

**DX1000/DX1000N/DX2000
PROFIBUS-DP (/CP1)
Communication Interface**

vigilantplant®

Thank you for purchasing Daqstation DX1000, DX1000N, or DX2000 (Hereafter, called "DX").

This manual explains the PROFIBUS-DP (/CP1 option) communication function of the DX. Read this manual together with other User's Manuals (IM04L41B01-01E, IM04L42B01-01E, and IM04L41B01-17E).

Notes

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Revisions

November 2008: 1st Edition
March 2010: 2nd Edition
December 2010: 3rd Edition

Symbols Used in This Manual

- **Units**

- k: Denotes 1000. Examples: 5 kg, 100 kHz
- K: Denotes 1024. Example: 640 Kbytes

- **Cautionary notes**

In this User's Manual, cautionary notes are distinguished by the following symbols:



Refer to corresponding location on the instrument. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

WARNING

Calls attention to actions or conditions that could cause serious injury or death to the user, and precautions that can be taken to prevent such occurrences.

CAUTION

Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note

Calls attention to information that is important for proper operation of the instrumen

- **Bold characters**

Denotes key or character string that appear on the DX screen.

The symbol ◇ indicates the key operation and menu selection procedure on the DX.

Assumption of Explanation

The explanation in this manual assumes that the DX is connected via communications with Programmable Logic Controller (PLC). For information on how to operate PLCs, see the user's manual of respective products.

This manual is intended for those who have used an PROFIBUS-DP.

In this manual, the screens of the DX1000 are used. The content displayed on the DX2000 screens are not different from those displayed on the DX1000 screen.

Revision History

Edition	DX	Description
1	Release number 3 (Version 3.0x)	Newly published.
	Style number 3	
2	Release number 4 (Version 4.0x)	Additions and improvements to explanations.
	Style number 3	
3	Same as edition 2.	Fixed explanations.

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Introduction of Features

PROFIBUS-DP

PROFIBUS is an open field bus standard (IEC61158) used in various applications for factory automation and process automation.

PROFIBUS-DP (Decentralized Periphery) is used for communication between PLCs and remote I/O, enabling high-speed data transmission.

Configuration Components

PROFIBUS-DP network consists of following components:

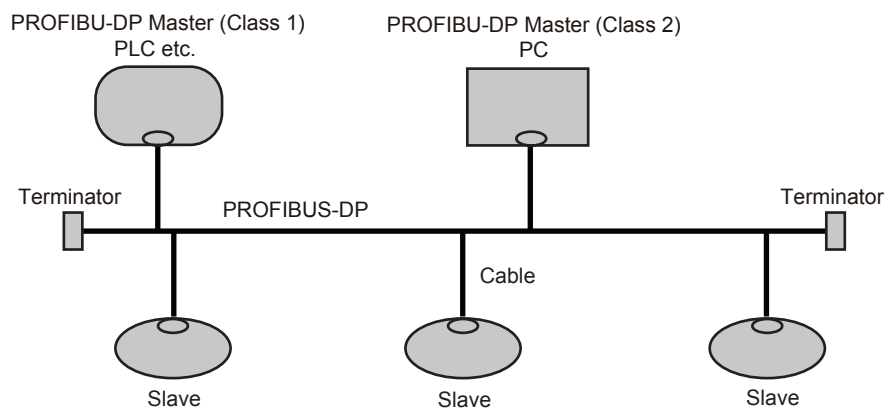
- Class 1 master
A controller to exchange information with the slave in a cyclic manner. This is a PLC or PC.
- Class 2 master
Engineering and configuration devices. This is either a PC on which configuration software has been installed or software itself.
- Slave
I/O devices accessed by the master. This includes I/O devices, sensors, or actuators. The DX is a slave device.
- Terminator
The terminator of the bus.
- Cable
A dedicated two-wire cable is used.
- Others
Repeater, coupler, and other components are also used if needed.

Note

127 nodes can be connected to the network.

Note

For details of PROFIBUS specifications and information, see the documents published from the PROFIBUS Organization in respective regions.



What the DX Can Do

The DX provides the following functions:

- Participate in an PROFIBUS-DP network as a PROFIBUS-DP slave.
- Communicate with a PLC from Siemens.
- The master can access internal data of the DX.

Data	Access
Measurement channel data	Read
Computation channel ^{*1} data	Read
Communication input data ^{**2}	Write

*1 This is an option (/M1 and /PM1).

*2 Communication input data, if coded in a calculation expression in the computation channel, can be displayed on the DX.

The following shows examples of usage.

- Data on devices on a network can be recorded by a PLC to the DX.
- Data measured by the DX can be acquired by a PLC.

Settings of the DX

The DX is ready to use after the node address settings have been made.

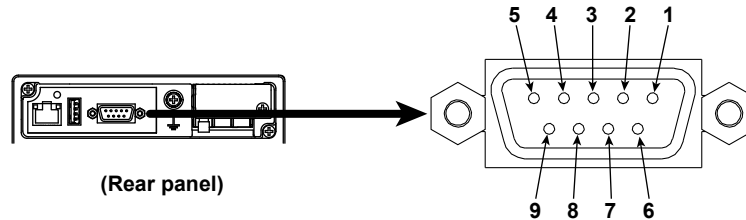
Access to the DX

The DX is a passive device on an PROFIBUS-DP. The DX cannot initiate a request. PLC, a class 1 master device, initiates a request and accesses the DX.

Connection to the PROFIBUS-DP Network

Cable Connection

Connect the PROFIBUS-DP cable to a PROFIBUS-DP connector provided on the back of the DX.



Connector

D-sub 9-pin (female) connector. Each pin corresponds to the following signals.

Pin	Signal name	Explanation
3	RxD/TxD - P	Positive data receive/transmit.
4	CNTR - P	RTS (for use by repeater).
5	DGND	Ground.
6	VP + 5 V	+ 5 V.
8	RxD/TxD - N	Negative data receive/transmit.

Pins 1, 2, 7, and 9 are not used.

Cable

A dedicated two-wire cable is used (two wires for the signal). This is not supplied with the DX. To be prepared separately.

Transmission Rate/Transmission Distance

The transmission rate varies depending on the transmission distance within the following range.

9.6 Kbps/1200 m to 12 Mbps/100 m

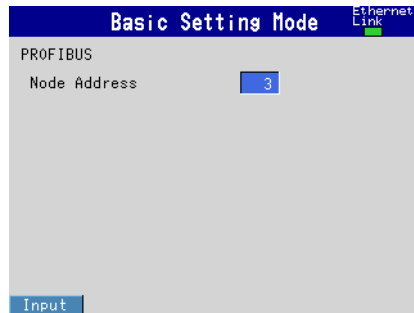
Terminator

The DX has no built-in terminator circuit. If a terminator is needed in terms of wiring, use a connector with a terminator.

Settings of the DX

Node Address Settings

- ◇ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (PROFIBUS)**.



- **Node Address**

Set a node address in the range of 0 to 125.

Note

The node address of PROFIBUS-DP can be checked on the Network Information Screen of the DX. You can open the Network Information Screen by pressing **FUNC** > **Network info** softkey.

Others

Status Output (option, /F1 and /F2)

If setting **Communication error** of the Status Output (/F1 or /F2 option) to **On**, a relay output is provided when a PROFIBUS-DP communication error occurs within the DX. If a communication error occurs, contact your nearest YOKOGAWA dealer for repairs.

See Section 2.9 of the *DX1000/DX1000N User's Manual (IM04L41B01-01E)* or *DX2000 User's Manual (IM04142B01-01E)*.

In Basic Setting Mode:

When the DX is in the basic setting mode, communications are available but input/output data is invalid.

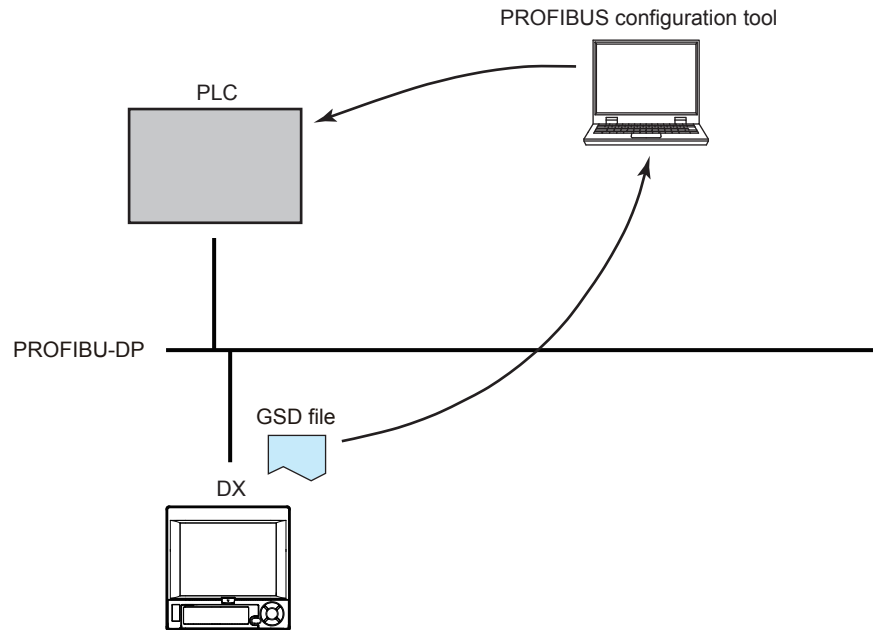
Preparation for PLC

GSD File

Installation

To have the DX participate in a network, you must first install the DX device database file (GSD file) in the configuration tool. A PLC communicates with the DX based on the information in the GSD file.

For information on using the configuration tool, see the configuration tool user's manual.



How to Obtain the GSD File

Obtain the GSD file from the Yokogawa Web site:

URL: www.yokogawa.com/ns/dxadv/download/

Contents of the GSD File

Contents other than those listed in the following table are omitted.

Item	Description
Model Name	Data Acquisition PROFIBUS I/F
Slave Family	0

Specification of Data

If you install the GSD file, the DX is added to the configuration tool as a "General" type "Slave". Select [Model] to expand the module list and select your DX model from the list.

Item	Explanation
Model	The model name described in the GSD file. Select the device to be configured from the model name of the "General" type and the "Slave" in the devices tree or list box.
Data Acquisition PROFIBUS I/F	
Module	The DX models are referred to as modules. Selecting the model "Data Acquisition PROFIBUS I/F" allows you to select a module.
DX1002	DX1002, DX1002N, without Option/M1 and /PM1
DX1002/M1	DX1002, DX1002N, with Option/M1 or /PM1
DX1004	DX1004, DX1004N, without Option/M1 and /PM1
DX1004/M1	DX1004, DX1004N, with Option/M1 or /PM1
DX1006	DX1006, DX1006N, without Option/M1 and /PM1
DX1006/M1	DX1006, DX1006N, with Option/M1 or /PM1
DX1012	DX1012, DX1012N, without Option/M1 and /PM1
DX1012/M1	DX1012, DX1012N, with Option/M1 or /PM1
DX2004	DX2004, without Option/M1 and /PM1
DX2004/M1	DX2004, with Option/M1 or /PM1
DX2008	DX2008, without Option/M1 and /PM1
DX2008/M1	DX2008, with Option/M1 or /PM1
DX2010	DX2010, without Option/M1 and /PM1
DX2010/M1	DX2010, with Option/M1 or /PM1
DX2020	DX2020, without Option/M1 and /PM1
DX2020/M1	DX2020, with Option/M1 or /PM1
DX2030	DX2030, without Option/M1 and /PM1
DX2030/M1	DX2030, with Option/M1 or /PM1
DX2040	DX2040, without Option/M1 and /PM1
DX2040/M1	DX2040, with Option/M1 or /PM1
DX2048	DX2048, without Option/M1 and /PM1
DX2048/M1	DX2048, with Option/M1 or /PM1

Communication Connection

You can establish a communication connection by using the configuraton tool and run it with a PLC. For information on using the configuration tool and a PLC, see the user's manuals of these products.

I/O Buffer and Data Mapping

A master device such as a PLC accesses internal data of the DX via the "Input buffer" and "Output buffer" of the DX. "Input" represents an input to the master, while "Output" represents an output from the master.

Mapping Method of the I/O buffer

The "Input buffer" and "Output buffer" of the DX for PROFIBUS-DP communication has 128 bytes each. Data is laid out as described in the following table. Data layout cannot be changed.

Buffer	Application	Description
Input	Reading measurement channel data and computation channel data	Locates all the measurement channel data from the top of the buffer. Locates as much computation channel data as possible in the remaining part of the buffer.

Buffer	Application	Description
Output	Writing communication input data	Locates as much communication input data as possible.

Data Count and Data Type

The DX data count is as follows:

Model	Measurement channel		Computation channel		Communication input data		
	Count	Number	Count	Number	Count	Number	
DX1002	2	001, 002	12	101 to 112	24	C01 to C24	
DX1004	4	001 to 004					
DX1006	6	001 to 006					
DX1012	12	001 to 012	24	101 to 124			
DX2004	4	001 to 004	60	101 to 112	60	C01 to C32 (C33 to C60) ^{*1}	
DX2008	8	001 to 008					
DX2010	10	001 to 010					
DX2020	20	001 to 020					
DX2030	30	001 to 030					
DX2040	40	001 to 040					
DX2048	48	001 to 048					
							101 to 127 (128 to 160) ^{*1}
							101 to 122 (123 to 160) ^{*1}
							101 to 117 (118 to 160) ^{*1}
			101 to 112 (113 to 160) ^{*1}				
			101 to 108 (109 to 160) ^{*1}				

*1 Data in parentheses cannot be located in a buffer because it exceeds the capacity of the I/O buffer.

Note

The communication input data for C01 to C24 (on the DX1000) or for C01 to C32 (on the DX2000) is reserved for PROFIBUS-DP.

You cannot write to these data numbers through other means (such as Modbus, EtherNet/IP, or communication commands).

Data Mapping

Data mapping for each model is shown in the table. The following symbols are used in the table.

Symbol	Explanation
CH1, CH2	Data of the measurement channel 1 or measurement channel 2.
CH101, CH112	Data of the computation channel 101 or computation channel 112.
C01, C24	Communication input data.
INT16	16-bit signed integer.
INT32_B	32-bit signed integer, BigEndian*.

* BigEndian: Assuming that a value of 01020304H is located as 01 02 03 04 in the buffer.

Note

- To acquire a physical value of the measurement channel data or computation channel data, it is necessary to obtain the decimal place and unit information in advance.
- The channel data or communication input data that cannot be allocated in the I/O buffer is not supported..

DX1002

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 7	CH101	INT32_B
8 – 11	CH102	
12 – 15	CH103	
16 – 19	CH104	
20 – 23	CH105	
24 – 27	CH106	
28 – 31	CH107	
32 – 35	CH108	
36 – 39	CH109	
40 – 43	CH110	
44 – 47	CH111	
48 – 51	CH112	
52 – 127	Always 0.	-

Mapping of the output buffer

Offset	Description	Data type
0 – 3	C01	INT32_B
4 – 7	C02	
8 – 11	C03	
12 – 15	C04	
16 – 19	C05	
20 – 23	C06	
24 – 27	C07	
28 – 31	C08	
32 – 35	C09	
36 – 39	C10	
40 – 43	C11	
44 – 47	C12	
48 – 51	C13	
52 – 55	C14	
56 – 59	C15	
60 – 63	C16	
64 – 67	C17	
68 – 71	C18	
72 – 75	C19	
76 – 79	C20	
80 – 83	C21	
84 – 87	C22	
88 – 91	C23	
92 – 95	C24	
96 – 127	Ignore anything that is written.	-

DX1004

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 11	CH101	INT32_B
12 – 15	CH102	
16 – 19	CH103	
20 – 23	CH104	
24 – 27	CH105	
28 – 31	CH106	
32 – 35	CH107	
36 – 39	CH108	
40 – 43	CH109	
44 – 47	CH110	
48 – 51	CH111	
52 – 55	CH112	
56 – 127	Always 0.	-

Mapping of the output buffer

Same as for the mapping of the DX1002 output buffer.

DX1006

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 15	CH101	INT32_B
16 – 19	CH102	
20 – 23	CH103	
24 – 27	CH104	
28 – 31	CH105	
32 – 35	CH106	
36 – 39	CH107	
40 – 43	CH108	
44 – 47	CH109	
48 – 51	CH110	
52 – 55	CH111	
56 – 59	CH112	
60 – 63	CH113	
64 – 67	CH114	
68 – 71	CH115	
72 – 75	CH116	
76 – 79	CH117	
80 – 83	CH118	
84 – 87	CH119	
88 – 91	CH120	
92 – 95	CH121	
96 – 99	CH122	
100 – 103	CH123	
104 – 107	CH124	
108 – 127	Always 0.	-

Mapping of the output buffer

Same as for the mapping of the DX1002 output buffer.

DX1012

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 17	CH9	
18 – 19	CH10	
20 – 21	CH11	
22 – 23	CH12	
24 – 27	CH101	
28 – 31	CH102	
32 – 35	CH103	
36 – 39	CH104	
40 – 43	CH105	
44 – 47	CH106	
48 – 51	CH107	
52 – 55	CH108	
56 – 59	CH109	
60 – 63	CH110	
64 – 67	CH111	
68 – 71	CH112	
72 – 75	CH113	
76 – 79	CH114	
80 – 83	CH115	
84 – 87	CH116	
88 – 91	CH117	
92 – 95	CH118	
96 – 99	CH119	
100 – 103	CH120	
104 – 107	CH121	
108 – 111	CH122	
112 – 115	CH123	
116 – 119	CH124	
120 – 127	Always 0.	-

Mapping of the output buffer

Same as for the mapping of the DX1002 output buffer.

DX2004

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 11	CH101	INT32_B
12 – 15	CH102	
16 – 19	CH103	
20 – 23	CH104	
24 – 27	CH105	
28 – 31	CH106	
32 – 35	CH107	
36 – 39	CH108	
40 – 43	CH109	
44 – 47	CH110	
48 – 51	CH111	
52 – 55	CH112	
56 – 127	Always 0.	-

Mapping of the output buffer

Offset	Description	Data type
0 – 3	C01	INT32_B
4 – 7	C02	
8 – 11	C03	
12 – 15	C04	
16 – 19	C05	
20 – 23	C06	
24 – 27	C07	
28 – 31	C08	
32 – 35	C09	
36 – 39	C10	
40 – 43	C11	
44 – 47	C12	
48 – 51	C13	
52 – 55	C14	
56 – 59	C15	
60 – 63	C16	
64 – 67	C17	
68 – 71	C18	
72 – 75	C19	
76 – 79	C20	
80 – 83	C21	
84 – 87	C22	
88 – 91	C23	
92 – 95	C24	
96 – 99	C25	
100 – 103	C26	
104 – 107	C27	
108 – 111	C28	
112 – 115	C29	
116 – 119	C30	
120 – 123	C31	
124 – 127	C32	

DX2008

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 19	CH101	NT32_B
20 – 23	CH102	
24 – 27	CH103	
28 – 31	CH104	
32 – 35	CH105	
36 – 39	CH106	
40 – 43	CH107	
44 – 47	CH108	
48 – 51	CH109	
52 – 55	CH110	
56 – 59	CH111	
60 – 63	CH112	
64 – 127	Always 0.	-

Mapping of the output buffer

Same as for the mapping of the DX2004 output buffer.

DX2010

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 17	CH9	
18 – 19	CH10	
20 – 23	CH101	INT32_B
24 – 27	CH102	
28 – 31	CH103	
32 – 35	CH104	
36 – 39	CH105	
40 – 43	CH106	
44 – 47	CH107	
48 – 51	CH108	
52 – 55	CH109	
56 – 59	CH110	
60 – 63	CH111	
64 – 67	CH112	
68 – 71	CH113	
72 – 75	CH114	
76 – 79	CH115	
80 – 83	CH116	
84 – 87	CH117	
88 – 91	CH118	
92 – 95	CH119	
96 – 99	CH120	
100 – 103	CH121	
104 – 107	CH122	
108 – 111	CH123	
112 – 115	CH124	
116 – 119	CH125	
120 – 123	CH126	
124 – 127	CH127	

Mapping of the output buffer

Same as for the mapping of the DX2004 output buffer.

DX2020

Mapping of the input buffer]

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 17	CH9	
18 – 19	CH10	
20 – 21	CH11	
22 – 23	CH12	
24 – 25	CH13	
26 – 27	CH14	
28 – 29	CH15	
30 – 31	CH16	
32 – 33	CH17	
34 – 35	CH18	
36 – 37	CH19	
38 – 39	CH20	
40 – 43	CH101	
44 – 47	CH102	
48 – 51	CH103	
52 – 55	CH104	
56 – 59	CH105	
60 – 63	CH106	
64 – 67	CH107	
68 – 71	CH108	
72 – 75	CH109	
76 – 79	CH110	
80 – 83	CH111	
84 – 87	CH112	
88 – 91	CH113	
92 – 95	CH114	
96 – 99	CH115	
100 – 103	CH116	
104 – 107	CH117	
108 – 111	CH118	
112 – 115	CH119	
116 – 119	CH120	
120 – 123	CH121	
124 – 127	CH122	

Mapping of the output buffer

Same as for the mapping of the DX2004 output buffer.

DX2030

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 17	CH9	
18 – 19	CH10	
20 – 21	CH11	
22 – 23	CH12	
24 – 25	CH13	
26 – 27	CH14	
28 – 29	CH15	
30 – 31	CH16	
32 – 33	CH17	
34 – 35	CH18	
36 – 37	CH19	
38 – 39	CH20	
40 – 41	CH21	
42 – 43	CH22	
44 – 45	CH23	
46 – 47	CH24	
48 – 49	CH25	
50 – 51	CH26	
52 – 53	CH27	
54 – 55	CH28	
56 – 57	CH29	
58 – 59	CH30	
60 – 63	CH101	
64 – 67	CH102	
68 – 71	CH103	
72 – 75	CH104	
76 – 79	CH105	
80 – 83	CH106	
84 – 87	CH107	
88 – 91	CH108	
92 – 95	CH109	
96 – 99	CH110	
100 – 103	CH111	
104 – 107	CH112	
108 – 111	CH113	
112 – 115	CH114	
116 – 119	CH115	
120 – 123	CH116	
124 – 127	CH117	

Mapping of the output buffer

Same as for the mapping of the DX2004 output buffer.

DX2040

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 17	CH9	
18 – 19	CH10	
20 – 21	CH11	
22 – 23	CH12	
24 – 25	CH13	
26 – 27	CH14	
28 – 29	CH15	
30 – 31	CH16	
32 – 33	CH17	
34 – 35	CH18	
36 – 37	CH19	
38 – 39	CH20	
40 – 41	CH21	
42 – 43	CH22	
44 – 45	CH23	
46 – 47	CH24	
48 – 49	CH25	
50 – 51	CH26	
52 – 53	CH27	
54 – 55	CH28	
56 – 57	CH29	
58 – 59	CH30	
60 – 61	CH31	
62 – 63	CH32	
64 – 65	CH33	
66 – 67	CH34	
68 – 69	CH35	
70 – 71	CH36	
72 – 73	CH37	
74 – 75	CH38	
76 – 77	CH39	
78 – 79	CH40	
80 – 83	CH101	INT32_B
84 – 87	CH102	
88 – 91	CH103	
92 – 95	CH104	
96 – 99	CH105	
100 – 103	CH106	
104 – 107	CH107	
108 – 111	CH108	
112 – 115	CH109	
116 – 119	CH110	
120 – 123	CH111	
124 – 127	CH112	

Mapping of the output buffer

Same as for the mapping of the DX2004 output buffer.

DX2048

Mapping of the input buffer

Offset	Description	Data type
0 – 1	CH1	INT16
2 – 3	CH2	
4 – 5	CH3	
6 – 7	CH4	
8 – 9	CH5	
10 – 11	CH6	
12 – 13	CH7	
14 – 15	CH8	
16 – 17	CH9	
18 – 19	CH10	
20 – 21	CH11	
22 – 23	CH12	
24 – 25	CH13	
26 – 27	CH14	
28 – 29	CH15	
30 – 31	CH16	
32 – 33	CH17	
34 – 35	CH18	
36 – 37	CH19	
38 – 39	CH20	
40 – 41	CH21	
42 – 43	CH22	
44 – 45	CH23	
46 – 47	CH24	
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Mapping of the output buffer

Same as for the mapping of the DX2004 output buffer.

Specifications

Basic Specifications

Item	Specifications
Data mapping	See "I/O Buffer and Data Mapping".
Node address	0 to 125
Interface	PROFIBUS-DP-V0 Slave
Transmission media	Dedicated two-wire cable (two wire for the signal)
Transmission rate/Transmission distance	9.6 Kbps/1200 m to 12 Mbps/100 m
Terminator	Not built-in (External termination is required.)

The DX data update interval

The DX data is updated in a scan interval. However, it is not faster than 250 ms.

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