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ABB INDUSTRIAL DRIVES

# CIO-01 I/O module and distributed I/O bus

## User's manual





# CIO-01 I/O module and distributed I/O bus

User's manual

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**Further information**



# 1

## Safety instructions

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### Contents of this chapter

The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an optional module to a drive, converter or inverter. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

### Use of warnings and notes

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. Notes draw attention to a particular condition or fact, or give information on a subject.

The manual uses these warning symbols:

**WARNING!**

Electricity warning tells about hazards from electricity which can cause injury or death, or damage to the equipment.

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**WARNING!**

General warning tells about conditions other than those caused by electricity, which can cause injury or death, or damage to the equipment.

---

**WARNING!**

Electrostatic sensitive devices warning tells you about the risk of electrostatic discharge which can cause damage to the equipment.

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## General

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### **WARNING!**

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

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Obey all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in [ACS880 liquid-cooled multidrive cabinets and modules safety instructions \(3AXD50000048633 \[English\]\)](#).
- Read the **software-function-specific warnings and notes** before changing the default settings of a function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read the **task-specific safety instructions** before starting the task. See the section describing the task.



For single drives, the complete safety instructions are given at the beginning of the hardware manual.

## Safety during operation

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### **WARNING!**

If the drive trips due to fan speed under limit (206.7 Fan speed fault limit), the PWM signal for controlling the fan will remain at nominal reference speed, which may lead to a restart of the fan even though the drive remains tripped.

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# Introduction to the manual

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## Contents of this chapter

This chapter contains information on the applicability and intended audience.

### Applicability

This document is applicable to the CIO-01 I/O module, later CIO module, and distributed I/O bus. It contains hardware and firmware information specific to them. CIO module is applicable to ACS880 liquid cooled cabinets and modules with the following control programs:

- ACS880 primary control program (v2.9x or later)
- ACS880 diode supply control program (ADILX v2.5x or later)
- ACS880 IGBT supply control program (AISLX v2.7x or later)
- ACS880 DC/DC converter control program (ADCLX v2.7x or later)
- ACS880 brake control program (ABCLX v2.7x or later).

### Compatibility

CIO module is compatible with the cooling fans used in the ACS880 liquid cooled drives.

### Target audience

This manual is intended for people who:

- design, install or commission a distributed I/O bus
  - do maintenance or fault tracing work on the distributed I/O bus.
-

## Terms and abbreviations

Term	Description
BCU	Type of control unit
CIO	I/O module for controlling cooling fans
DDCS	Distributed drives communication system protocol
DI	Digital input
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object. For example, variable, constant, or signal.
UCU	Type of control unit

## Cyber security disclaimer

This product can be connected to and communicate information and data via a network interface. The HTTP protocol, which is used between the commissioning tool (Drive Composer) and the product, is an unsecured protocol. For independent and continuous operation of product such connection via network to commissioning tool is not necessary. However it is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, prevention of physical access, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Notwithstanding any other provision to the contrary and regardless of whether the contract is terminated or not, ABB and its affiliates are under no circumstances liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

## Related documents

You can find manuals on the Internet. See below for the relevant code/link. For more documentation, go to [www.abb.com/drives/documents](http://www.abb.com/drives/documents).

	Manuals for ACS880 multidrives cabinets
	Manuals for ACS880 multidrives modules



# 3

## **Hardware description and operation principle**

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### **Contents of this chapter**

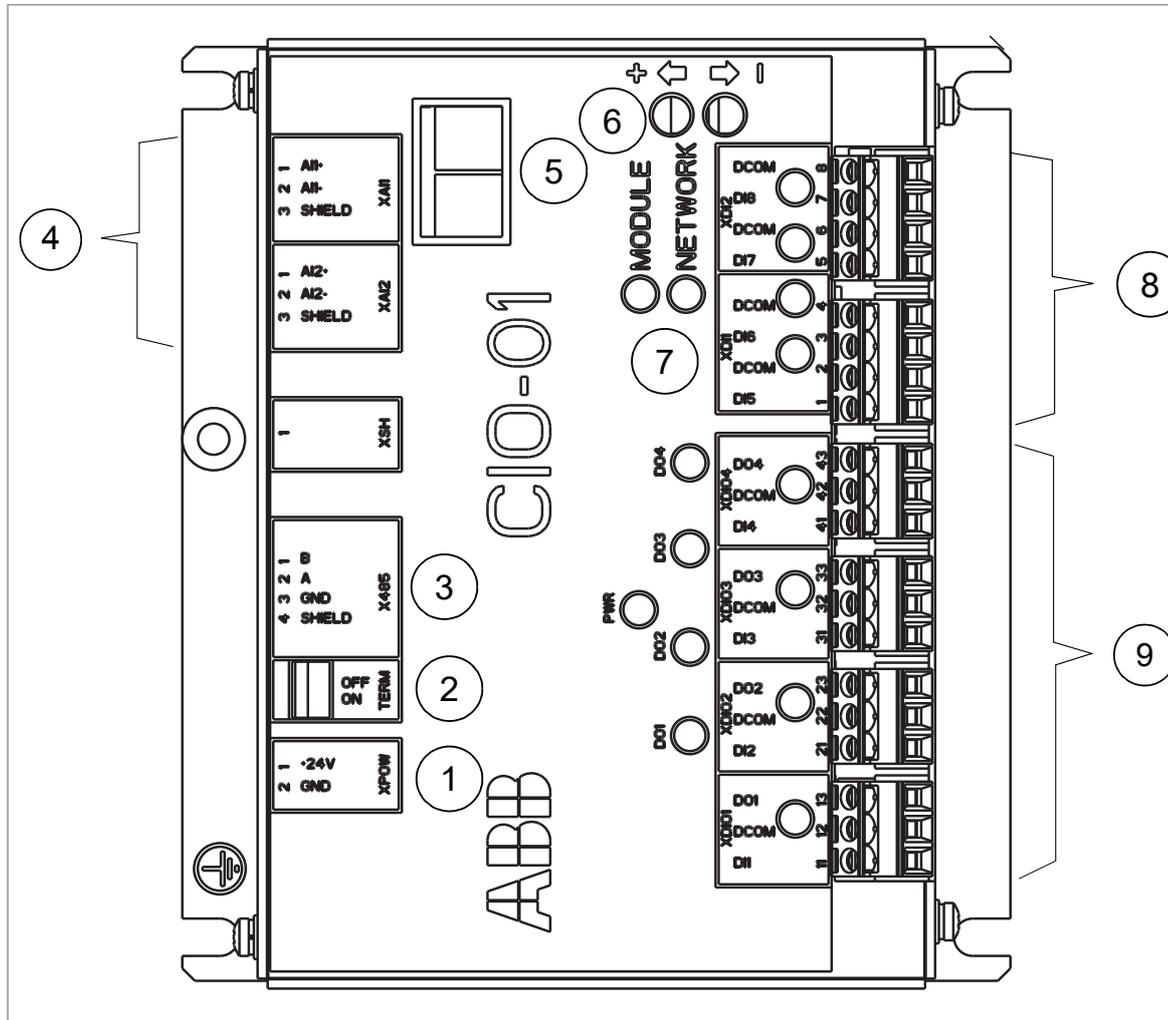
This chapter describes the CIO module and the distributed I/O bus.

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## Product overview

### ■ Layout drawing of CIO module

The following figure shows the layout of the CIO module.

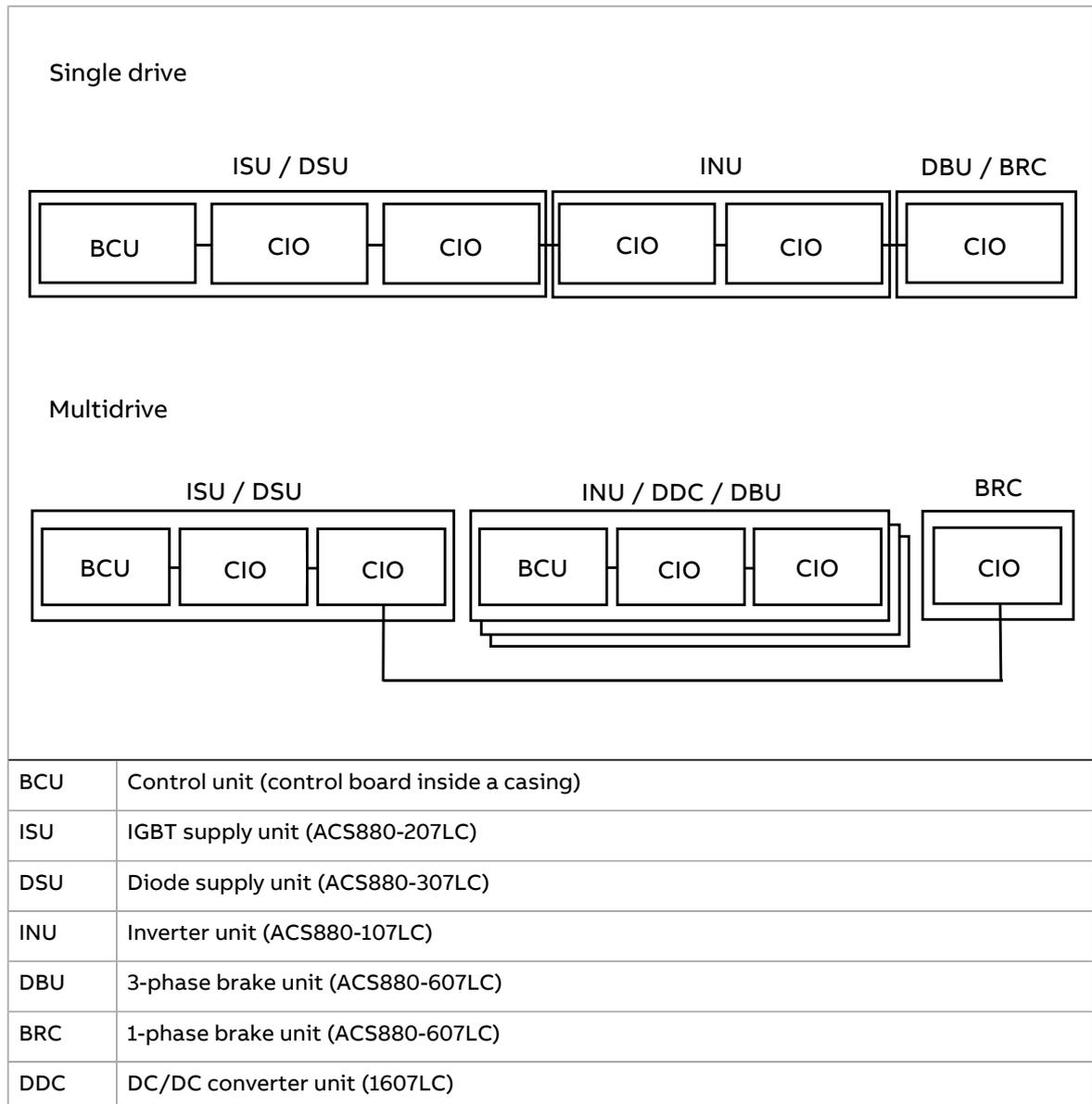


1.	Power supply XPOW
2.	I/O bus termination resistor switch
3.	RS-485 communication link (I/O bus)
4.	Analog inputs XAI1, XAI2
5.	7-segment displays for node number (1...99). Blinking node value indicates that the configuration change is pending. Solid node value indicates that the node ID configuration value has been acknowledged by the CIO module.
6.	Push buttons for node number selection. S1 decreases and S2 increases node number.
7.	LEDs of the CIO module
8.	Digital inputs XDI1, XDI2
9.	Digital inputs/outputs XDIO1...XDIO4

## Distributed I/O bus topology

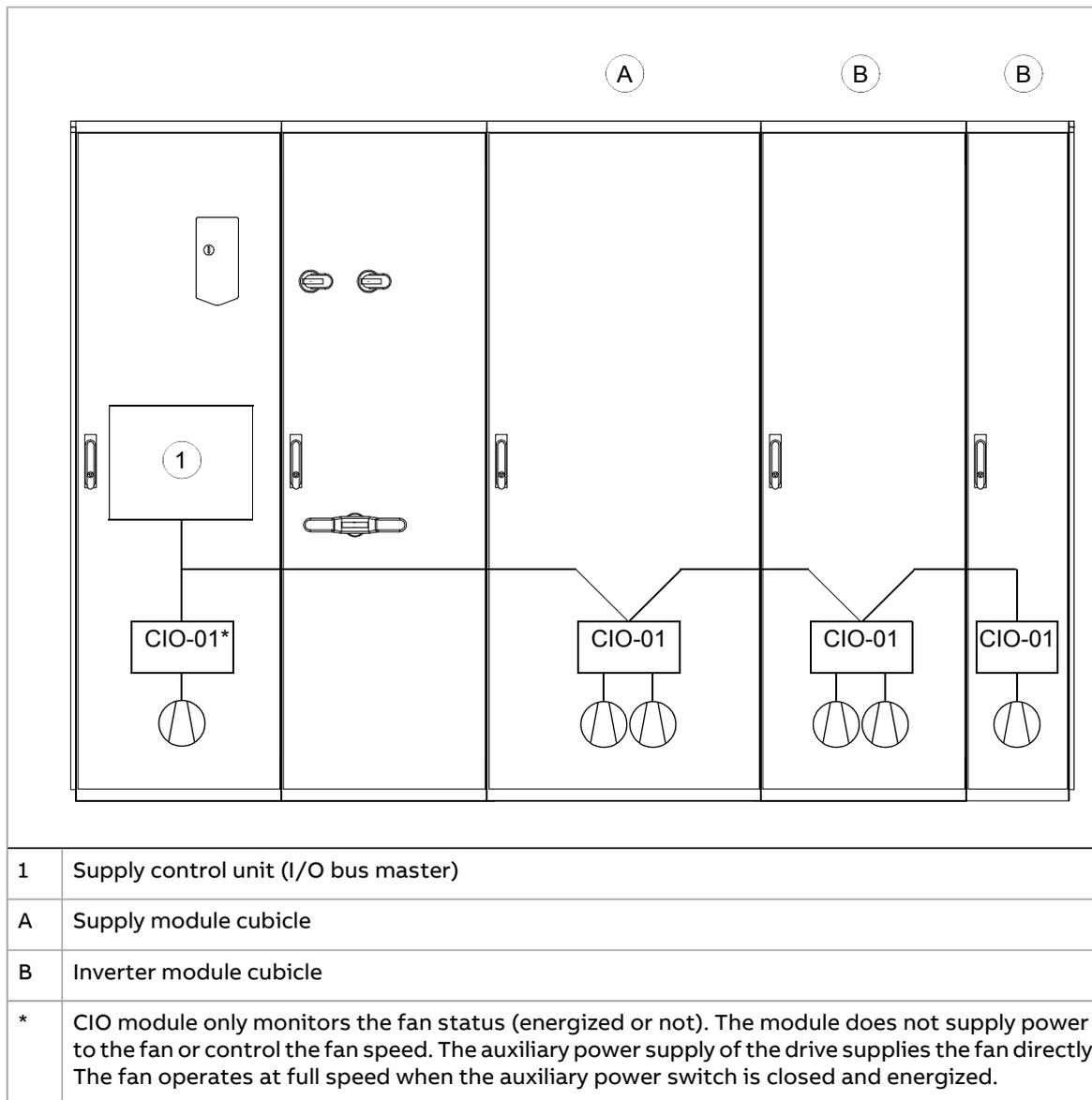
The control unit of the drive or unit is connected to CIO modules through distributed I/O bus. CIO modules monitor and control individual fans (maximum of 4 per module). Typically, each cubicle that contains a fan, also contains a CIO module.

Single drives and multidrives differ in the amount of control units used to control the CIO modules. Single drives have one control unit for all CIO modules and multidrives have multiple.



■ **Bus topology example - single drives**

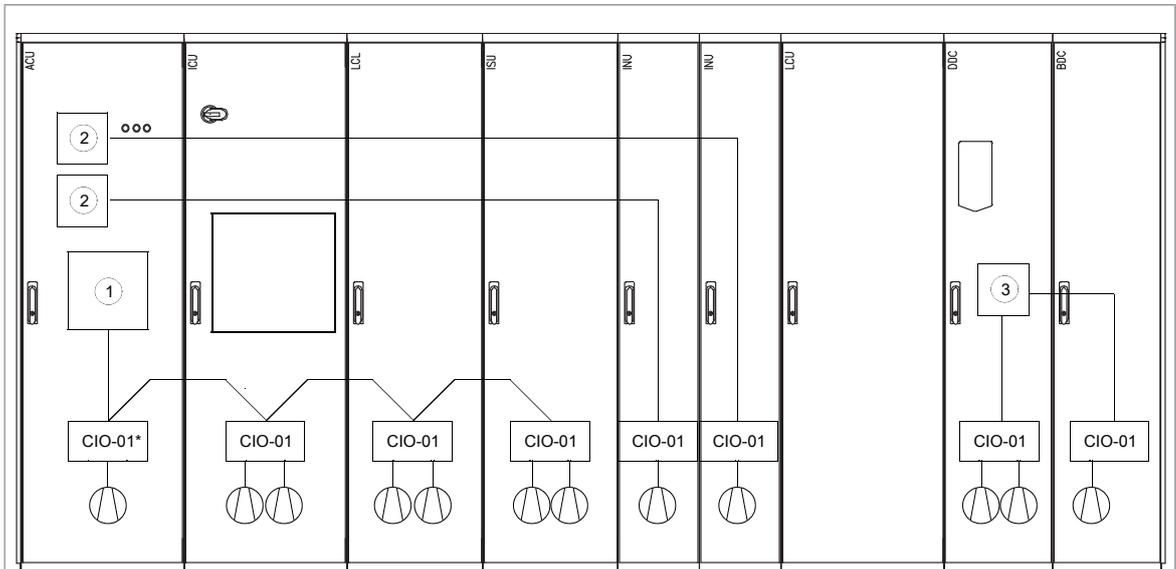
There is only one I/O bus that controls all the fans in single drives.



One CIO module contains connectors for four fans (speed reference output and feedback of the fans), two analog inputs, and four digital inputs. You can connect 16 CIO modules to the distributed I/O bus. Running numbers from 1 to 16 are used as node numbers for the CIO modules.

■ **Bus topology example - multidrives**

In multidrives, the control unit of each unit (supply, inverter, etc.) controls an I/O bus of its own.



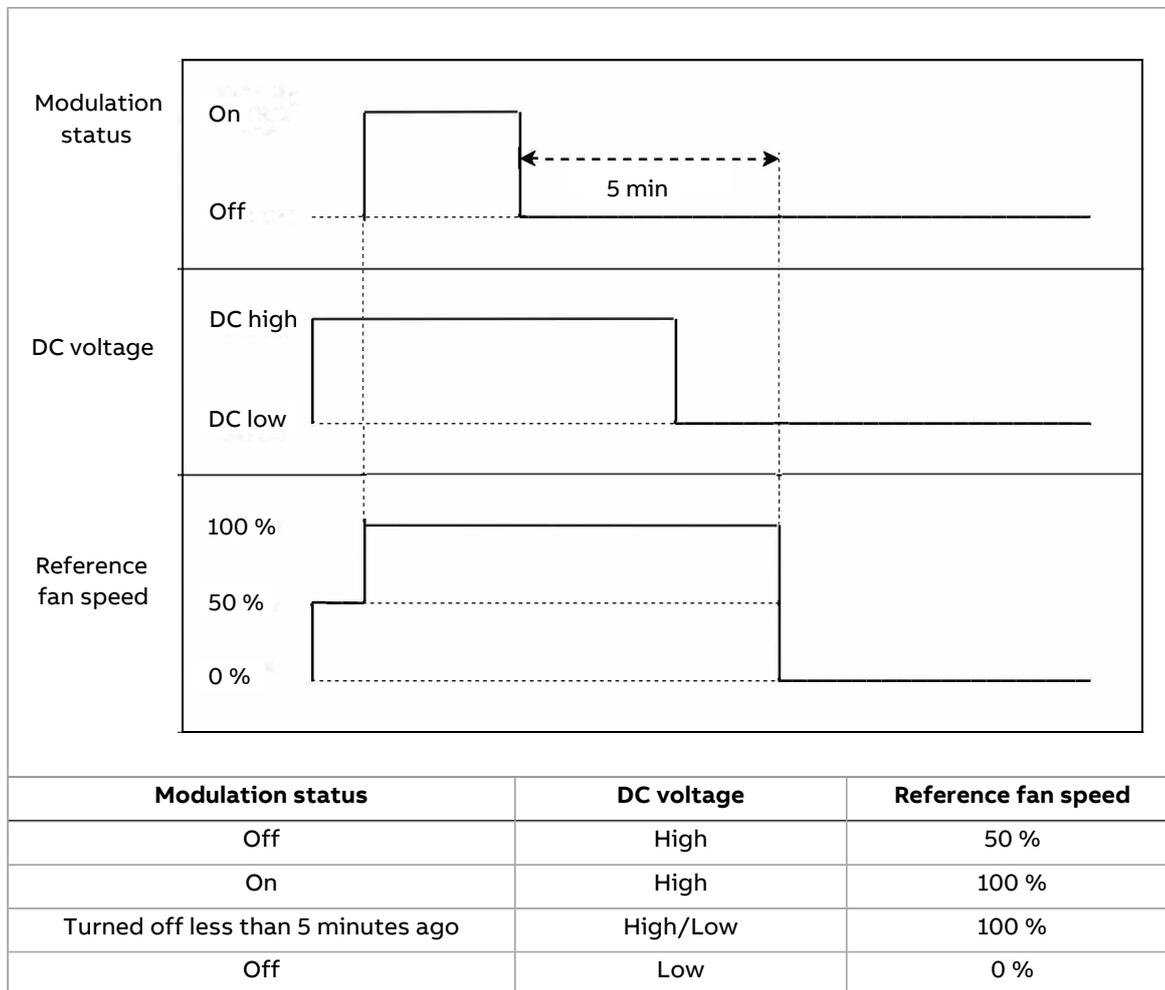
1	Supply control unit (I/O bus master)
2	Inverter control unit (I/O bus master)
3	Converter control unit (I/O bus master)
*	CIO module only monitors the fan status (energized or not). The module does not supply power to the fan or control the fan speed. The auxiliary power supply of the drive supplies the fan directly. The fan operates at full speed when the auxiliary power switch is closed and energized.

## Fan control

CIO modules monitor fan speed signals separately for all fans. The diagram below illustrates the fan control principle in an inverter unit.

Fan control is based on the status of the inverter unit IGBTs (modulating or not) and the voltage level in the drive DC link. The I/O bus master sends both the modulation status information and the DC voltage level value to all CIO modules. There are four different operating modes:

- DC voltage is low and modulation is off, the fan speed reference is 0
- DC voltage is high and modulation is off, the fan speed reference is 50%
- DC voltage is high and modulation is on, the fan speed reference is 100%
- there is a 5 minute delay for the fan speed reference reset after the modulation is stopped.



# 4

## Mechanical installation

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### Contents of this chapter

This chapter contains instructions on installing the module. The instructions are intended for panel builders and system integrators who install drive modules and related components (such as CIO module) into user-defined cabinet. For ABB cabinet-installed drives, the CIO modules are installed, wired and commissioned at the ABB factory.



### Unpacking and examining the delivery

1. Open the package.
  2. Make sure that the package contains the CIO module.
  3. Make sure that there are no signs of damage.
-

## Installing the CIO module

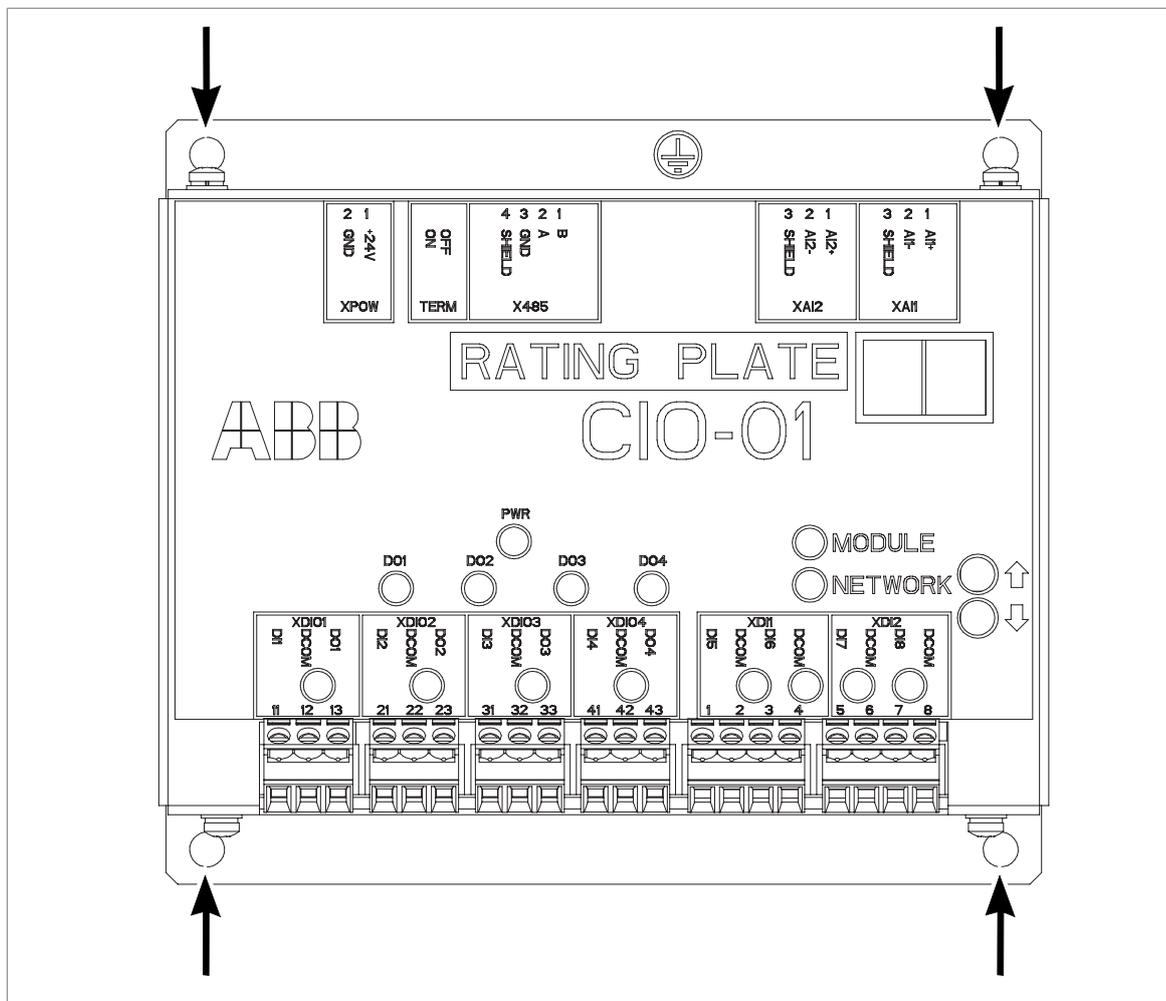


**WARNING!**

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

See chapter *Safety instructions*.

1. Do the Electrical safety precautions steps before you start the work. Refer to the drive safety instructions.
2. Install the CIO module in a drive cabinet environment.
3. Make sure that the ambient conditions meet the requirements given in *Ambient conditions* (Page 49) and the ambient conditions in the hardware manual of the drive or unit.
4. Fasten the module with screws on its corner holes and a conducting surface that is grounded to the cabinet main PE terminal. If needed, use an additional grounding wire under the screw.



# 5

## Electrical installation

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### Contents of this chapter

This chapter describes the electrical installation of the CIO module. The instructions are intended for panel builders and system integrators who install drive modules and related components (such as CIO module) into user-defined cabinets. For cabinet-installed drives, the CIO modules are installed, wired and commissioned at the ABB factory.

The wiring diagrams in this chapter are simplified presentations. For details, see the example circuit diagrams included in the hardware manuals for the multidrive modules.



## Default I/O diagram

Connectors of the CIO module and their default use is shown below.

Terminal			Description
XDIO1...XDIO4			Digital inputs/outputs
11	11	DI1	Monitoring (DI1) and control (DO1) (PWM output) of fan 1
12	12	DCOM	
13	13	DO1	
21	21	DI2	Monitoring (DI2) and control (DO2) (PWM output) of fan 2
22	22	DCOM	
23	23	DO2	
31	31	DI3	Monitoring (DI3) and control (DO3) (PWM output) of fan 3
32	32	DCOM	
33	33	DO3	
41	41	DI4	Monitoring (DI4) and control (DO4) (PWM output) of fan 4
42	42	DCOM	
43	43	DO4	
XD11, XD12			Digital inputs
1	1	DI5	CIO module miniature circuit breaker monitoring (0 = related warning or fault is given, jumpered to 1 as default) (Parameter 206.50)
2	2	DCOM	
3	3	DI6	CIO module fuse monitoring. 0 = related warning/fault is given. Parameter 206.51
4	4	DCOM	
5	5	DI7	DI7: Not in use in the control program.
6	6	DCOM	
7	7	DI8	DI8: Can be used for any purpose by using IEC program or general supervision function of the firmware. (0 = related warning or fault is given) (Parameter 206.53)
8	8	DCOM	
XA11, XA12			Analog inputs
1	1	AI1+	Reserved for fan temperature monitoring with an NTC thermal switch. No software support currently.
2	2	AI1-	
3	3	SHIELD	
1	1	AI2+	Reserved for fan temperature monitoring with an NTC thermal switch. No software support currently.
2	2	AI2-	
3	3	SHIELD	
X485			RS-485 communication link
1	1	B	RS-485 communication link (I/O bus).
2	2	A	
3	3	GND	
4	4	SHIELD	
TERM			I/O bus termination
ON <input type="checkbox"/> OFF			Termination resistor
XPOW			Power supply

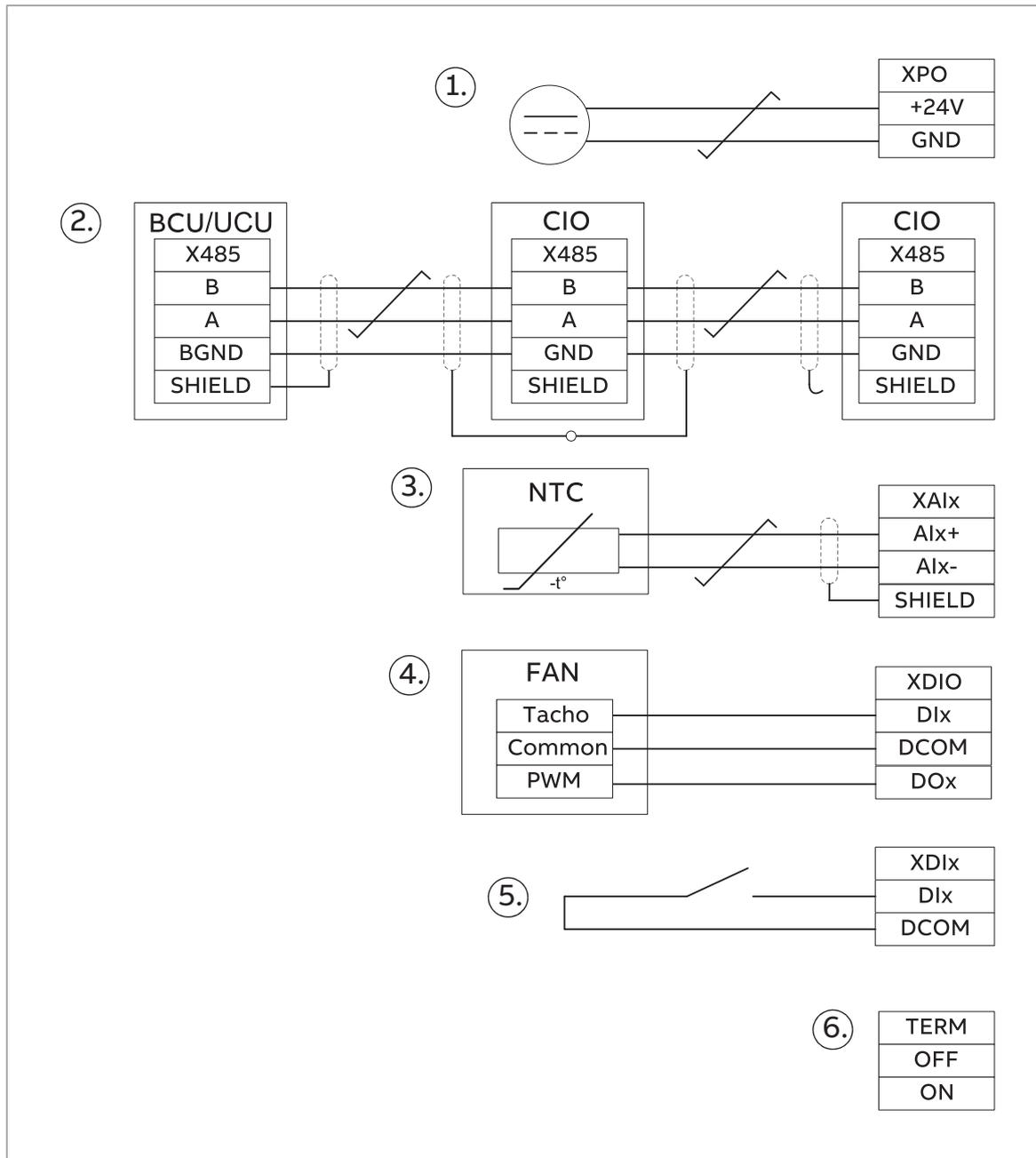
Terminal			Description
1	1	+24VI	24 V DC
2	2	GND	

## Cabling instructions

1. Do the Electrical safety precautions steps before you start the work. Refer to the drive safety instructions.
2. Connect the power supply cables to CIO modules.
3. Connect the serial communication cable to CIO modules and to the control unit.
4. On the last CIO module at the rear end of the bus, change the TERM plug to position ON. On the control unit end, make sure the TERM plug is in position OFF.
5. Connect the fan input and output signals to CIO modules.
6. Connect the additional monitoring signals to CIO module (if in use).



## Wiring example



1.	Power supply 24 V DC
2.	I/O bus
3.	Reserved for analog inputs for NTC temperature measurement. Currently no software support.
4.	Monitoring and control of fans
5.	Digital inputs
6.	I/O bus termination. I/O bus must be terminated at its physical ends.

## 6

## Start-up

### Contents of this chapter

This chapter describes the basic start-up procedure of the distributed I/O bus. The instructions are intended for panel builders and system integrators who install drive modules and related components (such as CIO module) into user-defined cabinet. For the ABB cabinet-installed drives, the CIO modules are installed, wired and commissioned at the ABB factory.

### Start-up procedure

<b>Tasks</b>	<input checked="" type="checkbox"/>
<b>Safety</b>	
 <b>WARNING!</b> Obey the safety instructions during the start-up procedure. See ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.  If you are not a qualified electrical professional, do not do installation or maintenance work.	<input type="checkbox"/>
<b>Hardware settings</b>	
Check the mechanical and electrical installation of the drive. See the hardware manuals.	<input type="checkbox"/>
Terminate the I/O bus at its physical ends: set the termination resistor switch of the CIO module on the rear of the I/O bus to ON position and terminate the other end of the I/O bus on the BCU or UCU control unit. Set intermediate termination resistors to OFF position.	<input type="checkbox"/>
Switch on the auxiliary power to the CIO modules.	<input type="checkbox"/>
<b>Note:</b> Fan power supply must remain de-energized.	



## 24 Start-up

<b>Tasks</b>	<input checked="" type="checkbox"/>
Set a unique node number to each CIO module (0...16): use the up and down buttons of the CIO module.	<input type="checkbox"/>
<b>Parameter settings</b>	
In the I/O bus master, set parameter 206.1 I/O bus enable to Yes.	<input type="checkbox"/>
Activate the appropriate CIO module's node number with parameter 206.18 Node activation. Use the same numbers that were set to the CIO modules during installation.	<input type="checkbox"/>
Set fan activation parameters 206.20 ... 206.23 according to the connected fans.	<input type="checkbox"/>
Verify that all nodes communicate without errors. Use parameters of parameter group 208 I/O bus diagnostics to help in verification and debugging.	<input type="checkbox"/>
<b>Energizing the fans and verifying the operation</b>	
Close the circuit breaker(s) to energize the fans.	<input type="checkbox"/>
<p>Close the cabinet doors before the first start of the fans and identification run to guarantee normal operation conditions concerning air flow and for safety. Continue the drive start-up normally and do the first start of the supply unit in order to power up the drive main and auxiliary circuits.</p> <p>On the first start, the control program performs identification run for the fans to detect the 100% rotation speed level. Identification run is performed whenever the control program detects fans without existing identification run results and fans are commanded to start. When the identification run is finished, the control program shows the detected results (100% level feedback pulse frequencies) in the parameters of parameter group 209 I/O bus fan identification for each fan. The fans are ready for use.</p> <p>Make sure that the detected feedback pulse frequencies are reasonable for the fan types. For allowed reference speed ranges, see the sticker inside each cabinet door or ensure that the detected fan pulse frequency is at least 75 % of the specified fan pulse frequency<sup>1)</sup>.</p>	<input type="checkbox"/>
Review the parameters in parameter group 206 I/O bus configuration to guarantee that supervision limits etc. are suitable for the application.	<input type="checkbox"/>

<sup>1)</sup> Fan pulse frequency [Hz] = rated fan speed [rpm] × pulses per round ÷ 60.



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## Program features

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### Contents of this chapter

This chapter describes the features supported by the control program.

### Overview

The ACS880 control program includes a function for the distributed I/O bus. The function controls and monitors each of the cooling fans in the liquid-cooled drives separately. The function detects malfunctioning fans and generates warning or fault messages when necessary. The control program also performs identification run for fans to detect the nominal speed values of the fans.

Supply, inverter or converter control unit acts as an I/O bus master. Each CIO module on the I/O bus controls the speed of its fans with PWM reference signals and monitors the speed of its fans with tachometer actual signals.

The settings of the distributed I/O bus can be accessed via control panel or Drive composer PC tool.

### Basic configuration of the distributed I/O bus

Distributed I/O bus is taken into use with 206.1 I/O bus enable. User can define warning and fault limits for fan speed (206.6 and 206.7) and communication break (206.9). User activates monitoring and control for fans with parameters 206.20 ... 206.23, and activates the nodes with parameter 206.18 Node activation. The control program shows malfunctioning fans in parameters 206.30 ... 206.33.

#### ■ Settings

Parameters:

- parameter group 206 I/O bus configuration.
-

Events:

- warning AE90 I/O bus communication
- warning AE91 Fan lifetime exceeded
- warning AE92 Fan speed
- fault 8E12 Fan speed.

## Service request parameters

User can select certain read and reset requests for the fans in the distributed I/O bus (207.3). User defines the CIO module and the fan (207.1, 207.2) and triggers the request (207.10). For a read request, user can also read the result from a parameter (207.11 ... 207.14). Selected request is performed with parameter 207.10, and the control program shows the output of the operation in parameters 207.11 ... 207.14 for each fan.

### ■ Settings

Parameters: parameter group 207 I/O bus service.

## Diagnostic counters

The control program displays amounts of messages (packets) sent by master (208.1, 208.2), and certain errors (208.3 ... 208.5) on the distributed I/O bus. Parameters 208.11 ... 208.26 show the amount of timeouts for each node, and parameter 208.6 shows the sum of timeouts in all nodes. User can reset error and timeout counters (208.80).

### ■ Settings

Parameters: parameter group 208 I/O bus diagnostics.

## Identification run of the fans

An identification run is performed whenever there are no existing identification run results for a fan and fans are commanded to start. Identification run is performed to detect the 100% rotation speed level of a fan. The identification sequence may take several minutes, during which the fans that are being identified run at full speed. After the identification procedure is successfully completed, the identified fans are given the regular fan reference which may be other than 100%.

The control program shows the results of the identification runs in parameters 209.1 ... 209.64. User can reset the last identification run result through the I/O bus service parameter group 207 I/O bus service.

### ■ Settings

Parameters: parameter group 209 I/O bus fan identification, parameter 207.2 Fan reset selection.

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## 8

# Parameters

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## Contents of this chapter

This chapter describes the actual signals and parameters related to the distributed I/O bus.

For details of other parameters, see the firmware manual of the drive, supply, inverter or converter unit.

## Terms and abbreviations

Term	Definition
Actual signal	Type of <b>parameter</b> that is the result of a measurement or calculation by the supply unit, or contains status information. Most actual signals are read-only, but some (especially counter-type actual signals) can be reset.
Def	(In the following table, shown on the same row as the parameter name) The default value of a <b>parameter</b> .
FbEq16	(In the following table, shown on the same row as the parameter range, or for each selection) 16-bit fieldbus equivalent: The scaling between the integer used in communication and the value shown on the panel when a 16-bit value is selected for transmission to an external system. A dash (-) indicates that the parameter is not accessible in 16-bit format.
Other	The value is taken from another source.
Parameter	Either an user-adjustable operating instruction for the supply unit, or an <b>actual signal</b> .
p.u.	Per unit

---

## Summary of parameter groups

Group	Contents
206 I/O bus configuration	Basic configuration of the distributed I/O bus.
207 I/O bus service	Service request parameters for selected node.
208 I/O bus diagnostics	Diagnostic counters of the distributed I/O bus.
209 I/O bus fan identification	Results of the identification run of the fan.

## Parameter listing

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
206	I/O bus configuration	Distributed I/O bus settings. This group is used to set limits to fans, enable I/O bus for fans and check statuses of fans. This group is only visible with a BCU or UCU control unit.	
206.1	I/O bus enable	Enables/disables the use of distributed I/O bus.	No / uint16
	No	Distributed I/O bus is disabled.	0
	Yes	Distributed I/O bus is enabled.	1
206.6	Fan speed warning limit	Defines the warning limit for fan speed. When fan speed is below the value given with this parameter (in relation to requested reference), the control program generates warning AE92 Fan speed. Parameter value 0 means that no warning will be generated.	75.0% / real32
	0.0 ... 100.0%	Warning limit for fan speed.	1% / 10%
206.7	Fan speed fault limit	Defines the fault limit for fan speed. When fan speed is below the value given with this parameter (in relation to requested reference), the control program generates fault 8E12 Fan speed. Parameter value 0 means that no fault will be generated.	0.0% / real32
	0.0 ... 100.0%	Fault limit for fan speed.	1% / 10%
206.8	Fan on-time warning limit	Defines the warning limit for fan lifetime. When the fan has been running longer (in hours) than the value given with this parameter, the control program generates warning AE91 Fan lifetime exceeded.	90000 h / uint32
	0 ... 596523 h	Warning limit for fan lifetime.	1 h / 1 h
206.9	Communication loss time	Defines a timeout for monitoring a node. The control program monitors whether an active node can not be found on the I/O bus. If a communication break lasts longer than the timeout, the control program generates warning AE90 I/O bus communication.	2 s / uint16
	0 ... 600 s	Communication loss time.	1 s / 1 s
206.18	Node activation	Activates communication for nodes 1...16.	- / uint16
	b0 Node 1	1 = Node 1 is active.	
	b1 Node 2	1 = Node 2 is active.	
	b2 Node 3	1 = Node 3 is active.	
	b3 Node 4	1 = Node 4 is active.	
	b4 Node 5	1 = Node 5 is active.	
	b5 Node 6	1 = Node 6 is active.	
	b6 Node 7	1 = Node 7 is active.	
	b7 Node 8	1 = Node 8 is active.	
	b8 Node 9	1 = Node 9 is active.	
	b9 Node 10	1 = Node 10 is active.	
	b10 Node 11	1 = Node 11 is active.	
	b11 Node 12	1 = Node 12 is active..	
	b12 Node 13	1 = Node 13 is active.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b13	Node 14	1 = Node 14 is active.	
b14	Node 15	1 = Node 15 is active.	
b15	Node 16	1 = Node 16 is active.	
	0000h...FFFFh		1 = 1
206.20	Fan activation nodes 1-4	Activates monitoring and control for fans of nodes 1...4.	- / uint16
b0	Node 1 fan 1	1 = Fan 1 of node 1 is active.	
b1	Node 1 fan 2	1 = Fan 2 of node 1 is active.	
b2	Node 1 fan 3	1 = Fan 3 of node 1 is active.	
b3	Node 1 fan 4	1 = Fan 4 of node 1 is active.	
b4	Node 2 fan 1	1 = Fan 1 of node 2 is active.	
b5	Node 2 fan 2	1 = Fan 2 of node 2 is active.	
b6	Node 2 fan 3	1 = Fan 3 of node 2 is active.	
b7	Node 2 fan 4	1 = Fan 4 of node 2 is active.	
b8	Node 3 fan 1	1 = Fan 1 of node 3 is active.	
b9	Node 3 fan 2	1 = Fan 2 of node 3 is active.	
b10	Node 3 fan 3	1 = Fan 3 of node 3 is active.	
b11	Node 3 fan 4	1 = Fan 4 of node 3 is active.	
b12	Node 4 fan 1	1 = Fan 1 of node 4 is active.	
b13	Node 4 fan 2	1 = Fan 2 of node 4 is active.	
b14	Node 4 fan 3	1 = Fan 3 of node 4 is active.	
b15	Node 4 fan 4	1 = Fan 4 of node 4 is active.	
	0000h...FFFFh		1 = 1
206.21	Fan activation nodes 5-8	Activates monitoring and control for fans of nodes 5...8.	- / uint16
b0	Node 5 fan 1	1 = Fan 1 of node 5 is active.	
b1	Node 5 fan 2	1 = Fan 2 of node 5 is active.	
b2	Node 5 fan 3	1 = Fan 3 of node 5 is active.	
b3	Node 5 fan 4	1 = Fan 4 of node 5 is active.	
b4	Node 6 fan 1	1 = Fan 1 of node 6 is active.	
b5	Node 6 fan 2	1 = Fan 2 of node 6 is active.	
b6	Node 6 fan 3	1 = Fan 3 of node 6 is active.	
b7	Node 6 fan 4	1 = Fan 4 of node 6 is active.	
b8	Node 7 fan 1	1 = Fan 1 of node 7 is active.	
b9	Node 7 fan 2	1 = Fan 2 of node 7 is active.	
b10	Node 7 fan 3	1 = Fan 3 of node 7 is active.	
b11	Node 7 fan 4	1 = Fan 4 of node 7 is active.	
b12	Node 8 fan 1	1 = Fan 1 of node 8 is active.	
b13	Node 8 fan 2	1 = Fan 2 of node 8 is active.	
b14	Node 8 fan 3	1 = Fan 3 of node 8 is active.	
b15	Node 8 fan 4	1 = Fan 4 of node 8 is active.	
	0000h...FFFFh		1 = 1
206.22	Fan activation nodes 9-12	Activates monitoring and control for fans of nodes 9...12.	- / uint16
b0	Node 9 fan 1	1 = Fan 1 of node 9 is active.	
b1	Node 9 fan 2	1 = Fan 2 of node 9 is active.	
b2	Node 9 fan 3	1 = Fan 3 of node 9 is active.	
b3	Node 9 fan 4	1 = Fan 4 of node 9 is active.	
b4	Node 10 fan 1	1 = Fan 1 of node 10 is active.	
b5	Node 10 fan 2	1 = Fan 2 of node 10 is active.	
b6	Node 10 fan 3	1 = Fan 3 of node 10 is active.	
b7	Node 10 fan 4	1 = Fan 4 of node 10 is active.	
b8	Node 11 fan 1	1 = Fan 1 of node 11 is active.	
b9	Node 11 fan 2	1 = Fan 2 of node 11 is active.	
b10	Node 11 fan 3	1 = Fan 3 of node 11 is active.	

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No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b11	Node 11 fan 4	1 = Fan 4 of node 11 is active.	
b12	Node 12 fan 1	1 = Fan 1 of node 12 is active.	
b13	Node 12 fan 2	1 = Fan 2 of node 12 is active.	
b14	Node 12 fan 3	1 = Fan 3 of node 12 is active.	
b15	Node 12 fan 4	1 = Fan 4 of node 12 is active.	
	0000h...FFFFh		1 = 1
206.23	Fan activation nodes 13-16	Activates monitoring and control for fans of nodes 13...16.	- / uint16
b0	Node 13 fan 1	1 = Fan 1 of node 13 is active.	
b1	Node 13 fan 2	1 = Fan 2 of node 13 is active.	
b2	Node 13 fan 3	1 = Fan 3 of node 13 is active.	
b3	Node 13 fan 4	1 = Fan 4 of node 13 is active.	
b4	Node 14 fan 1	1 = Fan 1 of node 14 is active.	
b5	Node 14 fan 2	1 = Fan 2 of node 14 is active.	
b6	Node 14 fan 3	1 = Fan 3 of node 14 is active.	
b7	Node 14 fan 4	1 = Fan 4 of node 14 is active.	
b8	Node 15 fan 1	1 = Fan 1 of node 15 is active.	
b9	Node 15 fan 2	1 = Fan 2 of node 15 is active.	
b10	Node 15 fan 3	1 = Fan 3 of node 15 is active.	
b11	Node 15 fan 4	1 = Fan 4 of node 15 is active.	
b12	Node 16 fan 1	1 = Fan 1 of node 16 is active.	
b13	Node 16 fan 2	1 = Fan 2 of node 16 is active.	
b14	Node 16 fan 3	1 = Fan 3 of node 16 is active.	
b15	Node 16 fan 4	1 = Fan 4 of node 16 is active.	
	0000h...FFFFh		1 = 1
206.30	Fan supervision status 1-4	Shows statuses of fans in nodes 1...4.	- / uint16
b0	Node 1 fan 1 failure	1 = Failure in fan 1 of node 1.	
b1	Node 1 fan 2 failure	1 = Failure in fan 2 of node 1.	
b2	Node 1 fan 3 failure	1 = Failure in fan 3 of node 1.	
b3	Node 1 fan 4 failure	1 = Failure in fan 4 of node 1.	
b4	Node 2 fan 1 failure	1 = Failure in fan 1 of node 2.	
b5	Node 2 fan 2 failure	1 = Failure in fan 2 of node 2.	
b6	Node 2 fan 3 failure	1 = Failure in fan 3 of node 2.	
b7	Node 2 fan 4 failure	1 = Failure in fan 4 of node 2.	
b8	Node 3 fan 1 failure	1 = Failure in fan 1 of node 3.	
b9	Node 3 fan 2 failure	1 = Failure in fan 2 of node 3.	
b10	Node 3 fan 3 failure	1 = Failure in fan 3 of node 3.	
b11	Node 3 fan 4 failure	1 = Failure in fan 4 of node 3.	
b12	Node 4 fan 1 failure	1 = Failure in fan 1 of node 4.	
b13	Node 4 fan 2 failure	1 = Failure in fan 2 of node 4.	
b14	Node 4 fan 3 failure	1 = Failure in fan 3 of node 4.	
b15	Node 4 fan 4 failure	1 = Failure in fan 4 of node 4.	
	0000h...FFFFh		1 = 1
206.31	Fan supervision status 5-8	Shows statuses of fans in nodes 5...8.	- / uint16
b0	Node 5 fan 1 failure	1 = Failure in fan 1 of node 5.	
b1	Node 5 fan 2 failure	1 = Failure in fan 2 of node 5.	
b2	Node 5 fan 3 failure	1 = Failure in fan 3 of node 5.	
b3	Node 5 fan 4 failure	1 = Failure in fan 4 of node 5.	
b4	Node 6 fan 1 failure	1 = Failure in fan 1 of node 6.	
b5	Node 6 fan 2 failure	1 = Failure in fan 2 of node 6.	
b6	Node 6 fan 3 failure	1 = Failure in fan 3 of node 6.	
b7	Node 6 fan 4 failure	1 = Failure in fan 4 of node 6.	
b8	Node 7 fan 1 failure	1 = Failure in fan 1 of node 7.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	b9 Node 7 fan 2 failure	1 = Failure in fan 2 of node 7.	
	b10 Node 7 fan 3 failure	1 = Failure in fan 3 of node 7.	
	b11 Node 7 fan 4 failure	1 = Failure in fan 4 of node 7.	
	b12 Node 8 fan 1 failure	1 = Failure in fan 1 of node 8.	
	b13 Node 8 fan 2 failure	1 = Failure in fan 2 of node 8.	
	b14 Node 8 fan 3 failure	1 = Failure in fan 3 of node 8.	
	b15 Node 8 fan 4 failure	1 = Failure in fan 4 of node 8.	
	0000h...FFFFh		1 = 1
206.32	Fan supervision status 9-12	Shows statuses of fans in nodes 9...12.	- / uint16
	b0 Node 9 fan 1 failure	1 = Failure in fan 1 of node 9.	
	b1 Node 9 fan 2 failure	1 = Failure in fan 2 of node 9.	
	b2 Node 9 fan 3 failure	1 = Failure in fan 3 of node 9.	
	b3 Node 9 fan 4 failure	1 = Failure in fan 4 of node 9.	
	b4 Node 10 fan 1 failure	1 = Failure in fan 1 of node 10.	
	b5 Node 10 fan 2 failure	1 = Failure in fan 2 of node 10.	
	b6 Node 10 fan 3 failure	1 = Failure in fan 3 of node 10.	
	b7 Node 10 fan 4 failure	1 = Failure in fan 4 of node 10.	
	b8 Node 11 fan 1 failure	1 = Failure in fan 1 of node 11.	
	b9 Node 11 fan 2 failure	1 = Failure in fan 2 of node 11.	
	b10 Node 11 fan 3 failure	1 = Failure in fan 3 of node 11.	
	b11 Node 11 fan 4 failure	1 = Failure in fan 4 of node 11.	
	b12 Node 12 fan 1 failure	1 = Failure in fan 1 of node 12.	
	b13 Node 12 fan 2 failure	1 = Failure in fan 2 of node 12.	
	b14 Node 12 fan 3 failure	1 = Failure in fan 3 of node 12.	
	b15 Node 12 fan 4 failure	1 = Failure in fan 4 of node 12.	
	0000h...FFFFh		1 = 1
206.33	Fan supervision status 13-16	Shows statuses of fans in nodes 13...16.	- / uint16
	b0 Node 13 fan 1 failure	1 = Failure in fan 1 of node 13.	
	b1 Node 13 fan 2 failure	1 = Failure in fan 2 of node 13.	
	b2 Node 13 fan 3 failure	1 = Failure in fan 3 of node 13.	
	b3 Node 13 fan 4 failure	1 = Failure in fan 4 of node 13.	
	b4 Node 14 fan 1 failure	1 = Failure in fan 1 of node 14.	
	b5 Node 14 fan 2 failure	1 = Failure in fan 2 of node 14.	
	b6 Node 14 fan 3 failure	1 = Failure in fan 3 of node 14.	
	b7 Node 14 fan 4 failure	1 = Failure in fan 4 of node 14.	
	b8 Node 15 fan 1 failure	1 = Failure in fan 1 of node 15.	
	b9 Node 15 fan 2 failure	1 = Failure in fan 2 of node 15.	
	b10 Node 15 fan 3 failure	1 = Failure in fan 3 of node 15.	
	b11 Node 15 fan 4 failure	1 = Failure in fan 4 of node 15.	
	b12 Node 16 fan 1 failure	1 = Failure in fan 1 of node 16.	
	b13 Node 16 fan 2 failure	1 = Failure in fan 2 of node 16.	
	b14 Node 16 fan 3 failure	1 = Failure in fan 3 of node 16.	
	b15 Node 16 fan 4 failure	1 = Failure in fan 4 of node 16.	
	0000h...FFFFh		1 = 1
206.40	MCB monitoring status	Indicates the status of fan miniature circuit breaker input (digital input DI5) of each I/O node.	- / uint16
	b0 I/O Node 1	Status of digital input DI5 of node 1.	
	b1 I/O Node 2	Status of digital input DI5 of node 2.	
	b2 I/O Node 3	Status of digital input DI5 of node 3.	
	b3 I/O Node 4	Status of digital input DI5 of node 4.	
	b4 I/O Node 5	Status of digital input DI5 of node 5.	
	b5 I/O Node 6	Status of digital input DI5 of node 6.	

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No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b6	I/O Node 7	Status of digital input DI5 of node 7.	
b7	I/O Node 8	Status of digital input DI5 of node 8.	
b8	I/O Node 9	Status of digital input DI5 of node 9.	
b9	I/O Node 10	Status of digital input DI5 of node 10.	
b10	I/O Node 11	Status of digital input DI5 of node 11.	
b11	I/O Node 12	Status of digital input DI5 of node 12.	
b12	I/O Node 13	Status of digital input DI5 of node 13.	
b13	I/O Node 14	Status of digital input DI5 of node 14.	
b14	I/O Node 15	Status of digital input DI5 of node 15.	
b15	I/O Node 16	Status of digital input DI5 of node 16.	
	0000h...FFFFh		1 = 1
206.41	Fuse monitoring status	Indicates the status of fan fuse monitoring input (digital input DI6) of each I/O node.	- / uint16
b0	I/O Node 1	Status of digital input DI6 of node 1.	
b1	I/O Node 2	Status of digital input DI6 of node 2.	
b2	I/O Node 3	Status of digital input DI6 of node 3.	
b3	I/O Node 4	Status of digital input DI6 of node 4.	
b4	I/O Node 5	Status of digital input DI6 of node 5.	
b5	I/O Node 6	Status of digital input DI6 of node 6.	
b6	I/O Node 7	Status of digital input DI6 of node 7.	
b7	I/O Node 8	Status of digital input DI6 of node 8.	
b8	I/O Node 9	Status of digital input DI6 of node 9.	
b9	I/O Node 10	Status of digital input DI6 of node 10.	
b10	I/O Node 11	Status of digital input DI6 of node 11.	
b11	I/O Node 12	Status of digital input DI6 of node 12.	
b12	I/O Node 13	Status of digital input DI6 of node 13.	
b13	I/O Node 14	Status of digital input DI6 of node 15.	
b14	I/O Node 15	Status of digital input DI6 of node 15.	
b15	I/O Node 16	Status of digital input DI6 of node 16.	
	0000h...FFFFh		1 = 1
206.43	CIO DI8 status	Indicates the logical state of digital input DI8 of each I/O node.	- / uint16
b0	I/O Node 1	Status of digital input DI8 of node 1.	
b1	I/O Node 2	Status of digital input DI8 of node 2.	
b2	I/O Node 3	Status of digital input DI8 of node 3.	
b3	I/O Node 4	Status of digital input DI8 of node 4.	
b4	I/O Node 5	Status of digital input DI8 of node 5.	
b5	I/O Node 6	Status of digital input DI8 of node 6.	
b6	I/O Node 7	Status of digital input DI8 of node 7.	
b7	I/O Node 8	Status of digital input DI8 of node 8.	
b8	I/O Node 9	Status of digital input DI8 of node 9.	
b9	I/O Node 10	Status of digital input DI8 of node 10.	
b10	I/O Node 11	Status of digital input DI8 of node 11.	
b11	I/O Node 12	Status of digital input DI8 of node 11.	
b12	I/O Node 13	Status of digital input DI8 of node 13.	
b13	I/O Node 14	Status of digital input DI8 of node 14.	
b14	I/O Node 15	Status of digital input DI8 of node 15.	
b15	I/O Node 16	Status of digital input DI8 of node 16.	
	0000h...FFFFh		1 = 1
206.50	MCB monitoring action	Selects the action to be taken when CIO module miniature circuit breaker monitoring is triggered. Each CIO module reads the monitoring signal via digital input DI5. If the signal is off (0) in any CIO module, it triggers the action selected with this parameter.	Warning / uint16
	No action	No action taken.	0

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Warning	The supply, inverter or converter control program generates an AE94 CIO MCB monitoring warning.	1
	Fault	The supply, inverter or converter control program trips on 8E14 CIO MCB monitoring.	2
206.51	Fuse monitoring action	Selects the action to be taken when fan fuse monitoring is triggered. Each CIO module reads the monitoring signal via digital input DI6. If the signal is off (0) in any CIO module, it triggers the action selected with this parameter.	No action / uint16
	No action	No action taken.	0
	Warning	The supply, inverter or converter control program generates an AE95 CIO fuse monitoring warning.	1
	Fault	The supply, inverter or converter control program trips on 8E15 CIO fuse monitoring.	2
206.53	CIO DI8 monitoring action	Selects the action to be taken when digital input DI8 monitoring of the CIO-01 module is triggered. Each CIO module reads the monitoring signal via digital input DI8. If the signal is off (0) in any CIO module, it triggers the action selected with this parameter.	No action / uint16
	No action	No action taken.	0
	Warning	The supply, inverter or converter control program generates an AE97 CIO DI8 monitoring warning.	1
	Fault	The supply, inverter or converter control program trips on 8E17 CIO DI8 monitoring.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
<b>207</b>	<b>I/O bus service</b>	Distributed I/O bus settings. This group is used to show the output of selected fans. This group is only visible with a BCU or UCU control unit.	
207.1	Node ID number	Selects the node for the operation selected with - / uint16 in parameter 207.03. Note: All the parameters in this parameter group concern the selected node only.	1 / uint16
	1 ... 99	Node ID number.	1 / 1
207.2	Fan reset selection	Selects the fan(s) of the selected node (207.01) for the operation selected with parameter 207.03 Command selection.	- / uint16
	b0 Fan 1	1 = Fan 1 in the selected node.	
	b1 Fan 2	1 = Fan 2 in the selected node.	
	b2 Fan 3	1 = Fan 3 in the selected node.	
	b3 Fan 4	1 = Fan 4 in the selected node.	
	b4...15 Reserved		
	0000h...FFFFh		1 = 1
207.3	Command selection	Selects the operation for the fan(s) selected with parameters 207.01 and 207.02.	None / uint16
	None	None.	0
	Read fan on-time	Shows the operating time (in hours) of the fan(s) in parameters 207.11...207.14.	1
	Reset fan on-time	Resets the on-time counter of the fan(s).	2
	Reset fan ID run	Resets the last identification run of the fan(s).	3
	Reset fan data	Resets the on-time counter and identification run data shown by parameters 207.11...207.14. Can be used if a fan is replaced with a new one.	4
	Read fan speeds	Shows the speeds (in Hz) of the fan(s) in parameters 207.11...207.14.	5
207.10	Service request trigger	Performs the operation selected with parameter 207.03 Command selection.	Done / uint16
	Done	Operation done or not requested.	0
	Refresh	Performs the operation.	1
207.11	Fan 1 data	Shows the output of the operation selected with parameter 207.03 Command selection for fan 1.	- / real32
	0.00 ... 2147483640.00	Fan 1 data.	1 / 100

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No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
207.12	Fan 2 data	Shows the output of the operation selected with parameter 207.03 Command selection for fan 2.	- / real32
	0.00 ... 2147483640.00	Fan 2 data.	1 / 100
207.13	Fan 3 data	Shows the output of the operation selected with parameter 207.03 Command selection for fan 3.	- / real32
	0.00 ... 2147483640.00	Fan 3 data.	1 / 100
207.14	Fan 4 data	Shows the output of the operation selected with parameter 207.03 Command selection for fan 4.	- / real32
	0.00 ... 2147483640.00	Fan 4 data.	1 / 100

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
<b>208</b>	<b>I/O bus diagnostics</b>	Distributed I/O bus settings. This group is used for diagnostics of I/O bus. This group is only visible with a BCU or UCU control unit.	
208.1	Transmitted packets	Displays a count of messages (ie. packets) transmitted by the master.	- / uint32
	0 ... 2147483647	Number of messages transmitted by the master.	1 / 1
208.2	Received packets	Displays a count of messages (ie. packets) sent to the master.	- / uint32
	0 ... 2147483647	Number of messages received by the master.	1 / 1
208.3	CRC errors	Displays a count of packets with a CRC error. An increasing count indicates errors in the check sum.	- / uint32
	0 ... 2147483647	Number of CRC errors.	1 / 1
208.4	UART errors	Displays a count of character errors. An increasing count indicates a configuration problem on the bus.	- / uint32
	0 ... 2147483647	Number of UART errors.	1 / 1
208.5	Modbus errors	Displays a count of Modbus® errors. An increasing count indicates errors on the Modbus protocol.	- / uint32
	0 ... 2147483647	Number of Modbus errors.	1 / 1
208.6	Timeouts	Displays a sum of time outs in all of the nodes (see parameters 208.11...208.26). A time out is a request response cycle in the I/O bus, where the bus master sends a request but does not get a correctly-formed response message in return within the time window reserved for the cycle.	- / uint32
	0 ... 2147483647	Number of timeouts.	1 / 1
208.11	Node 1 timeouts	Displays a count of timeouts in node 1.	- / uint32
	0 ... 2147483647	Number of timeouts in node 1.	1 / 1
208.12	Node 2 timeouts	Displays a count of timeouts in node 2.	- / uint32
	0 ... 2147483647	Number of timeouts in node 2.	1 / 1
208.13	Node 3 timeouts	Displays a count of timeouts in node 3.	- / uint32
	0 ... 2147483647	Number of timeouts in node 3.	1 / 1
208.14	Node 4 timeouts	Displays a count of timeouts in node 4.	- / uint32
	0 ... 2147483647	Number of timeouts in node 4.	1 / 1
208.15	Node 5 timeouts	Displays a count of timeouts in node 5.	- / uint32
	0 ... 2147483647	Number of timeouts in node 5.	1 / 1
208.16	Node 6 timeouts	Displays a count of timeouts in node 6.	- / uint32
	0 ... 2147483647	Number of timeouts in node 6.	1 / 1
208.17	Node 7 timeouts	Displays a count of timeouts in node 7.	- / uint32
	0 ... 2147483647	Number of timeouts in node 7.	1 / 1
208.18	Node 8 timeouts	Displays a count of timeouts in node 8.	- / uint32
	0 ... 2147483647	Number of timeouts in node 8.	1 / 1
208.19	Node 9 timeouts	Displays a count of timeouts in node 9.	- / uint32
	0 ... 2147483647	Number of timeouts in node 9.	1 / 1
208.20	Node 10 timeouts	Displays a count of timeouts in node 10.	- / uint32
	0 ... 2147483647	Number of timeouts in node 10.	1 / 1
208.21	Node 11 timeouts	Displays a count of timeouts in node 11.	- / uint32
	0 ... 2147483647	Number of timeouts in node 11.	1 / 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
208.22	Node 12 timeouts	Displays a count of timeouts in node 12.	- / uint32
	0 ... 2147483647	Number of timeouts in node 12.	1 / 1
208.23	Node 13 timeouts	Displays a count of timeouts in node 13.	- / uint32
	0 ... 2147483647	Number of timeouts in node 13.	1 / 1
208.24	Node 14 timeouts	Displays a count of timeouts in node 14.	- / uint32
	0 ... 2147483647	Number of timeouts in node 14.	1 / 1
208.25	Node 15 timeouts	Displays a count of timeouts in node 15.	- / uint32
	0 ... 2147483647	Number of timeouts in node 15.	1 / 1
208.26	Node 16 timeouts	Displays a count of timeouts in node 16.	- / uint32
	0 ... 2147483647	Number of timeouts in node 16.	1 / 1
208.80	Reset diagnostics counters	Resets error and timeout counters.	Done / uint16
	Done	Reset completed or not requested.	0
	Refresh	Resets error and timeout counters.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
<b>209</b>	<b>I/O bus fan identification</b>	Distributed I/O bus settings. This group is used to display results of ID runs of each fan. This group is only visible with a BCU or UCU control unit.	
209.1	Node 1 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 1.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 1.	1 Hz / 10 Hz
209.2	Node 1 fan 2 pulse freq	Displays the result of the identification run for fan 2 of node 1.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 2.	1 Hz / 10 Hz
209.3	Node 1 fan 3 pulse freq	Displays the result of the identification run for fan 3 of node 1.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 3 of node 1.	1 Hz / 10 Hz
209.4	Node 1 fan 4 pulse freq	Displays the result of the identification run for fan 4 of node 1.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 1.	1 Hz / 10 Hz
209.5	Node 2 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 2.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 2.	1 Hz / 10 Hz
209.6	Node 2 fan 2 pulse freq	Displays the result of the identification run for fan 2 of node 2.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 2 of node 2.	1 Hz / 10 Hz
209.7	Node 2 fan 3 pulse freq	Displays the result of the identification run for fan 3 of node 2.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 3 of node 2.	1 Hz / 10 Hz
209.8	Node 2 fan 4 pulse freq	Displays the result of the identification run for fan 4 of node 2.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 2.	1 Hz / 10 Hz
209.9	Node 3 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 3.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 3.	1 Hz / 10 Hz
209.10	Node 3 fan 2 pulse freq	Displays the result of the identification run for fan 2 of node 3.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 2 of node 3.	1 Hz / 10 Hz
209.11	Node 3 fan 3 pulse freq	Displays the result of the identification run for fan 3 of node 3.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 3 of node 3	1 Hz / 10 Hz
209.12	Node 3 fan 4 pulse freq	Displays the result of the identification run for fan 4 of node 3.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 3.	1 Hz / 10 Hz
209.13	Node 4 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 4.	0.0 Hz / real32





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No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 13.	1 Hz / 10 Hz
209.53	Node 14 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 14.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 14.	1 Hz / 10 Hz
209.54	Node 14 fan 2 pulse freq	Displays the result of the identification run for fan 2 of node 14.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 2 of node 14.	1 Hz / 10 Hz
209.55	Node 14 fan 3 pulse freq	Displays the result of the identification run for fan 3 of node 14.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 3 of node 14.	1 Hz / 10 Hz
209.56	Node 14 fan 4 pulse freq	Displays the result of the identification run for fan 4 of node 14.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 14.	1 Hz / 10 Hz
209.57	Node 15 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 15.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 15.	1 Hz / 10 Hz
209.58	Node 15 fan 2 pulse freq	Displays the result of the identification run for fan 2 of node 15.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 2 of node 15.	1 Hz / 10 Hz
209.59	Node 15 fan 3 pulse freq	Displays the result of the identification run for fan 3 of node 15.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 3 of node 15.	1 Hz / 10 Hz
209.60	Node 15 fan 4 pulse freq	Displays the result of the identification run for fan 4 of node 15.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 15.	1 Hz / 10 Hz
209.61	Node 16 fan 1 pulse freq	Displays the result of the identification run for fan 1 of node 16.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 1 of node 16.	1 Hz / 10 Hz
209.62	Node 16 fan 2 pulse freq	Displays the result of the identification run for fan 2 of node 16.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 2 of node 16.	1 Hz / 10 Hz
209.63	Node 16 fan 3 pulse freq	Displays the result of the identification run for fan 3 of node 16.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 3 of node 16.	1 Hz / 10 Hz
209.64	Node 16 fan 4 pulse freq	Displays the result of the identification run for fan 4 of node 16.	0.0 Hz / real32
	0.0 ... 5000.0 Hz	Result of the identification run for fan 4 of node 16.	1 Hz / 10 Hz



# Fault tracing

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## Contents of this chapter

The chapter lists the warning and fault messages including possible causes and corrective actions. It also contains descriptions for the LEDs of the CIO module.

## Warning and fault indications

A warning or fault message on the panel display or on Drive composer PC tool indicates abnormal drive status. Most warning and fault causes can be identified and corrected using the information in this chapter. If not, contact ABB representative.

### ■ Auxiliary code

Some faults and warnings have an auxiliary code for identifying the CIO module in question. The auxiliary code is a hex word that indicates the node ID.

Auxiliary code (Hex)	Node ID	Auxiliary code (Hex)	Node ID
0000 0000	1	0000 0008	9
0000 0001	2	0000 0009	10
0000 0002	3	0000 000A	11
0000 0003	4	0000 000B	12
0000 0004	5	0000 000C	13
0000 0005	6	0000 000D	14
0000 0006	7	0000 000E	15
0000 0007	8	0000 000F	16

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## Warning and fault messages

Code (hex)	Warning/Fault	Cause	What to do
AE90	I/O bus communication	Communication break noticed on I/O bus.	Check I/O bus wiring, powering of the nodes and node number settings on the CIO modules. Parameters of parameter group 208 I/O bus diagnostics can be used to identify the nodes that are not responding.
AE91	Fan lifetime exceeded	Warning limit for fan lifetime (206.8) has been exceeded.	Check node ID <sup>1)</sup> . Check fan runtimes for the node. Replace the old fan and reset the fan data via parameter group 207 I/O bus service.
AE92	Fan speed	Fan speed is under limit (206.6).	Check fan supervision status of all fans. See parameters 206.30 ... 206.33. Replace faulty fans.
AE93	Fan speed feedback error	Error in fan speed feedback (206.30 ... 206.33)	Check node ID <sup>1)</sup> . Check fan supervision status of all fans. See parameters 206.30 ... 206.33. Verify the identification run results against the tachometer pulse count of the fan feedback.
AE94	CIO MCB monitoring	Some of the bits of the MCB status word are 0 (206.40).	Check node ID <sup>1)</sup> . Check miniature circuit breaker and digital input DI5 of the appropriate CIO module.
AE95	CIO fuse monitoring	Some of the bits of the fuse status word are 0 (206.41).	Check node ID <sup>1)</sup> . Check fuses and digital input DI6 of the appropriate CIO module.
AE97	CIO DI8 monitoring	Some of the bits of the DI8 status word are 0 (206.43).	Check node ID <sup>1)</sup> . By default DI8 is not in use.
8E12	Fan speed	Fan speed is under the fault limit (206.7).	Check node ID <sup>1)</sup> . Check fan supervision status of all fans. See parameters 206.30 ... 206.33. Replace faulty fans.
8E13	I/O module version mismatch	Communication services of the CIO module are incompatible with the firmware version on the control unit.	Check node ID <sup>1)</sup> . Replace the incompatible CIO module.
8E14	CIO MCB monitoring	Some of the bits of the MCB status word are 0 (206.40).	Check node ID <sup>1)</sup> . Check miniature circuit breaker and digital input DI5.
8E15	CIO fuse monitoring	Some of the bits of the fuse status word are 0 (206.41).	Check node ID <sup>1)</sup> . Check fuses and digital input DI6.
8E17	CIO DI8 monitoring	Some of the bits of the DI8 status word are 0 (206.43).	Check node ID <sup>1)</sup> . Check digital input DI8.

<sup>1)</sup> See section Auxiliary code.

## LEDs of the CIO module

LED	Color	Description
MODULE	Green	Normal operation
	Red	System fault. Replace the CIO-01 module.
	Orange (ie. green and red)	Configuration change is pending: node address has been changed recently for the CIO-01 module, but the control program has not yet acknowledged the change.
NETWORK	Blinking green	Data transmission is ongoing on the RS-485 communication link: CIO-01 module received a message and generated a reply.
	Red	No communication on the RS-485 communication link: communication timeout has been exceeded.
PWR	Green	The module is powered (24 V supply).
DO1...DO4	Green	DO status for each channel. Lit when output is high.
DI1...DI8	Green	DI status for each channel. Lit when input is on (energized).



A large, bold, black number '10' is centered within a light grey square with rounded corners.

## Ordering information

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### CIO-01 I/O module

CIO-01 I/O module for distributed I/O bus control is not included in the module delivery but must be ordered separately. The distributed I/O bus controls and supervises each cabinet fan separately. It indicates malfunctioning fans by warning or fault messages. One CIO-01 can monitor and control up to 4 cabinet fans.

Type	Data	Qty	Ordering code
CIO-01	CIO-01 I/O module for distributed I/O bus control	1	3AXD50000041983

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# 11

## Maintenance

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### Contents of this chapter

This chapter includes maintenance intervals and procedures for the CIO module.

### Maintenance intervals

CIO module...	Years from start-up				
	6	9	12	15	18
for fan control (230 VAC and 24 VDC)		R			R
for fan control (115 VAC) <sup>1)</sup>	I/R		I/R		I/R

<sup>1)</sup> Replace CIO module or reset fan counters.

### Replacing the CIO module

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#### **WARNING!**

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur.

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See chapter [Safety instructions](#).

Before replacing the CIO module, check the node number of the old CIO module. Node numbers are defined at start-up. See [Start-up](#). If a CIO module is replaced, all the fans connected to the replaced CIO module need to be replaced as well. For instructions on how to replace the fan, see the appropriate hardware manual of the supply/inverter/converter unit. If fans are not replaced after replacing a CIO module, run-time supervision will reset at zero and will not work properly for the fans.

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### ■ Removing the CIO module

1. Do the Electrical safety precautions steps before you start the work. Refer to the drive safety instructions.
2. Disconnect the additional monitoring signals to CIO module (if any).
3. Disconnect the fan input and output signals to CIO modules.
4. Disconnect the serial communication cables from the CIO module.
5. Disconnect the power supply cables to the CIO module.
6. Unfasten the module's mounting screws.
7. Remove the CIO module from the drive cabinet.

### ■ Reinstalling the CIO module

For instructions on installing the CIO module, see chapters [Mechanical installation](#) and [Electrical installation](#).

## Resetting the fan data after replacing a fan

If fans are replaced with new ones, identification run result and internal run-time counters on the CIO module need to be reset. To reset fan data, do the following:

1. Set parameter [207.1](#) to the node the fan is connected to.
  2. Set parameter [207.2 Fan reset selection](#) to the fan that needs to be reset.
  3. Set parameter [207.3 Command selection](#) to [Reset fan data](#).
  4. Trigger the operation with parameter [207.10 Service request trigger](#) for the selected node.
-

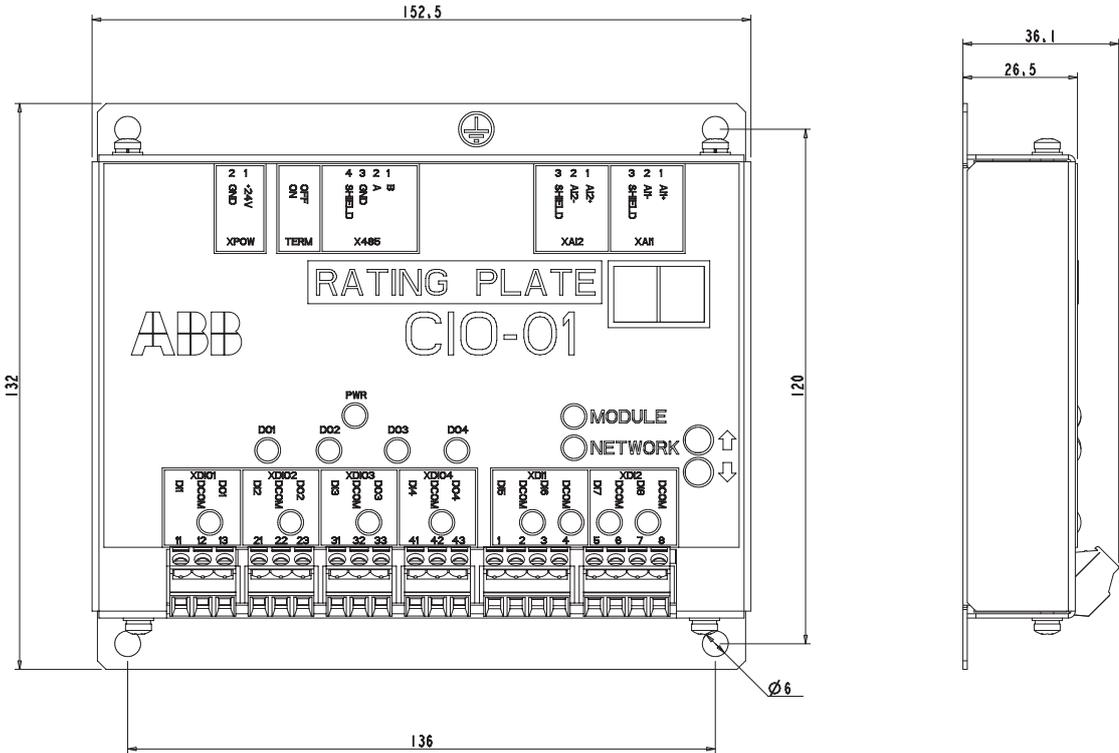
# 12

## Technical data

### Contents of this chapter

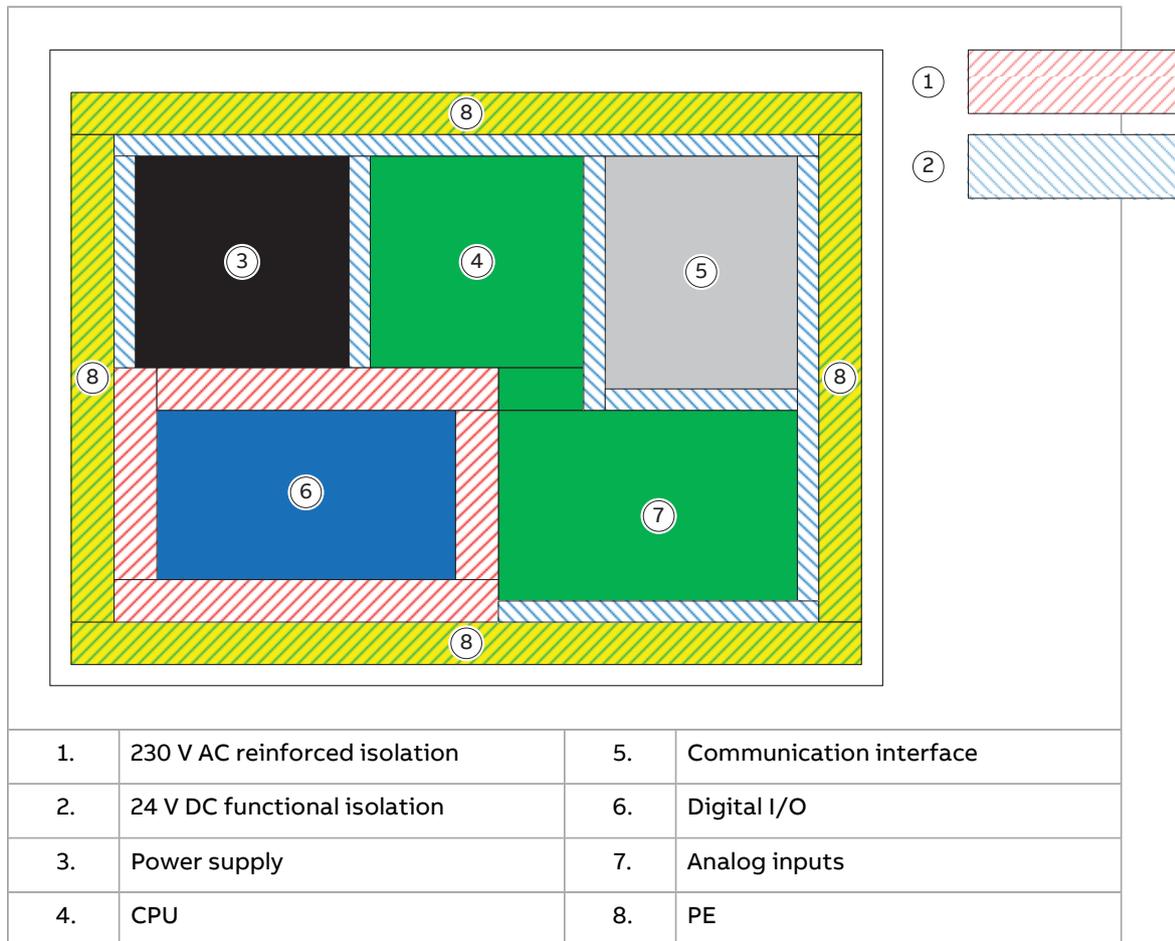
This chapter contains the technical data of the CIO module.

### Dimension drawing



## Isolation areas

- Power supply (functional 1.0 mm isolation)
- Digital I/Os (230 V AC TN reinforced 4.5 mm isolation)
- CPU and analog inputs (functional 1.0 mm isolation)
- Communication interface (functional 1.0 mm isolation)



## Specifications

Input voltage	24 V (-15%/+20%)
Maximum input current	1 A
Current consumption	100 mA (typical)
<b>RS-485</b>	
<ul style="list-style-type: none"> <li>power supply</li> <li>communication data rate</li> <li>cable length</li> </ul>	5 V (±5%), 100 mA < 200 kbps < 100 m
<b>Digital outputs (DO)</b>	
<ul style="list-style-type: none"> <li>power supply</li> <li>modulation frequency</li> <li>maximum sinking current</li> </ul>	15 V (±5%), 20 mA < 2 kHz 100 mA
<b>Digital inputs (DI)</b>	
<ul style="list-style-type: none"> <li>Power supply</li> <li>input frequency DI1...DI4</li> <li>input frequency DI5...DI8</li> <li>input impedance</li> </ul>	15 V (±5%), 100 mA < 2 kHz < 100 Hz 1250 ohm
<b>Analog inputs (AI)</b>	
Input impedance	> 1 kohm
Analog voltage measurement range NTC measurement (Not in use.)	0...5.0 V
<ul style="list-style-type: none"> <li>supply voltage</li> <li>nominal NTC value (25 °C)</li> <li>accuracy</li> <li>B value</li> </ul>	5 V (±5%) 10 kohm 1% 3975

## Ambient conditions

Storage temperature	-40 °C...+85 °C (-40...185 °F)
Operating temperature	+0 to +70 °C (32...158 °F)
Maximum relative humidity	90% (non condensing)
Maximum operating altitude	5000 m (16404 ft)

## Protection class

IP20

## Materials

Housing	Hot-dip zinc coated steel, cover painted
Package	Cardboard

## **Applicable standards**

See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048634 [English]).

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# Further information

## Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to [www.abb.com/searchchannels](http://www.abb.com/searchchannels).

## Product training

For information on ABB product training, navigate to [new.abb.com/service/training](http://new.abb.com/service/training).

## Providing feedback on ABB manuals

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