ABB INDUSTRIAL DRIVES

Hardware manual

BCU-01/11 control units

List of related manuals

General manuals	Code (English)
Safety instructions for ACS860 multidrive cabinets and modules	*3AXD50000034060*
Electrical planning instructions for ACS860 multidrive cabinets and modules	*3AXD50000034058*
Cabinet design and construction instructions for ACS860 multidrive modules	*3AXD50000034059*
BCU-01/11 control units hardware manual	*3AXD50000034055*
Inverter module manuals	
ACS860-104 inverter modules hardware manual	*3AXD50000034054*
ACS860 primary control program firmware manual	*3AXD50000034052*
ACS860 primary control program quick start-up guide	*3AXD50000034105*
Option manuals	
FDPI-02 diagnostics and panel interface user's manual	*3AUA0000113618*

You can find manuals and other product documents in PDF format on the Internet. See section *Document library on the Internet* on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

3AXD50000034055 Rev B
EN
EFFECTIVE: 2023-10-15

Table of contents

BCU-01/11 control units

Contents of the manual

This manual contains a description of the use and structure of the control unit and its technical data. It also describes how to install and maintain the control unit.

For safety information, see *Safety instructions for ACS860 multidrive cabinets and modules* (3AXD50000034060 [English]).

For information on the unit's electrical installation, see *Electrical planning instructions for ACS860 multidrive cabinets and modules* (3AXD50000034058 [English]) and the appropriate drive/converter/inverter hardware manual.

For the default I/O connection diagrams and more information on the connections, see the appropriate drive/converter/inverter hardware manual.

For the related manuals, see *List of related manuals*.

Safety

WARNING! Obey the safety instructions in *Safety instructions for ACS860 multidrive cabinets and modules* (3AXD50000034060 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

Terms and abbreviations

Later in this manual, term *converter* substitutes for string inverter.

Hardware description

The BCU-01/11 are control units used for controlling converters via fiber optic links. It contains integrated branching unit functionality for collecting and storing real-time data from the converter modules to help fault tracing and analysis. The data is stored in a secure data card.

The control unit types have a different number of fiber optic connections:

BCU type	No. of fiber optic connections
BCU-01	2
BCU-11	7

The control unit requires an external 24 V DC power source. It has two option slots for encoders and fieldbus adapters and a removable memory unit. For example, if the control unit needs to be replaced, the parameter settings can be retained by transferring the memory unit from the defective control unit to the new one.

The control unit has an on-board data logger that collects real-time data from the converter power stages to help fault tracing and analysis. The data is stored onto

the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

The drive-to-drive link (XD2D) is a daisy-chained RS-485 transmission line that allows basic master/follower communication with one master and multiple followers. The control unit has also one option slot for connecting the RDCO DDCS communication option board. For more information, see the appropriate hardware manual.

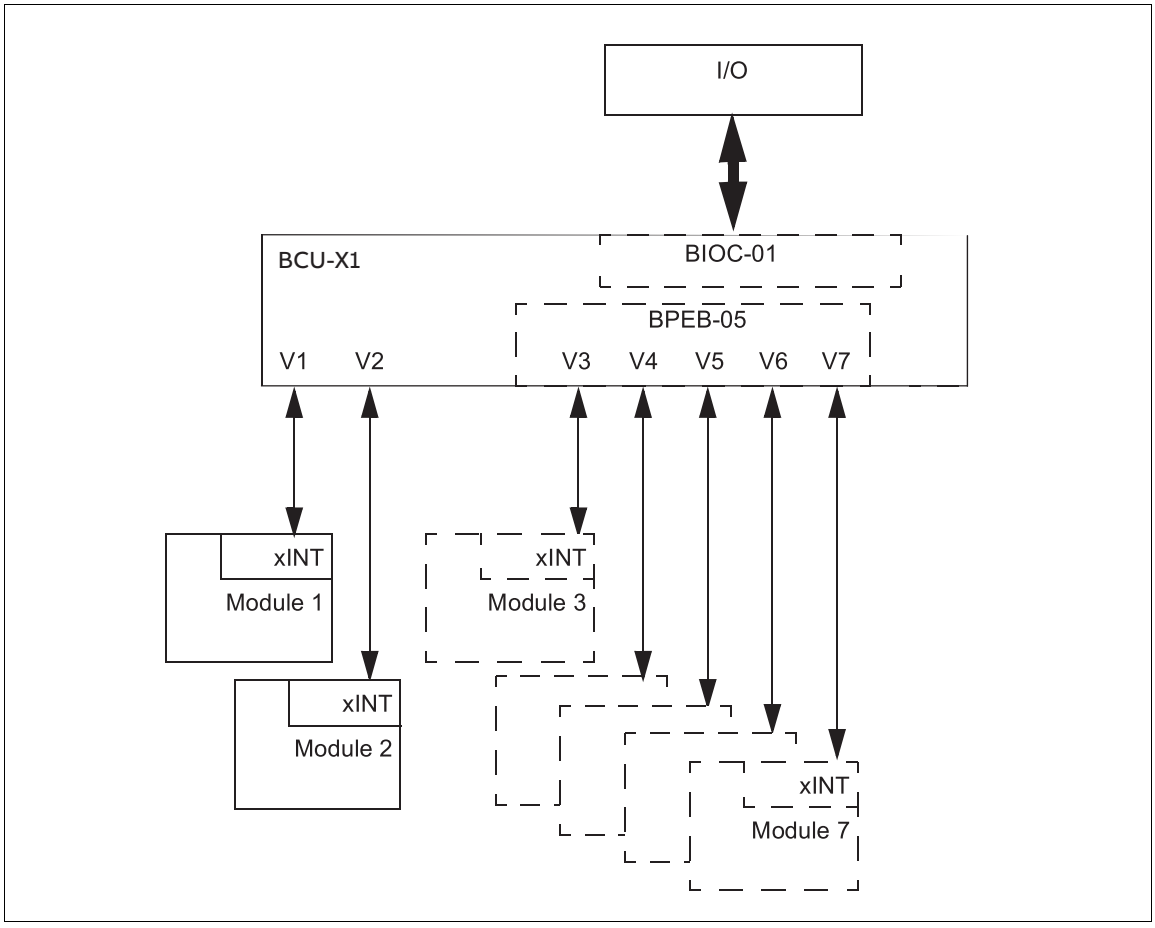
Fiber optic connections

BCU-01 control unit has two fiber optic connections for converter modules, V1 and V2. BCU-11 control unit has a BPEB-05 board that provides five additional fiber optic connections. Thus, BCU-11 has seven connections (V1…V7) in all.

The maximum lengths of the cables are:

- 1 mm plastic optical fiber cables, 35 m (115 ft)
- 200 µm hard-clad silica fiber cables, 100 m (328 ft).

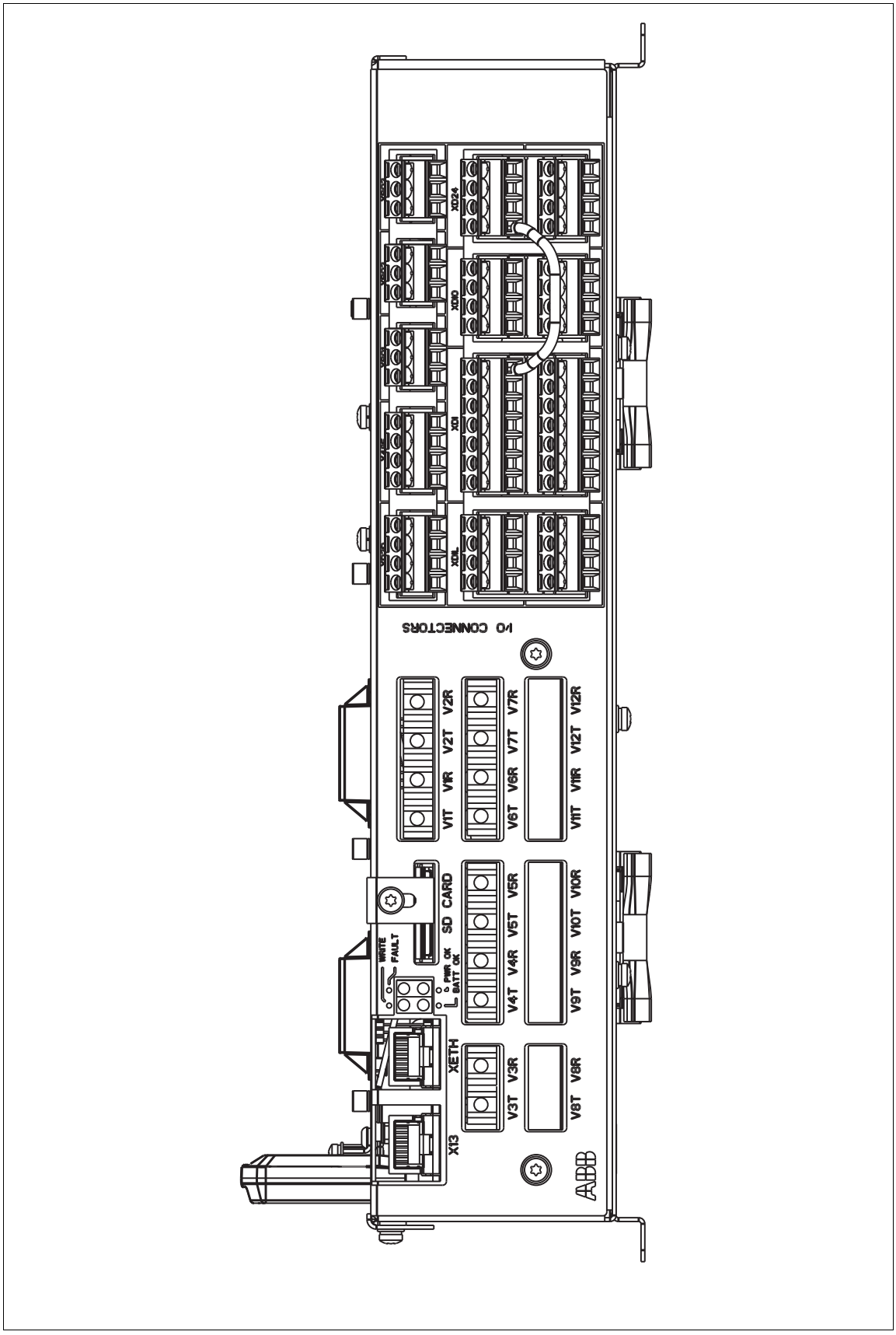
Fiber optic pairs connected to one control unit must have the same length. With long distances, cables of different length cause different delays, which can have an unwanted effect on the operation.



For instructions on connecting the control unit to the converter module, see the appropriate hardware manual.

Layout

The following figures show the layout of the BCU-01 control unit. For the default I/O connection diagrams and more information on the connections, see the appropriate hardware manual.


I/O CONNECTORS
X024
X020
X03
X04L
V1T V1R V2T V2R
V6T V6R V7T V7R
V11T V11R V12T V12R
SD CARD
V5T V5R V10T V10R
V4T V4R V9T V9R
WRITE FAULT
PWR OK
BATT OK
XETH
V3T V3R V8T V8R
X13
ABB

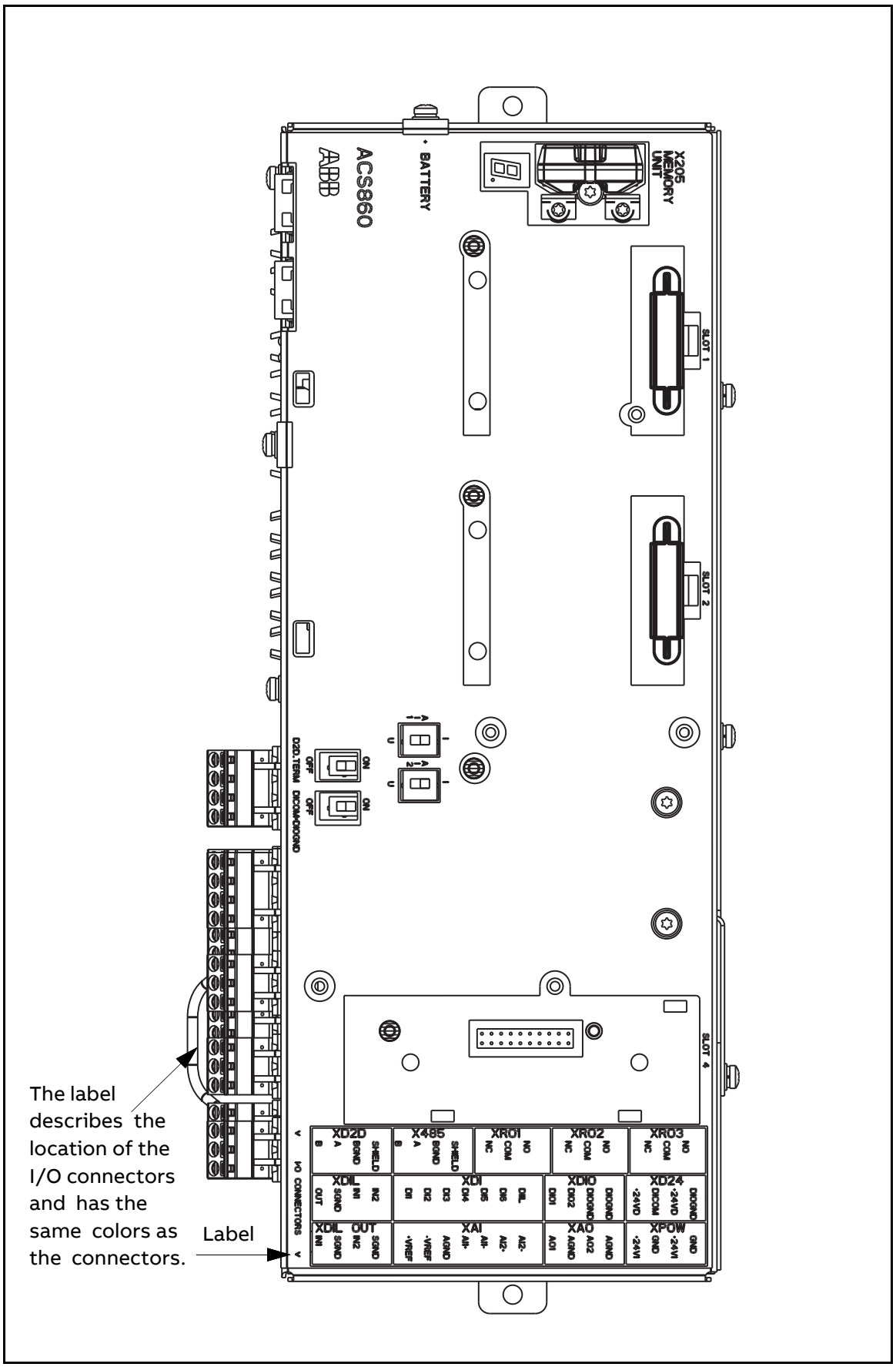


ABB
ACS860
BATTERY
X205
MEMORY
UNIT
SLOT 1
SLOT 2
SLOT 4
D2D TERM
DICOM
DIOGND
XD2D
X485
XRO1
XRO2
XRO3
XDIL
XDI
XDIO
XD24
XDIL
XAI
XAO
XPOW
I/O CONNECTORS
The label describes the location of the I/O connectors and has the same colors as the connectors.
Label

	Description
I/O connector	
XAI	Analog input
XAO	Analog output
XDI	Digital input and digital start interlock
XDIO	Digital input/output
XD2D	Drive-to-drive link
XD24	+24 V output for digital input
XPOW	External power input
XRO1	Relay output 1
XRO2	Relay output 2
XRO3	Relay output 3
XDIL	Drive interlock connection (input signal). **Note:** This input only acts as a true Drive interlock input in control units controlling a motor. In other applications (such as a supply or brake unit), de-energizing the IN1 and/or IN2 terminal will stop the unit but does not constitute a true safety function. For more information on Drive interlock, see the appropriate hardware manual.
XDIL OUT	Drive interlock connection (output for powering XDIL input of inverter modules).
X485	Not in use
Switch	
AI1	Analog input 1 current/voltage selection
AI2	Analog input 2 current/voltage selection
D2D TERM	Drive-to-drive link termination
DICOM = DIOGND	Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats).
Fiber optic connector	
V1T…V7T, V1R…V7R	Fiber optic connector to converter module: T = Transmitter, R = Receiver
Connector for optional module	
SLOT 1	F-type adapter If FDPI-02 diagnostics and panel interface is used, it has to be installed in slot 1 with two screws.
SLOT 2	F-type adapter
SLOT 4	RDCO-0x DDCS communication option modules
Control panel and Ethernet connector	
XETH	Not in use
X13	Control panel
Memory unit and card connector	
X205 MEMORY UNIT	Converter memory unit connector
SD CARD	Secure digital card holder (Data logger memory for the fiber optic links)

	Description
Miscellaneous	
+ Battery	Real-time clock battery

The 7-segment display

The following table describes the indications of the 7-segment display on the control unit. Multicharacter indications are displayed as repeated sequences of characters.

	“U” is indicated shortly before “o”. The control program has been launched and is running.
	Flashing character. The firmware cannot be started: The memory unit is missing or corrupted.
	The firmware download from a PC to the control unit is in progress.
	At the converter power-up, the 7-segment display can show short indications of, for example, “1”, “2”, “b” or “U”. These are normal indications immediately after powering up the converter. If the 7-segment display ends up showing other values than described above after the power-up, it indicates a hardware failure.

Checking the delivery

Check that all items listed below are present. Check that there are no signs of damage:

- control unit with the I/O connectors
- memory unit
- SD/SDHC flash memory card (inserted in its slot)
- real-time clock battery.

Identifying different control unit types

Before installation, check that the control unit has the correct control program for the converter hardware in question. The control program is shown in the label attached to the memory unit.

Check also that the control unit is suitable for your equipment configuration.

Mechanical installation

WARNING! Do not install the control unit in the immediate vicinity of electromagnetic disturbance sources, such as relays, contactors, brake choppers, power and motor cabling. The minimum recommended distance from such components is 200 mm. We recommend to install metallic screening between the control unit and the source of disturbance. This can reduce the required distance.

WARNING! Mount the control unit so that air can pass freely through the ventilation holes in the housing. Avoid mounting directly above heat-generating equipment.

You can mount the control unit on a vertical or horizontal standard 35 × 7.5/15 mm DIN rail. In vertical direction, you can mount the unit either top or bottom upwards. When mounting the unit horizontally, the connectors must be downwards and the connector texts the right way up.

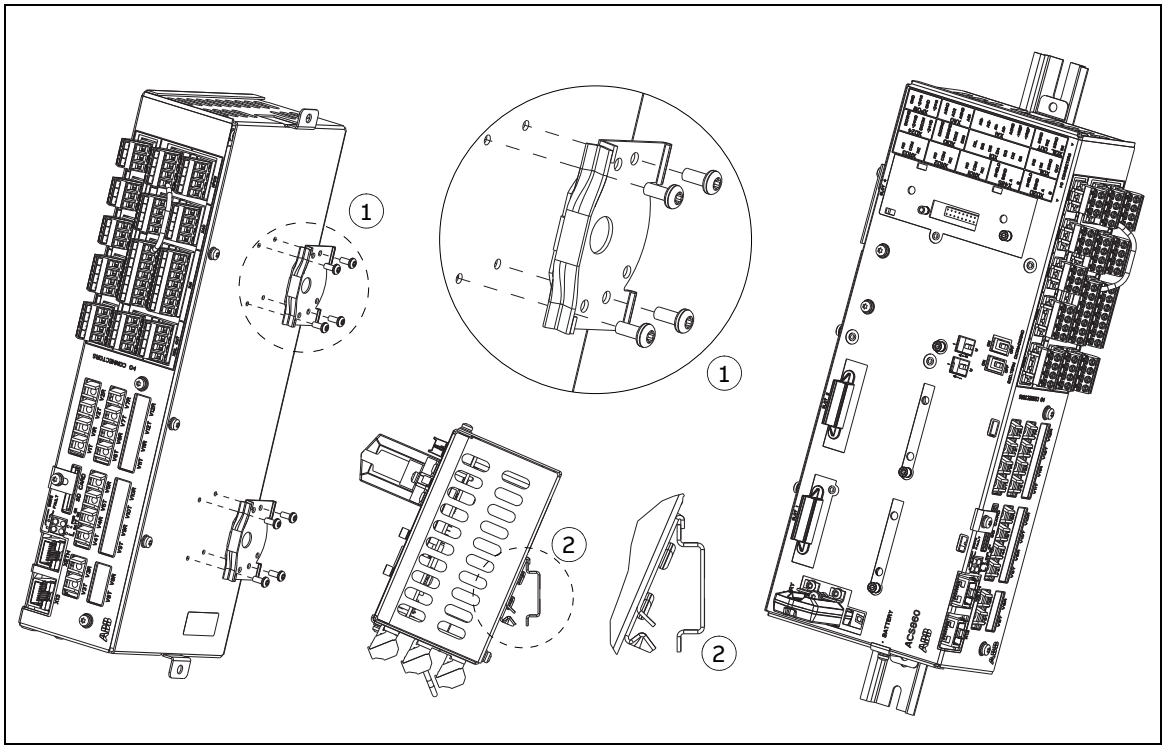
Leave enough space for cabling, and replacing the memory unit and real-time clock battery. See sections *Replacing the real-time clock battery*, *Replacing the memory unit* and *Replacing the SD/SDHC memory card* on page *15*.

Installing the control unit

The control unit is grounded through the DIN rail.

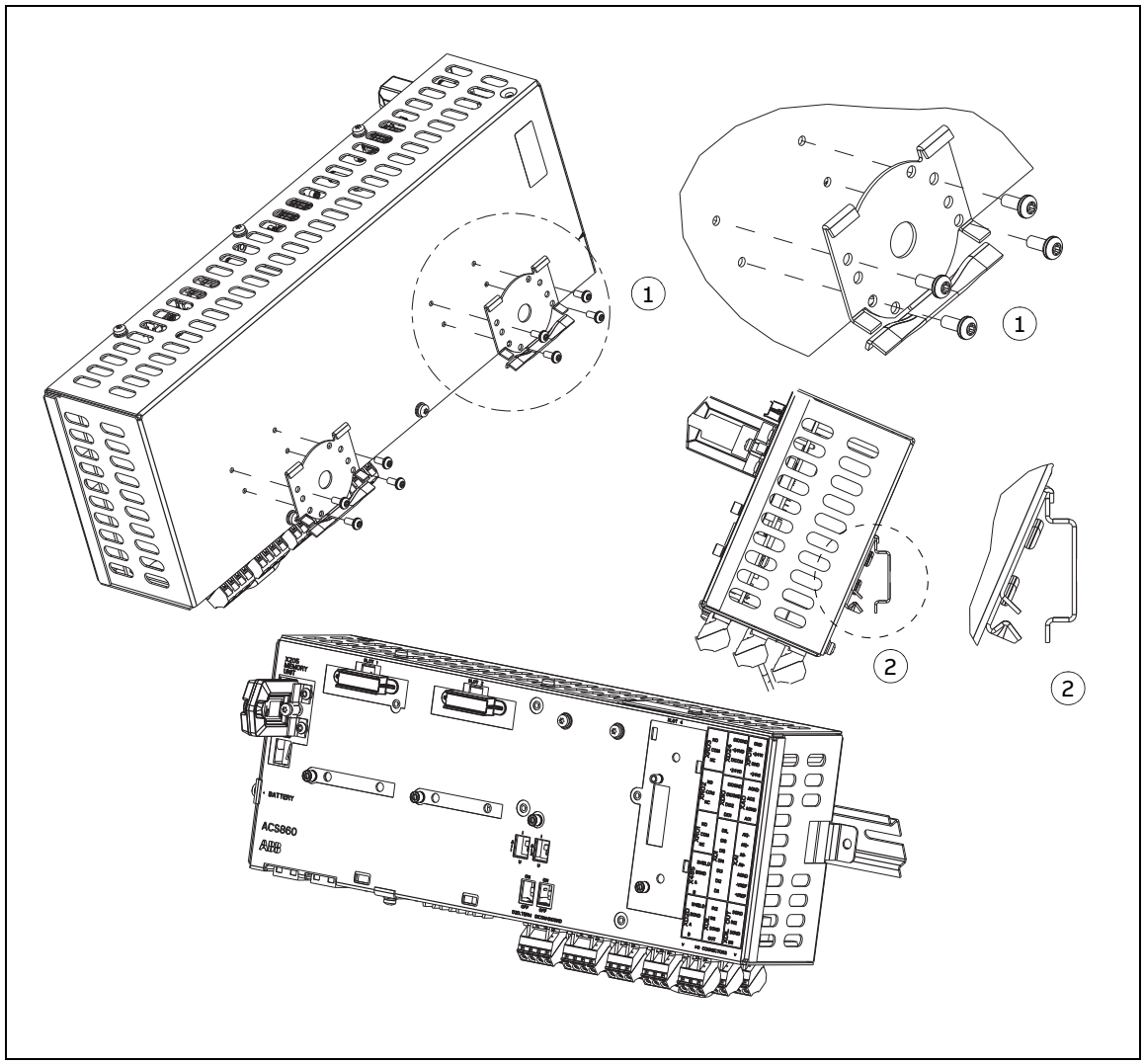
Vertical DIN rail mounting

1. Fasten the latch to the back of the control unit with four screws.
2. Clip the control unit to the rail as shown below.



Horizontal DIN rail mounting

1. Fasten the latches to the back of the control unit with four screws.
2. Clip the control unit to the rail as shown below.



Electrical installation

WARNING! Obey the safety instructions given in *Safety instructions for ACS860 multidrive cabinets and modules* [3AXD50000034060 (English)]. If you ignore the safety instructions, injury or death can occur. If you are not a qualified electrician, do not do electrical work.

Connect the +24 V external power supply to the control unit connector XPOW.

Connect the fiber optic cables and gate driver board wiring from the converter module to the control unit according to the instructions given in the converter module hardware manual.

For general electrical installation instructions, see *Electrical planning instructions for ACS860 multidrive cabinets and modules* [3AXD50000034058 (English)].

Fault tracing

LEDs

LED	
BATT OK	When on, the battery voltage of the real time clock is OK (higher than 2.8 V). When off, • battery voltage is below 2.8 V, • battery is missing, or • control unit is not powered.
PWR OK	When on, internal voltage is OK.
FAULT	When on, the control program indicates that the equipment is faulty. See the appropriate firmware manual.
WRITE	When on, writing to the SD card is in progress.

Maintenance

Replacing the real-time clock battery

Replace the real-time clock battery if the BATT LED is not illuminated when the control unit is powered. For information on the LED, see *Fault tracing* on page *14*.

See A in figure *See the appropriate documentation: drive or inverter module hardware manual.* on page *16*.

1. Undo the fastening screw and remove the battery. For the replacement battery type, see *Real-time clock battery* on page *20*.
2. Insert the new battery according to figure *See the appropriate documentation: drive or inverter module hardware manual.*.
3. Dispose the old battery according to local disposal rules or applicable laws.
4. Set the real-time clock.

Replacing the memory unit

WARNING! Do not remove or insert the memory unit when the control unit is powered.

See B in figure *See the appropriate documentation: drive or inverter module hardware manual.* on page *16*.

1. To remove the memory unit, undo the fastening screw and pull the memory unit out. See the following figure.
2. Insert the new memory unit and fasten the screw.

Replacing the SD/SDHC memory card

Note: Do not remove the SD card while the yellow WRITE LED is lit. Writing to the SD card is in progress.

See C in figure *See the appropriate documentation: drive or inverter module hardware manual.* on page *16*.

1. Undo the fastening screw of the clip covering the memory card and press the card to remove it. For the card location, see the following figure. For the replacement card type, see *Ground isolation diagram* on page *19*.
2. Insert the new card in reverse order.

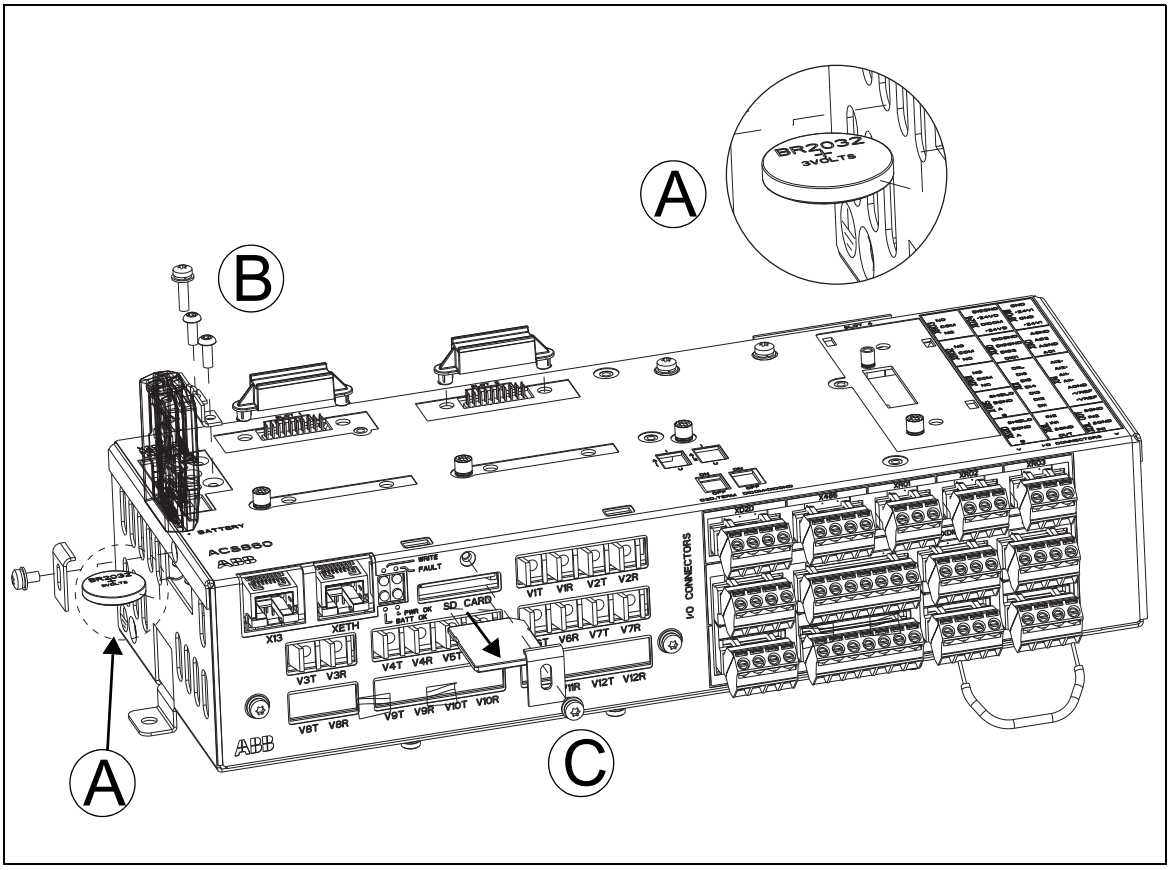
Replacing the control unit

See section *Installing the control unit* on page *11*.

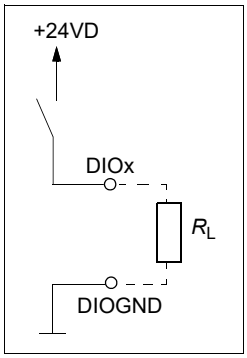
1. If the control unit has been installed vertically, remove the end bracket.
2. Remove the control unit from the rail.
3. Undo the four fastening screws with which the latch has been fastened to the back of the control unit.
4. Pull out the detachable terminal blocks which have control cables connected.
5. Install the new control unit in reverse order.

Note: If there is a safety circuit connected to the DIL terminals (XDIL) of the control unit, redo its acceptance test according to the instructions given in the inverter or drive module hardware manual.

See the appropriate documentation: drive or inverter module hardware manual.



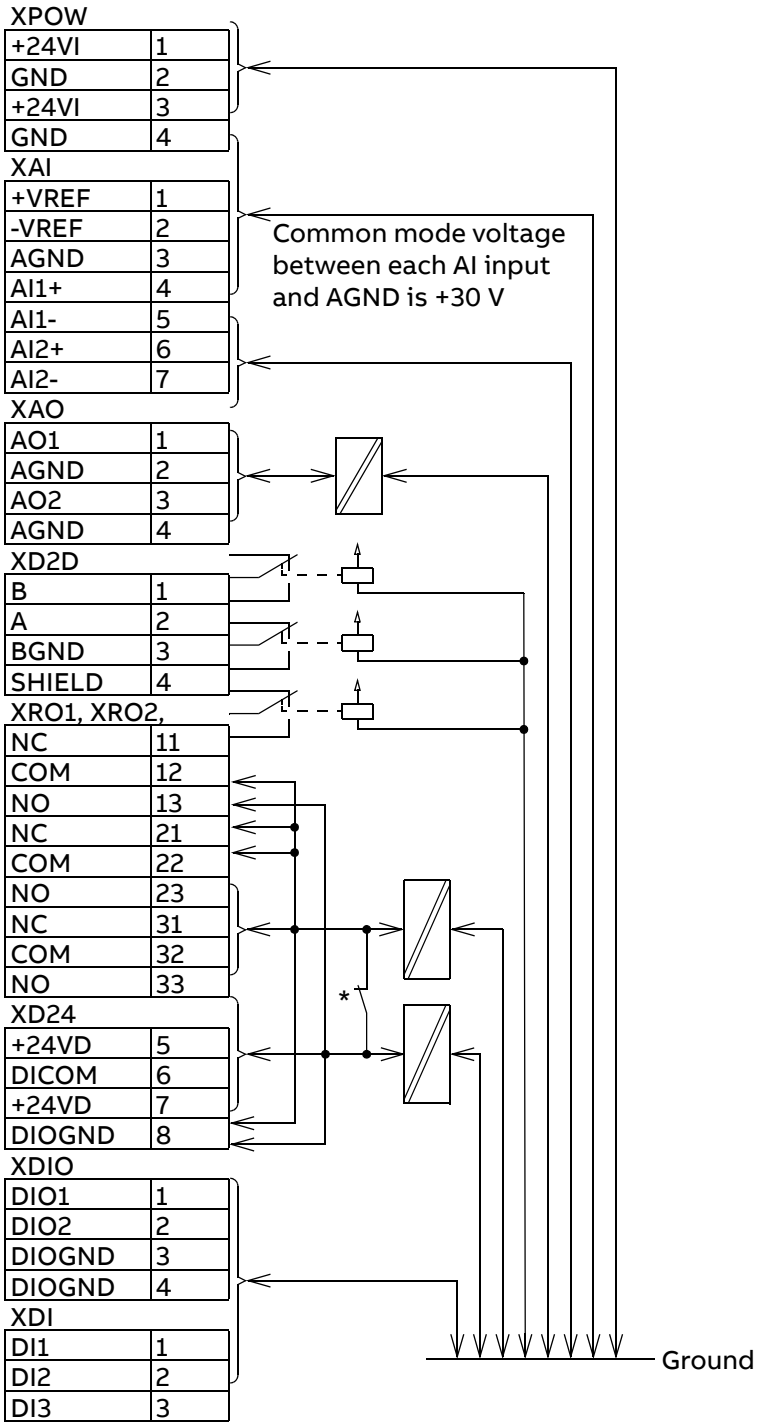
Technical data

Connector data	
Power supply (XPOW)	Connector pitch 5 mm, wire size 2.5 mm^2 24 V (±10%) DC, 2 A External power input. Two supplies can be connected for redundancy.
Relay outputs RO1…RO3 (XRO1…XRO3)	Connector pitch 5 mm, wire size 2.5 mm^2 250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:2 and XD24:4)	Connector pitch 5 mm, wire size 2.5 mm^2 Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1…DI6 (XDI:1…XDI:6)	Connector pitch 5 mm, wire size 2.5 mm^2 24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP (DI1…DI5), NPN (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms DI6 (XDI:6) can alternatively be used as an input for a PTC thermistor. “0” > 4 kohm, “1” < 1.5 kohm I_{max}: 15 mA (DI1…DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	Connector pitch 5 mm, wire size 2.5 mm^2 24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP Hardware filtering: 0.04 ms, digital filtering up to 8 ms
Digital inputs/outputs DIO1 and DIO2 (XDIO:1…XDIO:4) **Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0…16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). DIO2 can be configured as a 24 V level square wave frequency output. See the firmware manual.**	Connector pitch 5 mm, wire size 2.5 mm^2 As inputs: 24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm Filtering: 1 ms As outputs: Total output current from +24 VD is limited to 200 mA 

Reference voltage for analog inputs +VREF and -VREF **(XAI:1 and XAI:2)**	Connector pitch 5 mm, wire size 2.5 mm^2 10 V ±1% and –10 V ±1%, R_{load} 1…10 kohm Maximum output current: 10 mA
Analog inputs AI1 and AI2 (XAI:4 … XAI:7). **Current/voltage input mode selection by switches**	Connector pitch 5 mm, wire size 2.5 mm^2 Current input: –20…20 mA, R_{in}: 100 ohm Voltage input: –10 …10 V, R_{in} > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range Inaccuracy with Pt100 sensors: 10 °C (50 °F)
Analog outputs AO1 and AO2 **(XAO)**	Connector pitch 5 mm, wire size 2.5 mm^2 0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
Drive-to-drive link **(XD2D)**	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: RS-485 Termination by switch
RS-485 connection **(X485)**	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: RS-485
Drive interlock connection (XDIL)	Connector pitch 5 mm, wire size 2.5 mm^2 Input voltage range: -3…30 V DC Logic levels: “0” < 5 V, “1” > 17 V For the unit to start, both connections must be “1” Current consumption: 66 mA (continuous) per DIL channel per inverter module EMC (immunity) according to IEC 61326-3-1
Drive interlock output (XDIL OUT)	Connector pitch 5 mm, wire size 2.5 mm^2 To DIL connector of inverter module
Control panel connection **(X13)**	Connector: RJ-45 Cable length < 3 m
Ethernet connection **(XETH)**	Connector: RJ-45
SDHC memory card slot **(SD CARD)**	Memory card type: SDHC Maximum memory size: 4 GB

The terminals on the board fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.

Ground isolation diagram



*Ground selector (DICOM=DIOGND) settings

DICOM=DIOGND: ON All digital inputs share a common ground (DICOM connected to DIOGND). This is the default setting.
DICOM=DIOGND: OFF Ground of digital inputs DI1…DI5 and DIIL (DICOM) is isolated from DIO signal ground (DIOGND). Isolation voltage 50 V.

Dimensions

Height		Width		Width with connectors		Depth		Depth with memory unit		Depth with memory unit and latch	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
311	12.24	125	4.92	139	5.47	74	2.9	110	4.33	115	4.53

Battery	
Real-time clock battery	BR2032

Protection classes	
Degree of protection (IEC/EN 60529)	IP10
Overvoltage category (IEC 60664-1)	II
Protective class (IEC/EN 61800-5-1)	I
Protective class (IEC 62109-1)	II

Ambient conditions	
Air temperature in operation	+0 to +70 °C (158 °F)

Materials	
Housing	Hot-dip zinc coated steel
Package	Cardboard

Parts Name	Hazard Substance					
	(Pb)	(Hg)	(Cd)	(Cr^{6+})	(PBB)	(PBDE)
PCBA	×	○	○	○	○	○
Metal parts	○	○	○	○	○	○
Plastic parts	○	○	○	○	○	○
Other Nonmetal parts	○	○	○	○	○	○
Fans	○	○	○	○	○	○
Cable/wires	○	○	○	○	○	○

This table is made according to SJ/T 11364

○: means the content of this hazard substance in the homogeneous materials of the parts is less than the limit requirement in GB/T 26572

×: means the content of this hazard substance in the homogeneous materials of the parts is exceed the limit requirement of GB/T 26572

PCBA: include Printed Circuit Board and the components.

Depending on the model/type of product, it may not contain all of the above parts. It is subject to the purchased actual product model/type.

 This environmental protection period applies only when the product is used according to the conditions required by the user manual.

To protect the environment and human health:

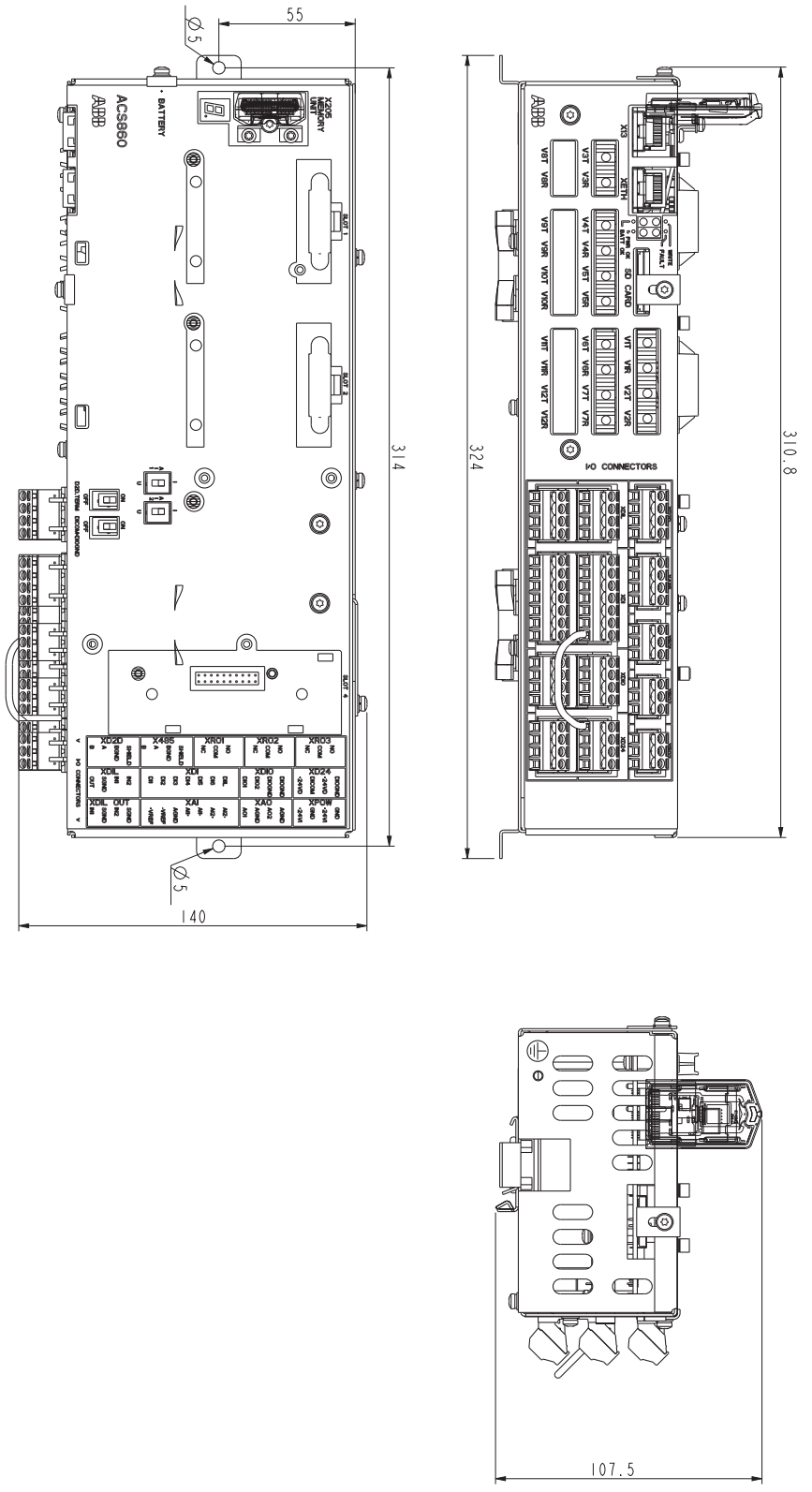
1. The scrapped product should be separated from domestic waste and sent to a qualified place of disposal.
2. Recycling center should use appropriate methods to recycle/deal with the materials.
3. For more information about this product recycling, please contact local government, recycling center or your local dealer.

Applicable standards	
EN 61800-5-1:2007	Adjustable speed electrical power drive systems. Part 5-1: Safety requirements – electrical, thermal and energy
EN 61800-3:2004	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. 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, 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. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Dimension drawing



Note: If no any special notes, all the dimensions in manual use metric unit (mm). Please contact ABB if you have any question related to drawings.

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.

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *ABB University*.

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