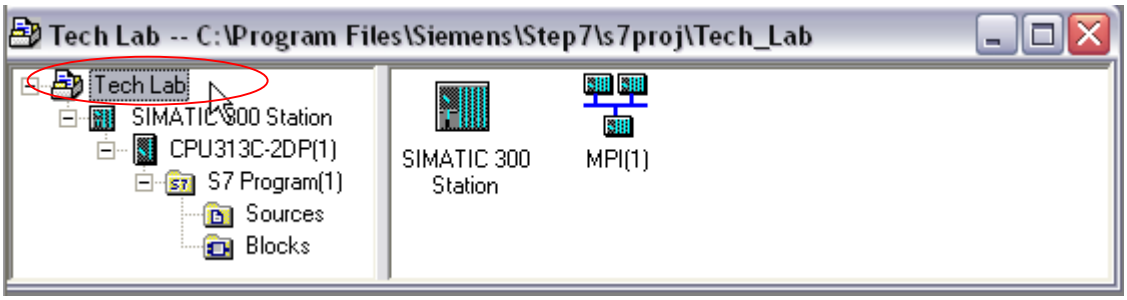
The terms used for particular objects are defined in the Help file as follows:



Project View

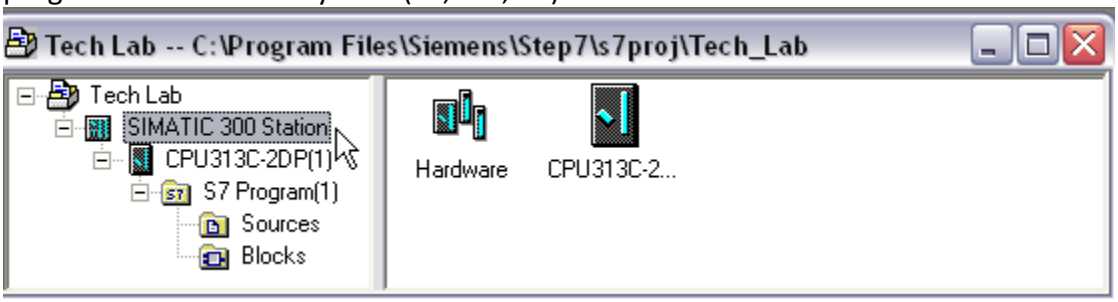
Projects are used for storing the data and programs which are generated when you create a limited automation solution in an orderly way. The data belonging to a project include the following:

- Configuration data for the hardware used and parameter assignment data for modules
- Configuration data for network communication
- Programs for programmable modules

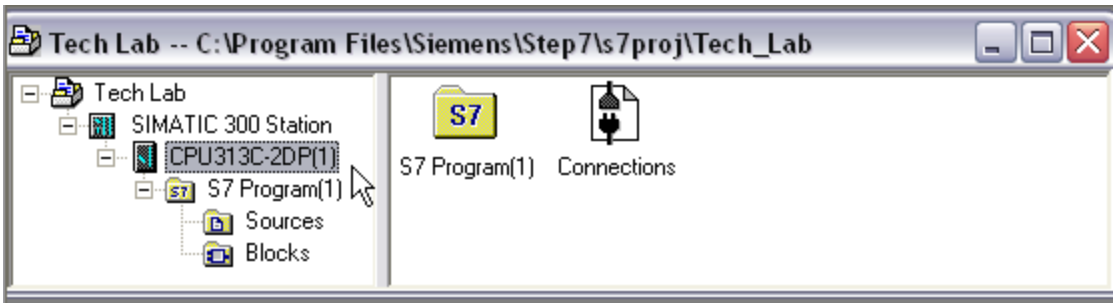


Station View

You insert a SIMATIC station (for example, SIMATIC 300) if you want to configure a programmable control system (S7, M7, C7).



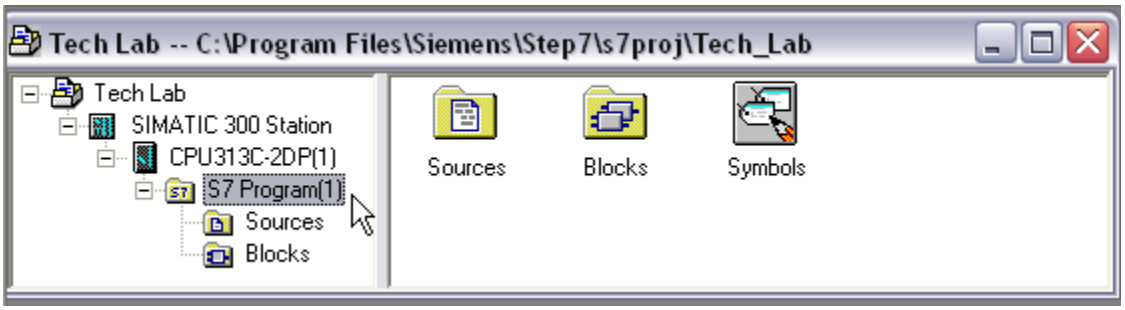
Processor View



Processor view defines object that processor interacts with:

- ***Program Objects***: The "S7 Program" object is a folder for blocks, source files, and charts for programmable S7 modules (module, programmable). It also contains the symbol table.
- ***Connection Object***: This object is used for determining the communication connections (connection configuration). By double-clicking this object, you gain access to the network view (the connection table for this module is then opened).

Program Module View



Program module view defines source code, block and symbols used in a project:

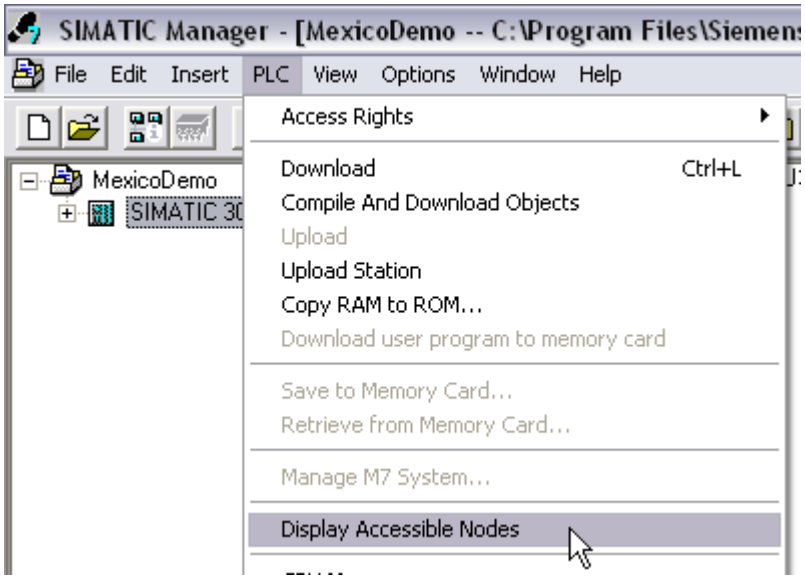
- ***Sources:*** The source file folder is used for saving text or graphic source files; for example, STL source files, SCL source files, or Graph source files.
- ***Block:*** The block folder is used to store the following:
  - Logic blocks,
  - Data blocks (DB),
  - System data (a double-click on this object displays a list of the system data blocks (SDB)),
  - Variable tables (for monitoring and modifying variables).
- ***Symbol Object***: The symbol table is used to store symbols.

Configuring S7 Interface

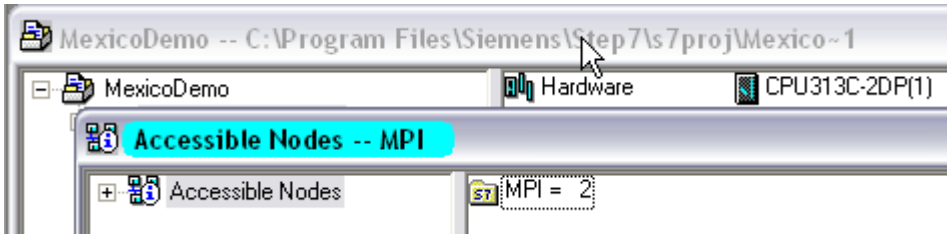
Communication between STEP 7 and SIMATIC S7 processor(s) depends on interface card used in the application. SIMATIC Manager enables testing and setting up the communication interface as follows:

- Check for default communication settings by selecting

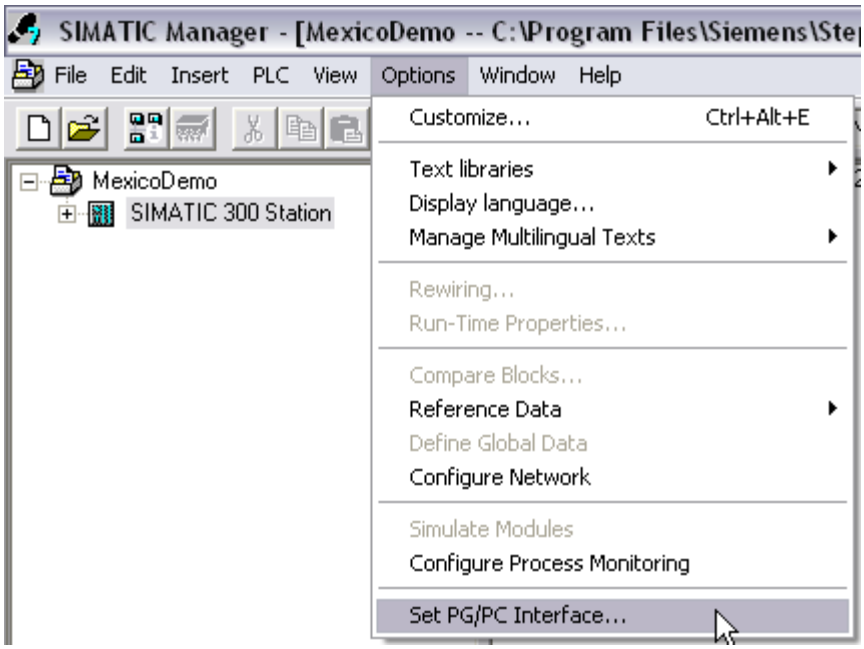
  "PLC>Display Accessible Nodes" menu function or simply click on icon



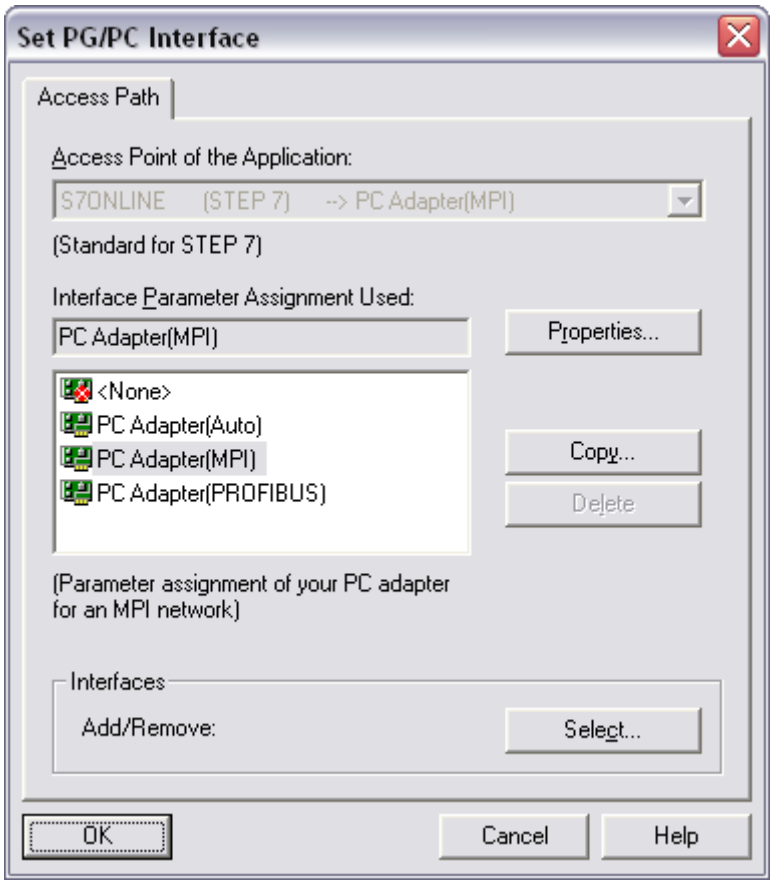
- The Manager opens new communication window, goes online and shows available connections on the right part of the window:



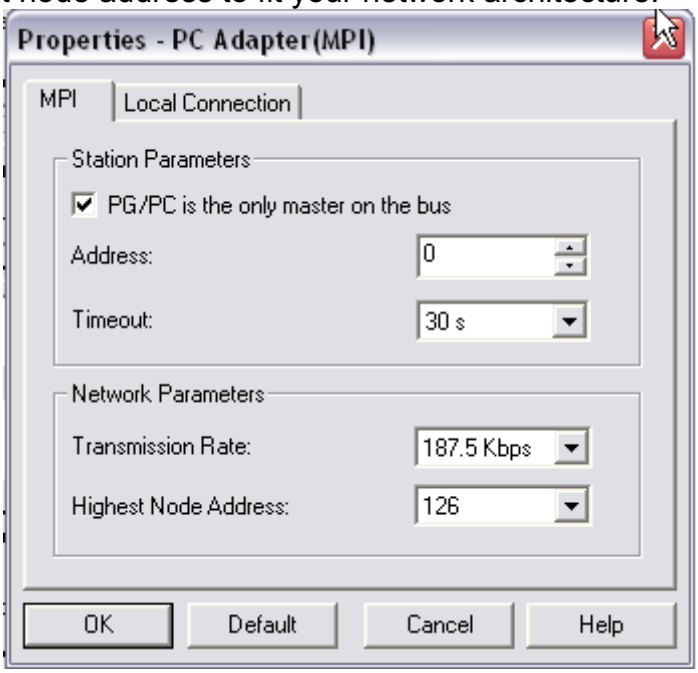
- If connection does not exist (no MPI= 2 address on the right) , close current MPI window and go to:
  "Options>Set PG/PC interface"
  menu function and select (highlight) type of interface that is used to connect PC to S7 processor:



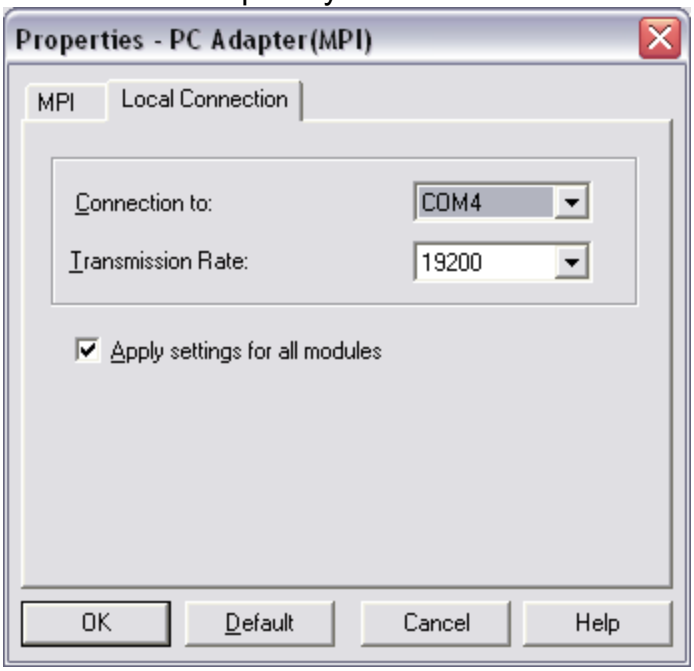
- Select type of interface that is used in the application and press ***"Properties"***



- Use ***"Station Parameters"*** field to define connection between PC and interface card,
- Use "Network Parameters" field to define connection between interface card and S7 processor. Set transmission rate to maximum allowed value and adjust highest node address to fit your network architecture.



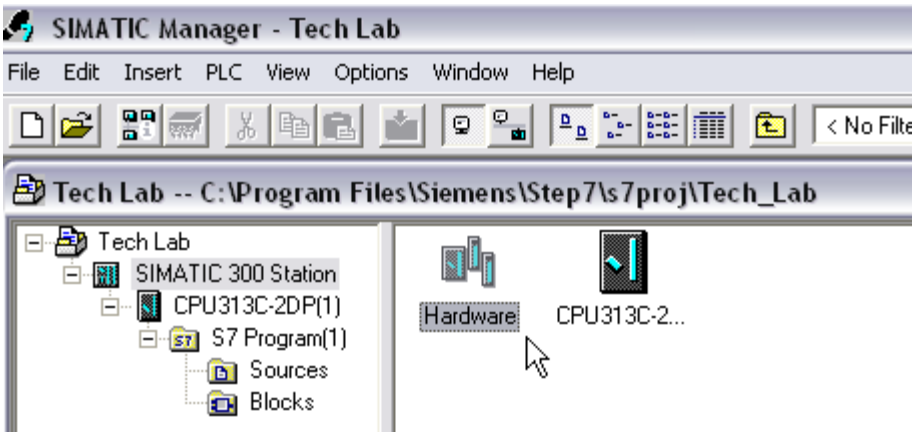
- Set PC communication port by selection ***"Local Connection"*** tab:



- Save settings by pressing "OK" and close all property and setup windows.
- Repeat above steps until communication is ok. Settings will be downloaded to S7.

Configuring Profibus-DP Network

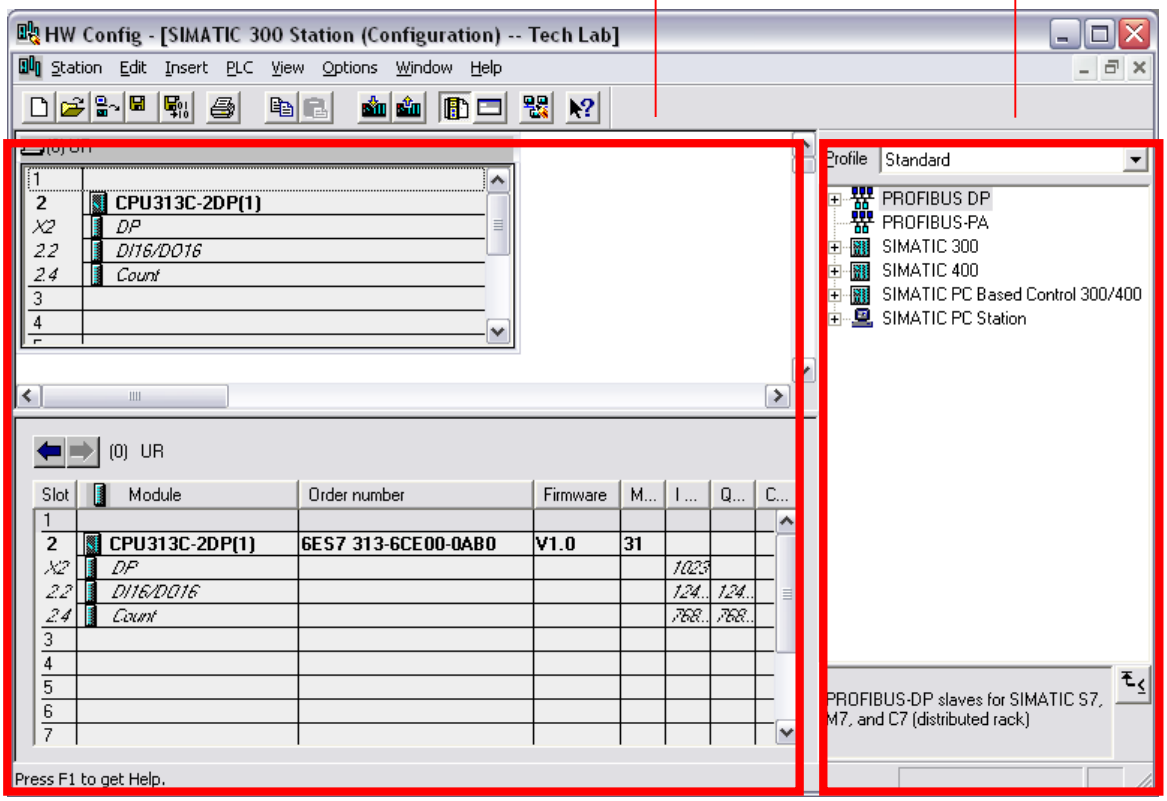
Open Station view and Double-click on Hardware icon. This action will open separate ***"Hardware Configuration"*** window.



Hardware Configuration Window

It consists of two regions:

- Hardware Catalog
- Station Window



Station Window

The station window is a window of the HWCONFIG application in which the components from the ”Hardware Catalog” window are placed.
All other actions, such as dragging connections or the setting of module parameters also take place in the station window.
The station window is split into two sections:

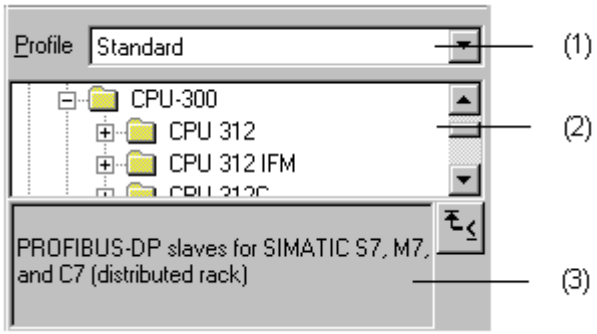
- The upper half of the station window contains the racks in the form of small configuration tables with DP slaves displayed as symbols. The connections between the interface modules and the configuration of DP master system is only visible in the upper half of the station window.
- The lower half of the station window contains the detailed view of the rack or DP slave selected in the upper half. Additional controls (e.g. the “Pack Addresses” button for ET 200S) can be displayed, depending on which object is shown in the bottom half of the station window. It also shows an IO map overview.
- Buttons for Navigating in the Detail View

Hardware Catalog

The Hardware Catalog window provides all racks, modules, and interface sub-modules that can be used to configure your structure.

Use Hardware Catalog key to display or hide the catalog.

Open the catalog with the “***View > Catalog”*** menu command or press key



(1) You can use the "Profile" drop-down list to set different catalog profiles. These profiles enable you to customize the hardware catalog to meet your needs.

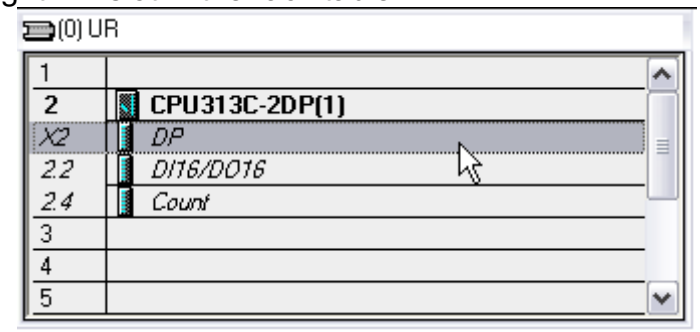
(2) The field below the drop-down list is used to select the components that you can configure and assign parameters to with STEP 7. These components are listed alphabetically in a tree structure similar to that in the Windows Explorer. To provide a better overview, components of the same type (i.e. CPU-300) are grouped in folders in a

hierarchical structure. The number of components may be greater if optional packages are installed. A "pluggable" component is represented by a symbol.
This symbol is either accompanied by the order number or the version number if several firmware versions are grouped under one order number.

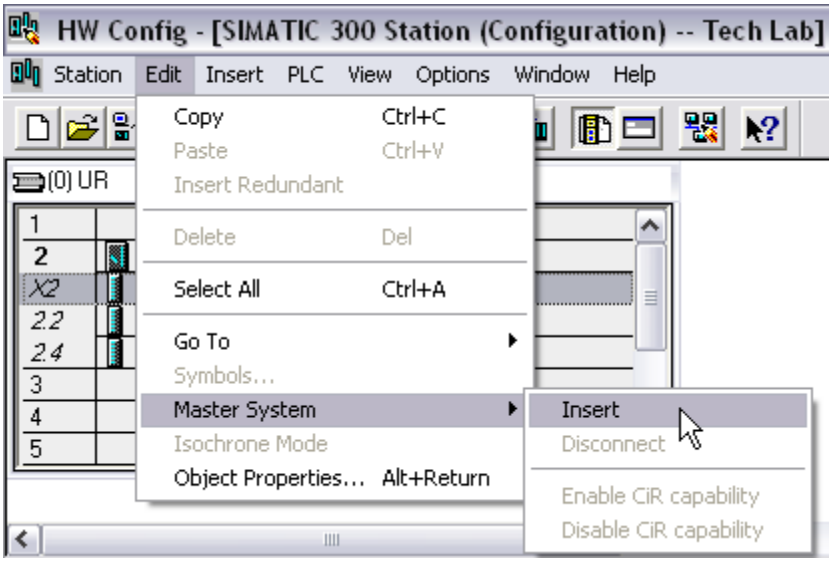
(3) The field below the one used to select components contains information about the components selected. It provides a brief description of their primary function and thus helps you to make the correct selection.

Adding Profibus_DP Network

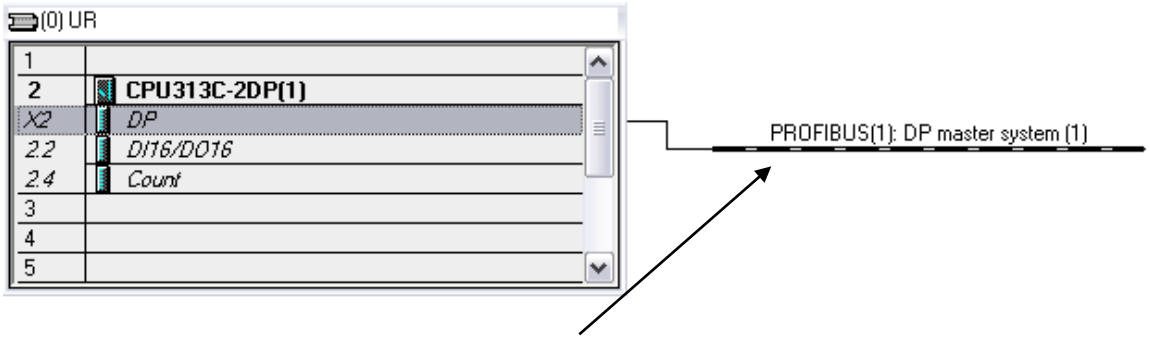
Highlight DP slot in the rack table:



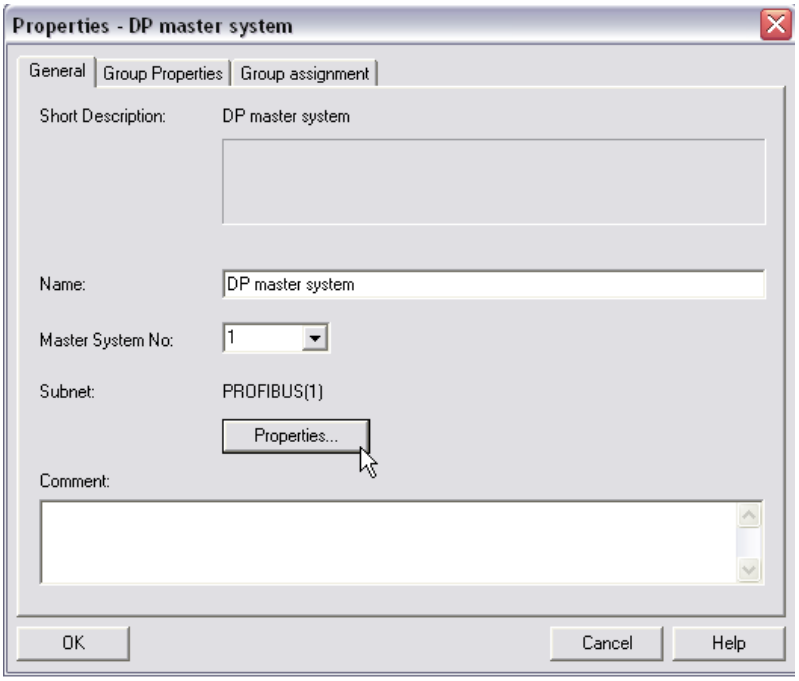
Select “Edit>Master System>Insert” menu function:



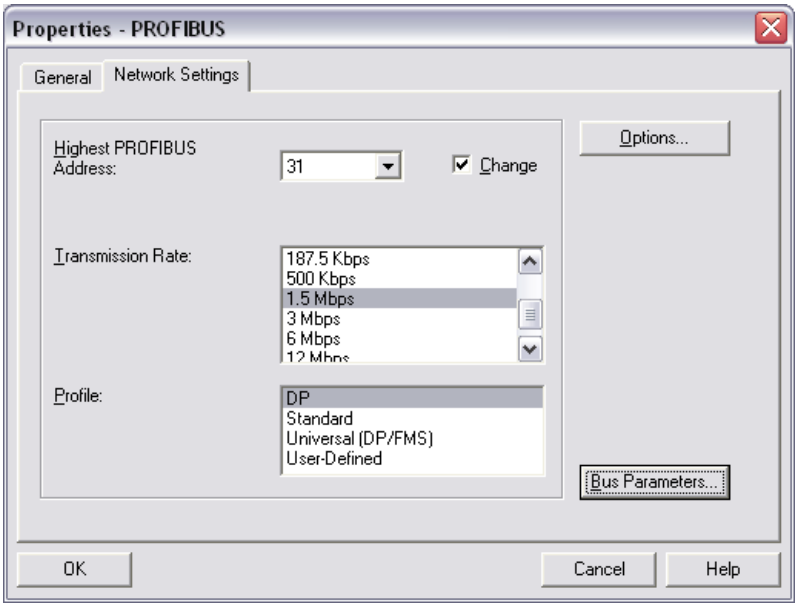
Insert DP network:



Right-click on the “Profibus(1): DP master system(1)” symbol
Open network DP master system properties. You need to define communication properties by clicking on ***“Property”*** tab



Set “*Highest address*”, “*Transmission rate*” and “*Profile*” values.



Once the network parameters are defined, confirm “OK” new settings and closed windows.

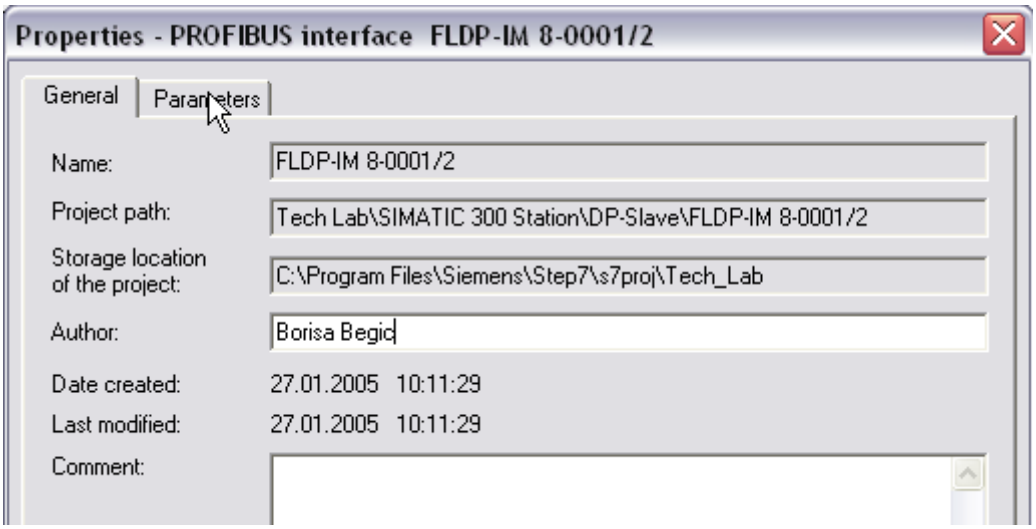
Back to hardware catalog, you will be able to add devices from the ***“Hardware Catalog”*** that will participate in the DP network architecture.

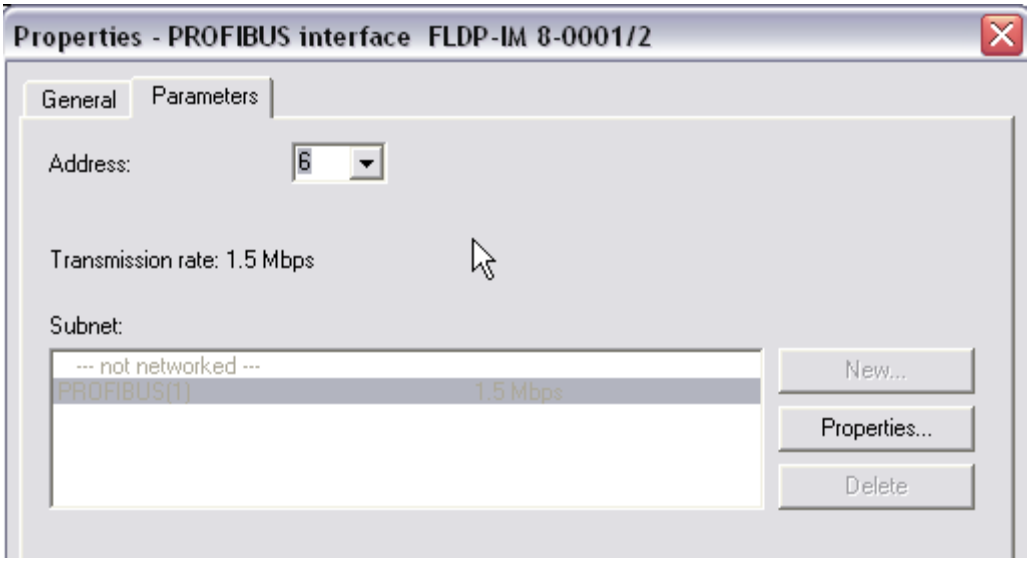
Adding Nodes

Steps include:

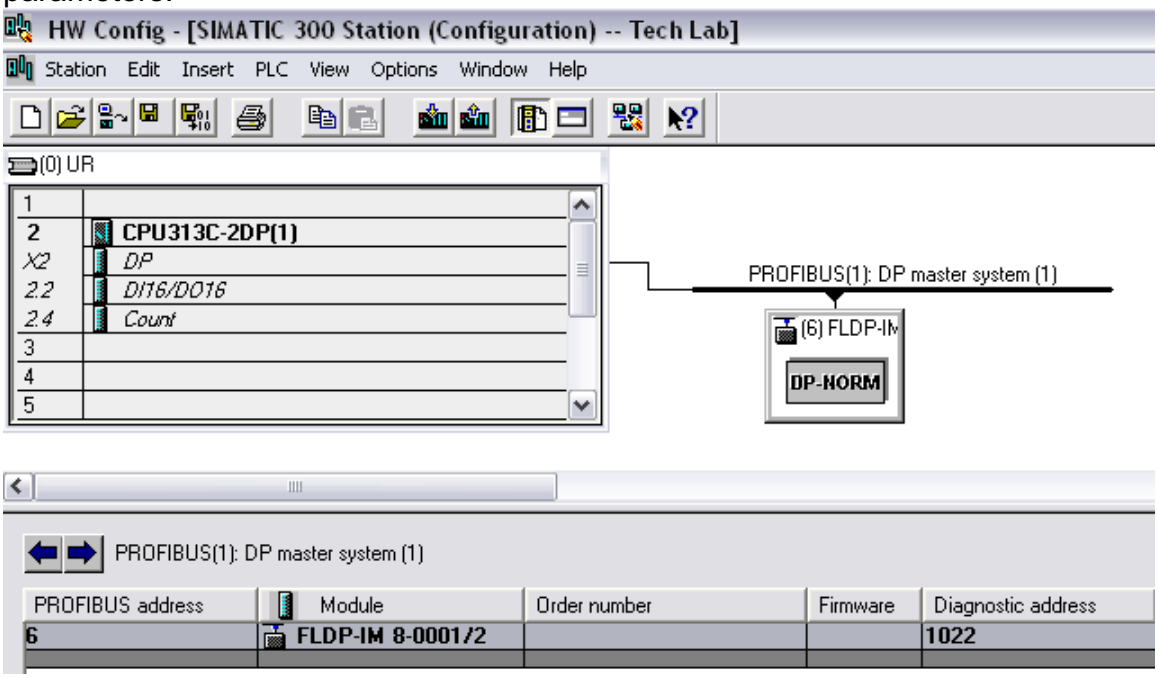
- Expand the list and look for nodes in the Hardware Catalog.
- If devices do not exist in the list, install GSD/GDE profiles into the Hardware Catalog.
- Highlight device, drag and drop node on the DP network line
- "Device Property Window" comes up. Select ***"Parameters"*** tab and specify node address. Hit OK to save settings and close property window.

Note: Make sure that node address and data rate of devices added to DP network match with Profibus-DP network properties that were previously defined in the project.

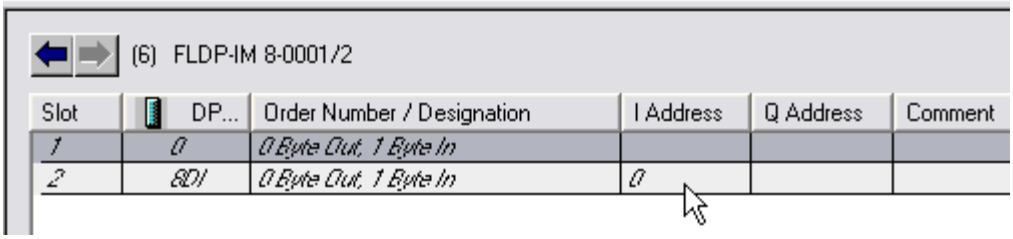




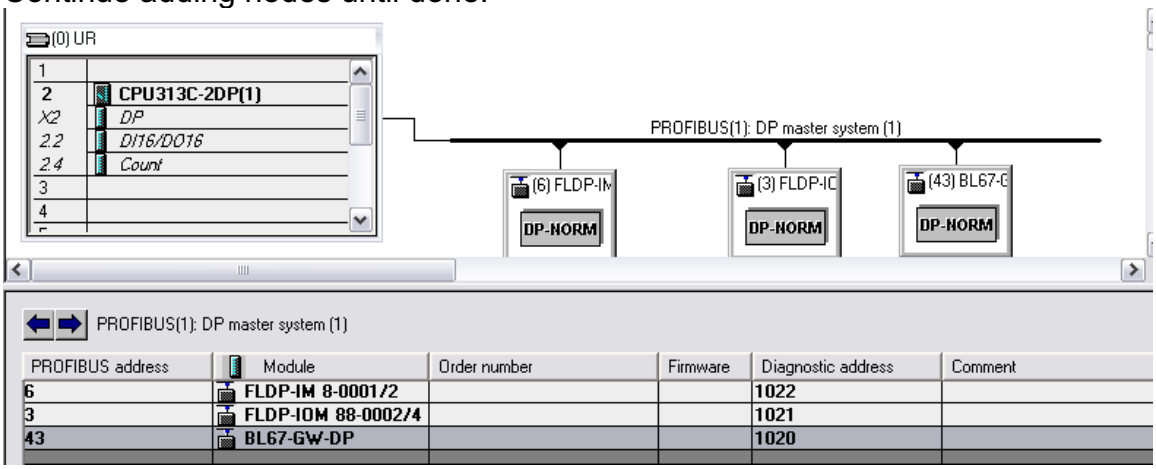
The first node is added to the DP network. Station window shows just added node parameters:



Click on right arrow icon to change station view and show device's IO map.

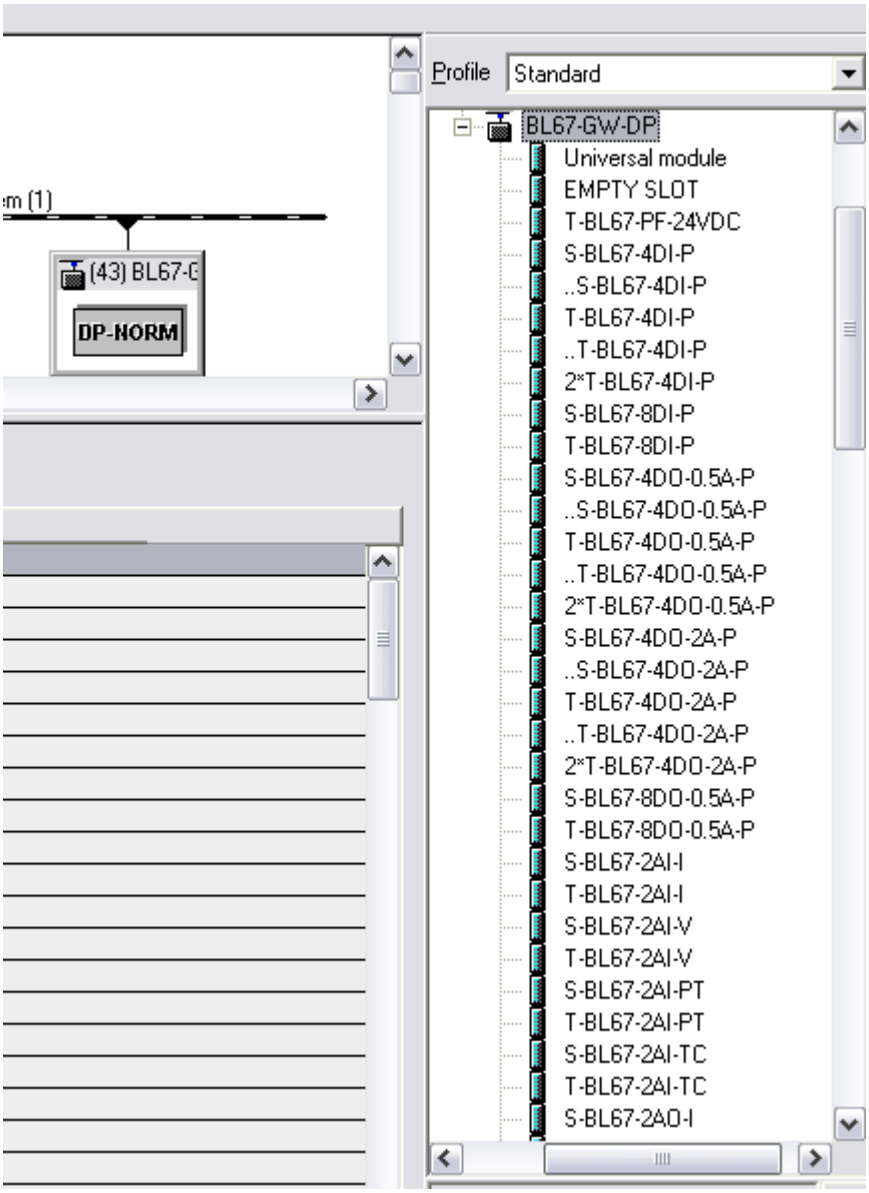


Continue adding nodes until done.



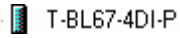
Adding Modular Nodes

Each modular node may have different module structure, such as BL20 and/or BL67 devices, Siemens ET200x series, etc.

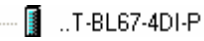


Procedure requires that each slice is separately entered, just as any stand alone module.

When first of a kind module needs to be dragged and dropped into configuration use the first defined module in the list, for example:



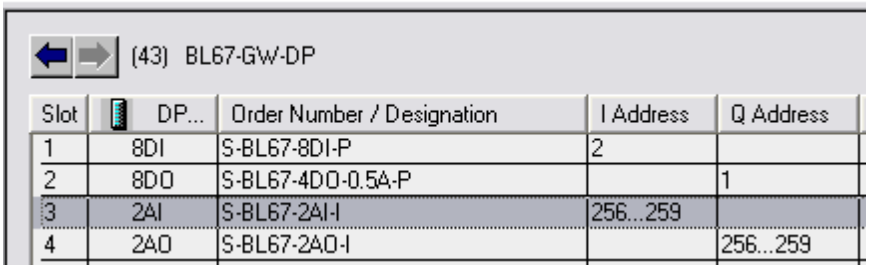
Any subsequent module of the same type use secondly defined module,
for example:



Note:
“T” stands for “type specific” module gsd configuration file.

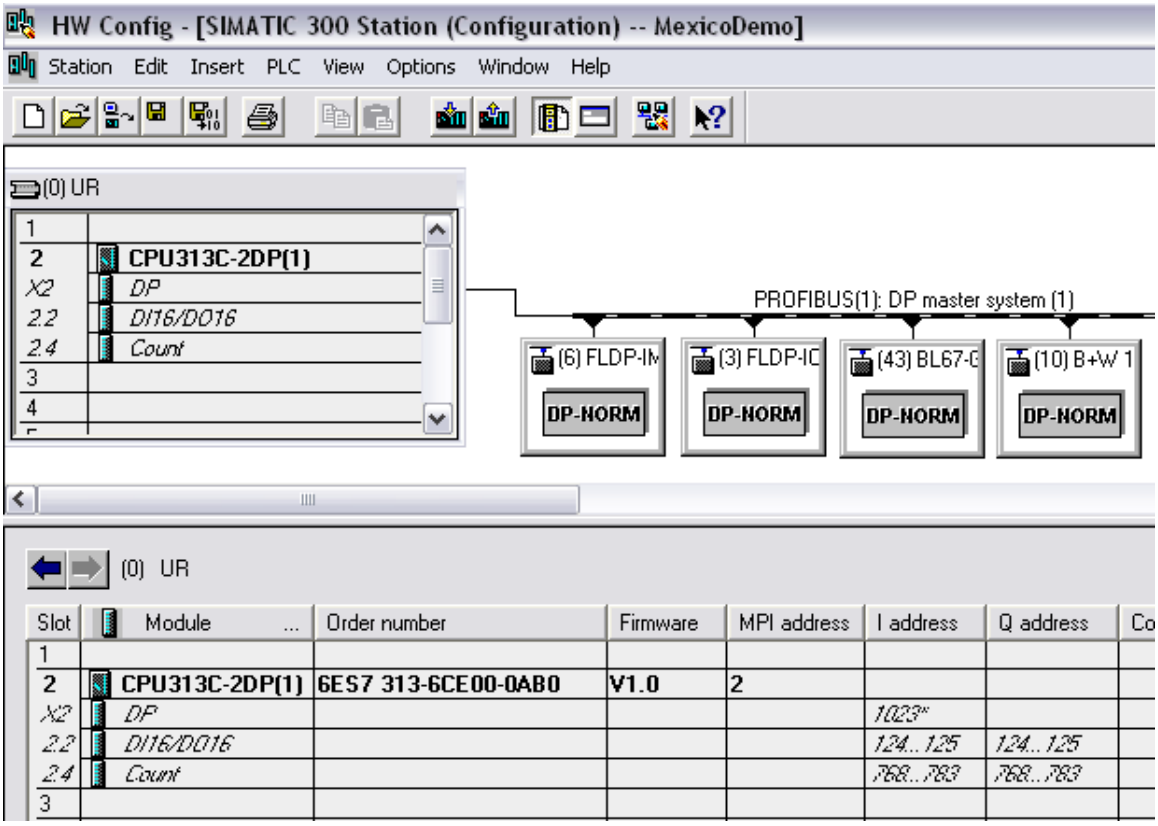
“S” stands for “generic” module gsd file

When done, BL67 device configuration looks like:



Reviewing DP Network Configuration

The hardware configuration of completely defined network looks like:



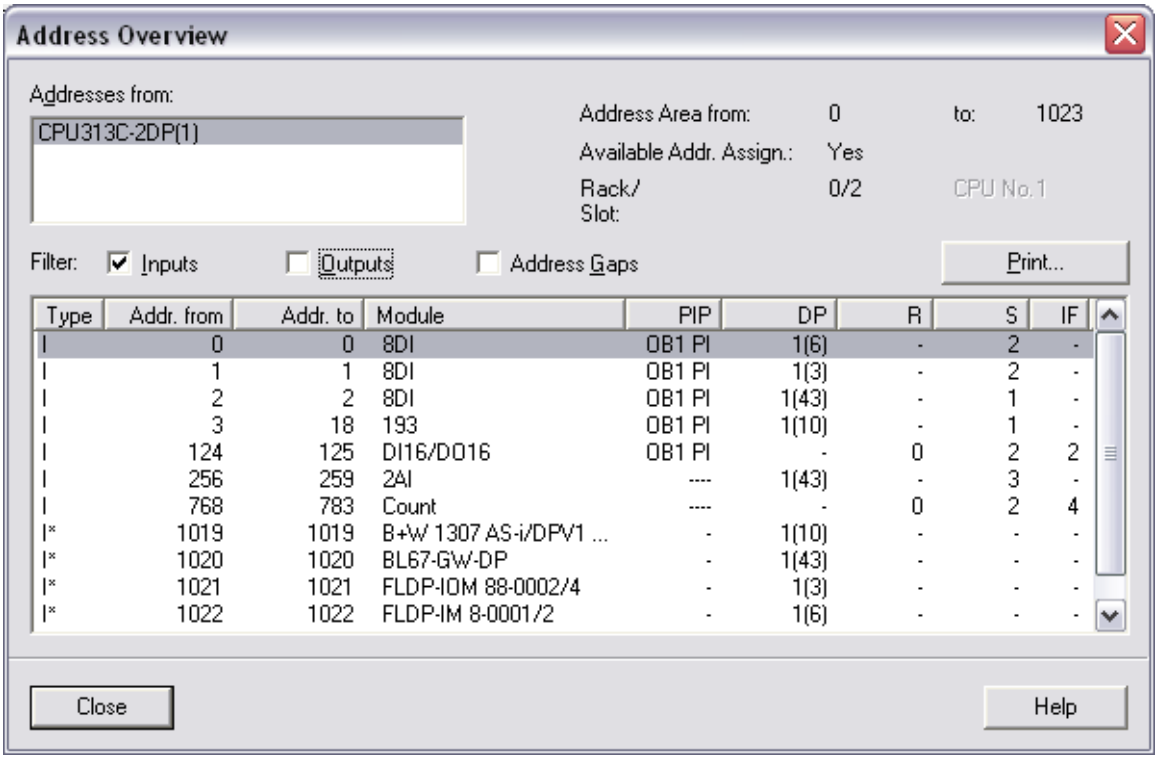
From this point it is necessary to:

- Check IO map
- Print some data
- Save configuration
- Download configuration to PLC
- Go online
- Verify communication
- Verify IO map

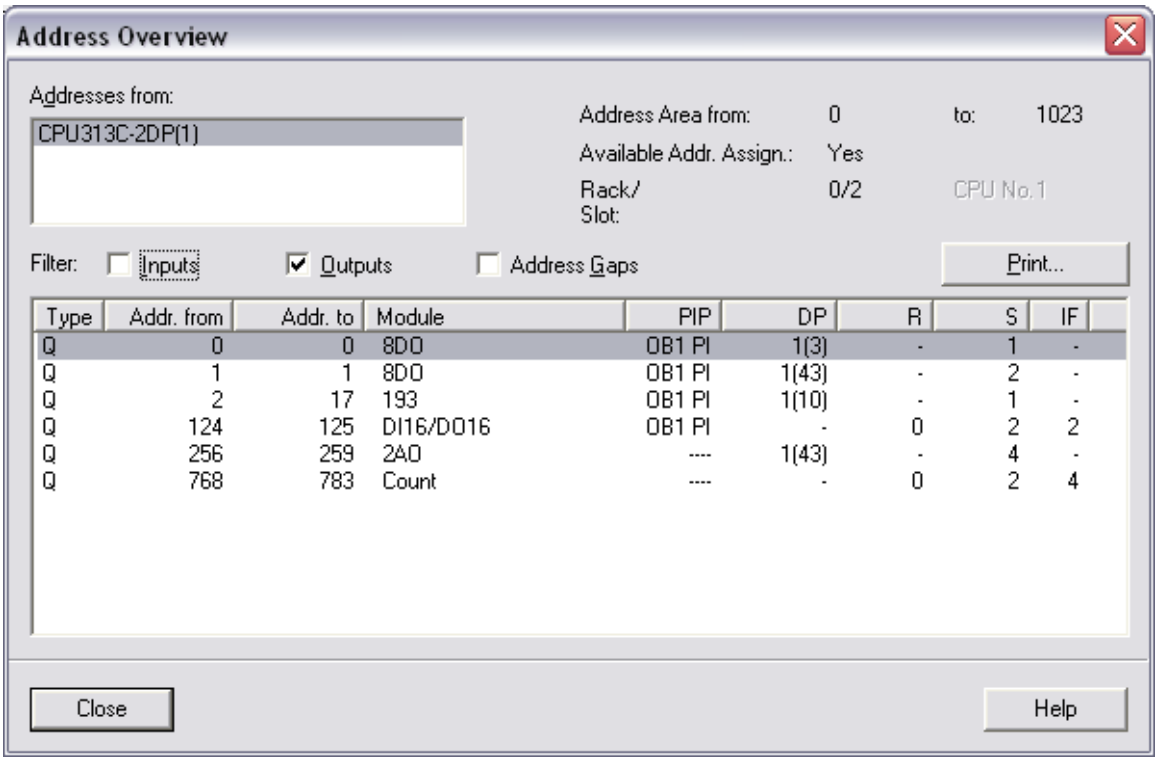
Check IO Map

Press ***Address Overview*** button to check IO data mapping. Filtering check boxes enable viewing of input only, output only or entire IO maps. Print map for your records. *"DP"* column indicates DP node address. *"Addr."* Indicates PLC memory offset address.

Input map overview page:



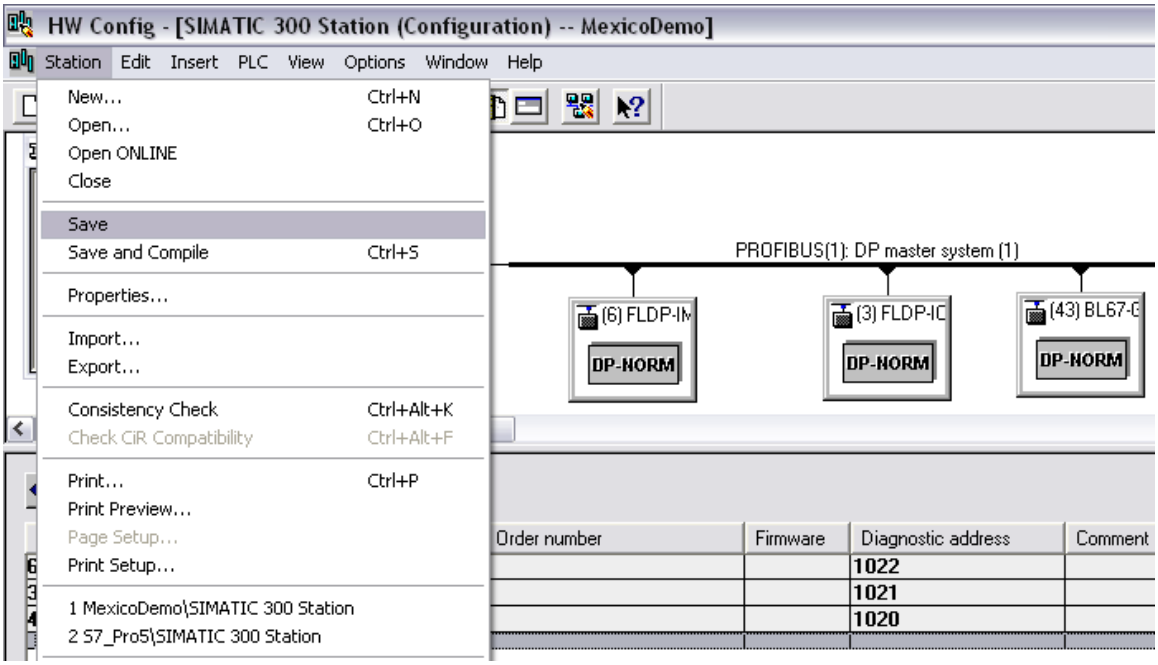
Output map overview page:



Save Hardware Configuration

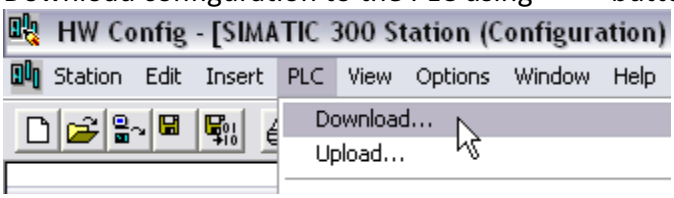
Save Hardware configuration by pressing:

- "***Save***" button: or
- "***Save and Compile***" button or
- go to "***File > Save***" or ***"File>Save and Compile"*** menus



Download Configuration

Download configuration to the PLC using button or ***"PLC>Download"*** menu function:



Follow instructions on the screen.

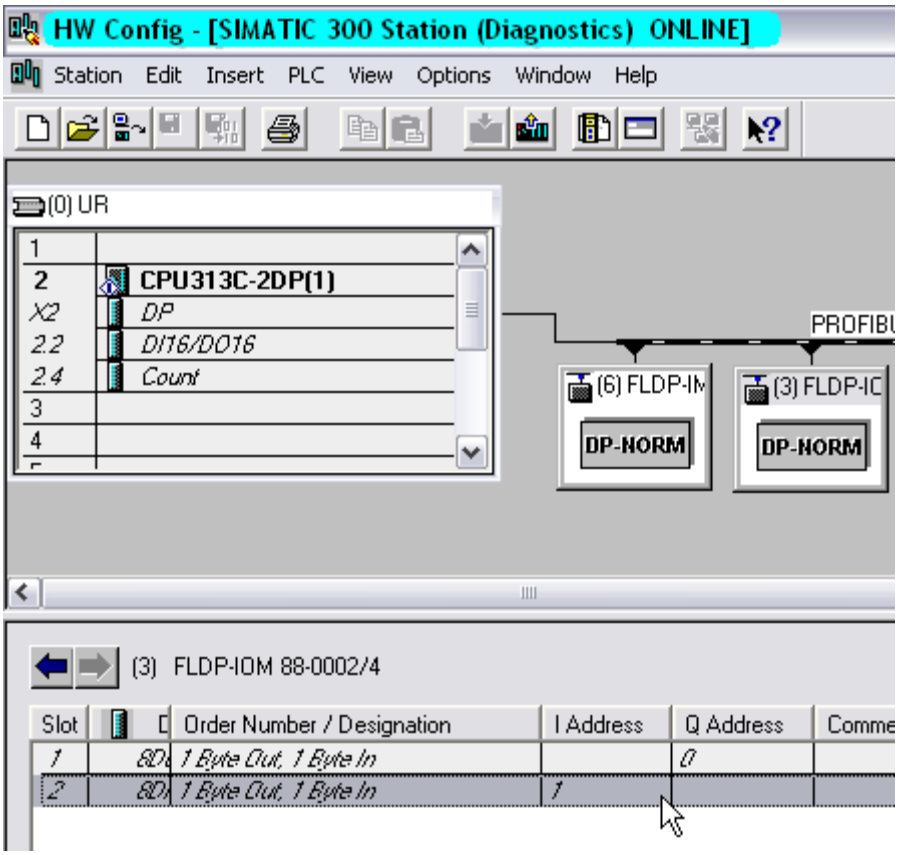
ON-LINE Data Monitoring

Once the hardware configuration is downloaded to the PLC processor and DP network brought on line, you may use various ways to monitor IO data of the devices connected to the DP network.

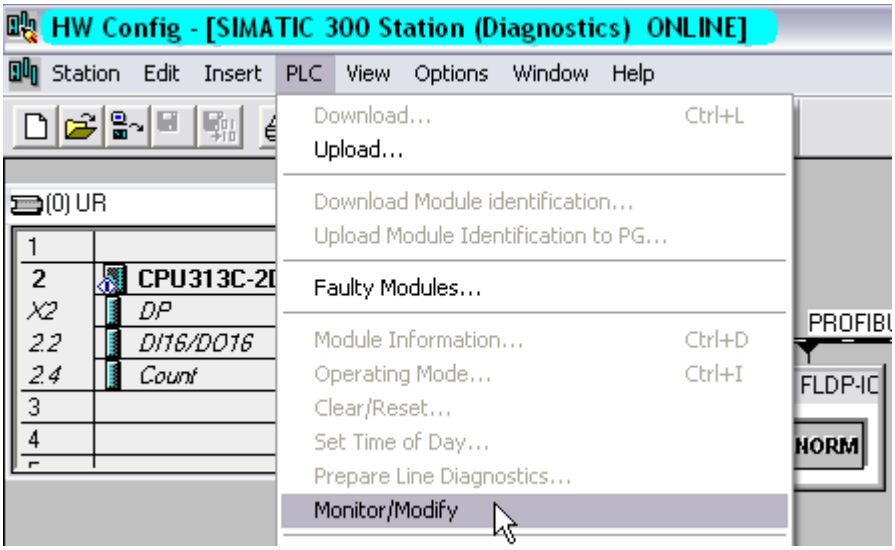
Input Data Monitoring

Procedure:

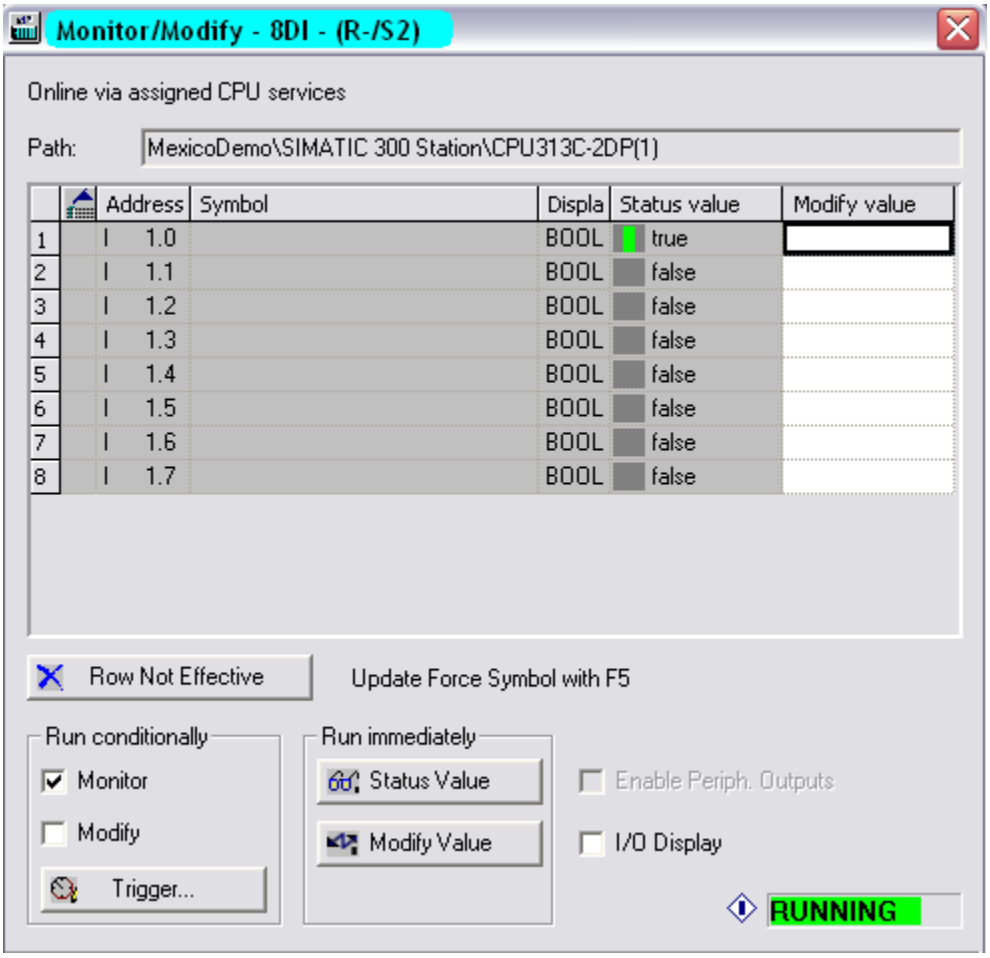
- Open off-line Hardware Configuration application
- Go on-line by pressing button
- Click on the DP network a device to be monitored
- Select input or output data at the device data map e.g. FLDP-IOM 88-0002



- Select ***"PLC>Monitor/Modify"*** menu function



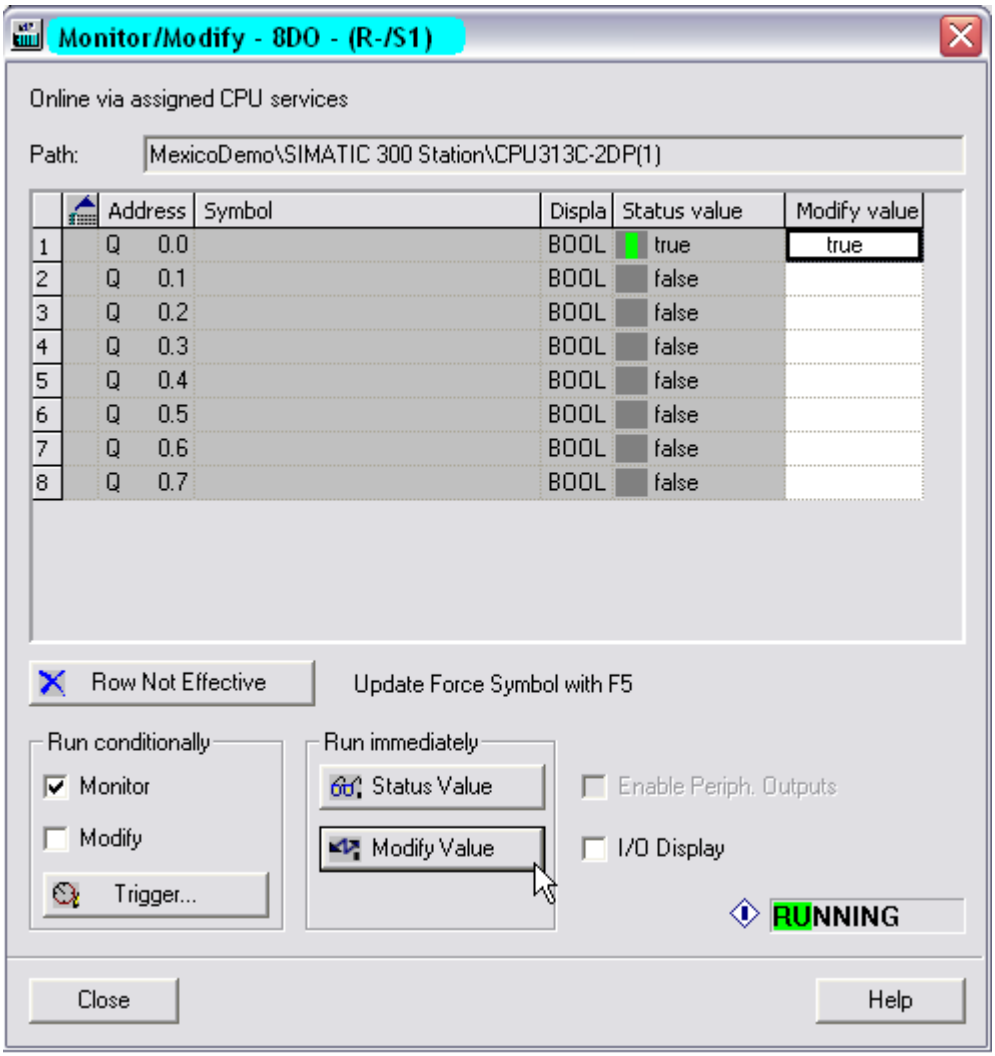
- Check "Monitor" box on the on-line display of the device



Output Data Monitoring

Procedure:

- Follow the same procedure as above to monitor / **force** outputs to desired state
- For each output in "**Modify value**" column enter:
  - 0 to turn output OFF
  - 1 to turn output ON
- A single or multiple outputs may be at a time
- Press ***"Modify Value"*** button to execute command



Important: do not forget to restore initial output states before closing application.

References:

1. SIEMENS
   Configuring Hardware and Communication Connections
   STEP 7 V5.2,
   Order #: 6ES7810-4CA06-8BA0

2. SIEMENS
   Working with STEP 7 V5.2, Getting Started
   Order #: 6ES7810-4CA06-8BA0

3. SIEMENS,
   STEP 7 V5.2 Help File