



# Application Note

Siemens S7 PLC and FC 300 Profibus



VLT® AutomationDrive FC 300

## Siemens S7 PLC and FC 300 Profibus

### Introduction

This application note describes how to set up a PROFIBUS system between a Danfoss Drives FC 300 frequency converter and S7 PLC 315-2 from Siemens.

It is assumed that you are already familiar with the Simatic S7 system.

Only the steps which are required in order to establish communication between the FC 300 Profibus and the Simatic S7-315-2 DP PLC are shown.

#### NOTE!:

The examples do not describe all the functions needed for a real application, for example error handling.

This note describes:

- System description
- Configuring the Profibus network
- Downloading and troubleshooting
- Check of communication
- Simatic project for download

Details of some of the components/ software:

FC 300 with PROFIBUS interface - sw. version 2.xx.

FC 300 GSD version 2.00

PLC S7-315-2 DP (6ES7 315-2AG10-0AB0 / V2.0)

SIMATIC Manager version 5.3 + SP1

### System description

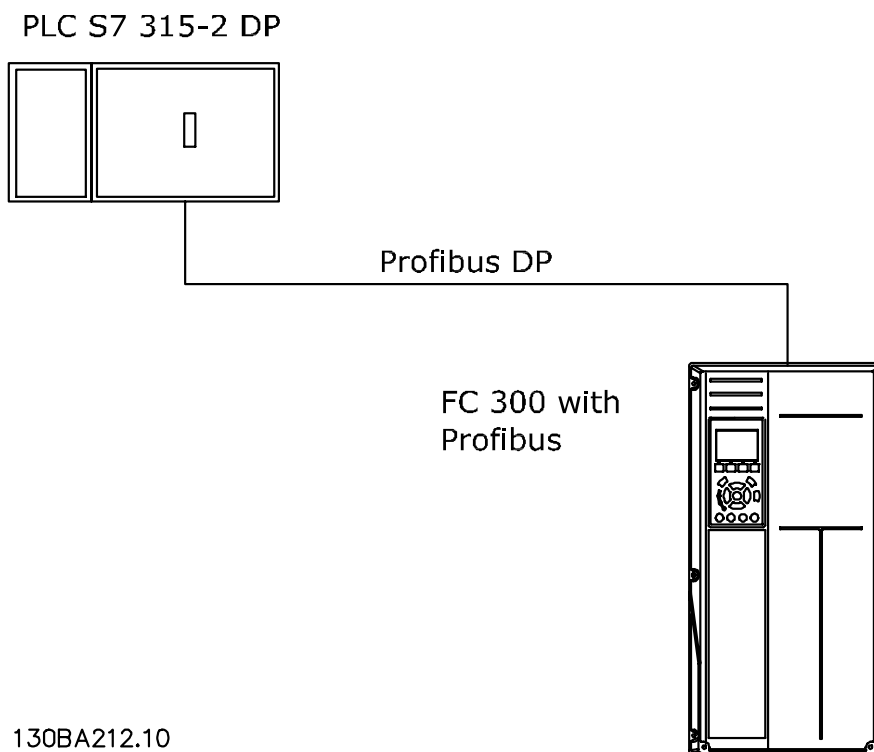
The drawing shows the system in this application note.

On the PROFIBUS network the stations are programmed in the following way:

S7 PLC 315-2 DP: Address number 1.

FC 300: Address number 5 PPO Type 2

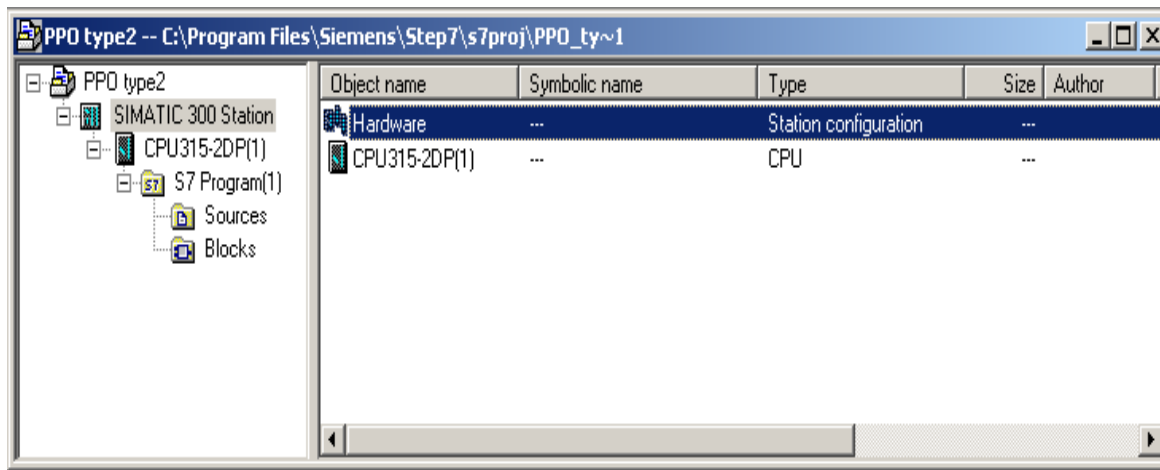
Module consistent.



## Configuring the Profibus network

Start the SIMATIC Manager and create a new project.

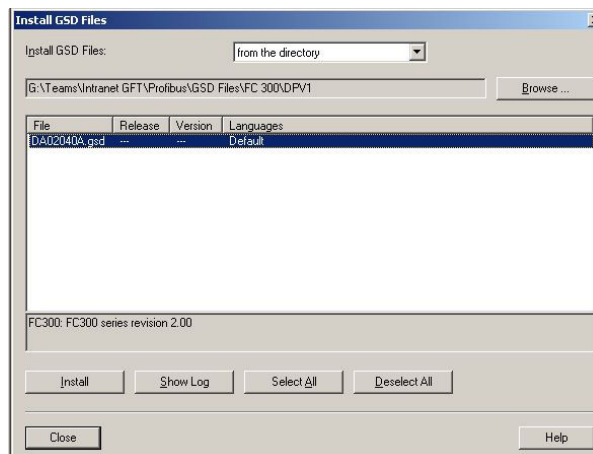
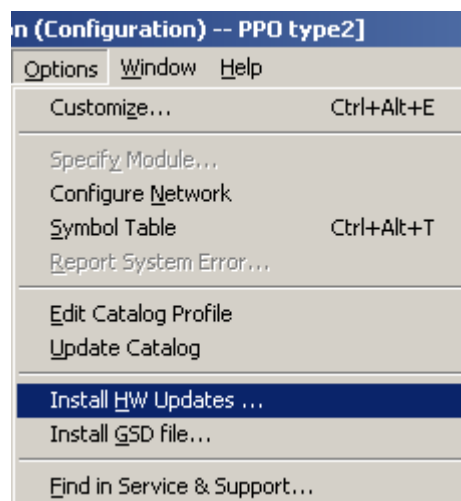
Open Hardware configuration in S7 Manager to configure the system.



In order to configure a PROFIBUS system, the configuration tool needs a GSD file for each type of slave on the network. The GSD file is a PROFIBUS DP "standard" text file containing the necessary communications setup data for a slave. Download the necessary GSD files at <http://www.danfoss.com/BusinessAreas/DrivesSolutions>

The first step in configuration of the PROFIBUS Master is to import the GSD file in the configuration tool. The steps outlined below show how to add a new GSD file to the Simatic Manager software tool. For each drive series, a GSD file is typically imported once only, following the initial installation of the software tool.

Using the browser for the GSD file, choose to install the needed GSD files. Both the GSD file and a bitmap for the device will be imported into the Hardware catalogue.

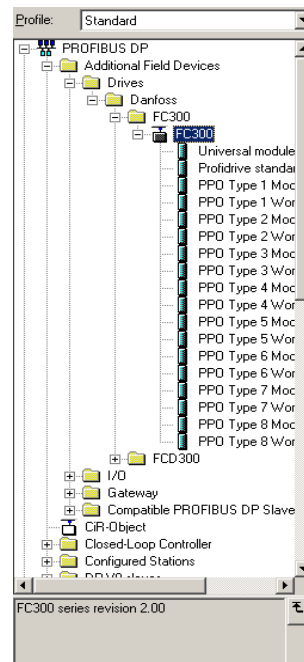


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### Configuring the Profibus network

The GSD file is now imported and will be accessible via the following path in the Hardware catalogue.

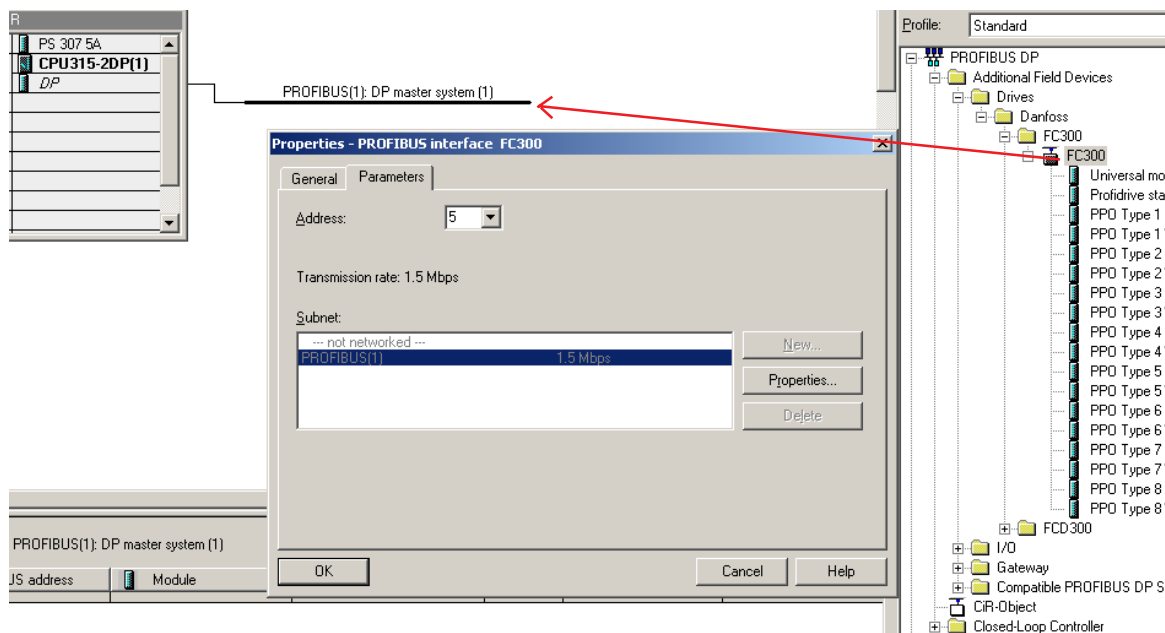
Note that the GSD revision should display a revision higher than 2.00.



Insert a Profibus network and add a PROFIBUS Master system. Setup the Profibus network to a baud rate from 9.6 kbaud to 12 Mbaud.

Select FC 300 from the Hardware catalogue and drag and drop it to the PROFIBUS network.

A window for the address of the FC 300 now appears. Select the address from the scroll-down list. Note that this address setting must match the address setting in par. 9-18 Node address.



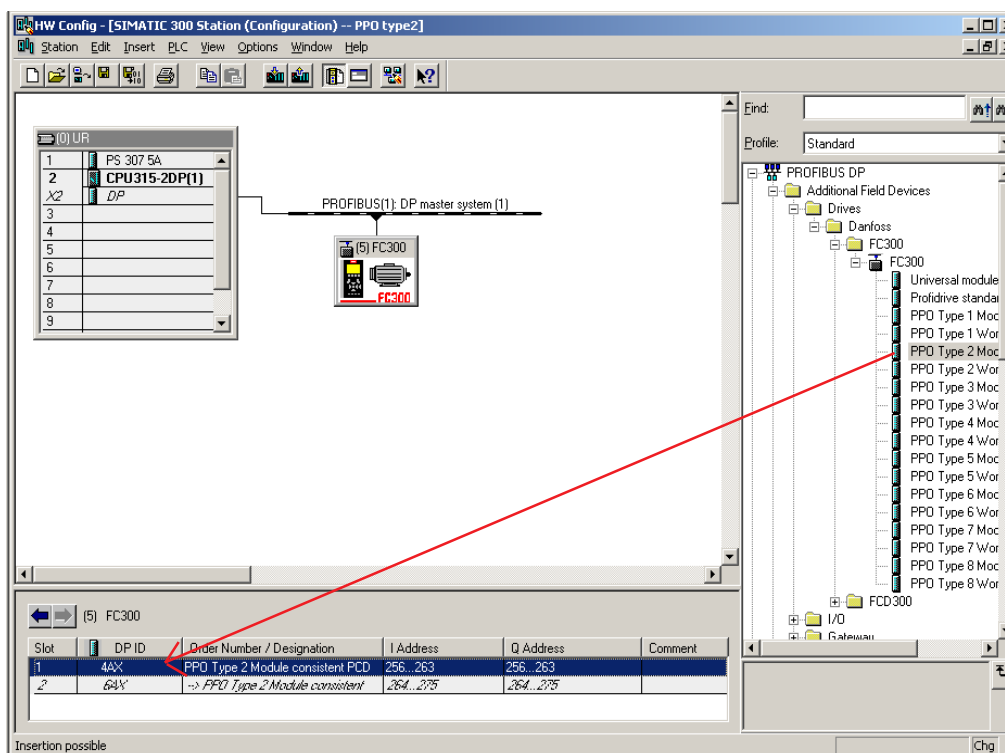
## Siemens S7 PLC and FC 300 Profibus

### Configuring the Profibus network

The next step is to set up the peripheral input and output data via a PPO type. In the peripheral area data is transmitted cyclically via PPO types. In the example below, a PPO type 2 Module consistent is dragged and dropped to the first slot. The choice of PPO type is made in the master configuration, and is then automatically recorded in the frequency converter. No manual setting of PPO types in the FC 300 is required.

The current PPO type can be read in par. 9-22 Telegram selection.

In addition, all PPO types can be set up as word consistent or module consistent. For FC 300, the process data area can be word or module consistent, whereas the parameter channel must always be module consistent. Module consistent data is transmitted as sets of interrelated words transferred simultaneously between the PLC program and the Profibus master. Word consistent data is transmitted as individual independent words between the PLC and the Profibus master.



## Siemens S7 PLC and FC 300 Profibus

### Configuring the Profibus network

The system is now set up to use the PPO type 2 in the following peripheral I/O area:

Parameter Characteristic (PCA), i.e. read and write to parameters.

Process data, i.e. write a Control word and Reference and receiving a Status word and Main Actual Value.

| Master to Slave         |         |          |         |                       |           |              |                |         |         |
|-------------------------|---------|----------|---------|-----------------------|-----------|--------------|----------------|---------|---------|
| Parameter channel (PCA) |         |          |         | Process channel (PCD) |           |              |                |         |         |
|                         |         |          |         | PCD 1                 | PCD 2     | PCD 3        | PCD 4          | PCD 5   | PCD 6   |
| PCA                     | Index   | High PVA | Low PVA | Control word          | Reference | Torque limit | Ramp 1 up time | Empty   | Empty   |
| PQW 256                 | PQW 258 | PQW 260  | PQW 262 | PQW 264               | PQW 266   | PQW 268      | PQW 270        | PQW 272 | PQW 274 |

| Slave to Master         |         |          |         |                       |                   |               |           |               |         |
|-------------------------|---------|----------|---------|-----------------------|-------------------|---------------|-----------|---------------|---------|
| Parameter channel (PCA) |         |          |         | Process channel (PCD) |                   |               |           |               |         |
|                         |         |          |         | PCD 1                 | PCD 2             | PCD 3         | PCD 4     | PCD 5         | PCD 6   |
| PCA                     | Index   | High PVA | Low PVA | Status word           | Main Actual Value | Motor current | Frequency | Digital input | Empty   |
| PIW 256                 | PIW 258 | PIW 260  | PIW 262 | PIW 264               | PIW 266           | PIW 268       | PIW 270   | PIW 272       | PIW 274 |

PQW means the data from the Master to the Slave. By PCA the output data will contain the request of a parameter read or write. By Process data the first word of output data is the Control word of the FC 300 and the next is the Reference. The rest of the words can be freely configured to transmit different kind of data to the FC 300 in parameter 915 *PCD Write Configuration*.

PIW means the data from the Slave to the Master. By PCA the input data will contain the response of a parameter read or write. By Process data the first word of input data is the Status word of the FC 300 and the next is the Main Actual Value. The rest of the words can be freely configured to transmit different kind of process data in parameter 916 *PCD Read Configuration*. See example on next page.

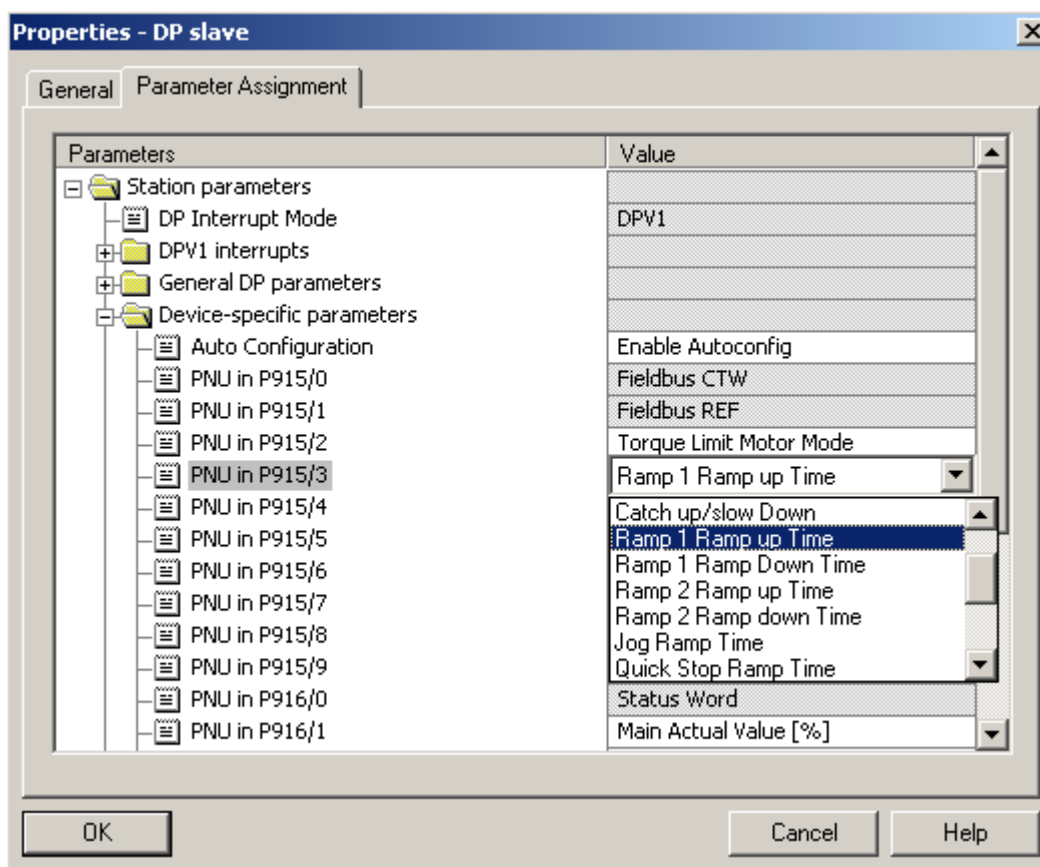
## Siemens S7 PLC and FC 300 Profibus

### Configuring the Profibus network

Normally the setup of the PCD area is done in parameter 915 *PCD Write Configuration* and 916 *PCD Read Configuration* via the LCP or the MCT 10 Setup Software. In FC 300 it is possible to automatic configure the PCD area in the PLC via the GSD file in Simatic Manager. The configuration of parameter 915 and 916 is done when either the PLC or the VLT is being power up via the parameterise telegram.

Note that to configure the PCD area via the PLC the FC 300 and the GSD file need to have a software version higher than 2.00.

Double click on the FC 300 and the click on Parameter assignment:



By Device-specific parameters it is possible to use the Scroll down list to setup the PCD area. Remember to chose "Enable Autoconfig" for automatic configuration of PCD data.

P915/0 to P915/9 is process data written from the PLC to the FC 300, PQW area.

P916/0 to P916/9 process data from the FC 300 to the PLC, PIW area.

## Configuring the Profibus network

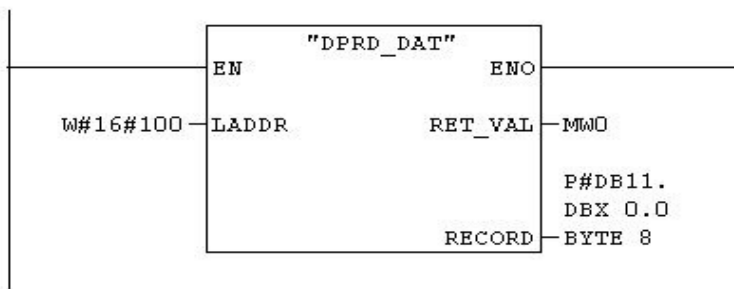
The Parameter channel can only be access as consistent data and there for System Function Call (SFC) are needed. In Simatic you should use SFC 14 for reading data and SFC 15 for writing data.

The Process channel can be access as module or word consistent. In this example module consistent is used and therefore again SFC 14 / 15 is needed.

If a PPO type 2 Word consistent was chosen the peripheral I/O area can be access in each word.

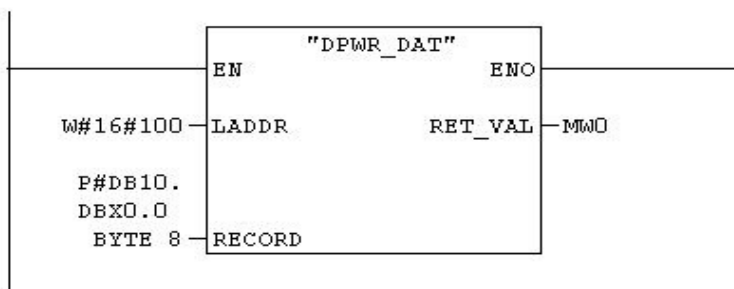
### Network 1 : Read PCV

Read Data from the Parameter Channel to DB11.



### Network 2 : Write PCV

Write Data to the Parameter Channel from DB10.



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## Siemens S7 PLC and FC 300 Profibus

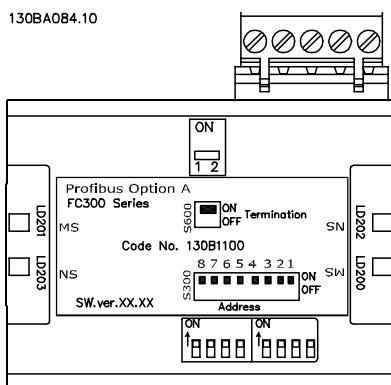
### Downloading and troubleshooting

Set the PLC in stop with the key on the PLC processor and download the program.

Note that the FC 300 will show a Fieldbus fault while the PLC is in Stop mode.

Before the PLC can be set in RUN mode ensure that the node address in par. 918 match the corresponding address in the program. Note that a change of parameter 918 is first active at next power up.

After the download of the PLC program the LED marked as "NS" on the Profibus card should be solid green when the key on the S7 master is set in RUN. This indicate that the master and slave is communicating.



The LED marked "MS" indicates the module status, i.e. acyclical DP V1 communication from either a PROFIBUS master class 1 (PLC) or a master class 2 (MCT 10, FDT tool). When this light shows constant green, then DP V1 communication from master classes 1 and 2 is active.

If the "NS" LED on the FC 300 Profibus card isn't solid green the fault could be:

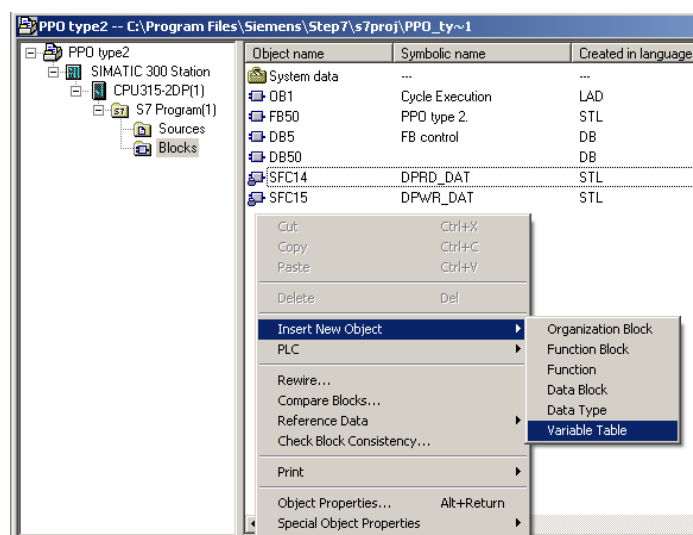
- Wrong address setting in parameter 918 *Node address* according to the master.
- After changing the parameter 918 *Node address* the power hasn't been cycle.
- Wrong cable connection, check the cable by the master and the FC 300.  
62 = RxD/TxD-P Red cable  
63 = RxD/TxD-N Green cable
- The termination of the Profibus network isn't correct done.
- Wrong GSD file. Check that the used GSD file is for FC 300.

See the FC 300 Profibus Operating Instruction for a more comprehensive troubleshooting.

### Check of the communication

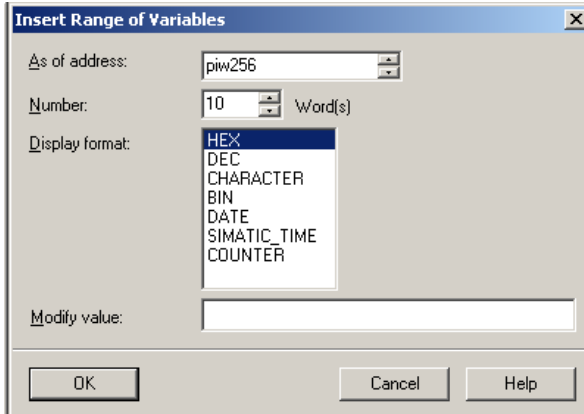
To easily check the communication between a Master and the FC 300 in the Simatic Manager a Variable Table (VAT) can be created.

Go to S7 Programs and Blocks and create a VAT table.



## Check of the communication

Open the VAT table and insert a range of variable from PIW 256 of 10 words and range of variable from PQW 256 of 10 words.



Now the peripheral input data from PIW 256 – 274 can be monitored by clicking on the glasses.



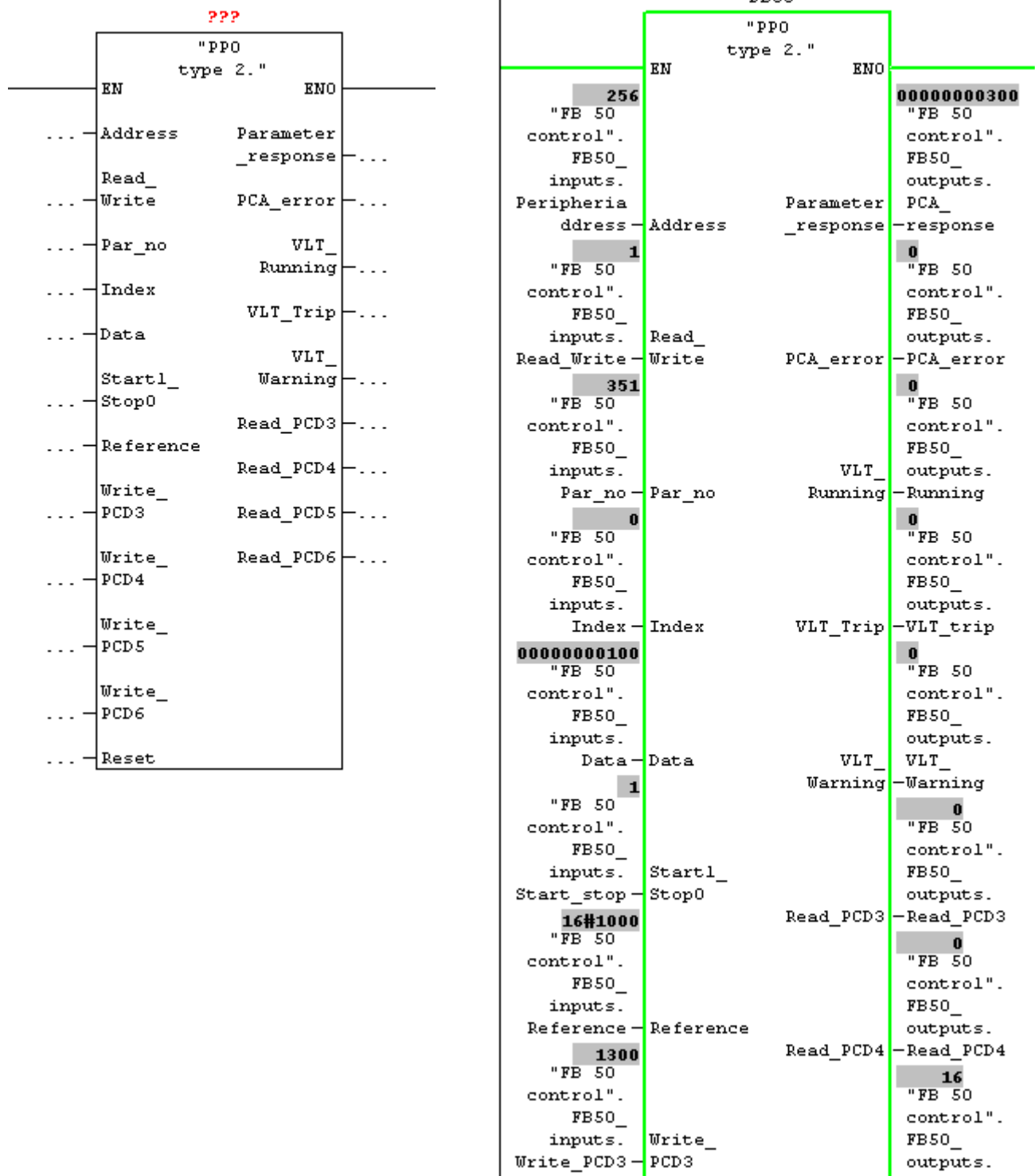
In this example the peripheral input data will show the following:

- PIW 256 shows the PCA response of a parameter transfer double word (parameter 351).
- PIW 262 shows the data of parameter 351 (300)
- PIW 264 shows the FC 300 Status word
- PIW 266 shows the Main actual Value
- PIW 268 shows the actual Motor current (1.55 Amp)
- PIW 270 shows the frequency (12.6 Hz)
- PIW 272 shows the status of the digital inputs (terminal 19 = 1)

| Var - VAT_1                                                      |         |        |       |              |              |
|------------------------------------------------------------------|---------|--------|-------|--------------|--------------|
| Table Edit Insert PLC Variable View Options Window Help          |         |        |       |              |              |
| VAT_1 -- @PPO type2\SIMATIC 300 Station\CPU315-2DP(1)\S7 Program |         |        |       |              |              |
|                                                                  | Address | Symbol | Displ | Status value | Modify value |
| 1                                                                | PIW 256 |        | HEX   | W#16#215F    |              |
| 2                                                                | PIW 258 |        | HEX   | W#16#0000    |              |
| 3                                                                | PIW 260 |        | HEX   | W#16#0000    |              |
| 4                                                                | PIW 262 |        | HEX   | W#16#012C    |              |
| 5                                                                | PIW 264 |        | HEX   | W#16#0F07    |              |
| 6                                                                | PIW 266 |        | HEX   | W#16#1000    |              |
| 7                                                                | PIW 268 |        | HEX   | W#16#009B    |              |
| 8                                                                | PIW 270 |        | HEX   | W#16#007E    |              |
| 9                                                                | PIW 272 |        | HEX   | W#16#0010    |              |
| 10                                                               | PIW 274 |        | HEX   | W#16#0000    |              |

## Simatic project

A Simatic project is available for downloading on <http://www.danfoss.com/BusinessAreas/DrivesSolutions>. This project contains a Function Block 50 which can be used to parameterise and control a FC 300 via PP0 type 2 Module consistent. Download the zip file ???.





[www.danfoss.com/drives](http://www.danfoss.com/drives)

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