MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

ABB

BCU-12 3AUA0000110430

BCU-12 INDUSTRIAL DRIVE CONTROL UNIT

Used with the applicable ABB BCU control units configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: ABB technical documentation for BCU-12 3AUA0000110430

2

Operation principle and hardware description

Contents of this chapter

This chapter gives information about the hardware of the control units.

Hardware description

The control unit is used for controlling converter modules via fiber optic links. The control unit 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 on a memory card which can be analyzed by ABB service personnel.

The control unit requires an external 24 V DC power source. It has three option slots for I/O extensions, encoders and fieldbus adapters, and a removable memory unit. If it is necessary to replace the control unit, you can keep the parameter settings by moving the memory unit from the defective control unit to the new one. The control unit has one option slot for connecting a RDCO DDCS communication option module. The control unit also has a connection for a control panel.

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 X485 connection provides a connection for the optional CIO-01 I/O module.

Fiber optic connections

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

Type	Number of fiber optic connections
BCU-02	2
BCU-12	7
BCU-22	12

The maximum length of the cables with 1 mm plastic optical fiber (POF) cable is 35 m (115 ft).

Make sure that:

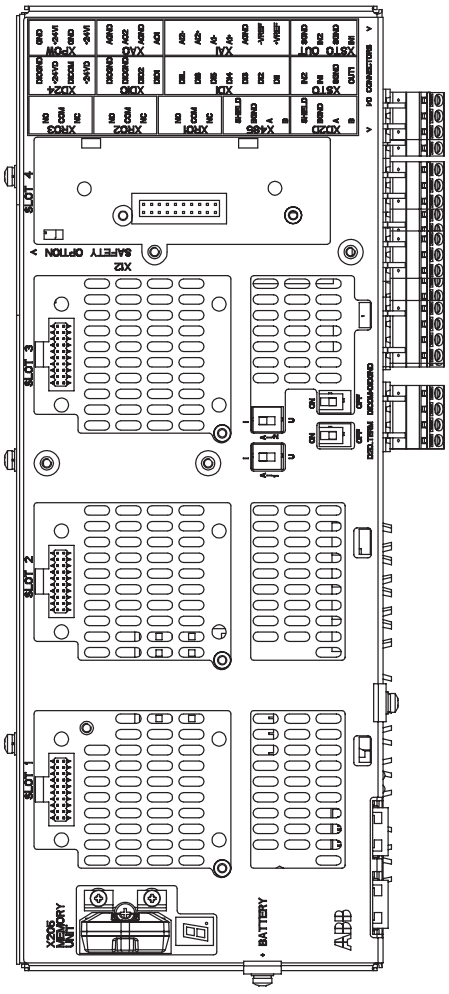
- both cables in a fiber optic pair have the same length, and
- each fiber optic pair connected to one control unit has the same length.

With long distances, cables of different lengths cause different delays, which can have an unwanted effect on the operation.

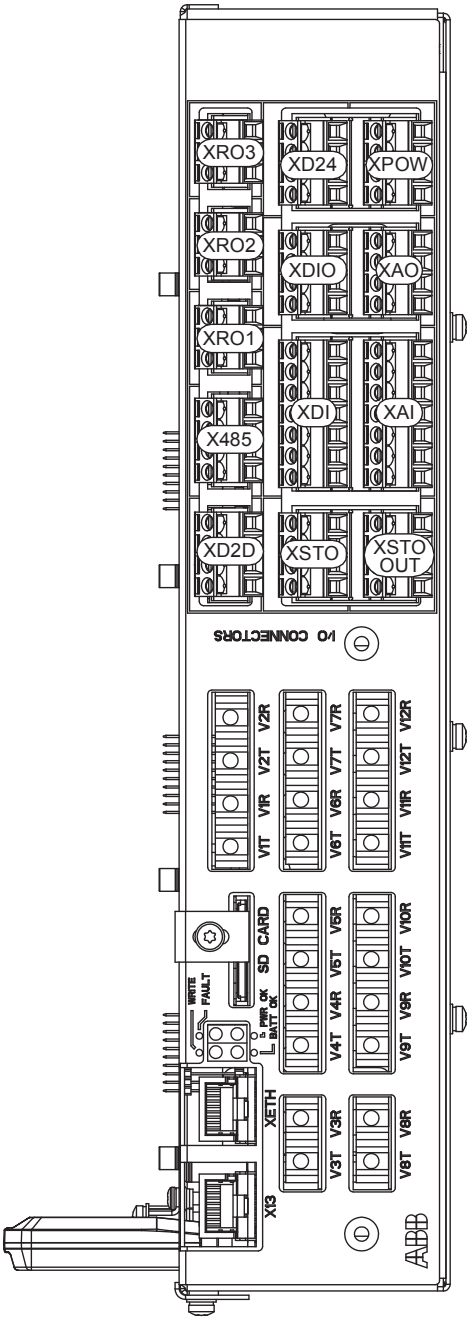
For instructions on how to connect the control unit to the converter module(s), refer to the applicable hardware manual.

Layout

The figures show the layout of the control unit. For the default I/O connection diagrams and more information on the connections, refer to the converter hardware manual.



	Description
I/O	I/O terminals (see following diagram)
SLOT 1	I/O extension, encoder interface or fieldbus adapter module connection. (This is the sole location for an FDPI-02 diagnostics and panel interface.)
SLOT 2	I/O extension, encoder interface or fieldbus adapter module connection
SLOT 3	I/O extension, encoder interface, field-bus adapter or FSO safety functions module connection
SLOT 4	RDCO DDCS communication option module connection
X205	Memory unit connection
BATTERY	Holder for real-time clock battery (BR2032)
AI1	Mode selector for analog input AI1 (I = current, U = voltage)
AI2	Mode selector for analog input AI2 (I = current, U = voltage)
D2D TERM	Termination switch for drive-to-drive link (D2D)
DICOM= DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats). See the ground isolation diagram.
7-segment display Multicharacter indications are displayed as repeated sequences of characters	
o	(“U” is indicated briefly before “o”.) Control program running
U	Control program startup in progress
L	(Flashing) Firmware cannot be started. Memory unit missing or corrupted
1	Firmware download from PC to control unit in progress
2	At power-up, the display may show short indications of eg. “1”, “2”, “b” or “U”. These are normal indications immediately after power-up. If the display ends up showing any other value than those described, it indicates a hardware failure.



	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XSTO	Safe torque off connection (input signals)
XSTO OUT	Safe torque off connection (to inverter modules)
X12	(On the opposite side) Connection for FSO safety functions module (optional) **Note:** The FSO safety functions module can be used only with ACS880 inverters.
X13	Control panel, PC connection through the control panel
X485	Not in use by default
V1T/V1R, V2T/V2R	Fiber optic connection to modules 1 and 2 (VxT = transmitter, VxR = receiver)
V3T/V3R … V7T/V7R	Fiber optic connection to modules 3…7 (BCU-12 and BCU-22 only) (VxT = transmitter, VxR = receiver)
V8T/V8R … V12T/V12R	Fiber optic connection to modules 8…12 (BCU-22 only) (VxT = transmitter, VxR = receiver)
SD CARD	Data logger memory card for inverter module communication
BATT OK	Real-time clock battery voltage is higher than 2.8 V. If the LED is off when the control unit is powered, replace the battery.
FAULT	The control program has generated a fault. See the firmware manual of the supply/inverter unit.
PWR OK	Internal voltage is sufficient
WRITE	Writing to memory card in progress. Do not remove the memory card.

3

Mechanical installation

Contents of this chapter

This chapter gives information on the mechanical installation of the control unit and the contents of the delivery.

Examining the delivery

Make sure that these items are included:

- control unit with the I/O connector plugs
- memory unit
- SD/SDHC flash memory card (inserted in its slot)
- real-time clock battery (BR2032).

Make sure that there are no signs of damage to the items.

Identifying different control unit types

Before you install the control unit, make sure that it has the correct control program. The control program is shown on the label attached to the memory unit.

Make sure that the control unit is correct for your equipment configuration.

Installing the control unit onto a DIN rail

NOTICE Do not install the control unit adjacent to electromagnetic disturbance sources (for example, relays, contactors, brake choppers, and power cabling). The minimum recommended distance to such components is 200 mm (7.9 in). ABB recommends that you install metallic screening between the control unit and the source of disturbance. This can reduce the required distance.

NOTICE Make sure that air can pass freely through the ventilation holes in the control unit housing. Do not install the control unit directly above heat-generating equipment. If you do not obey these instructions, the control unit can become too hot.

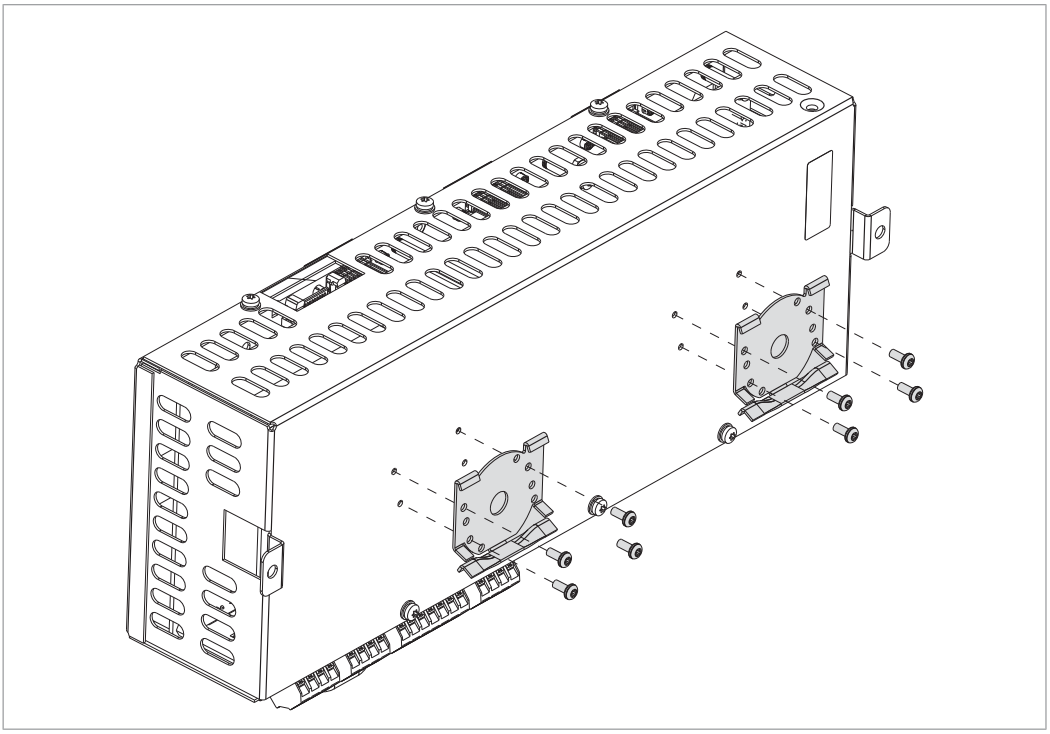
You can install the control unit horizontally or vertically onto a standard 35 × 7.5/15 mm DIN rail. If the control unit is installed horizontally, make sure that the connectors point down. If the control unit is installed vertically, the connectors can point to the left or right.

Leave sufficient free space around the control unit for:

- cabling
- cooling
- replacing the memory unit and real-time clock battery.

The control unit is grounded through the DIN rail and the grounding screw.

1. Attach the two latches to the back of the control unit with four screws for each latch.



2. Ground the control unit to the cabinet frame with a grounding conductor. Use a M4×6 or M4×8 screw to attach the grounding conductor to the control unit. Refer

4

Electrical installation

Contents of this chapter

This chapter gives information on the electrical installation of the control unit.

Installation procedure



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.

1. Connect an external power supply to the control unit connector XPOW. For the power supply specifications, refer to the technical data. If necessary, you can connect a second power supply for redundancy.
2. Connect the fiber optic cables from the converter module to the control unit. Refer to the instructions given in the converter module hardware manual.
3. Connect the control cables to the control unit. Refer to the instructions given in the converter module hardware manual.

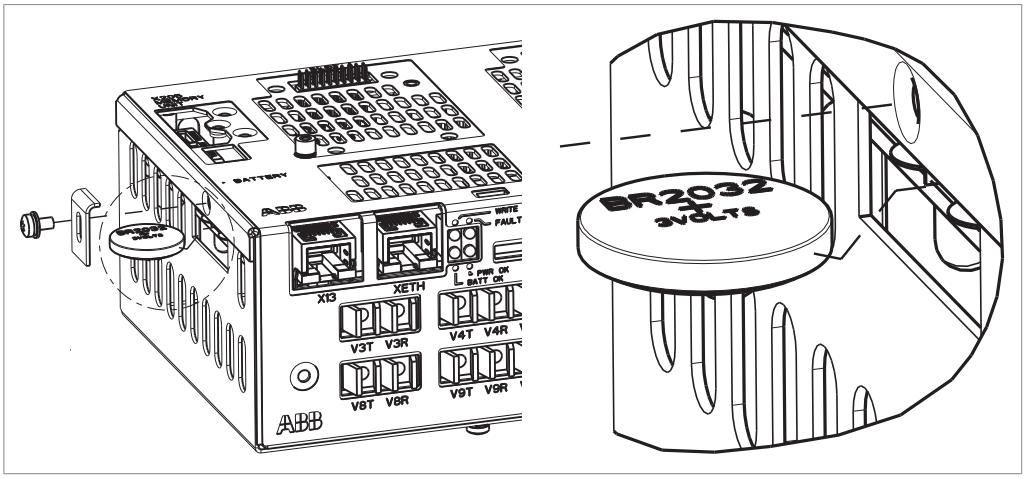
Related documents

For information on the electrical installation of the FSO safety functions module, refer to the applicable FSO module user's manual.

For information on the electrical installation of an I/O extension, fieldbus adapter, or pulse encodure interface module, refer to the documentation of the module.

For the default I/O connection diagrams and more information on the connections, refer to the applicable converter module hardware manual.

4. If necessary, set the real-time clock.
5. Discard the old battery according to local disposal rules or applicable laws.



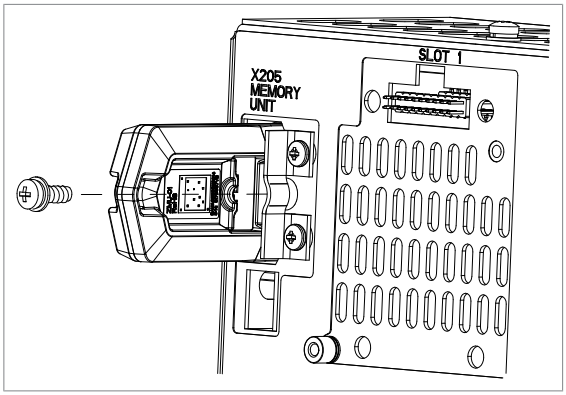
Replacing the memory unit

If you replace the control unit, move the memory unit from the old control unit to the new control unit to keep the existing parameter settings.

⚠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.

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

1. Stop the drive and do the steps in section **Electrical safety precautions** of the converter hardware manual.
2. Make sure that the control unit is not powered.
3. Remove the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.

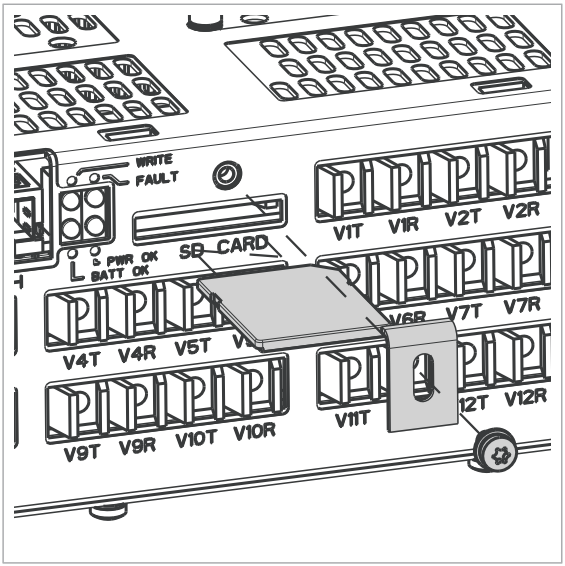


Replacing the SD/SDHC memory card

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.

Do not remove the SD card while the yellow WRITE LED is on. Writing to the SD card is in progress. For the replacement card type, see the technical data.

1. Stop the drive and do the steps in section **Electrical safety precautions** of the converter hardware manual.
2. Remove the screw and the clip covering the memory card.
3. Push the card to remove it.
4. Install the new card in reverse order.



Replacing the control unit

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.

Replace the control unit as follows:

1. Stop the drive and do the steps in section **Electrical safety precautions** of the converter hardware manual.
2. Disconnect the fiber optic cables.
3. Disconnect the control cables. You can pull out the detachable terminal blocks that have control cables connected.
4. If the control unit is attached to the rail with screws or end brackets, remove them.
5. Remove the control unit from the rail.

6. Disconnect the grounding conductor from the control unit.
7. Remove the latches from the back of the control unit.
8. Install the new control unit. Refer to section Installing the control unit onto a DIN rail (page 16).
9. Connect the control cables to the new control unit.
10. Connect the fiber optic cables to the new control unit.
11. Move the memory unit from the old control to the new control unit. Refer to section Replacing the memory unit (page 26).

If there is a safety circuit connected to the XSTO terminals of the control unit, do the validation test of the safety function after you replace the control unit. Refer to the drive or inverter module hardware manual, safety option user's manual, and/or the related FSO safety functions module user's manual.

6

Technical data

Contents of this chapter

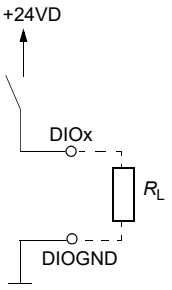
This chapter contains the technical data for the control units.

Connector data

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm^2 (22…12 AWG). Connector pitch is 5 mm.

The maximum tightening torque for screw terminals is 0.45 N·m (4 lbf·in).

Power supply (XPOW)	24 V DC (±10%), 2 A External power input. Two supplies can be connected to the BCU control unit for redundancy.
Relay outputs RO1…RO3 (XRO1…XRO3)	250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:5 and XD24:7)	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)	24 V logic levels: “0” < 5 V, “1” > 15 V R_{in}: 2.0 kohm (DI1…DI5) Input type: NPN/PNP (DI1…DI5), PNP (DI6) Hardware filtering: 0.04 ms, digital filtering up to 8 ms I_{max}: 15 mA (DI1…DI5), 5 mA (DI6)
Start interlock input DIIL (XDI:7)	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 and XDIO:2) 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). In some control programs, DIO2 can be configured as a 24 V level square wave frequency output. Refer to the firmware manual, parameter group 11.	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 +24VD is limited to 200 mA 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI: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	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 Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 … 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination by switch
RS-485 connection (X485)	Physical layer: RS-485 Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 … 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft)
Safe torque off connection (XSTO)	Input voltage range: -3…30 V DC Logic levels: "0" < 5 V, "1" > 17 V. **Note:** Both circuits must be closed to enable start and operation (IN1 and IN2 must be connected to OUT). This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but SIL/PL classified Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption: 66 mA (continuous) per STO channel per drive/inverter module EMC (immunity) according to IEC 61326-3-1 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	To STO connector of inverter module.
Control panel connection (X13)	Connector: RJ-45 Cable length < 100 m (328 ft)