DC DRIVE - PRODUCT INFORMATION

Quick start-up guide – PROFINET IO - DCS880 and FENA-21/FPNO-21

Connection of DCS880 via FENA-21/FPNO-21 with PROFINET IO

Table of contents

General Information

After the adapter module FENA-21 or FPNO-21 has been mechanically and electrically installed according to the instructions in chapters Mechanical installation and Electrical installation of the fieldbus adapter manual, which is used (see Related documents), the communication between the drive and the module must be set-up.

The detailed procedure of activating the module for PROFINET IO communication with the drive depends on the drive type. The PROFINET parameters in the device requires setting to establish the communication to the PLC. The following manual gives DCS880 specific start-up instructions.

Once communication between the drive and the adapter module has been established, several configuration parameters are shown to the user. These parameters are listed in chapter DCS880 configuration as fieldbus device and must be checked first and adjusted wherever necessary. Parameters can be adjusted via the control panel or by Drive Composer.

Note: The new parameter settings take effect only when power is cycled or when the fieldbus adapter refresh parameter (51.27 or 54.27) is used.

Related documents

A list of related manuals is provided in the DCS880 List of all manuals.
Additionally the FPNO-21 User manual provides further information regarding the communication profiles and parameter settings FPNO-21 PROFINET fieldbus adapter module User manual or for FENA-21 adapter in FENA-01/-11/-21 Ethernet adapter module User manual.

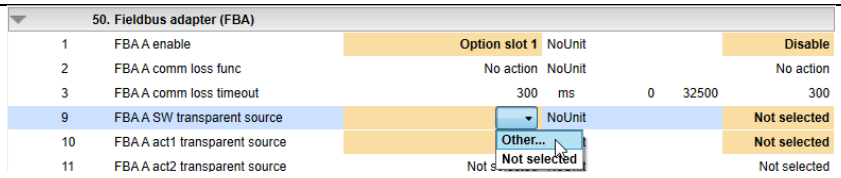
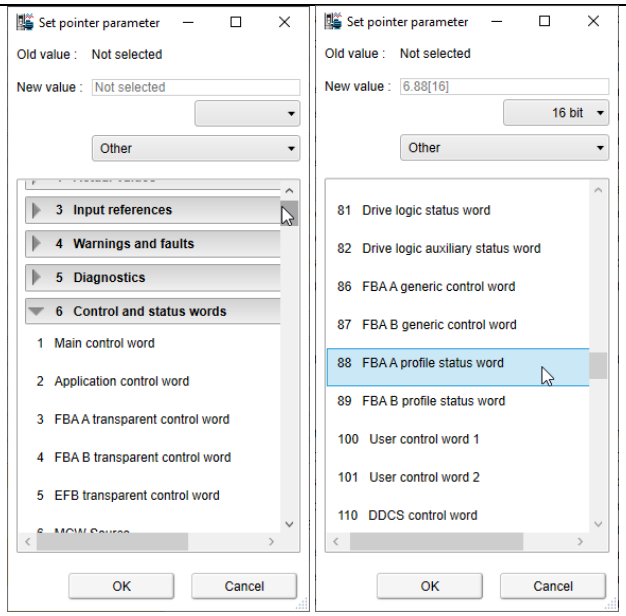
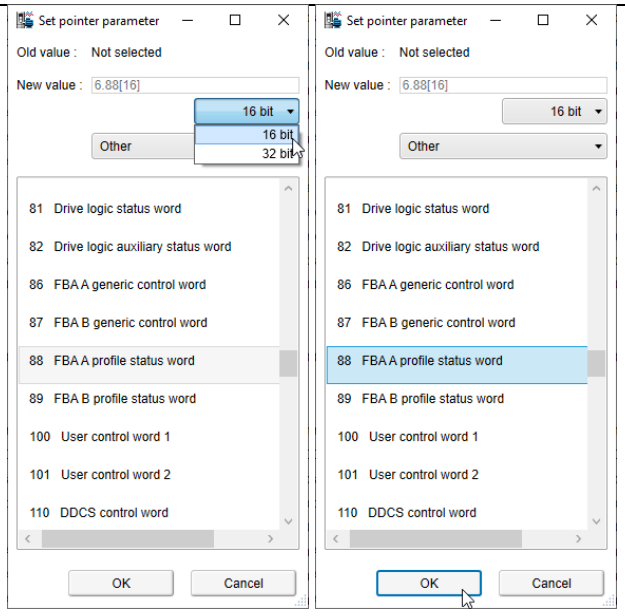
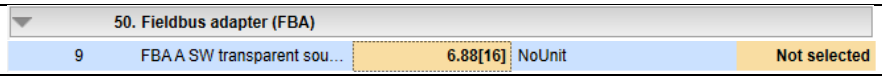
All information regarding DCS880 and compatible fieldbus communication adapters as well as example parameter files for FPNO-21 and FENA-21 configuration of the DCS880 can be found in DCS880 fieldbus options FW 2.05 and later or directly be downloaded here - FENA-21 default parameter set DCS880 3ADW000592 and FPNO-21 default parameter set DCS880 3ADW000593.

Firmware version

2.05.0.0 and higher.

Use the “Other...” function

E. g. connect 06.88 FBA A profile status word to 50.09 FBA A SW transparent source.

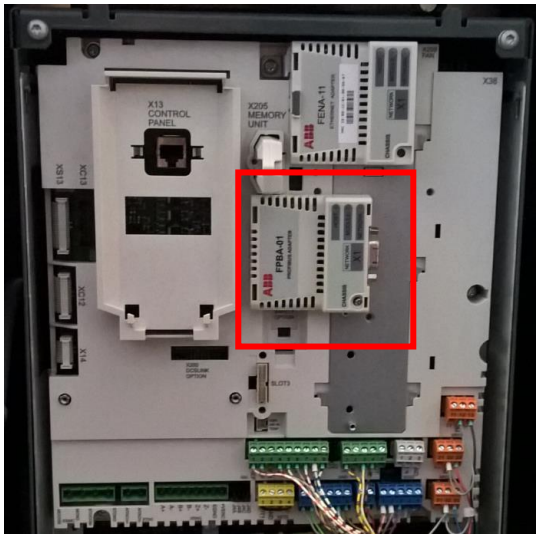
In 50.09 FBA A SW transparent source choose **Other...**	
Open **group 6** and choose parameter **06.88**:	
Choose **16 bit** and press **Ok**:	
Now the connection is established:	

DCS880 configuration as fieldbus device

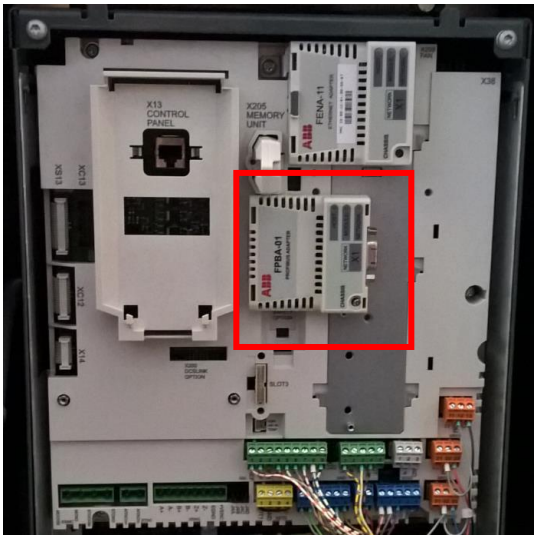
Configuration of the fieldbus adapter

Parameter group 50

To configure the DCS880 as a fieldbus device, the fieldbus adapter requires parameter configuration. In a DCS880 up to two fieldbus adapters can be configured. One as fieldbus adapter A (FBA A) and the other as fieldbus adapter B (FBA B). The following settings in Parameter group 50 will enable an FBA according to the installed slot and will read the F-series adapter information to adapt the parameter groups 51 FBA A settings or 54 FBA B setting accordingly.

Parameter	Setting
50.01 FBA A enable	**0**: Disable; **1**: Option slot1; **2**: **Option slot2**; here selected. **3**: Option slot3; 
50.02 FBA A comm loss func	**0**: No action; **1**: **Fault**; occurs only when the thyristor power controller is controlled from the fieldbus. **2**: Warning; **3**: Last speed; **4**: Speed reference safe; **5**: Fault always; occurs even though no control is expected from the fieldbus.
50.03 FBA A comm loss timeout	**300 ms**. (default)
50.29 FBA A Profile	**0: ABB Drive profile;** in case 51.02 Protocol/Profile = **PNIO T16**. **1**: **DCP**; in case 51.02 Protocol/Profile = **PNIO Pdrive**. **Note:** More information see chapter Communication profile.
⚠	Each change in parameter groups 50, 51, 52 and 53 must be validated using 51.27 FBA A par refresh = Refresh or for FBA B configuration 54.27 FBA B par refresh = Refresh.

Same is applicable for the FBA B configuration:

Parameter	Setting
50.31 FBA B Enable	**0**: Disable; **1**: Option slot1; **2**: **Option slot2**; here selected. **3**: Option slot3; 
50.32 FBA A comm loss func	**0**: No action; **1**: **Fault**; occurs only when the thyristor power controller is controlled from the fieldbus. **2**: Warning; **3**: Last speed; **4**: Speed reference safe; **5**: Fault always; occurs even though no control is expected from the fieldbus.
50.33 FBA A comm loss timeout	**300 ms**.
50.59 FBA A Profile	**0: ABB Drive profile;** in case 51.02 Protocol/Profile = **PNIO T16**. **1: DCP;** in case 51.02 Protocol/Profile = **PNIO Pdrive**. **Note:** More information see chapter Communication profile.
⚠	Each change in parameter groups 50, 51, 52 and 53 must be validated using 51.27 FBA A par refresh = Refresh or for FBA B configuration 54.27 FBA B par refresh = Refresh.

Parameter Group 51/54

Depending on the selected fieldbus adapter parameters (FBA A or FBA B) the communication settings for PROFINET IO must be configured in parameter group 51 for FBA A or parameter group 54 for FBA B. The below example shows the settings for PROFINET IO configured as FBA A in combination with the F-Series adapter FPNO-21 or FENA-21.

<table>
<tr><th>Parameter</th><th>Setting</th></tr>
<tr><td>51.01 FBA A type</td><td>FPNO/FENA; signal thus, read-only.</td></tr>
<tr><td>51.02 Protocol/Profile</td><td>Available profiles for PROFINET IO:
PNIO Pdrive; in case 50.29 FBA A profile = DCP.
PNIO ABB Pro; not recommended.
PNIO T16; in case 50.29 FBA A profile = ABB Drive profile.
PNIO T32; not recommended
PNIO PdriveM; NOT supported.</td></tr>
<tr><td>51.03 Commrate</td><td>Auto: sets the bit rate for the Ethernet interface.</td></tr>
<tr><td>51.04 IP configuration</td><td>Static IP: Static IP address according 51.05…51.08.
Dyn IP DHCP: Dynamic IP address.</td></tr>
<tr><td>51.05 IP address 1</td><td>192; example.</td></tr>
<tr><td>51.06 IP address 2</td><td>168; example.</td></tr>
<tr><td>51.07 IP address 3</td><td>1; example.</td></tr>
<tr><td>51.08 IP address 4</td><td>16; example.</td></tr>
<tr><td>51.09 Subnet CIDR</td><td>24; example.

<table>
<tr><th>CIDR</th><th>Dotted decimal</th><th>CIDR</th><th>Dotted decimal</th></tr>
<tr><td>31</td><td>255.255.255.254</td><td>15</td><td>255.254.0.0</td></tr>
<tr><td>30</td><td>255.255.255.252</td><td>14</td><td>255.252.0.0</td></tr>
<tr><td>29</td><td>255.255.255.248</td><td>13</td><td>255.248.0.0</td></tr>
<tr><td>28</td><td>255.255.255.240</td><td>12</td><td>255.240.0.0</td></tr>
<tr><td>27</td><td>255.255.255.224</td><td>11</td><td>255.224.0.0</td></tr>
<tr><td>26</td><td>255.255.255.192</td><td>10</td><td>255.192.0.0</td></tr>
<tr><td>25</td><td>255.255.255.128</td><td>9</td><td>255.128.0.0</td></tr>
<tr><td>24</td><td>255.255.255.0</td><td>8</td><td>255.0.0.0</td></tr>
<tr><td>23</td><td>255.255.254.0</td><td>7</td><td>254.0.0.0</td></tr>
<tr><td>22</td><td>255.255.252.0</td><td>6</td><td>252.0.0.0</td></tr>
<tr><td>21</td><td>255.255.248.0</td><td>5</td><td>248.0.0.0</td></tr>
<tr><td>20</td><td>255.255.240.0</td><td>4</td><td>240.0.0.0</td></tr>
<tr><td>19</td><td>255.255.224.0</td><td>3</td><td>224.0.0.0</td></tr>
<tr><td>18</td><td>255.255.192.0</td><td>2</td><td>192.0.0.0</td></tr>
<tr><td>17</td><td>255.255.128.0</td><td>1</td><td>128.0.0.0</td></tr>
<tr><td>16</td><td>255.255.0.0</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>51.19 T16 scale</td><td>99: Defines the scaling for reference 1 and actual 1 only with 51.02 Protocol/Profile = PNIO T16.
Ref type = Transparent FBA_A/B_Ref1 = Ref1_from_PLC * (T16_Scale + 1)
Here example 99 → (99 + 1) * Ref_from_PLC.</td></tr>
<tr><td>51.20 Telegram type</td><td>PPO3;
PPO4;
PPO6;
PPO7; example.
ST1; not recommended.
ST2; not recommended.</td></tr>
<tr><td>51.25 PN Name Index</td><td>Allows defining the PROFINET IO station name in the format: “abbdrive-xx”, where xx is the value of the parameter name index.</td></tr>
</table>

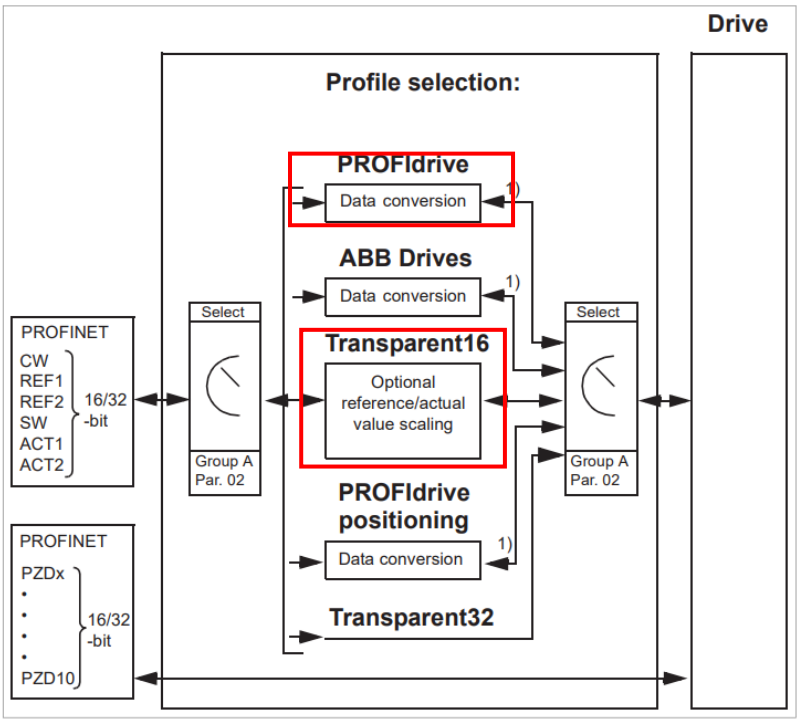
51.27 FBA A par refresh	Validates any changed adapter module configuration parameter settings. After refreshing, the value reverts automatically to 0 = Done. **Note:** This parameter cannot be changed while the drive is running.
51.32 FBA A comm SW ver	**Read-only**. Displays firmware patch and build number of the adapter module in the xxyy format, where: xx = patch number/yy = build number.
51.33 FBA A appl SW ver	**Read-only**. Displays firmware version of the adapter module in xxyy format, where: xx = major revision number/yy = minor revision number.

Communication profile for PROFINET IO

Communication profiles are ways of conveying control commands (control word, status word, references, and actual values) between the master station and the DC drive.
For DCS880 and PROFINET IO the following profiles are available:

- PROFIdrive.
- Transparent 16 (for ABB drives profile).

Attention: To use the typical ABB Drives profile for DCS880, the communication profile requires Transparent 16 setting. It is adapted to the ABB Drives profile (see table below) via the DC specific Data conversion using parameter 50.29.



Note: The diagram is applicable only when PPO messaging is used. If Standard Telegrams (ST) are used, the communication profile is selected automatically.

DCS880 settings profile dependent:

ABB Drives Profile	**50.29** FBA A Profile: **ABB Drives profile**	**50.59** FBA B Profile: **ABB Drives profile**
	51.02 FBA A Protocol/Profile: **PNIO T16**	**54.02** FBA B Protocol/Profile: **PNIO T16**
PROFIdrive	**50.29** FBA A Profile: **DCP**	**50.59** FBA B Profile: **DCP**
	51.02 FBA A Protocol/Profile: **PNIO Pdrive**	**54.02** FBA B Protocol/Profile: **PNIO Pdrive**

The following example will explain the configuration for the ABB Drives Profile via PNIO T16. For more information about different profile selection, please refer to the Fieldbus adapter manual for FPNO-21 or FENA-21.

Communication protocol for PROFINET IO

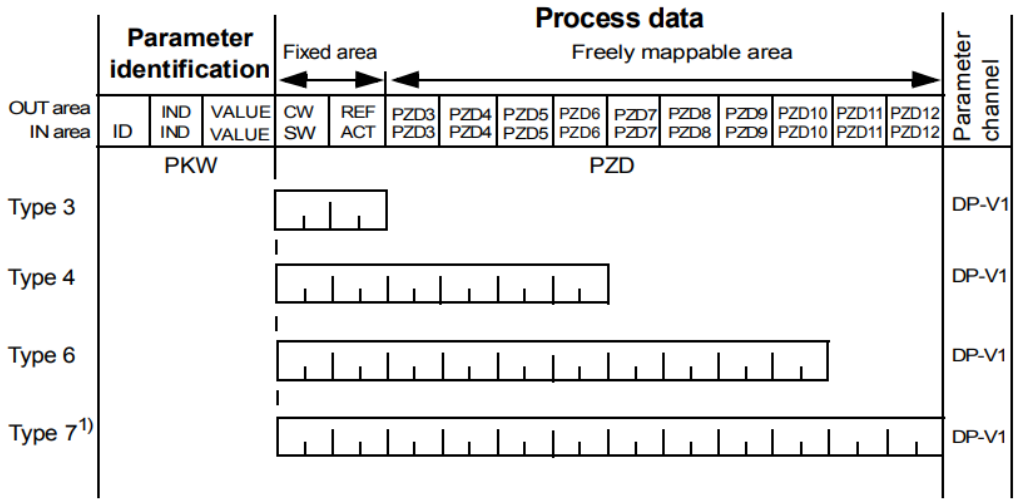
PROFINET IO with FPNO-21 and FENA-21 uses two different communication channels to exchange data:

- The standard UDP/IP and TCP/IP channel is used for parameterization and configuration of devices and for acyclic operations.
- The real time (RT) channel is used for cyclic data transfer and alarms.

The properties and services of a PROFINET IO device are described in a GSD file written in GSDML (General Station Description Markup Language). The GSD file describes the device-specific modules and the method of assigning modules and sub-modules to predefined slots and sub-slots.
The **GDSML** file can be downloaded for FENA-21 and for FPNO-21 (Link to webpage) or via this direct download links FENA-21 GSDML download or FPNO-21 GSDML download.

Cyclic message types

In this guide the cyclic communication of PROFINET IO will be used. For further information regarding the PROFINET IO protocol and profile types, please refer to the according manuals. The following picture shows the PPO-types and the process data mapping according to the selected type.



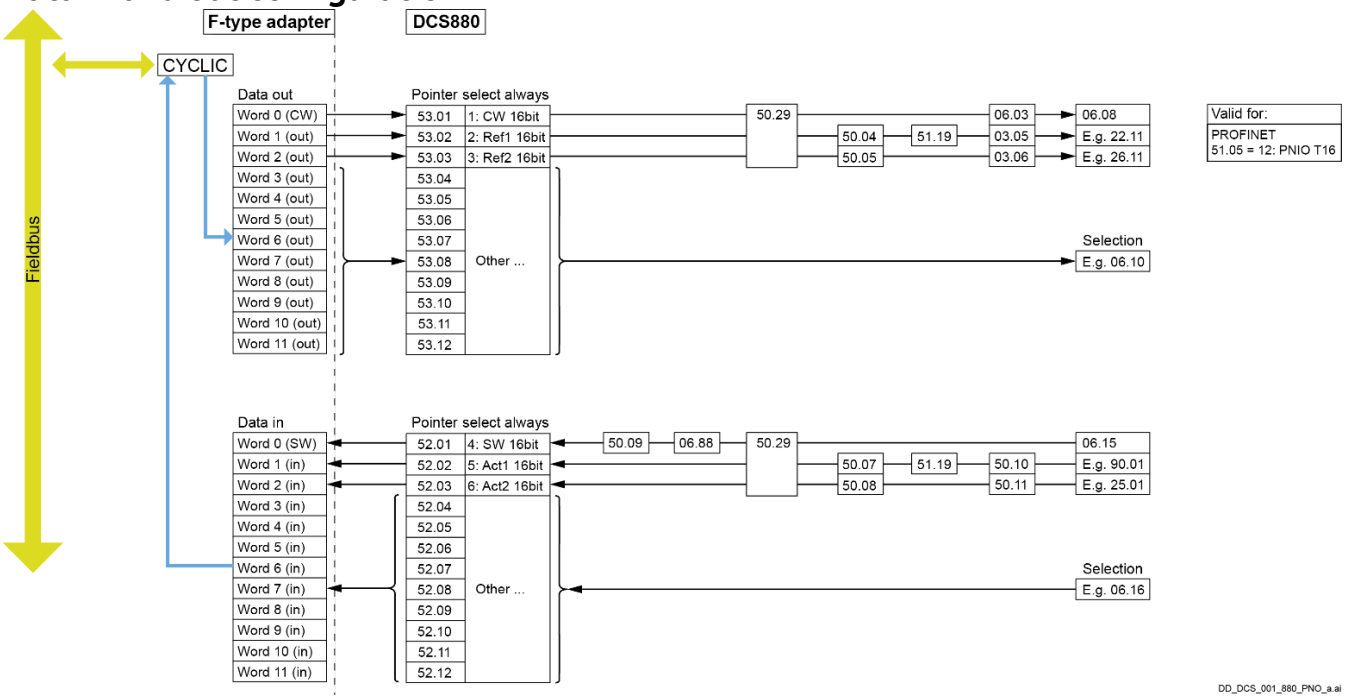
OUT area – Data sent from master to slave (control data)
IN area – Data sent from slave to master (actual data)

Parameter identification:
ID – Parameter identification
IND – Index for arrays
VALUE – Parameter value (Max. 4 bytes)
PKW – Parameter ID/value

Process data:
CW – Control word
SW – Status word
REF – Reference
ACT – Actual value
PZD – Process data (application-specific)
DW – Data word

In this configuration example the PPO-type PPO7 (parameter 51.20: PPO7) is used in combination with the PROFINET IO ABB Drives profile (50.29: ABB Drives profile & 51.02 PNIO T16).

Data in and out configuration



Data in configuration

⚠	Setting of parameters 52.01 ... 52.03 see above drawing. Do **not** use **Other...**!
	For parameters 52.04 ... 52.12 only mapping **Other...** is valid. Different mappings like SW 16bit, Act1 16bit or Act2 16bit are not allowed.

Defining the actual values in group 52: PLC ⇐ DCS880.			
PZD	**Pointer**	**Setting**	**Remarks**
1	**52.01**	4: **SW 16bit**;	For 50.29 FBA A profile = **ABB Drive profile** set: – 50.09 FBA A SW transparent source = **Other... =** e.g., **06.15[16]**, for 06.15 Main status word. For 50.29 FBA A profile = **DCP** set: – 50.09 FBA A SW transparent source = **Not selected** (default).
2	**52.02**	5: **ACT1 16bit**;	For 50.29 FBA A profile = **ABB Drive profile** set: – 50.10 FBA A SW transparent source = **Other... =** e.g., **01.01[16]**, for 01.01 Used motor speed filtered. For 50.29 FBA A profile = **DCP** set: – 50.10 FBA A SW transparent source = **Not selected** (default).
3	**52.03**	6: **ACT2 16bit**;	For 50.29 FBA A profile = **ABB Drive profile** set: – 50.11 FBA A SW transparent source = **Other... =** e.g., **25.01[16]**, for 25.01 Torque reference speed control. For 50.29 FBA A profile = **DCP** set: – 50.11 FBA A SW transparent source = **Not selected** (default).
4	**52.04**	**Other...**;	52.04 FBA data in4 = **Other... =** e.g., **06.16[16]**, for 06.16 Drive status word 1 (actual value 4). Scaling depends on signal/parameter.
	...	...	...
12	**52.12**	**Other...**;	52.12 FBA data in12 (actual value 12). Scaling depends on signal/parameter.
⚠	Each change in parameter groups 50, 51, 52 and 53 must be validated using 51.27 FBA A par refresh = Refresh.		

The following table shows the bytes send by the DCS880 drive to the PLC with the above example configuration:

01	02	03	04	05	06	07	08	…	…	23	24
Status Word		Speed feedback		Torque reference		Actual value 4		…		Actual value 12	

Data out configuration

⚠	Setting of parameters 52.01 ... 52.03 see above drawing. Do **not** use Other… CW/SW/ACT/REF are fixed by the communication protocol.
	For parameters 52.04 … 52.12 only mapping **Other…** is valid. Different mappings like SW 16bit, Act1 16bit or Act2 16bit are not allowed.

Defining the reference values in group 53: PLC ⇒ DCS880.			
PZD	**Pointer**	**Setting**	**Remarks**
1	**53.01**	1: **CW 16bit**;	For 50.29 FBA A profile = **ABB Drive profile** or **DCP**. – Control Word, visible in 06.03 FBA A transparent control word. Selected by 06.08 Main control word source = **FBA A**.
2	**53.02**	2: **Ref1 16bit**;	For 50.29 FBA A profile = **ABB Drive profile** set: – Scaling by 50.04 FBA A ref1 type = **Auto** (default). – 51.19 T16 scale = **99**; sets the multiplier (multiplier = 51.19 + 1). – Reference value 1, visible in 03.05 FBA A reference 1. – Selected e. g. by 22.11 Speed reference 1 source = **FBA A reference 1**. For 50.29 FBA A profile = **DCP** set: – Reference value 1, visible in 03.05 FBA A reference 1. – Selected e. g. by 22.11 Speed reference 1 source = **FBA A reference 1**.
3	**53.03**	3: **Ref2 16bit**;	For 50.29 FBA A profile = **ABB Drive profile** set: – Scaling by 50.05 FBA A ref2 type = **Auto** (default). – Reference value 2; visible in 03.06 FBA A reference 2. – Selected e. g. by 26.11 Torque reference 1 source = **FBA A reference 2**. For 50.29 FBA A profile = **DCP** set: – Reference value 2; visible in 03.06 FBA A reference 2. – Selected e. g. by 26.11 Torque reference 1 source = **FBA A reference 2**.
4	**53.04**	**Other…**;	53.04 FBA data out4 = **Other… = 06.10[16]**, for, e. g. 06.10 Auxiliary control word 1 (reference value 4). Scaling depends on parameter.
…	…	…	…
12	**53.12**	**Other…**;	53.12 FBA data out12 (reference value 4). Scaling depends on parameter.
⚠	Each change in parameter groups 50, 51, 52 and 53 must be validated using 51.27 FBA A par refresh = Refresh.		

The following table shows the bytes received by the DCS880 drive from the PLC with the above example configuration:

01	02	03	04	05	06	07	08	…	…	23	24
Control Word		Speed reference		Torque reference		Reference value 4		…		Reference value 12	

Status-, control word and reference handling

After configuration of the fieldbus adapter and setting the communication profile, the correct control mode and reference handling is required.

Control word

Therefore, the main control word (MCW) source should be linked to the receiving control word (CW):

6. Control and status words				
8	Main control word source	FBA A	NoUnit	None

To switch on the DCS880 via the control word from the PLC, the command location must be mapped to the PLC control word. This can be done via parameter group **20. Start/Stop/Direction**:

20. Start/Stop/Direction				
1	Command location	Main control word	NoUnit	Local I/O

References

The reference for the speed or torque controller of the DCS880 can be send individually. In this example speed reference is send form PLC to the DC drive via FBA A Ref 1.

22. Speed reference selection				
11	Speed reference 1 source	FBA B reference 1	NoUnit	AI1 scaled

The operation mode of the drive can be checked via Actual operation mode 19.01:

19. Operation mode				
1	Actual operation mode	Speed	NoUnit	Speed

Status word

The status word can be mapped directly to the communication profile via parameter 50.09 FBA SW transparent source. Here as example the 06.15 Main status word is transmitted to the PLC.

6. Control and status words						
15	Main status word	0x0331	NoUnit	0x0000	0xffff	0x0000

For the transparent 16 profile (51.02 or 54.02 = **PNIO T16**) the control and status word are visible in parameters 06.86 to 06.89:

6. Control and status words						
86	FBA A generic control word	0x0476	NoUnit	0x0000	0xffff ffff	0x0000
87	FBA B generic control word	0x0000	NoUnit	0x0000	0xffff ffff	0x0000
88	FBA A profile status word	0x0331	NoUnit	0x0000	0xffff	0x0000
89	FBA B profile status word	0x0000	NoUnit	0x0000	0xffff	0x0000

Actual values

For the Transparent 16 profile – which is used to achieve ABB Drives Profile via DC specific conversion parameter 50.29, the parameters 50.09, 50.10 and 50.11 can be used to select the required actual values for sending them to the PLC.

	50. Fieldbus adapter (FBA)			
9	FBA A SW transparent sou...	6.15[16]	NoUnit	Not selected
10	FBA A act1 transparent so...	1.1[16]	NoUnit	Not selected
11	FBA A act2 transparent so...	1.17[16]	NoUnit	Not selected

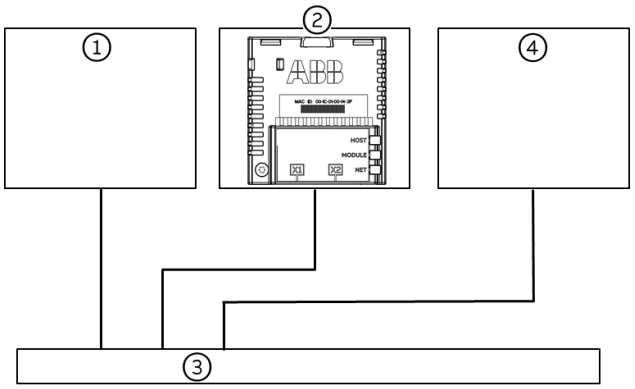
Scaling and profile selection

For ABB Drives Profile via Transparent 16 profile or PROFIdrive profile the scaling can be selected via the following parameters. The Transparent 16 profile and reference/actual value scaling and can be adapted with 51.19 or 54.19 – T16 scaling according to the description shown in chapter Parameter Group 51/54.
Reference and actual value scaling depend on profile- and parameter selection.
All reference values are scaled to ±10.000 (decimal), this equals ±100.00 %. The exception is speed. The scaling value of 46.02 M1 speed scaling actual corresponds to 20.000 speed units.

Parameter	Setting
50.04 FBA A ref1 type **50.05 FBA A ref2 type** **50.07 FBA A act1 type** **50.08 FBA A act2 type**	0: **Auto**; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied. 1: **Transparent**; no scaling is applied (1 = 1.00). 2: **General**; generic reference with a scaling of 100 = 1 (e. g. integer and two decimals). 3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual. 4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual. 5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.

Example configuration PLC – ABB AC500

In this configuration example the following star topology is used. The ABB AC500 PLC and the PC for PLC configuration, in this example shown here, are connected via a switch/router.



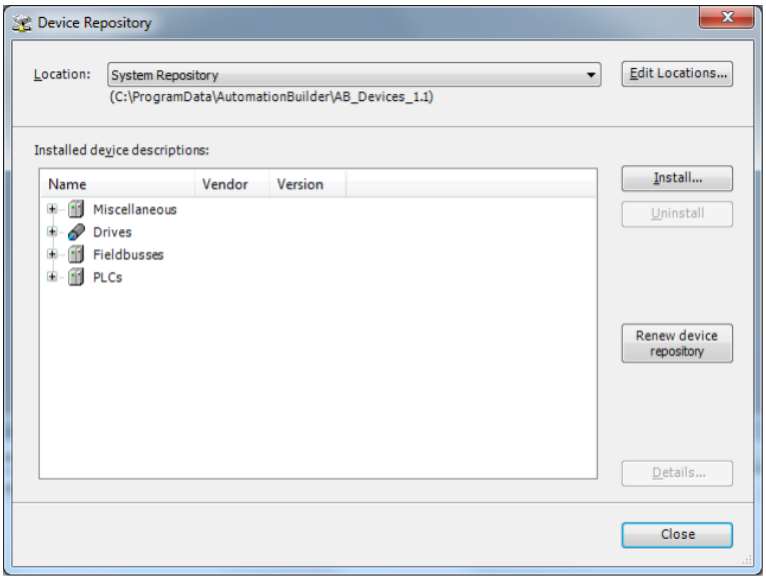
1) Other devices.
2) FPNO-21 /FENA-21 connected to a DCS880.
3) Switch or Router.
4) ABB AC500 PLC

Network configuration for PROFINET IO

This example shows how to configure PROFINET IO communication between an ABB AC500 PLC and the adapter module FENA-21 using Automation builder. The same procedure is applicable for FPNO-21 adapter module.

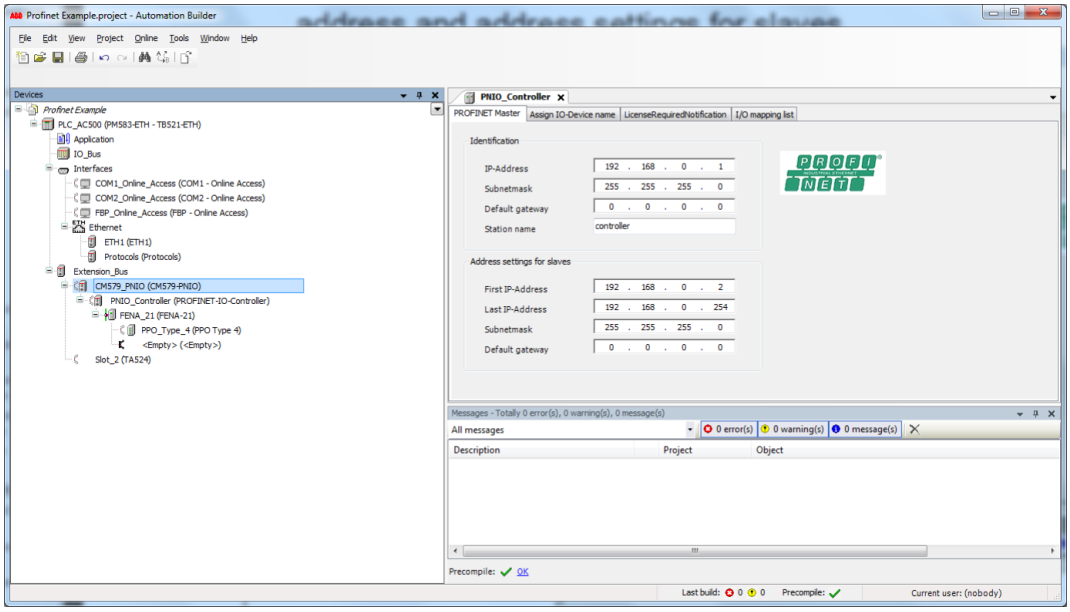
Before you start, make sure that you have downloaded the FENA-21/FPNO-21 GSD file from the Document library.

1. Start the Automation Builder software.
2. On the Tools menu, select Device Repository.
3. In the window that opens, click Install... and browse for the GSD-file.

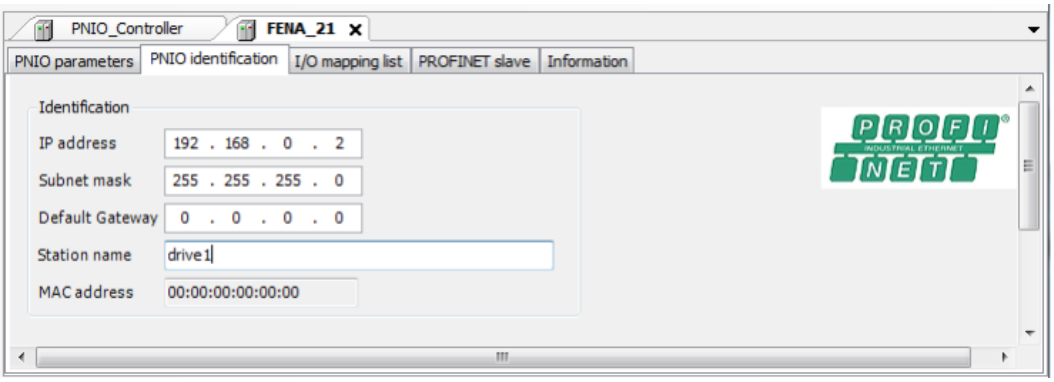


4. Open or create the PLC project that is used to control the drive.

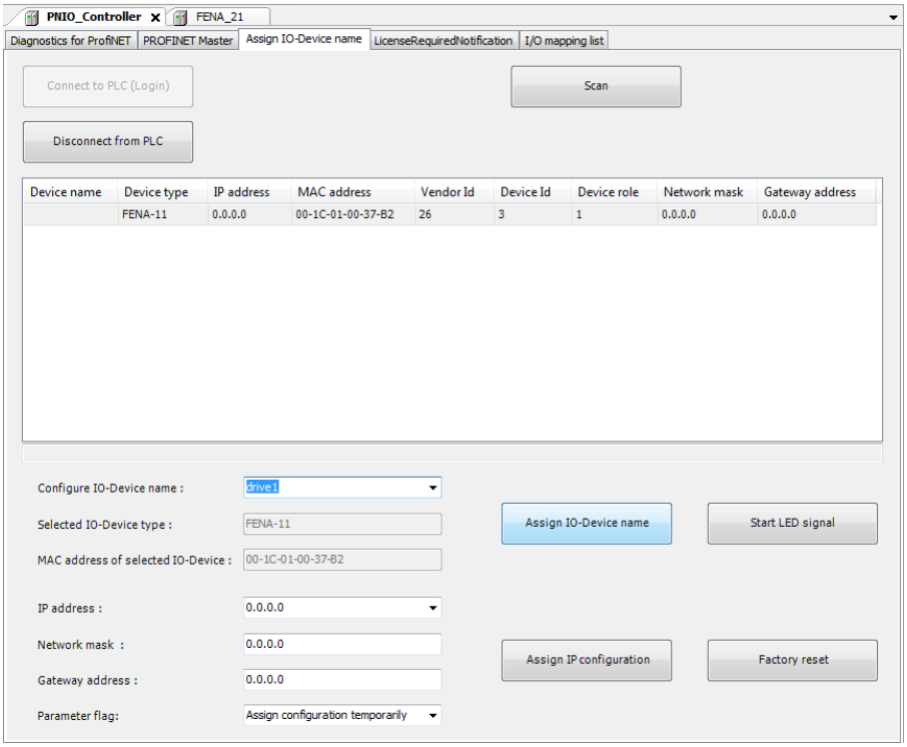
5. Add the CM579-PNIO PROFINET master device to the PLC project, if necessary.
6. Add the adapter module to the PROFINET IO network.
7. Add the I/O module, for example, PPO Type 4 to the adapter module to define cyclical communication between the module and the PLC.
8. Define the CM579-PNIO master properties, such as the IP address and address settings for slaves.



9. Define the adapter module properties: On the PNIO identification tab, select the IP address and Subnet mask, and type the Station name. **Note:** Use only small letters and arabic numbers for the Station name.



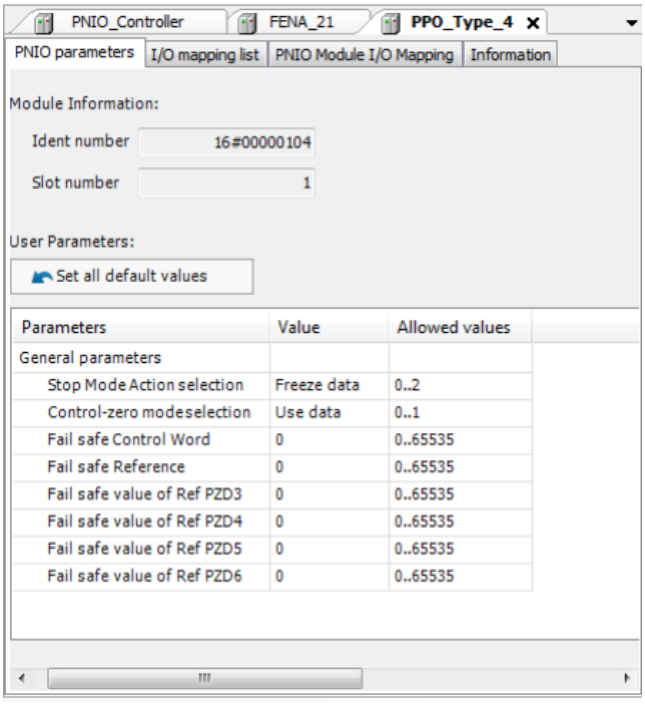
10. Open the PLC program.
11. Compile the project and download it to the PLC. This is necessary for you to be able to configure the CM579-PNIO master device and allow it to scan the network.
12. Return to the CM579-PNIO master properties. On the Assign station name tab, do the following tasks: Click Connect to PLC (Login) and select the communication link used between Control Builder and the PLC. Then, click Scan slaves to find all PROFINET slaves connected to the network.

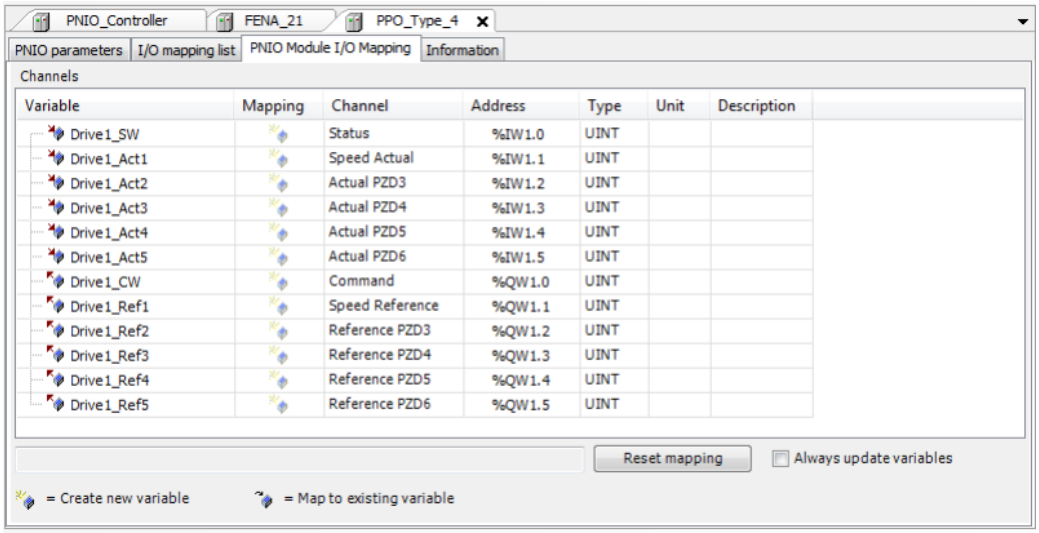


- In the **Configure station name** box, select the station name defined for the module in step 9, and then click **Assign station name**.
- In the **IP address** and **Network mask** boxes, select/type the IP address and subnet mask defined in step 9, and then click **Assign IP configuration**.

13. Define the I/O module properties:

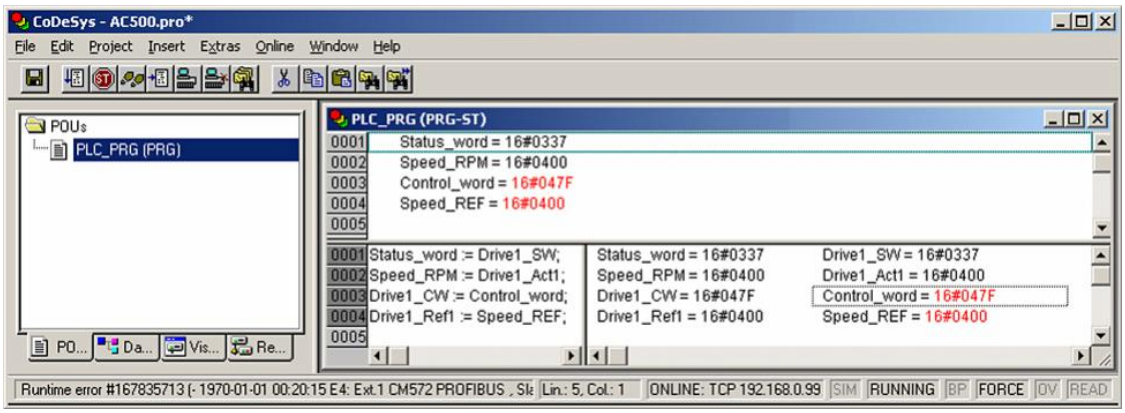
- On the PNIO parameters tab, configure the Stop mode and Control-zero mode functionalities, and define fail safe values for the PLC output process data (PZDs).
- On the **PNIO Module I/O Mapping** tab, type names for the variables that refer to the drive's signals in the PLC program.





14. Open the PLC program and create a program that controls the drive.
15. Compile the project and download it to the PLC.

    Note: Make sure that the variable names defined for the drive's signals are used in the PLC program, too. Otherwise, the communication will not work.



DCS Family

DCS550-S modules
The compact drive for machinery application

20 ... 1,000 A_{DC}
0 ... 610 V_{DC}
230 ... 525 V_{AC}
IP00

- Compact
- Robust design
- Adaptive and winder program
- High field exciter current

DCS880 modules
For safe productivity

20 ... 5,200 A_{DC}
0 ... 1,500 V_{DC}
230 ... 1,200 V_{AC}
IP00

- Safe torque off (STO) built in as standard
- Compact and robust
- Single drives, 20 A_{DC} to 5,200 A_{DC}, up to 1,500 V_{DC}
- IEC 61131 programmable
- Intuitive control panel and PC tool with USB connection and start up assistant
- Wide range of options to serve any DC motor application

DCS880-A enclosed converters
Complete drive solutions

20 ... 20,000 A_{DC}
0 ... 1,500 V_{DC}
230 ... 1,200 V_{AC}
IP21 – IP54

- Suitable for motoric and non motoric applications (e.g. electrolysis & hydrogen production)
- Individually adaptable to customer requirements
- User-defined accessories like external PLC or automation systems can be included
- High power solutions in 6- and 12-pulse up to 20,000 A_{DC}, 1,500 V_{DC}
- In accordance to usual standards
- Individually factory load tested
- Detailed documentation

DCT880 modules
Thyristor power controller

20 ... 4,200 A_{AC}
110 ... 990 V_{AC}
IP00

- Precise power control in industrial heating applications
- Two or three phase devices
- Power optimizer for peak load reduction
- Built on ABB's all-compatible drives architecture
- Intuitive control panel and PC tool with USB connection and start up assistant
- Application control programs and drive application programming with IEC 61131 programming

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