SIEMENS

T I A Training document

Last revision: 02/2002

Training document for the company-wide automation solution

Totally Integrated Automation (T I A)

MODULE D3

PROFIBUS DP with

Master CPU 315-2DP / Slave ET 200L

The following symbols stand for the specified modules:

Information

Programming

Example exercise

Notes
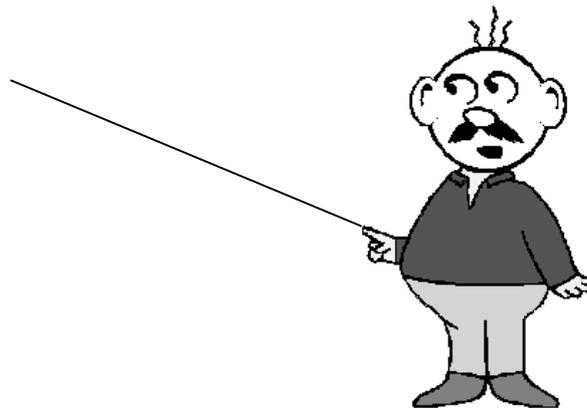
1.   FORWARD

The module D3 is assigned content wise to **Industrial field bus systems**.

```
                    ┌──────────────────────────┐
                    │      Basics of           │
                    │  STEP 7- Programming     │
                    │  2 - 3 days    A modules │
                    └──────────────────────────┘
                                │
                    ┌──────────────────────────┐
                    │  Additional functions of │
                    │  STEP 7- Programming     │
                    │  2- 3 days    B modules  │
                    └──────────────────────────┘
```

| Industrial field bus systems 2- 3 days D modules | Sequencer Programming 2- 3 days C modules | Process visualization 2- 3 days F modules |

```
        ┌──────────────────────────┐
        │     IT- Communication    │
        │    with SIMATIC S7       │
        │   1- 2 days E modules    │
        └──────────────────────────┘
```
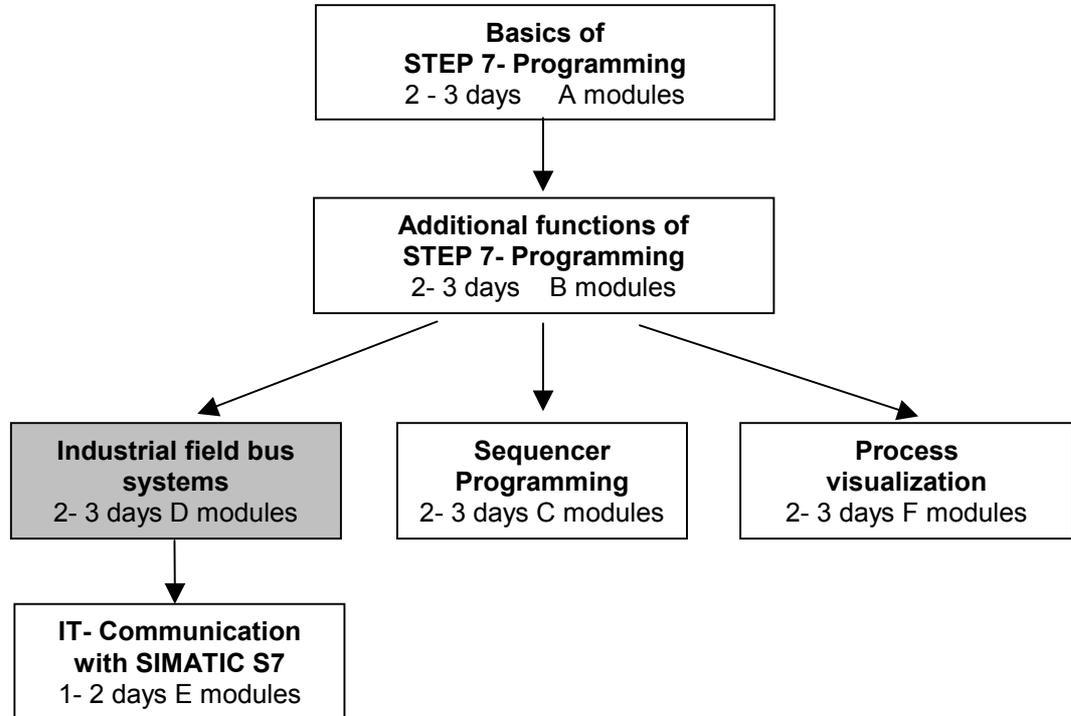
Learning goal:

In this module, the reader should learn how the PROFIBUS DP is taken into operation with the CPU 315-2DP as a master and the ET 200L as a slave. The module shows the principle procedure by means of a short example.

Requirements:

For the successful use of this module, the following knowledge is assumed:

- Knowledge in the use of Windows 95/98/2000/ME/NT4.0
- Basics of PLC- Programming with STEP 7 (e.g. Module A3 - 'Startup' PLC programming with STEP 7)
- Basics of the PROFIBUS DP (e.g. Appendix IV – Basics of field bus systems with SIMATIC S7-300)

| **Forward** | Notes | Commission |

Required hardware and software

1 PC, Operating system Windows 95/98/2000/ME/NT4.0 with
  - Minimal: 133MHz and 64MB RAM, approx. 65 MB free hard disk space
  - Optimal: 500MHz and 128MB RAM, approx. 65 MB free hard disk space

2 Software STEP 7 V 5.x

3 MPI- Interface for the PC (e.g. PC- Adapter)

4 PLC SIMATIC S7-300 with the CPU 315-2DP
Example configuration:
  - Network: PS 307 2A
  - CPU: CPU 315-2DP

5 Distributed I/O ET 200L with 16 digital In- and outputs

6 PROFIBUS cable with 2 PROFIBUS slots

2 STEP 7

1 PC

3 PC Adapter

4 SIMATIC S7-300
with CPU 315-2DP

6 PROFIBUS cable

5 ET 200L
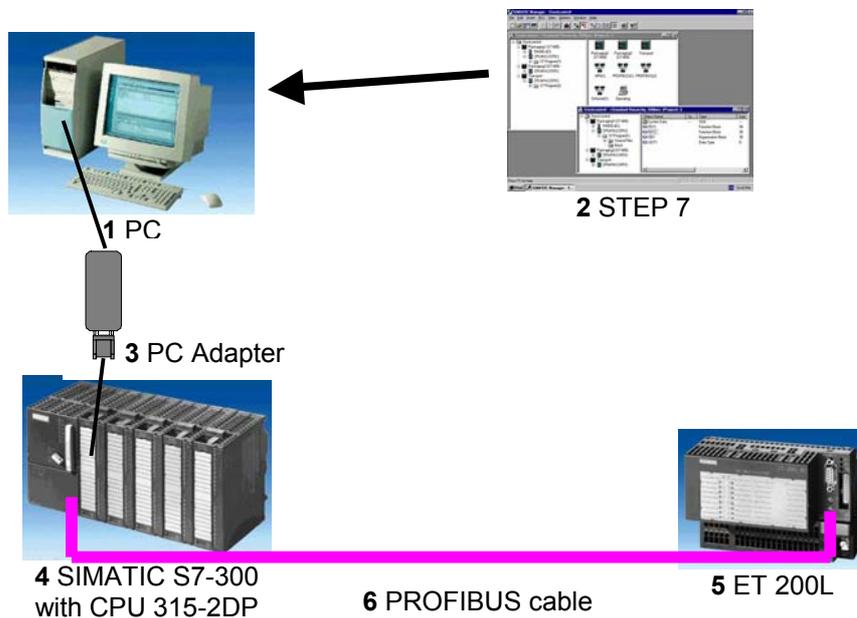
Forward	Notes	Commission

2. NOTES FOR THE OPERATION OF THE CPU 315-2DP

The CPU 315-2DP is a CPU that is made available with an integrated PROFIBUS DP interface.
For the CPU 315-2DP, the following PROFIBUS protocol profiles are available at your disposal:

- DP- Interface as a master or slave in accordance with EN 50170. PROFIBUS-DP (Distributed I/O) is the protocol profile for the connection of distributed I/O/Field equipment with fast reaction time.

A further characteristic is that the addresses of the in- and output modules can be parameterized by this CPU.

The CPU capability is given with the following data:
- 16K Statements. 48Kbyte RAM (integrated) 80Kbyte RAM
- 1024 Byte DI/DO
- 128 Byte AI/AO
- 0,3 ms / 1K Instructions
- 64 Counters
- 128 Timers
- 2048 Memory bits

Note: The CPU 315-2DP is appointed here on the PROFIBUS as a master.

3. NOTES FOR THE OPERATION OF THE ET 200L

The ET 200L is a distributed I/O system with a small, compact configuration. The ET 200L is a passive participator (Slave) on the PROFIBUS-DP.
The PROFIBUS address is adjusted with two rotary switches.
Another possible adjustment of the PROFIBUS address is with a power recovery. Therefore, the ET 200L must be turned off and then back on.

Forward	**Notes**	Commission

4.   COMMISSIONING THE PROFIBUS (MASTER CPU315-2DP / SLAVE ET200L)

In the following example, the commissioning of a mono master system with the CPU315-2DP as a master and an ET 200L as a slave is described. For the testing of the configuration, a program will be written in which a display lamp H1 is triggered by the simultaneous activation of two buttons S0 and S1.

Assignment list:

I0.0	S0	Button selection 1
I0.1	S1	Button selection 2
Q0.0	H1	Display lamp

1. The central tool in STEP 7 is the **SIMATIC Manager**, which is opened here with a double click ($\rightarrow$ SIMATIC Manager).

SIMATIC Manager

2.   STEP 7- Programs are administered in projects . Such a project will be created ($\rightarrow$ File $\rightarrow$ New).

Forward	Notes	**Commission**
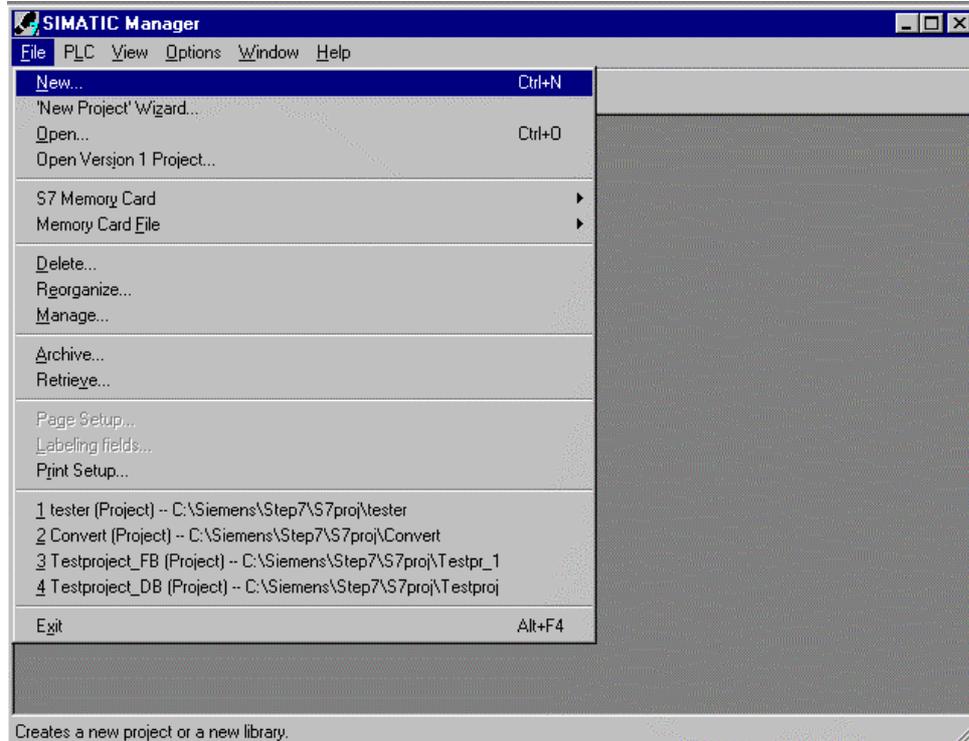
3. Give the **Name ET200L** to the project (→ ET200L → OK).
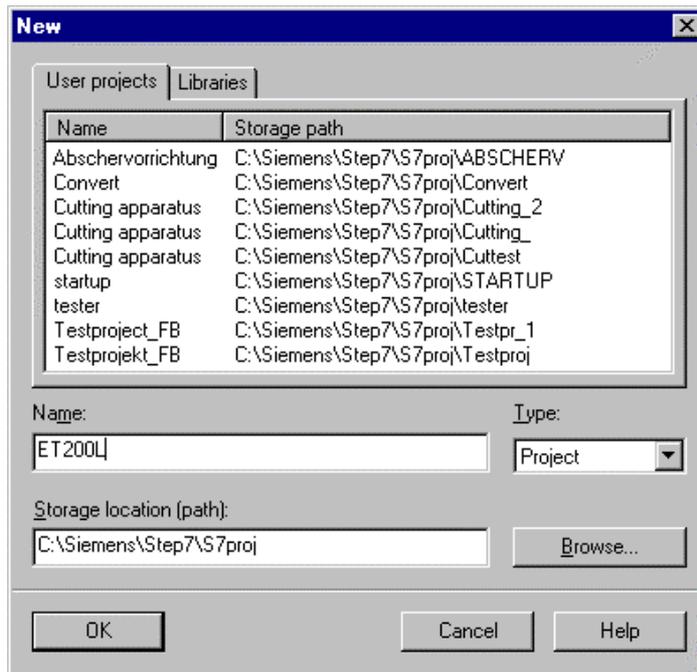
4. Highlight your project and insert a **PROFIBUS Subnet** (→ ET200L → Insert → Subnet → PROFIBUS).

Forward	Notes	**Commission**
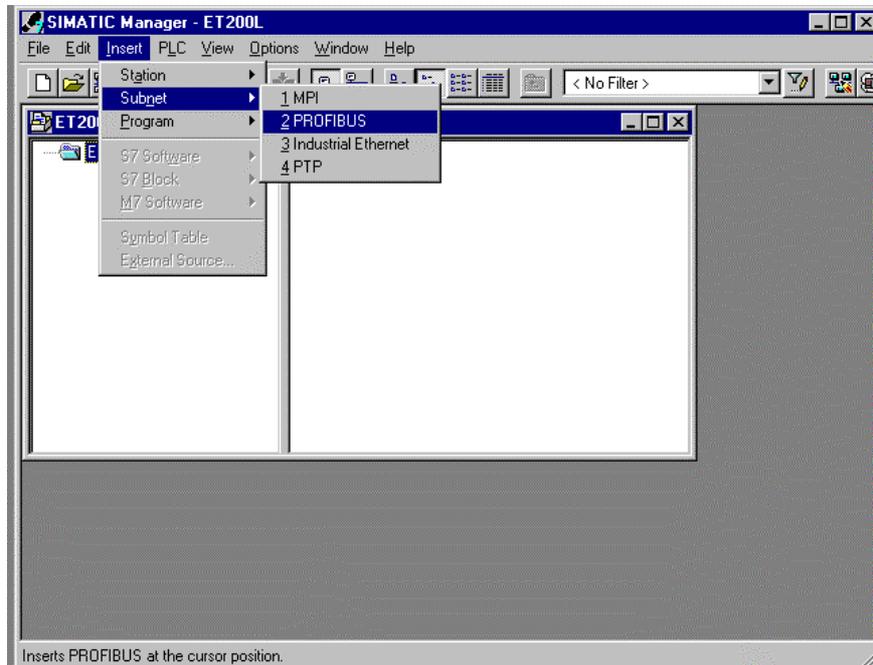
5. Then insert a **SIMATIC 300-Station** ($\rightarrow$ Insert $\rightarrow$ Station $\rightarrow$ SIMATIC 300-Station).
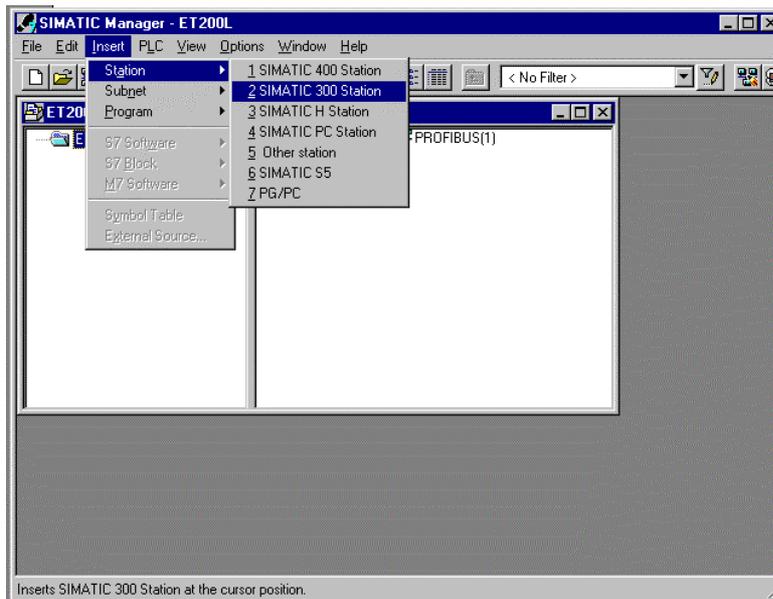
6. Open the configuration tool for the **Hardware** with a double click ($\rightarrow$ Hardware).
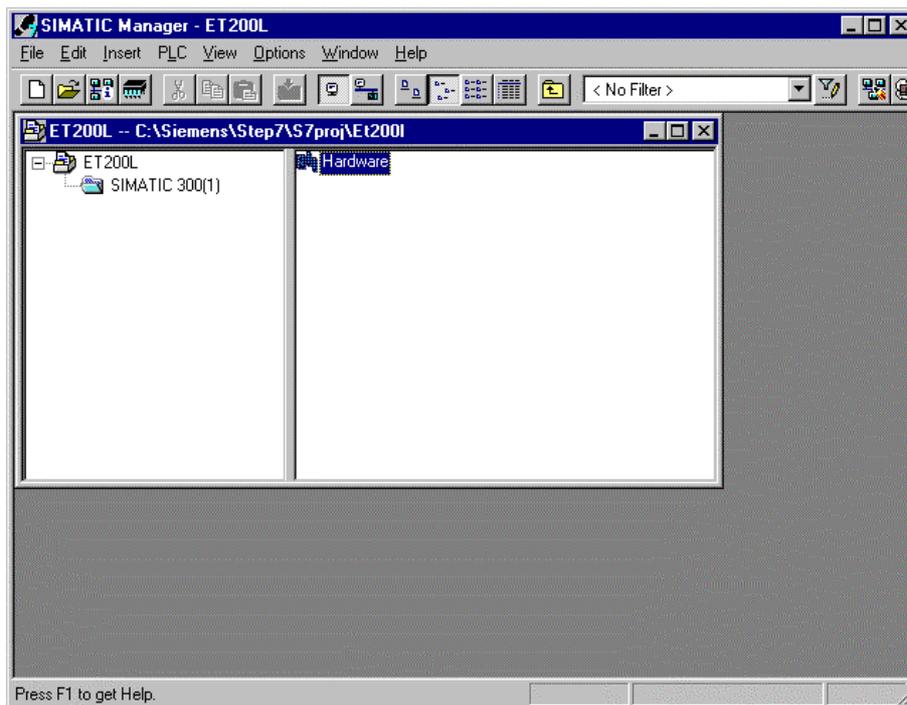
Forward	Notes	**Commission**

7. Open the hardware catalog with a click on the symbol ▭ (→ ▭).
   There you will see the directories are divided into the following:
   - PROFIBUS-DP, SIMATIC 300, SIMATIC 400 and SIMATIC PC Based Control,
   all module racks, modules and interface modules for the configuration of your hardware
   configuration are made available.
   Insert a **Rail** with a double click(→ SIMATIC 300 → RACK-300 → Rail).
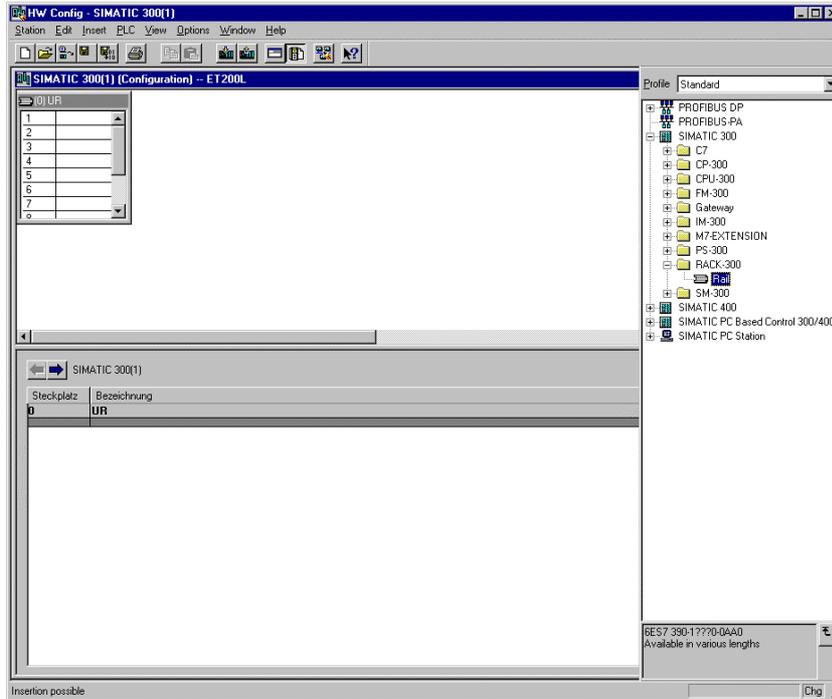
After the insert, a configurations table for the configuration of the Rack 0 appears automatically.

	Forward	Notes	**Commission**

8. Now all modules can be chosen out of the hardware catalog and inserted into the configuration table and are also inserted into your rack.
    To insert, you must click on the name of the respective module, hold the mouse button and Drag & Drop the module into a line of the configurations table. We will begin with the power supply **PS 307 2A** ($\rightarrow$ SIMATIC 300 $\rightarrow$ PS-300 $\rightarrow$ PS 307 2A).
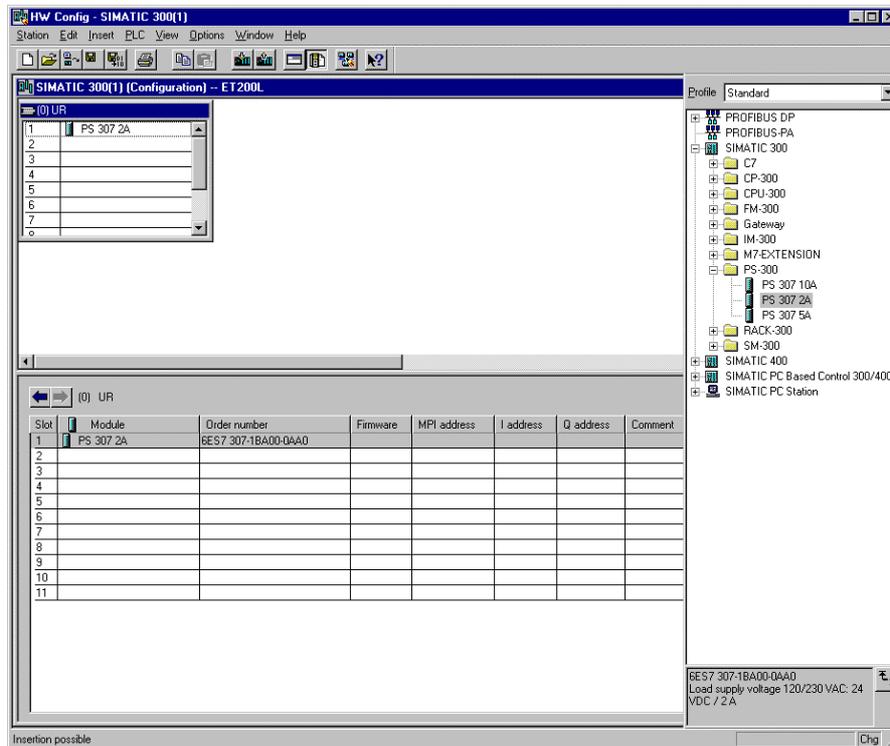
Note: If your hardware differs from what is shown above, then you must select the appropriate modules from the catalog and insert them into the rack. The part numbers of the individual modules, which are found on the components, are indicated in the footer of the catalog.

Forward	Notes	**Commission**

9. In the next step, we drop the CPU 315-2DP into the second card location. This allows for the part number and version of the CPU to be read off ($\to$ SIMATIC 300 $\to$ CPU-300 $\to$ CPU 315-2DP $\to$ 6ES7 315-2AF03-0AB0 $\to$ V1.1).
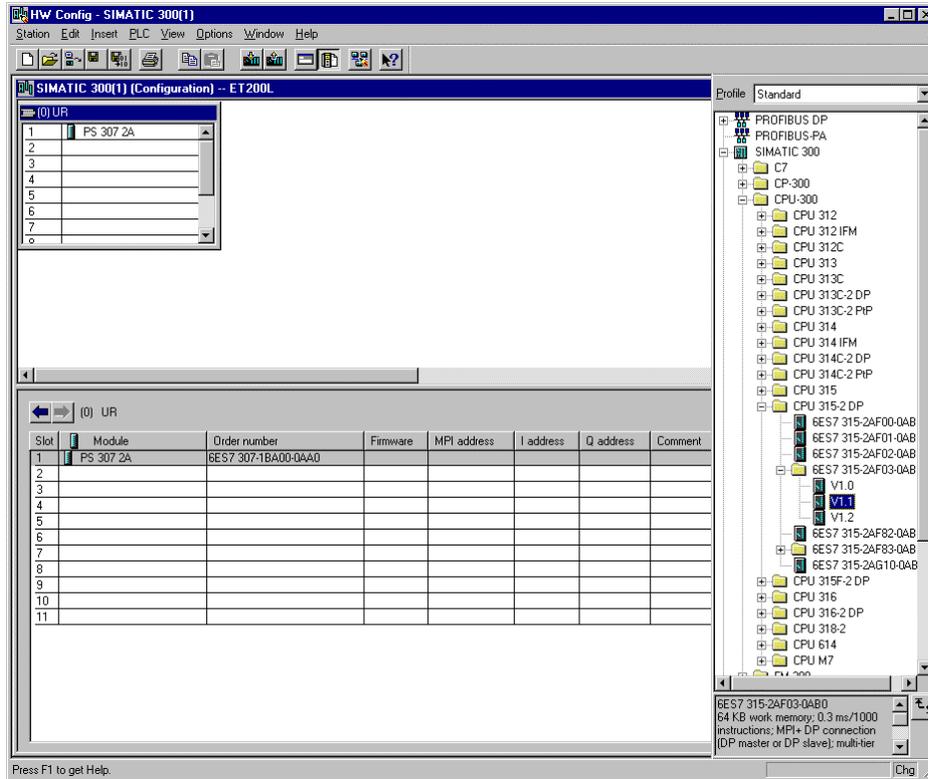
10. By the entering of the CPU, the following window appears, in which you assign a PROFIBUS address to the CPU 315-2DP and must already choose the first PROFIBUS net. When you want to alter the parameter of the PROFIBUS net, you must highlight it and then click on **Properties** ($\to$ Properties).

Forward	Notes	**Commission**
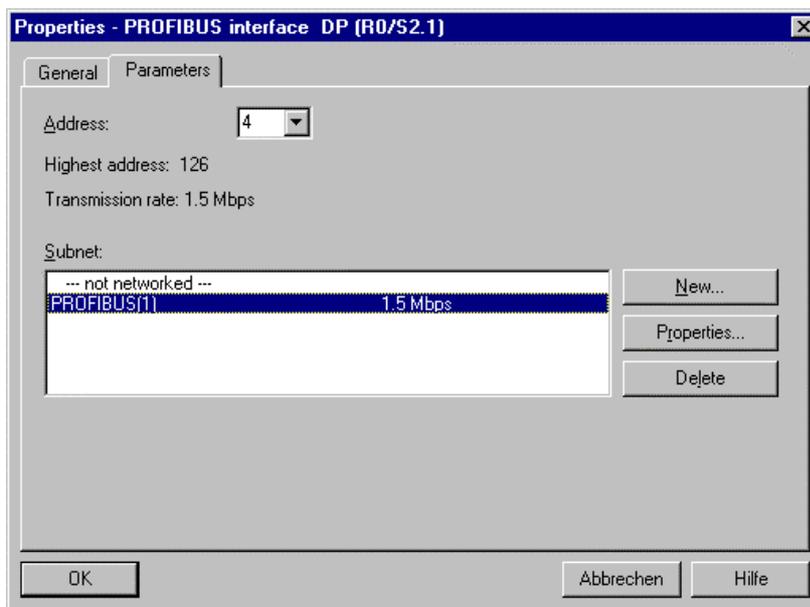
11. Now you can choose the **Highest PROFIBUS Address** (here → 126), the **Transmission Rate** (here → 1,5 Mbit/s) and the **Profile** (here → DP). (→ OK).
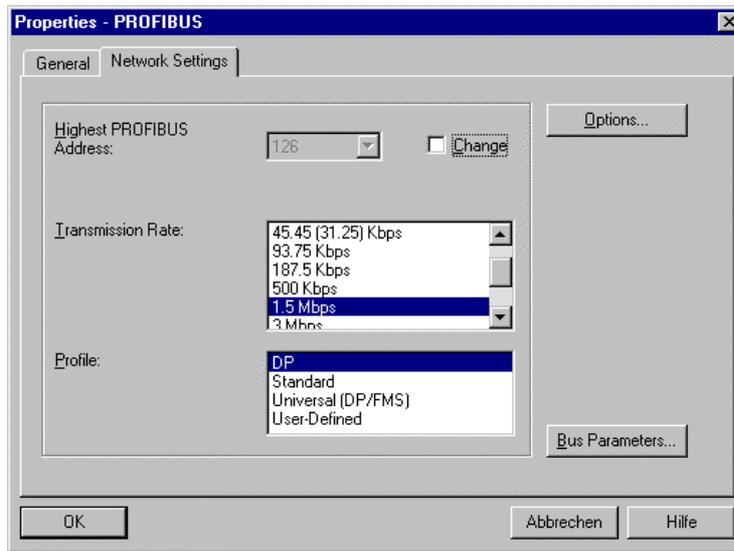
12. Then a bar chart for the **Master system** is shown to the right of the CPU315-2DP, in which you can arrange the PROFIBUS. This happens by clicking the desired module (Here the **ET 200L** with **16DI/16DO**) from the hardware catalog in the path **PROFIBUS-DP**. By Drag & Drop click with the mouse, it can be dropped into the master system. (→ PROFIBUS DP → ET 200L → L-16DI/16DO→ 6ES7 133-1BL00-0XB0).
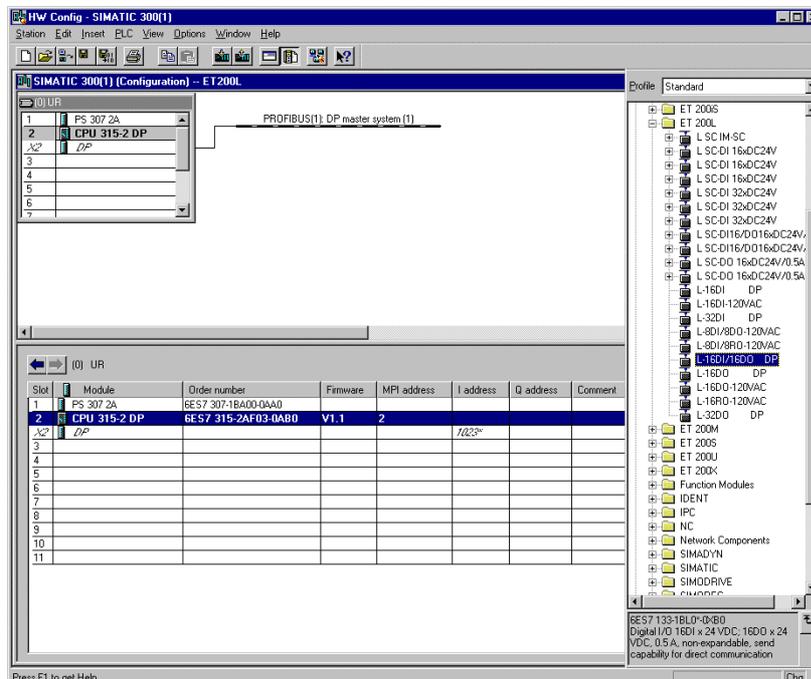
Forward	Notes	**Commission**

13. By the entering of the slave, the following window is displayed in which you must assign a PROFIBUS address to the slave. This address must be identical with the address that you created in the rotary switch of the ET 200L (→ 5 → OK).

14. The addresses of in- and outputs to the ET 200L can now be modified.
   This happens by a double click on the corresponding input and output modules in the ET 200L and is adjusted in the register **Address**.
   In any case these addresses should be required. An automatic address allocation takes place in the sequence similar to how the slaves are entered (→ 16 DO Universal module → Address → OK).

Forward	Notes	**Commission**

15. The configuration table should first be saved and compiled with a click on ⬚ and then downloaded into the PLC with ⬚. The mode switch on the CPU must be on STOP! (→ ⬚ → ⬚)
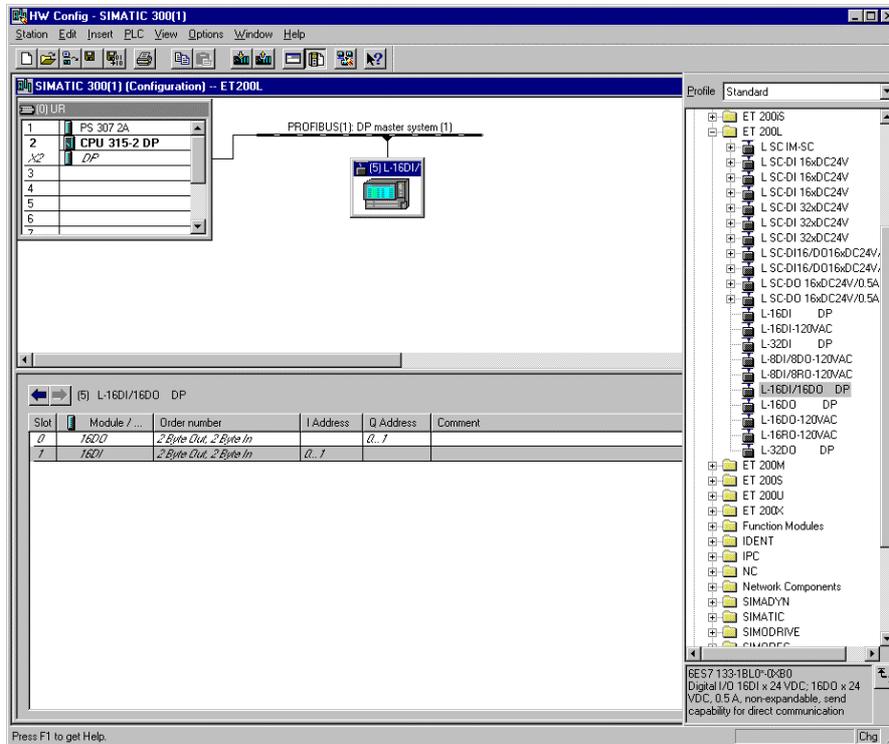
16. The CPU 315-2DP is then activated as the target module for the download activity (→ OK).

Forward	Notes	**Commission**
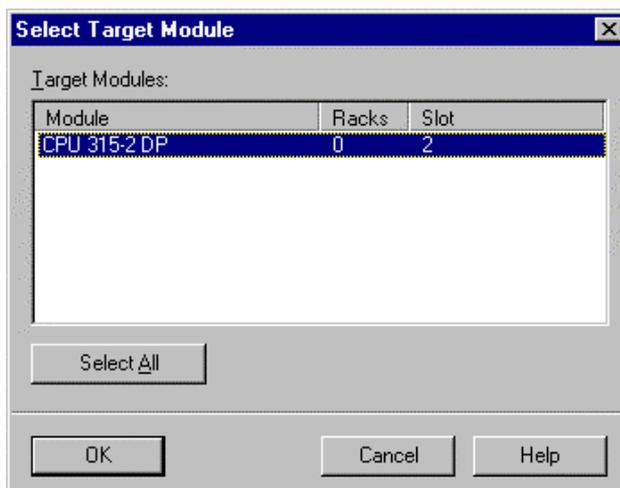
17. The station address of the CPU in the MPI net is then chosen. You are only connected with the CPU so you can accept with **OK** (→ OK).
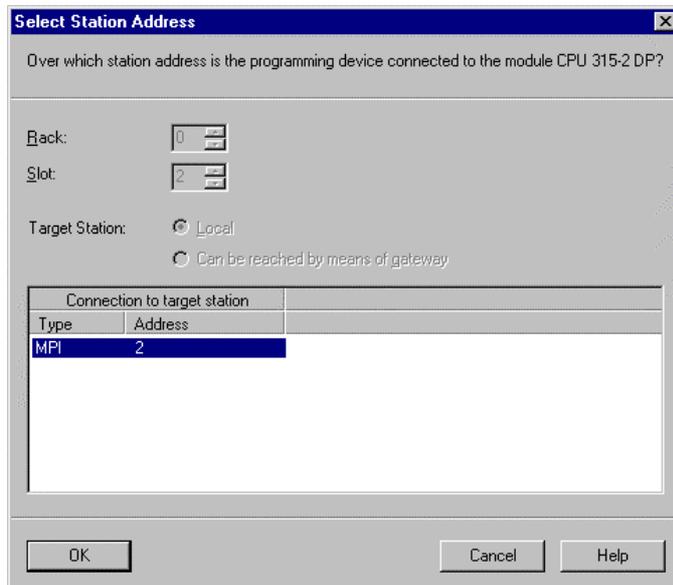
18. From the **SIMATIC Manager**, you can open the block **OB1** with a double click in the editor **LAD, STL, FBD: Program blocks** (→ OB1).

Forward	Notes	**Commission**
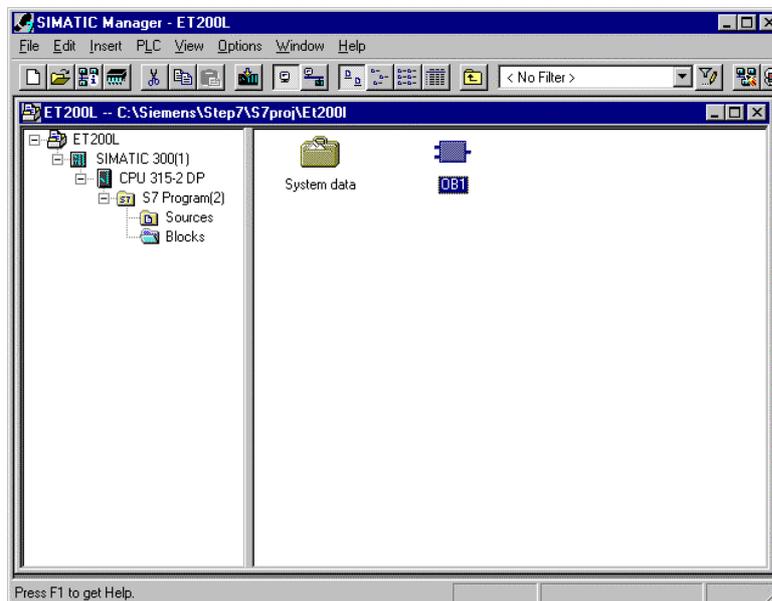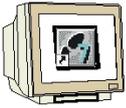
19. Optional: Enter the properties of the OB1 for documentation and accept with OK (→OK).

Properties - Organization Block

General - Part 1 | General - Part 2 | Calls | Attributes

Name: OB1

Symbolic Name:

Symbol Comment:

Created in Language: FBD

Project path:

Storage location of project: C:\Siemens\Step7\S7proj\Et200l

	Code	Interface
Date created:	25/09/2002 05:53:07	
Last modified:	07/02/2001 03:03:43	15/02/1996 04:51:12

Comment: "Main Program Sweep (Cycle)"

OK | Cancel | Help

Forward	Notes	**Commission**

20. With **LAD, STL, FBD: Program blocks**, you now have an editor which gives you the possibilty to generate your STEP 7- Program. Here the organization block OB1 was already opened with the first network. In order to generate your first logical operation, you must highlight the first network. Now you can write your first STEP 7- Program. Several programs can usually be divided into networks. Open a new network by clicking on the network symbol [HKO ...].

The STEP 7- Program to be tested can now be downloaded into the PLC.

In our case, the OB1 is the only block. Save the organization block with [💾] and click on download [📥]. The mode switch of the CPU must be on STOP! (→ [💾] → [📥])

```
LAD/STL/FBD - OB1                                          _ □ ×
File  Edit  Insert  PLC  Debug  View  Options  Window  Help

[D][🖿][💾][🖨]  [✂][📋][📋]  [↩][↪]  [📟][📥][▭]
[🖿][<][>][🖿]  [HKO ...]  [▨][▨][▤][▨][▤][⊣][⊤][⊢]  [▸?]

■ OB1 -- ET200L\SIMATIC 300(1)\CPU 315-2 DP              │ HKO  New network          ▲
                                                         │ ⊞ [&] Bit logic
 OB1 :   "Main Program Sweep (Cycle)"                    │ ⊞ [<] Comparator
                                                         │ ⊞ [≈] Converter
 Comment:                                                │ ⊞ [+1] Counter
                                                         │ ⊞ [DB] DB call
                                                         │ ⊞ [G] Jumps
 Network 1: Title:                                       │ ⊞ [±I] Integer fct.
                                                         │ ⊞ [±R] Floating-point fct.
 Comment:                                                │ ⊞ [↗] Move
                                                         │ ⊞ [꜀꜀] Program control
                                                         │ ⊞ [ᴎ] Shift/Rotate
            ┌───┐                                        │ ⊞ [꜀?] Status bits
        ┌───┤ & │         Q0.0                           │ ⊞ [⊙] Timers
   I0.0─┤   │   │         ┌───┐                           │ ⊞ [꜀꜀] Word logic
        │   │   ├─────────┤ = │                           │   [▣] FB blocks
   I0.1─┤   │   │         └───┘                           │   [▣] FC blocks
        └───┤   │                                        │   [▣] SFB blocks        ▼
            └───┘                                        │                         ⮥
                                                         │                         [?]
◀│                                                    ▶│
┃◀│◀│▶│▶┃\ 1: Error ⋀ 2: Info /
Press F1 to get Help.                    [💬] │ offline    │ Abs │ Nw 1
```

21. Through the switching of the mode switch to RUN, the program is started and after a click on the symbol [𝟞𝟞ˆ] for monitoring, the program in the **OB1** can be monitored (→ [𝟞𝟞ˆ]).

	Forward	Notes	**Commission**