# Reading out the topology data of a PROFINET IO system

## SFB52 "RDREC"

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# Question

In the user program of an S7-300 or S7-400 CPU with integrated PN interface, how can you read out the current topology of the PROFINET IO system connected?

# Answer

Follow the instructions and notes listed in this document for a detailed answer to the above question.

# Contents

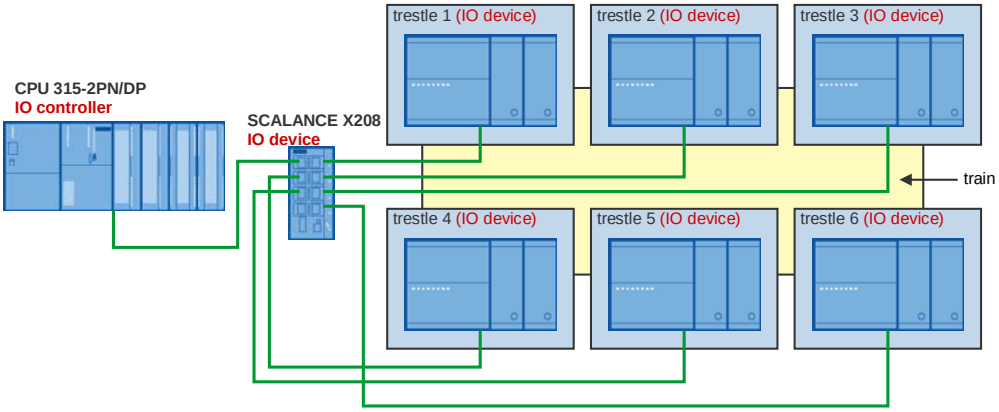
# 1 Introduction

In this entry, we show you how to read out the current topology of the PROFINET IO system connected in the user program of an S7-300 or S7-400 CPU with integrated PN interface.

This is needed in plants where tools are used at different points in the plant, for example, and the interconnection of the PROFINET IO nodes thus changes.

**Example**

Figure 1-1



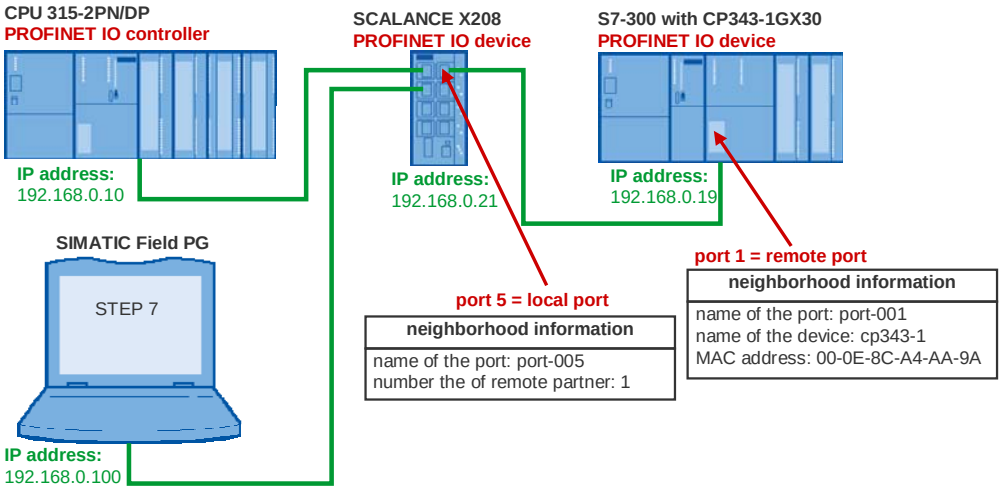

A train is lifted by 6 trestles. However, the trestles are always somewhere else. The topology can tell you which trestles are standing opposite each other and can be controlled accordingly.

You can read out the neighbor information of ports with SFB52 "RDREC" using data record number 802A (hex). In this way, you determine the topology data of the PROFINET IO nodes. You can evaluate and process this data in the user program.

# 2 Structure of the PROFINET IO system

## 2.1 Overview

Figure 2-1




## 2.2 Description

In this example, a S7-300 CPU 315-2PN/DP is used as PROFINET IO controller. In the PROFINET IO system of the CPU 315-2PN/DP, the following modules are used as PROFINET IO devices:

- SCALANCE X208 (6GK5 208-0BA10-2AA3)
- CP343-1 Advanced (6GK7 343-1GX30-0XE0)

The SIMATIC Field PG with STEP 7 is required to configure the PROFINET IO system.

The PROFINET IO controller and the PROFINET IO devices are in the same IP subnetwork. The following IP addresses are used in this example.

Table 2-1

| Device | IP address | Subnet mask |
|---|---|---|
| SIMATIC Field PG | 192.168.0.100 | 255.255.255.0 |
| CPU 315-2PN/DP | 192.168.0.10 | 255.255.255.0 |
| SCALANCE X208 | 192.168.0.21 | 255.255.255.0 |
| CP343-1 Advanced | 192.168.0.19 | 255.255.255.0 |

Port 1 of the CP343-1 Advanced is connected to Port 5 of the SCALANCE X208.

In the user program of CPU 315-2PN/DP, the neighbor information is read out from Port 5 of the SCALANCE X208 with the system function block SFB52 "RDREC" using data record number 802A (hex). The neighbor information includes data from the local Port 5 of the SCALANCE X208 and from the remote Port 1 of the CP343-1 Advanced.

With the reading out of the neighbor information, the topology data is in the user program and can be evaluated.

In this example, the following neighbor information is required for evaluating and processing in the user program of the CPU 315-2PN/DP.

Table 2-2

| Topology data | Description | Value |
|---|---|---|
| Length of local port name | Length of name of Port 5 of the SCALANCE X208 | 8 |
| Name of the local port | Name of Port 5 of the SCALANCE X208 | port-005 |
| Number of remote partners | In this example, a PROFINET IO device, the CP343-1 Advanced, at Port 5 of the SCALANCE X208. | 1 |
| Length of remote port name | Length of name of Port 1 of the CP343-1 Advanced | 8 |
| Name of the remote port | Name of Port 1 of the CP343-1 Advanced | port-001 |
| Length of remote device name | Length of device name of CP343-1 Advanced | 5 |
| Remote device name | Device name of the CP343-1 Advanced connected to Port 5 of the SCALANCE X208 | cp343 |
| Remote MAC Address | MAC address of the CP343-1 Advanced connected to Port 5 of the SCALANCE X208 | 00-0E-8C-A4-AA-9A |

# 3 Configuration

## 3.1 S7 Program

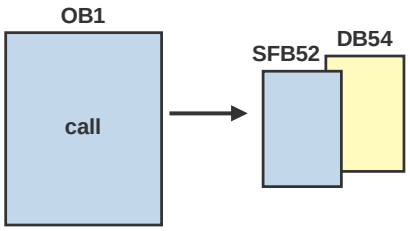
### Overview of the S7 program structure

In this example, the neighbor information is read out from Port 5 of the SCALANCE X208 with the system function block SFB52 "RDREC" using data record number 802A (hex).

The system function block SFB52 "RDREC" is located in the Standard Library → System Function Blocks → STEP 7 blocks.

SFB52 "RDREC" is called in the S7 program of the CPU315-2PN/DP that is acting as PROFINET IO controller.
The following Figure 3-1 shows the structure of the S7 program of the CPU315-2PN/DP.

Figure 3-1



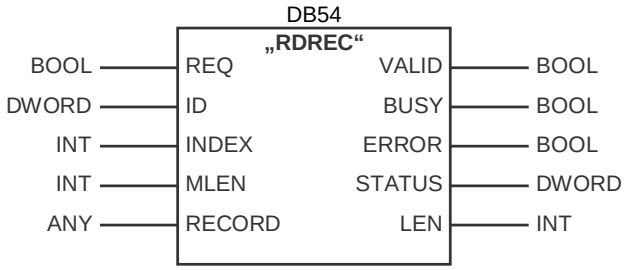

### Explanations for the S7 program

In the S7 program of the CPU 315-2PN/DP, the system function block SFB52 "RDREC" including the the instance data block DB54 is called cyclically in OB1.

## 3.2 Parameterizing SFB52 "RDREC"

### Parameterizing SFB52 "RDREC"

Figure 3-2




### Description

Using the SFB52 "RDREC" (read record), you read the data record with the number INDEX of the components addressed by ID. This can be a centrally slotted module or a distributed component (PROFINET DP or PROFINET IO).

In this example, you read data record number 802A (hex) from a distributed component. The distributed component is the SCALANCE X208 that is configured as a PROFINET IO device.

### Input parameters

The following table shows you an overview of the input parameters of the SFB52 "RDREC".

Table 3-1

| Parameters | Data type | Description |
|---|---|---|
| REQ | BOOL | REQ=1: perform data record transfer<br>REQ=0: end data record transfer |
| ID | DWORD | Diagnostic address |
| INDEX | INT | Data record number |
| MLEN | INT | Max. length in bytes of the data record data to be read |
| RECORD | ANY | Target area for the data record read |

### Output parameters

The following table shows you an overview of the output parameters of the SFB52 "RDREC".

Table 3-2

| Parameters | Data type | Description |
|---|---|---|
| VALID | BOOL | New data record has been received and is valid |
| BUSY | BOOL | BUSY=1: The read procedure has not yet finished |
| ERROR | BOOL | ERROR=1: An error has occurred in the read procedure |
| STATUS | DWORD | Block status and error information |
| LEN | INT | Length of data record data read |

### Parameterizing

Figure 3-3

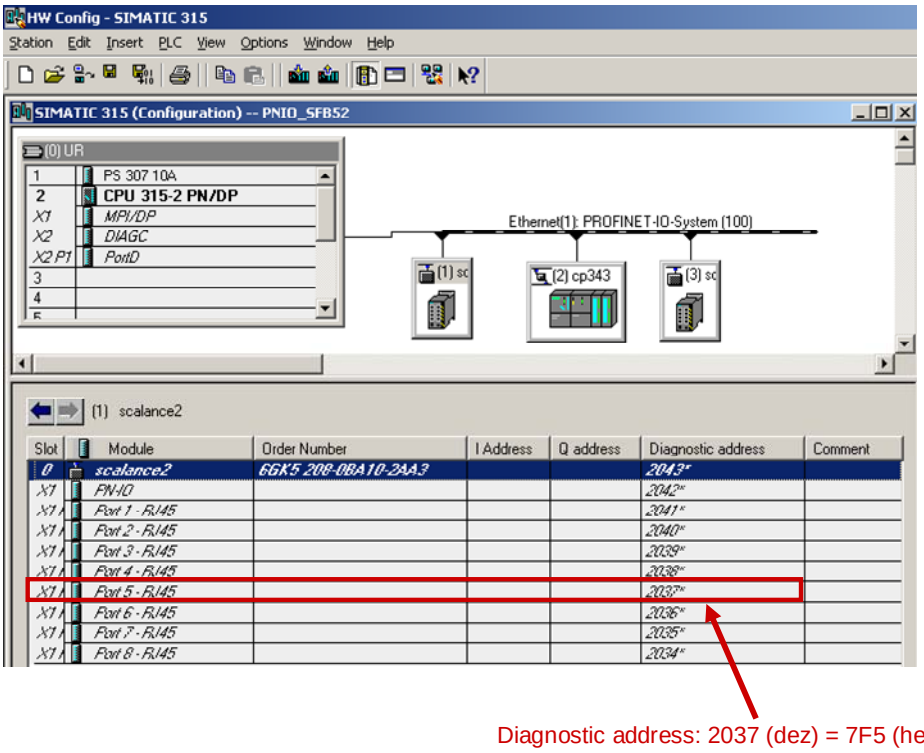
```
OB1 :   "Main Program Sweep (Cycle)"
Comment:
Network 1: Title:
Comment:

      L     W#16#802A
      T     MW   100

      CALL  "RDREC" , DB54
       REQ   :=M0.5
       ID    :=DW#16#7F5
       INDEX :=MW100
       MLEN  :=300
       VALID :=M110.0
       BUSY  :=M110.1
       ERROR :=M110.2
       STATUS:=MD112
       LEN   :=MW116
       RECORD:=P#DB10.DBX0.0 BYTE 300
```

SFB52 "RDREC" is parameterized as follows:

In this example, the input parameter REQ is controlled via the marker bit M0.5. Set the marker bit M0.5 = true to perform reading of data record number 802A (hex). Reset the marker bit M0.5 = false to end reading of data record number 802A (hex).

At input parameter ID you specify the diagnostics address of the port from which the neighbor information is to be read. In this case, the neighbor information is read from Port 5 of the SCALANCE X208. Thus, at the input parameter ID, you specify the diagnostics address 0x7F5 of Port 5 of SCALANCE X208. The address can be found in the hardware configuration of the CPU 315-2PN/DP (see Figure 3-4).

Figure 3-4




At the input parameter INDEX you specify the data record number 802A (hex). In this example, the data record number is buffered in the following memory area:

- Marker (the data record number is buffered in MW 100.)

Alternatively, you can buffer the data record number in the following memory areas:

- Data block
- Input
- Output

At the input parameter INDEX you specify the memory area in which the data record number is stored, e.g. MW 100.

Using the input parameter MLEN you define the maximum number of bytes you want to read. In this example a maximum of 300 bytes are read.

Select the target area RECORD that is at least as great as the maximum number of bytes to be read. In this example a data block is selected as target area, e.g. DB10. According to MLEN, it has a size of 300 bytes.

## 3.3 Structure of the data record data

The following table shows the structure of the neighbor information that is read out with SFB52 "RDREC" using data record number 802A (hex).

Table 3-3

| | Neighbor information | Data type | Value |
|---|---|---|---|
| Header | Block type | Word | 527 (dec) |
| | Data record length as from "High version" | Word | 68 (dec) |
| | High version | Byte | 1 (dec) |
| | Low version | Byte | 0 (dec) |
| | Spare | Byte | 0x00 |
| | Reserve | Byte | 0x00 |
| LLDP data of the local port | Slot number | Word | 0x0000<br>0x0000 – 0x7FFF<br>→ Number of submodules |
| | Subslot number | DWORD | 0x80050870<br>0x0001 – 0x7FFF<br>→ Number of the submodule<br>0x8000 – 0x8FFF<br>→ Number of the port in the submodule |
| | Length of the port name = x | Byte | 8 (dec) |
| | Port name | 1-x char | port-005 |
| | Number of remote partners | Byte | 1 (dec) |
| | Fill up to data word limit | 0-3 bytes | 0x00 |
| LLDP data of the remote port | Length of remote port name = y | Byte | 8 (dec) |
| | Remote port name | 1-y char | port-001 |
| | Length of remote device name = z | Byte | 5 (dec) |
| | Remote device name | 1-z char | cp343 |
| | Fill up to data word limit | 0-3 bytes | 0x00 |
| | Line delay | DWORD | 0x00 |
| | Remote MAC address | Byte | 0x00 |
| | Remote MAC address | Byte | 0x0E |
| | Remote MAC address | Byte | 0x8C |
| | Remote MAC address | Byte | 0xA4 |
| | Remote MAC address | Byte | 0xAA |
| | Remote MAC address | Byte | 0x9A |
| | Reserve | Byte | 0x00 |
| | Reserve | Byte | 0x00 |
| Network data of the local port | MAU type transmission rate | Word | 0x0010 → Default value 100BASETXFD |
| | Reserve | Byte | 0x00 |
| | Reserve | Byte | 0x00 |

| | Neighbor information | Data type | Value |
|---|---|---|---|
| | Reserve | Byte | 0x00 |
| | Reserve | Byte | 0x00 |
| | Reserve | Byte | 0x00 |
| | Reserve | Byte | 0x00 |
| | Multicast restrictions | DWORD | 0x00000000<br>Bit 0=1 →block the multicast MAC address 01-0E-CF-00-02-00<br>Bit 1=1 →block the multicast MAC address 01-0E-CF-00-02-01<br>…<br>Bit 31=1 →block the multicast MAC address 01-0E-CF-00-02-1F |
| | LinkStatus.Link | Byte | 0x01 → Up<br>0x02 → Down<br>0x03 → Testing |
| | LinkStatus.Port | Byte | 0x01 → disable<br>0x02 → blocking<br>0x04 → learning<br>0x05 → forwarding<br>0x06→ broken |
| | Reserve | Byte | 0x00 |
| | Reserve | Byte | 0x00 |
| | Media type | DWORD | 0x00000000<br>→ unknown<br>0x00000001<br>→ copper cable<br>0x00000002<br>→ fiber optic cable<br>0x00000003<br>→ Radio communication |

**Note** If you connect a different PROFINET IO device instead of the CP343-1 Advanced at the Port 5 of the SCALANCE X208, the data record data is updated automatically. The neighbor information of the new PROFINET IO is displayed in DB10.

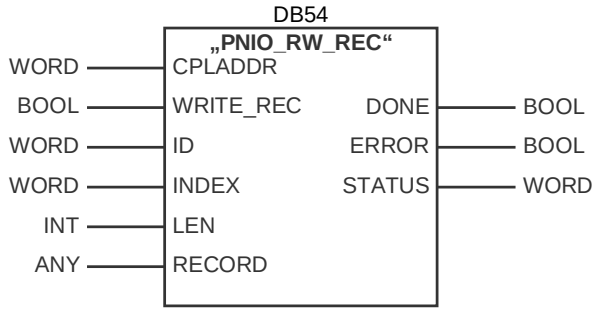
# 4 Alternative solution

## 4.1 CP343-1 as PROFINET IO Controller

If you use a CP343-1 as PROFINET IO controller, then you use the FB52 "PNIO_RW_REC" from the "SIMATIC_NET_CP" library to read and write data records.

### Overview of FB52 "PNIO_RW_REC"

Figure 4-1




### Input parameters

The following table shows you an overview of the input parameters of the FB52 "PNIO_RW_REC".

Table 4-1

| Parameters | Data type | Description |
|---|---|---|
| CPLADDR | WORD | Module start address |
| WRITE_REC | BOOL | WRITE_REC=1: write data record<br>WRITE_REC=0: read data record |
| ID | WORD | Diagnostics address |
| INDEX | WORD | Data record number |
| LEN | INT | Length of data record read in bytes (maximum length is 480 bytes). |
| RECORD | ANY | Target area for the data record read |

### Output parameters

The following table shows you an overview of the output parameters of the FB52 "PNIO_RW_REC".

Table 4-2

| Parameters | Data type | Description |
|---|---|---|
| DONE | BOOL | DONE=1: data record transferred successfully |
| ERROR | BOOL | ERROR=1: an error has occurred in the read or write procedure |
| STATUS | WORD | Block status and error information |

## 4.2 Difference between SFB52 "RDREC" and FB52 "PNIO_RW_REC"

With SFB52 "RDREC" the INDEX input parameter is an INTEGER. The data record number 802A is a hexadecimal value. If you want to specify this directly at the input parameter INDEX, you must first convert the data record number.

With FB52 "PNIO_RW_REC" the INDEX input parameter is a WORD. Here, you can specify the data record number directly as hexadecimal value (W#16#802A) at the input parameter INDEX.