

Configuration of an S7-300 as DP Slave on an S7-400H as DP Master Using the Y-link

PROFIBUS DP

FAQ • August 2011



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Question

How do you configure the S7-300 CPU or the CP342-5 as DP slave on an S7-400H as DP master using the Y-link?

Answer

The instructions and notes listed in this document provide a detailed answer to this question.

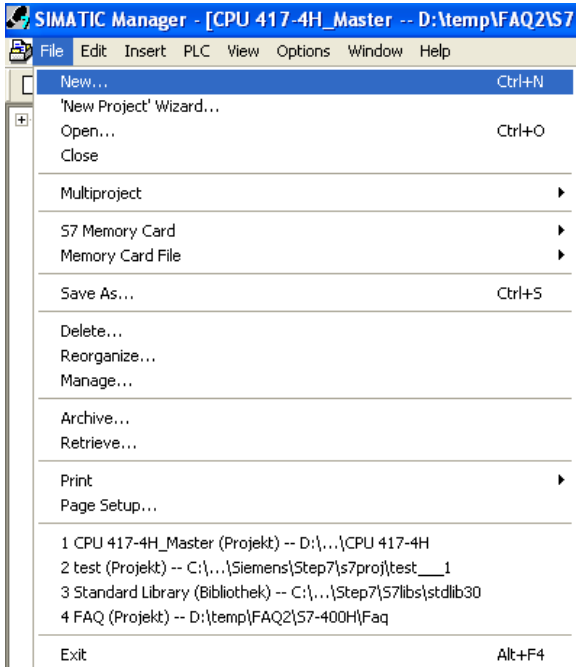
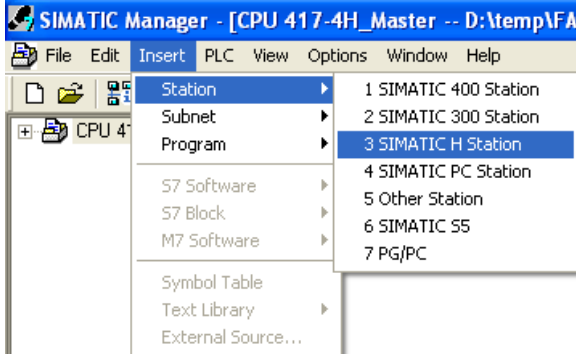
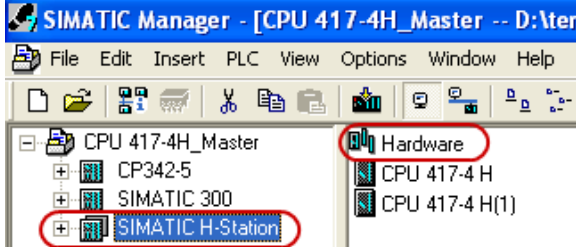
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1 Configuration of the S7-400H as DP Master

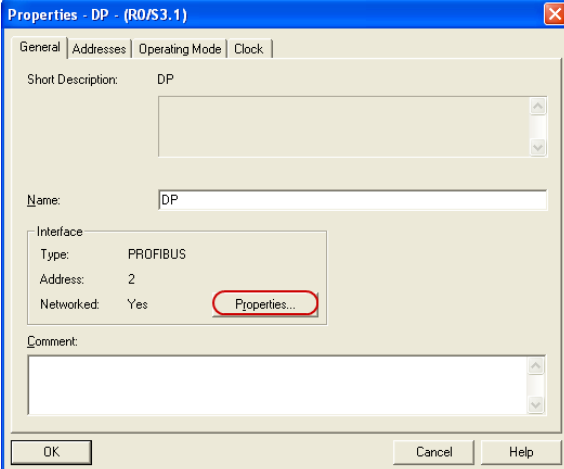
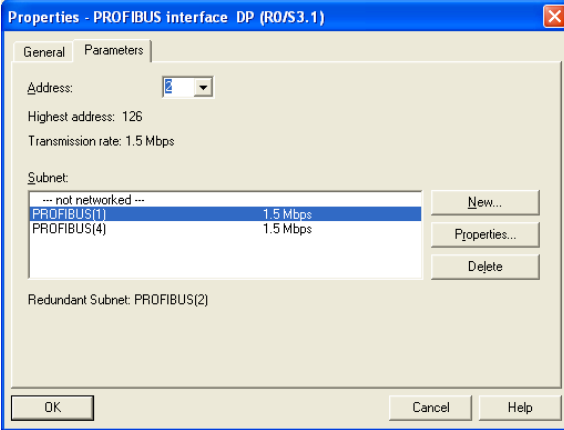
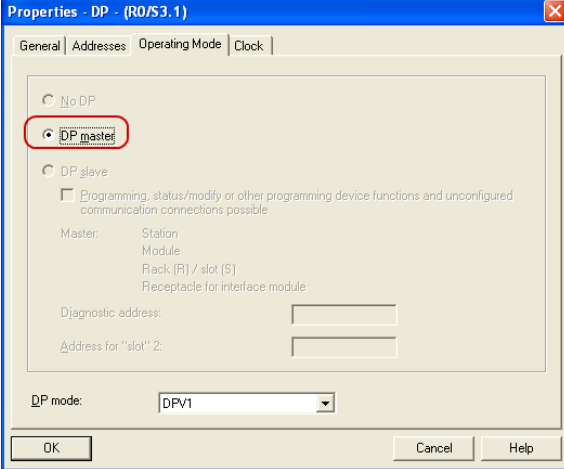
In the example, a CPU 417-4H is configured as DP master. An S7-300 CPU and a CP342-5 are connected as DP slaves to the DP master system using the Y-link. Please follow the instructions below for configuring the CPU417-4H as DP master.

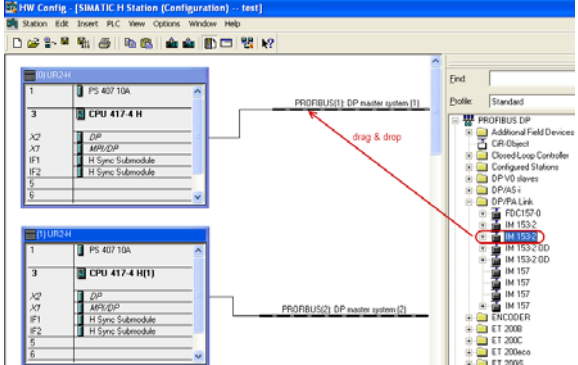
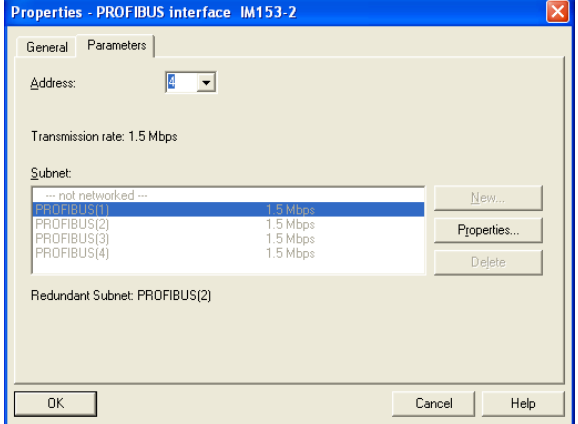
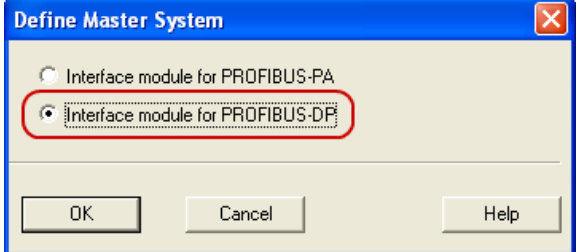
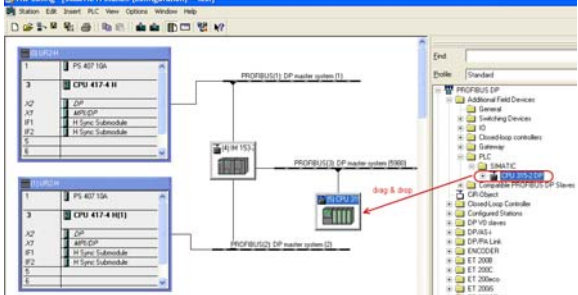
Table 1-1

No.	Action	Remark
1.	In the SIMATIC Manager, you create a new STEP 7 project via the menu "File → New".	 <p>The screenshot shows the SIMATIC Manager interface with the 'File' menu open. The menu items include: New... (Ctrl+N), 'New Project' Wizard..., Open... (Ctrl+O), Close, Multiproject, S7 Memory Card, Memory Card File, Save As... (Ctrl+S), Delete..., Reorganize..., Manage..., Archive..., Retrieve..., Print, and Page Setup... At the bottom, the project list shows: 1 CPU 417-4H_Master (Projekt) -- D:\...\CPU 417-4H, 2 test (Projekt) -- C:\...\Siemens\Step7\s7proj\test__1, 3 Standard Library (Bibliothek) -- C:\...\Step7\S7libs\stdlib30, and 4 FAQ (Projekt) -- D:\temp\FAQ2\S7-400H\Faq. The 'Exit' option is also visible at the bottom right (Alt+F4).</p>
2.	Add a SIMATIC H station via "Insert → Station".	 <p>The screenshot shows the SIMATIC Manager interface with the 'Insert' menu open. The 'Station' option is selected, and a sub-menu is displayed with the following items: 1 SIMATIC 400 Station, 2 SIMATIC 300 Station, 3 SIMATIC H Station (highlighted), 4 SIMATIC PC Station, 5 Other Station, 6 SIMATIC S5, and 7 PG/PC. Other menu items like Subnet, Program, S7 Software, S7 Block, M7 Software, Symbol Table, Text Library, and External Source... are also visible.</p>
3.	Select the SIMATIC H station. Then double-click the "Hardware" item to open the hardware configuration.	 <p>The screenshot shows the SIMATIC Manager hardware configuration window. The project tree on the left includes CPU 417-4H_Master, CP342-5, SIMATIC 300, and SIMATIC H-Station. The 'Hardware' view on the right shows the configuration for the selected station, listing CPU 417-4 H and CPU 417-4 H(1). Red circles highlight the 'SIMATIC H-Station' in the project tree and the 'Hardware' view header.</p>

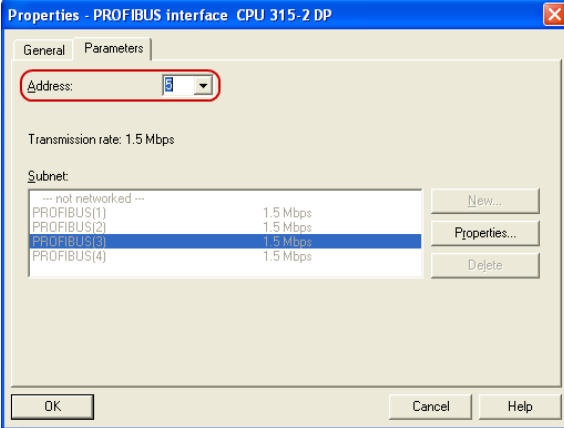
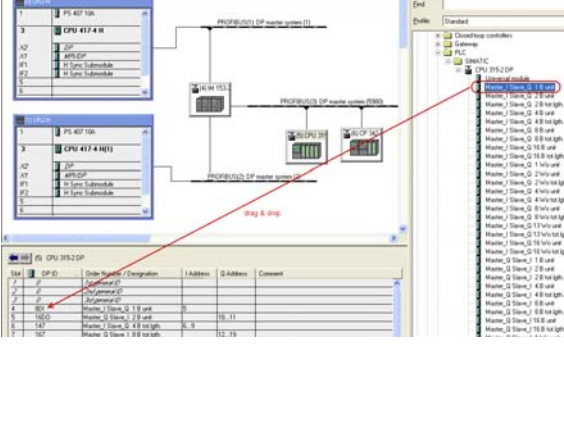
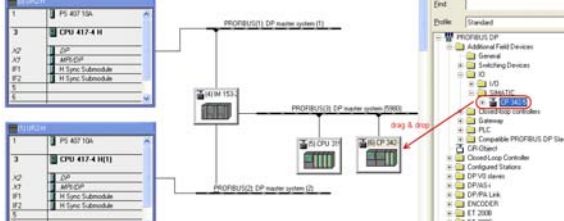
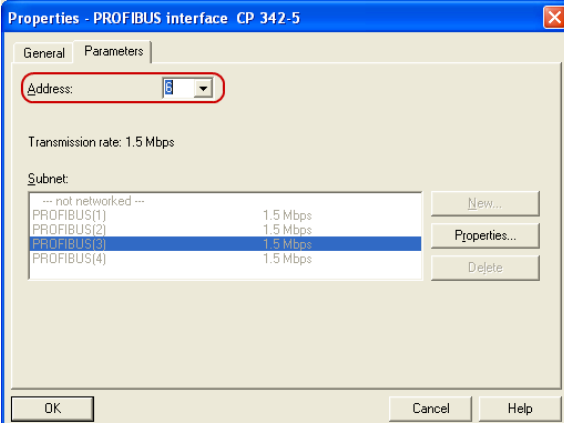
No.	Action	Remark
4.	In the hardware catalog under "SIMATIC 400 → RACK-400" you select a rack which is suitable for configuring redundant controllers and which matches your hardware setup, UR2-H, for example. Insert the selected rack by drag-and-drop into the hardware configuration.	
5.	In the hardware catalog under "SIMATIC 400 → PS-400", select the relevant power supply and drag-and-drop this to slot 1 of the rack.	
6.	In the hardware catalog under "SIMATIC 400 → CPU-400 → CPU 400-H", select the relevant CPU and drag-and-drop this to any slot of the rack.	
7.	Insert an H-Sync module from the hardware catalog at each of the slots IF1 and IF2 of the rack.	
8.	Copy the configured rack and paste it as a second rack to make the controller CPU 417-4H redundant. Double-click the DP interface of the CPU 417-4H in the first rack to open the "Properties" dialog of the DP interface.	

1 Configuration of the S7-400H as DP Master

No.	Action	Remark
9.	In the Properties dialog of the DP interface → "General" tab click on the "Properties" button.	
10.	Assign a PROFIBUS address to the DP interface and assign a PROFIBUS subnet to the DP interface. If no PROFIBUS subnet has been created yet, click the "New" button to create a new PROFIBUS subnet. Apply the settings with "OK".	
11.	In the Properties dialog of the DP interface, you switch to the "Operating Mode" tab. Select "DP master" as the operating mode.	
12.	Repeat Steps 8 to 11 for the DP interface of the CPU 417-4H in the second rack. Note Assign a different PROFIBUS subnet to the DP interface than the one for the CPU 417-4H in the first rack.	

No.	Action	Remark
13.	<p>In the hardware catalog under "PROFIBUS-DP → DP/PA-Link", select the interface module you are using in your Y-link. Drag-and-drop the selected interface module to the PROFIBUS DP master system of the CPU 417-4H in the first rack.</p>	
14.	<p>Assign a PROFIBUS address to the PROFIBUS interface of the interface module. Apply the settings with "OK".</p>	
15.	<p>You have the option of configuring an interface module for PROFIBUS-PA (DP/PA Link) or an interface module for PROFIBUS-DP (Y-link). In this example select "Interface module for PROFIBUS-DP" to configure a Y-link. Apply the settings with "OK".</p>	
16.	<p>In the following Entry ID you download the GSD files of the S7-300 CPU and PROFIBUS CP you are using as DP slaves: 113652.</p>	
17.	<p>Install the downloaded GSD files in the hardware configuration. Instructions for the installing the GSD files are available in Entry ID: 2383630.</p>	<p>Note If you are using an S7-300 or S7-400 CPU as DP slave on the DP master system of a Y-link, then you must configure the S7-300 or S7-400 CPU via the GSD file.</p>
18.	<p>In the hardware catalog under "PROFIBUS-DP → Additional Field Devices → PLC → SIMATIC" you select the CPU that you are operating as DP slave on the DP master system of the Y-link. Drag-and-drop the selected CPU to the PROFIBUS DP master system of the Y-link.</p>	

1 Configuration of the S7-400H as DP Master

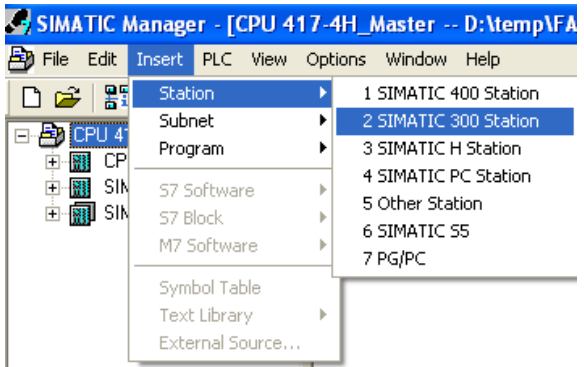
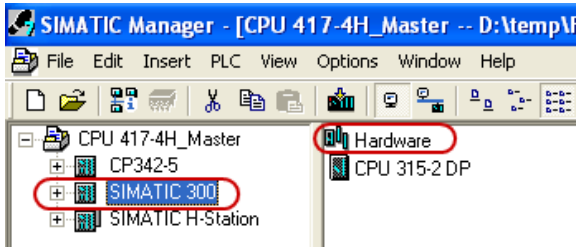
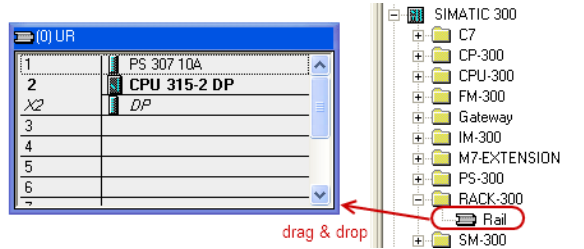
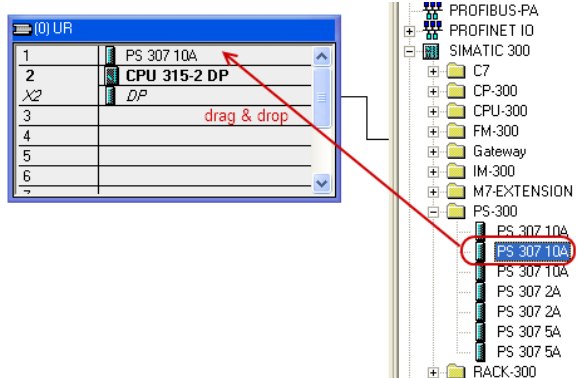
No.	Action	Remark
19.	<p>In the "Properties – PROFIBUS interface CPU 315-2DP" dialog you select the PROFIBUS address for the S7-300 CPU that you are operating as DP slave on the DP master system of the Y-link.</p> <p>In this example the S7-300 CPU has the PROFIBUS address 5.</p>	
20.	<p>Select the S7-300 CPU that is configured as DP slave and insert the modules for the IO data exchange from the hardware catalog in the slots of the CPU.</p> <p>The IO data areas below are configured for the DP master in this example:</p> <ul style="list-style-type: none"> • I address 5 (1 byte, consistent over unit) • Q address 10 and 11 (2 bytes, consistent over unit) • I address 6 to 9 (4 bytes, consistent over total length) • Q address 12 to 19 (8 bytes, consistent over total length) 	
21.	<p>In the hardware catalog under "PROFIBUS-DP → Additional Field Devices → IO → SIMATIC" you select the PROFIBUS CP that you are operating as DP slave on the DP master system of the Y-link. Drag-and-drop the selected CP to the PROFIBUS DP master system of the Y-link.</p>	
22.	<p>In the "Properties – PROFIBUS interface CP 342-5" dialog you select the PROFIBUS address for the CP that you are operating as DP slave on the DP master system of the Y-link.</p> <p>In this example the CP has the PROFIBUS address 6.</p>	

No.	Action	Remark
23.	<p>Mark the CP that is configured as DP slave and insert the modules for the IO data exchange from the hardware catalog in the slots of the CP.</p> <p>The IO data areas below are configured for the DP master in this example:</p> <ul style="list-style-type: none"> • I address 0 (1 byte, consistent over 1 byte) • Q address 0 and 1 (2 bytes, consistent over 1 byte) • I address 1 (4 bytes, total consistency) • Q address 2 to 9 (8 bytes, total consistency) 	
24.	<p>Save and compile the hardware configuration of the SIMATIC H station. Load the configuration into the CPU417-4H.</p>	

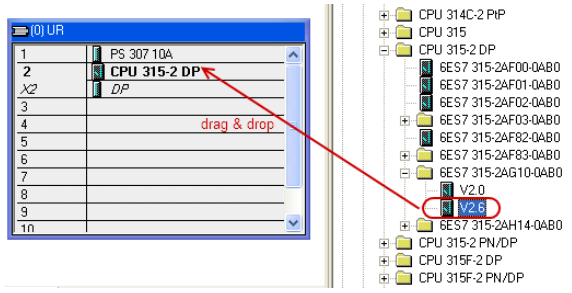
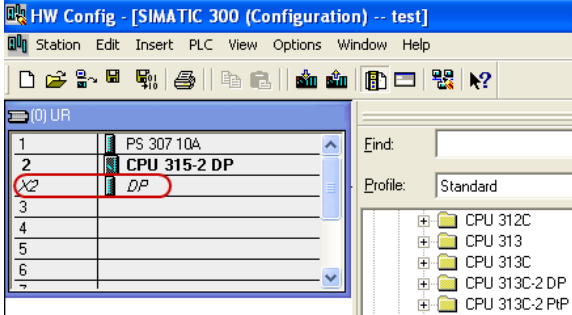
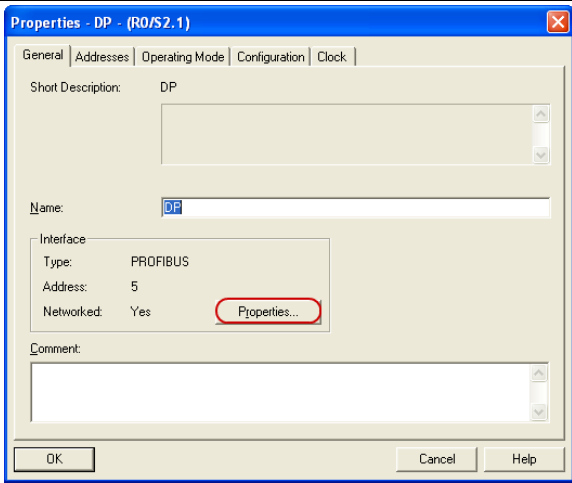
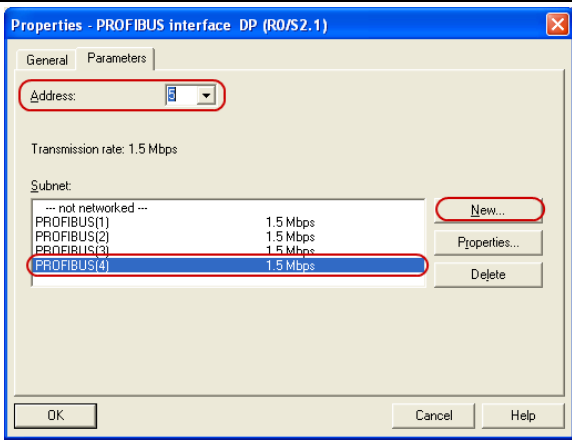
2 Configuration of the S7-300 CPU as DP Slave

In this example, an S7-300 CPU and a CP342-5 are configured as DP slaves to a CPU 417-4H as DP master. Proceed as follows to configure the S7-300 CPU as DP slave.

Table 2-1

No.	Action	Remark
1.	Insert a SIMATIC 300 station via the "Insert → Station" menu.	
2.	Select the inserted SIMATIC 300 station. Then double-click the "Hardware" item to open the hardware configuration.	
3.	In the hardware catalog, under "SIMATIC 300 → RACK 300", select the rail and drag-and-drop this into the hardware configuration.	
4.	In the hardware catalog under "SIMATIC 300 → PS-300", select the relevant power supply and drag-and-drop this to slot 1 of the rail.	

2 Configuration of the S7-300 CPU as DP Slave

No.	Action	Remark
5.	In the hardware catalog under "SIMATIC 300 → CPU-300", select the relevant CPU and drag-and-drop this to slot 2 of the rail.	 <p>The screenshot shows the hardware catalog window with a list of components. 'CPU 315-2 DP' is selected and being dragged to slot 2 of the rail. A red arrow points from the CPU to the slot. The rail currently contains 'PS 307 10A' in slot 1 and 'CPU 315-2 DP' in slot 2. The 'DP' label is highlighted in red.</p>
6.	Double-click on the DP interface of the S7-300 to open the Properties dialog of the DP interface.	 <p>The screenshot shows the 'HW Config' window. The hardware catalog on the left shows 'CPU 315-2 DP' selected in slot 2. The 'DP' label is circled in red. The right pane shows a list of components including 'CPU 312C', 'CPU 313', 'CPU 313C', 'CPU 313C-2 DP', and 'CPU 313C-2 PiP'.</p>
7.	In the Properties dialog of the DP interface → "General" tab click on the "Properties" button.	 <p>The screenshot shows the 'Properties - DP - (R0/S2.1)' dialog box. The 'General' tab is active. The 'Name' field contains 'DP'. The 'Interface' section shows 'Type: PROFIBUS', 'Address: 5', and 'Networked: Yes'. The 'Properties...' button is circled in red.</p>
8.	<p>For the DP interface of the S7-300 CPU, select the PROFIBUS address that you assigned in the hardware configuration of the SIMATIC H station for the DP slave.</p> <p>Click on the "New" button to insert a new PROFIBUS subnet.</p> <p>Assign the newly created PROFIBUS subnet to the DP interface.</p> <p>The S7-300 CPU must be connected to a different PROFIBUS subnet than in the hardware configuration of the SIMATIC H station, because otherwise when the system data is generated, a double assignment of the PROFIBUS address of the DP slave S7-300 CPU is detected.</p> <p>Apply the settings with "OK".</p>	 <p>The screenshot shows the 'Properties - PROFIBUS interface DP (R0/S2.1)' dialog box. The 'Parameters' tab is active. The 'Address' field is set to 5. The 'Transmission rate' is 1.5 Mbps. The 'Subnet' list shows 'PROFIBUS(1)', 'PROFIBUS(2)', 'PROFIBUS(3)', and 'PROFIBUS(4)'. The 'PROFIBUS(4)' entry is highlighted in blue. The 'New...' button is circled in red.</p>

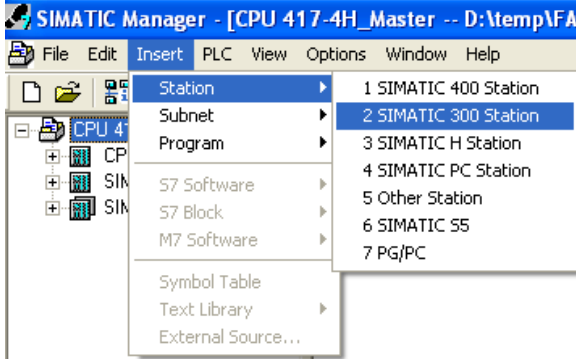
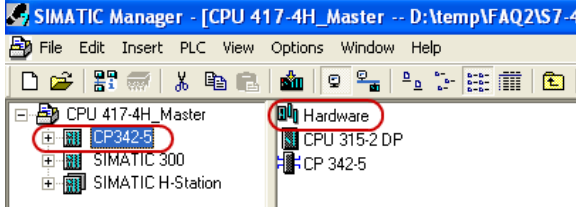
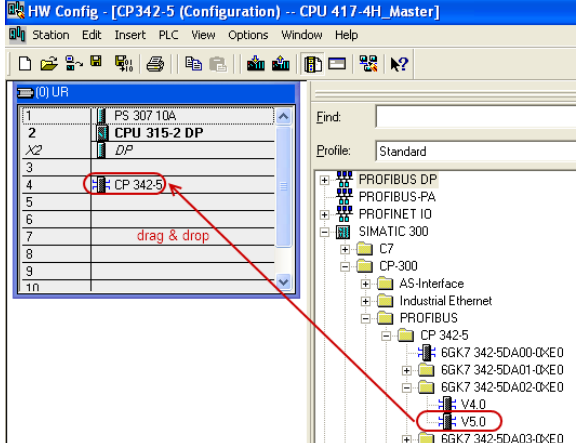
2 Configuration of the S7-300 CPU as DP Slave

No.	Action	Remark																																			
9.	<p>In the Properties dialog of the DP interface, you switch to the "Operating Mode" tab. Select "DP slave" as the operating mode.</p> <p>Disable the "Test, commissioning and routing" option, because it is not allowed to configure an active node on a Y-link.</p> <p>Apply the settings with "OK".</p>																																				
10.	<p>In the Properties dialog of the DP interface, you switch to the "Configuration" tab. Define an IO data area for data exchange between DP master and DP slave. The IO data areas must be defined according to the configuration in the DP master, in other words inputs on the DP master are outputs on the DP slave and vice versa. The length, unit and consistency of the IO data areas must be identical.</p> <p>The IO data areas below are configured for the DP slave in this example:</p> <ul style="list-style-type: none"> • Q address 0 (1 byte, consistent over unit) • I address 0 and 1 (2 bytes, consistent over unit) • Q address 1 to 4 (4 bytes, consistent over total length) • I address 2 to 9 (8 bytes, consistent over total length) 	<table border="1" data-bbox="821 869 1316 1064"> <thead> <tr> <th>Row</th> <th>Mode</th> <th>Partner DP a...</th> <th>Partner addr.</th> <th>Local addr.</th> <th>Length</th> <th>Consiste...</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MS</td> <td>--</td> <td>--</td> <td>A 0</td> <td>1 Byte</td> <td>Unit</td> </tr> <tr> <td>2</td> <td>MS</td> <td>--</td> <td>--</td> <td>E 0</td> <td>2 Byte</td> <td>Unit</td> </tr> <tr> <td>3</td> <td>MS</td> <td>--</td> <td>--</td> <td>A 1</td> <td>4 Byte</td> <td>All</td> </tr> <tr> <td>4</td> <td>MS</td> <td>--</td> <td>--</td> <td>E 2</td> <td>8 Byte</td> <td>All</td> </tr> </tbody> </table>	Row	Mode	Partner DP a...	Partner addr.	Local addr.	Length	Consiste...	1	MS	--	--	A 0	1 Byte	Unit	2	MS	--	--	E 0	2 Byte	Unit	3	MS	--	--	A 1	4 Byte	All	4	MS	--	--	E 2	8 Byte	All
Row	Mode	Partner DP a...	Partner addr.	Local addr.	Length	Consiste...																															
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4	MS	--	--	E 2	8 Byte	All																															
11.	<p>Save and compile the hardware configuration of the S7-300 station. Load the configuration into the CPU.</p>																																				

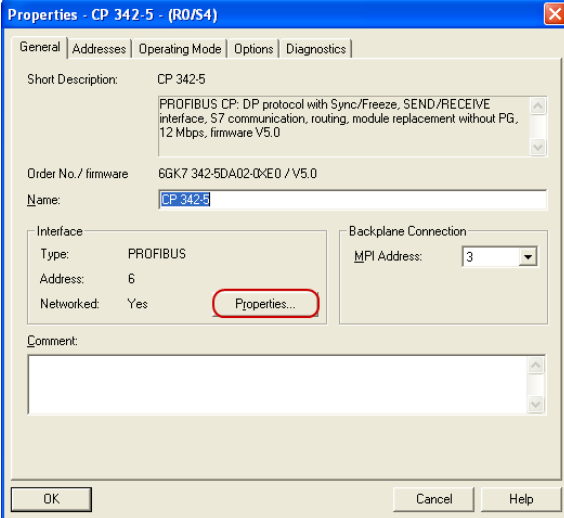
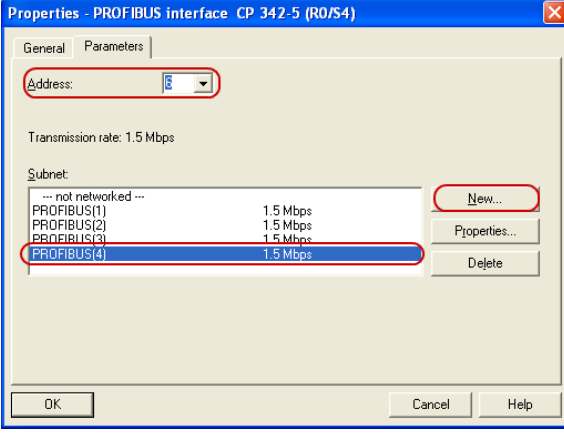
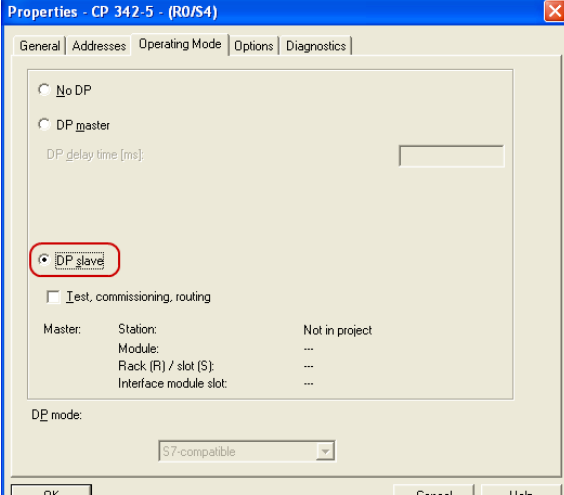
3 Configuration of the CP342-5 as DP Slave

In this example, an S7-300 CPU and a CP342-5 are configured as DP slaves to a CPU 417-4H as DP master. Follow the instructions below for configuring the CP342-5 as DP slave.

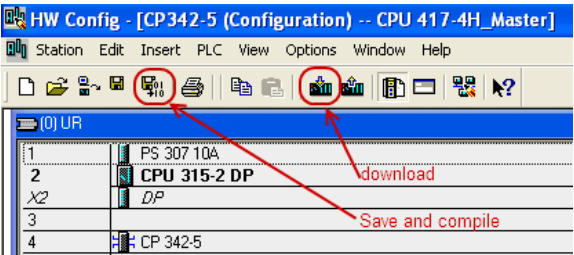
Table 3-1

No.	Action	Remark
1.	Insert a SIMATIC 300 station via the "Insert → Station" menu.	
2.	Select the inserted SIMATIC 300 station. Then double-click the "Hardware" item to open the hardware configuration.	
3.	In the hardware catalog, under SIMATIC 300, select the rail, the relevant power supply, CPU and the CP342-5 and drag-and-drop them into the hardware configuration. Double-click on the CP342-5 to open the Properties dialog of the CP342-5.	

3 Configuration of the CP342-5 as DP Slave

No.	Action	Remark
4.	In the Properties dialog of the CP342-5 → "General" tab click the "Properties" button.	 <p>The screenshot shows the 'Properties - CP 342-5 - (R0/S4)' dialog box with the 'General' tab selected. The 'Properties...' button is circled in red.</p>
5.	<p>For the CP342-5, select the PROFIBUS address that you assigned in the hardware configuration of the SIMATIC H station for the DP slave.</p> <p>Click on the "New" button to insert a new PROFIBUS subnet.</p> <p>Assign the newly created PROFIBUS subnet to the CP342-5.</p> <p>The CP342-5 must be connected to a different PROFIBUS subnet than in the hardware configuration of the SIMATIC H station, because otherwise when the system data is generated, a double assignment of the PROFIBUS address of the CP342-5 is detected.</p> <p>Apply the settings with "OK".</p>	 <p>The screenshot shows the 'Properties - PROFIBUS interface CP 342-5 (R0/S4)' dialog box with the 'Parameters' tab selected. The 'Address' dropdown is set to 6. In the 'Subnet' list, 'PROFIBUS(4)' is highlighted with a red circle. The 'New...' button is also circled in red.</p>
6.	<p>In the Properties dialog of the CP342-5, you switch to the "Operating Mode" tab. Select "DP slave" as the operating mode.</p> <p>Disable the "Test, commissioning and routing" option, because it is not allowed to configure an active node on a Y-link.</p> <p>Apply the settings with "OK".</p>	 <p>The screenshot shows the 'Properties - CP 342-5 - (R0/S4)' dialog box with the 'Operating Mode' tab selected. The 'DP slave' radio button is selected and circled in red. The 'Test, commissioning, routing' checkbox is unchecked.</p>

3 Configuration of the CP342-5 as DP Slave

No.	Action	Remark
7.	Save and compile the hardware configuration of the S7-300 station. Load the configuration into the CPU.	

4 S7 Program of the DP Slave CP342-5

The CP342-5 always transfers the data consistently. For data exchange via PROFIBUS you call functions FC1 "DP_SEND" and FC2 "DP_READ" in the user program of the CPU.

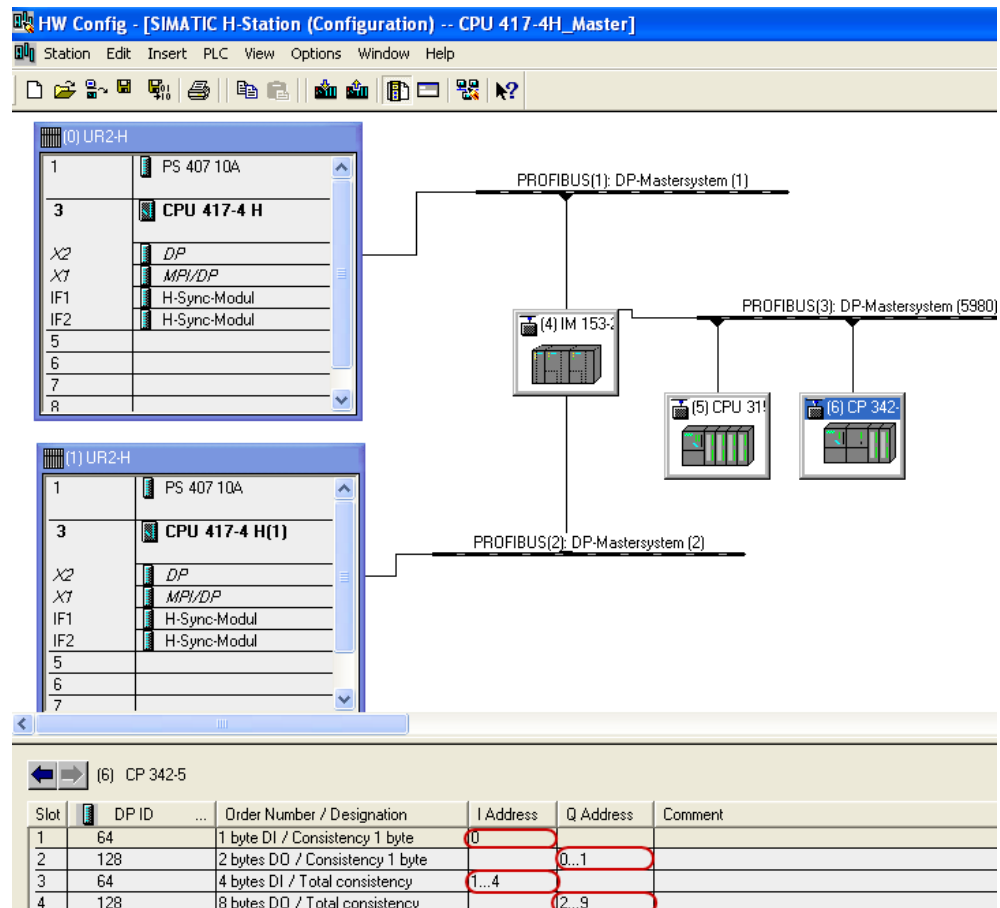
Functions FC1 and FC2 are available in the "SIMATIC_NET_CP → CP 300 → Blocks" library.

Parameterization of FC1 "DP_SEND"

The FC1 "DP_SEND" transfers the input data of the DP slave to the CP342-5 for transfer to the DP master.

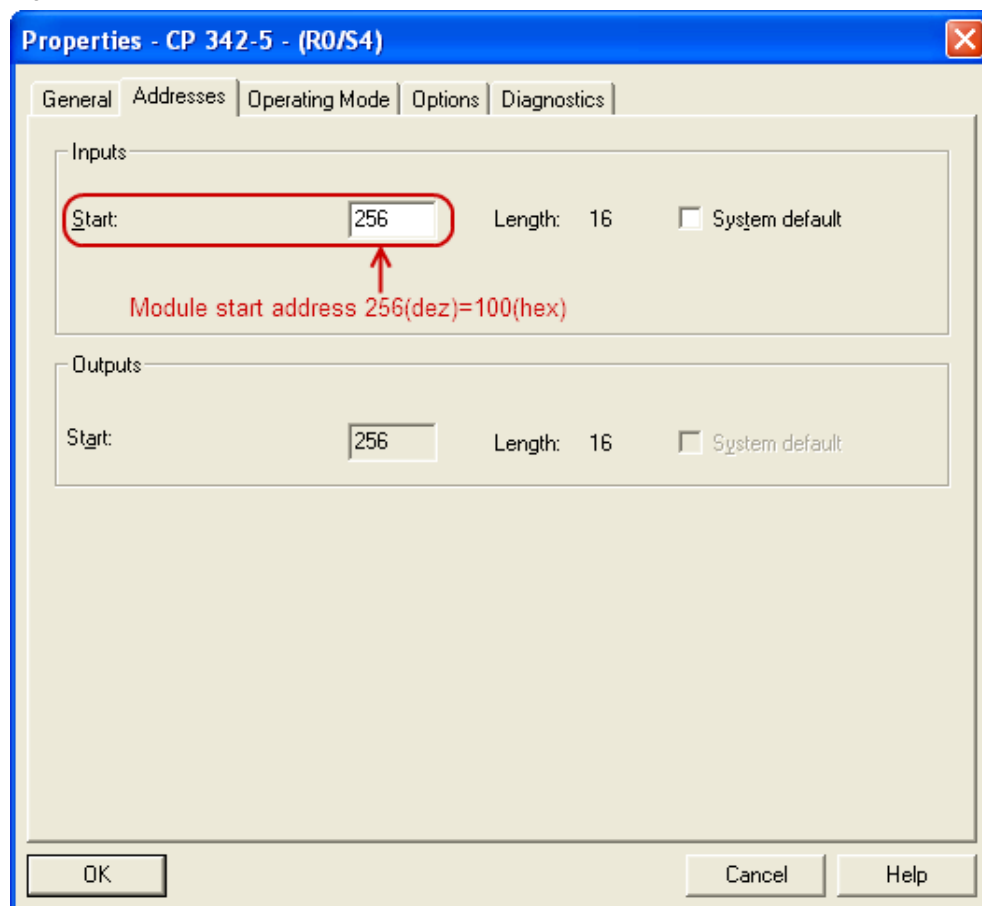
In this example, the input data is configured with the start address 0 and a length of 5 bytes, which means that the I addresses 0 to 4 are the address area of the input data (see Figure 4-1).

Figure 4-1



At the input parameter CPLADDR of FC1, you specify the module start address. You take the module start address from the hardware configuration of the S7-300 station that is configured as DP slave. In the hardware configuration you open the Properties dialog of the CP342-5. The module start address is defined in the "Addresses" tab (see Figure 4-2).

Figure 4-2



At the SEND input parameter of FC1 you specify the address and length of the DP data area in which the input data of the DP slave are stored. The length of the DP data area must correspond to the length of the address area of the input data.

In this example, the FC1 "DP_SEND" transfers the 5 bytes of input data of the DP slave to the DB1 as of address 0 for transfer to the DP master.

Figure 4-3

```

CALL "DP_SEND"
CPLADDR:=W#16#110           Module start address
SEND   :=P#DB1.DEX0.0 BYTE 5
DONE   :=M10.0             DP data area where the input data of the
ERROR  :=M10.1             DP slave are saved
STATUS :=MW12

```

Parameterization of FC2 "DP_READ"

FC2 "DP_READ" reads the output data transferred from the DP master into the DP data area specified on the block.

In this example, the output data is configured with the start address 0 and a length of 10 bytes, which means that the Q addresses 0 to 9 are the address area of the output data (see Figure 4-1).

At the input parameter CPLADDR of FC2, you specify the module start address. You take the module start address from the hardware configuration of the S7-300 station that is configured as DP slave. In the hardware configuration you open the Properties dialog of the CP342-5. The module start address is defined in the "Addresses" tab (see Figure 4-2).

At the RECV input parameter of FC2 you specify the address and length of the DP data area in which the output data is received. The length of the DP data area must correspond to the length of the address area of the output data.

In this example, FC2 "DP_RECV" reads the 10 bytes of output data transferred from the DP master into DB2 as of address 0.

Figure 4-4

```
CALL "DP_RECV"  
CPLADDR :=W#16#110 ← Module start address  
RECV :=P#DB2.DEX0.0 BYTE 10  
NDR :=M20.0  
ERROR :=M20.1 DP data area where the output data transferd  
STATUS :=MW22 by the DP master are saved  
DPSTATUS:=MB24
```

5 S7 Program of the DP Slave CPU 315-2DP

With the DP slave CPU 315-2DP the operating system handles the sending and receiving of data.

Neither load and transfer commands nor system functions or functions are called in the user program of the DP slave CPU 315-2DP to send and receive data.

6 S7 Program of the DP Master

Using transfer commands or the SFC15 "DPWR_DAT" system function you access the IO or the process image of the outputs.

Using load commands or the SFC14 "DPRD_DAT" system function you access the IO or the process image of the inputs.

The load and transfer commands support consistent reading out or writing of a maximum of 4 bytes.

If you read out or write 3 bytes or more than 4 bytes consistently, you call the SFC14 "DPRD_DAT" and SFC15 "DPWR_DAT" system functions in the S7 program of the DP master.

The IO data areas below are configured for access to the DP slave CP342-5 in this example (see Figure 6-1 and Table 6-1):

Figure 6-1

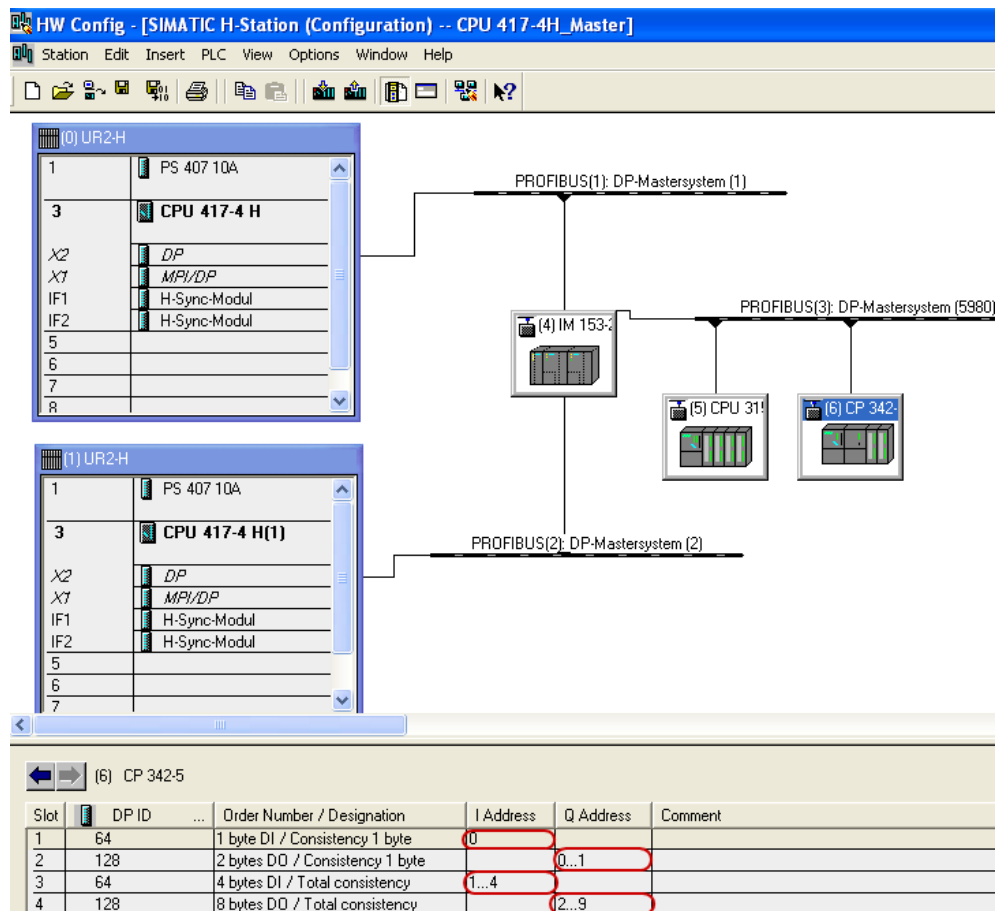


Table 6-1

IO address	Length
I address 0	1 byte
I addresses 1 to 4	4 bytes
Q addresses 0 and 1	2 bytes
Q addresses 2 to 9	8 bytes

Using load and transfer commands or the SFC15 "DPWR_DATA" you access the process image of the outputs and inputs. You read the data out of the configured data area of the input addresses or write the data to the configured data area of the output addresses in order to transfer the data to the DP slave CP342-5.

Figure 6-2

```

OB1 : "Main Program Sweep (Cycle)"
Kommentar:
Netzwerk 1: read and write data from DP-Slave CP342-5
Kommentar:

// read data
    L    EB    0
    T    DB1.DBB 0           // read Input address 0 (1 Byte DI)

    L    ED    1
    T    DB1.DBD 1           // read Input address 1 to 4 (4 Byte DI)

// write data
    L    DB2.DEW 0           // write Output address 0 and 1 (2 Byte DO)
    T    AW    0

CALL "DPWR_DAT"           // write Output address 2 to 9 (8 Byte DO)
LADDR :=W#16#2
RECORD :=P#DB2.DBX2.0 BYTE 8
RET_VAL:=MW12

```

The IO data areas below are configured for access to the DP slave CPU315-2DP in this example (see Figure 6-3 and Table 6-2):

Figure 6-3

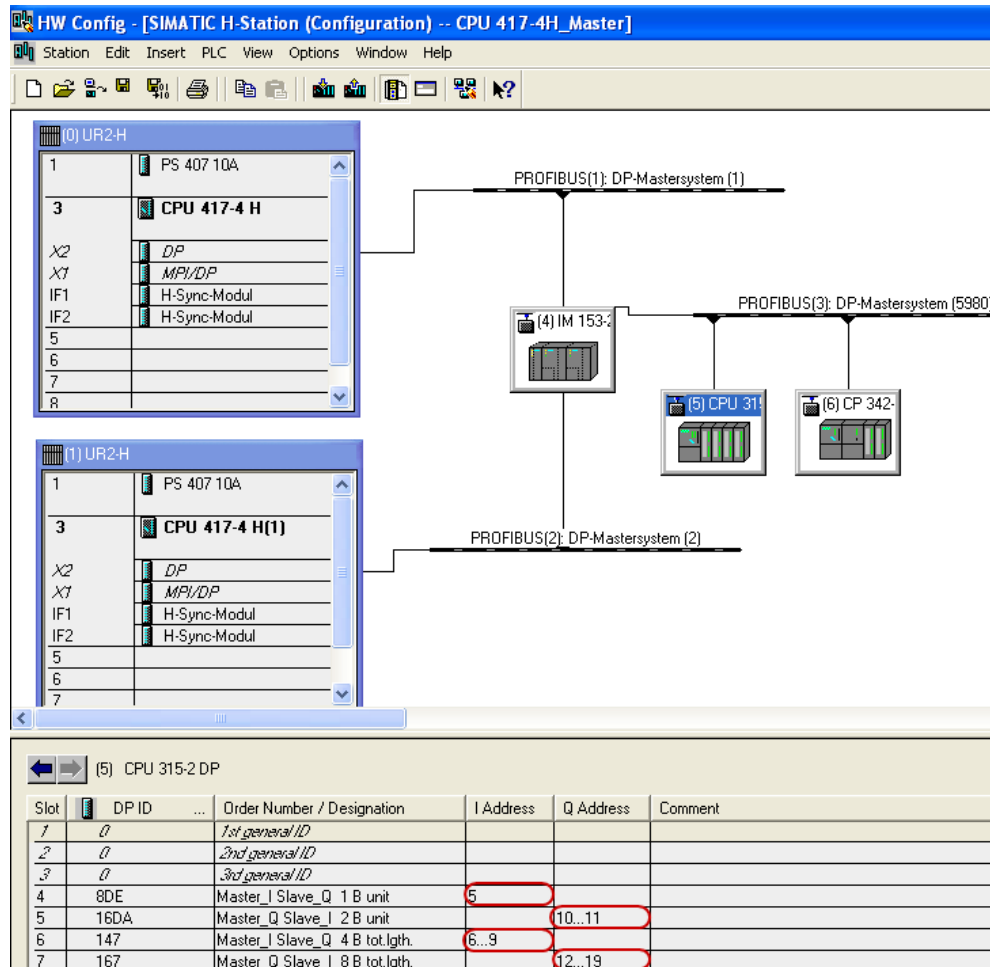


Table 6-2

IO address	Length
I address 5	1 byte
I addresses 6 to 9	4 bytes
Q addresses 10 and 11	2 bytes
Q addresses 12 to 19	8 bytes

Using load and transfer commands or the SFC15 "DPWR_DATA" you access the process image of the outputs and inputs. You read the data out of the configured data area of the input addresses or write the data to the configured data area of the output addresses in order to transfer the data to the DP slave CPU 315-2 DP.

Figure 6-4

Netzwerk 2: read and write data from DP-Slave CPU315-2DP

```

Kommentar:
// read data

L   EB   5           // read Input address 0 (1 Byte)
T   DB3.DBB  0

L   ED   6           // read Input address 6 to 9 (4 Byte)
T   DB3.DBD  1

// write data

L   DB4.DBW  0           // write Output address 10 and 11 (2 Byte)
T   AW   10

CALL "DPWR_DAT"           // write Output address 12 to 19 (8 Byte)
LADDR :=W#16#C
RECORD :=P#DB4.DEX 2.0 BYTE 8
RET_VAL:=MW10

```