ABB Drives

Installation and Start-up Guide

Bus Connection
Interface Module
NBCI-02

Bus Connection Interface Module NBCI-02

Installation and Start-up Guide

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Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the NBCI-02 Bus Connection Interface Module. The material in this chapter must be studied before attempting any work on, or with, the unit.

Warnings and Notes

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions which can, if proper steps are not taken, lead to a serious fault condition, physical injury and death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

Warnings

Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:

Dangerous Voltage Warning: warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.

General Warning: warns of situations which can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.

Electrostatic Discharge Warning: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Notes

Readers are notified of the need for special attention or additional information available on the subject with the following symbols:

CAUTION! **Caution** aims to draw special attention to a particular issue.

Note: **Note** gives additional information or points out more information available on the subject.

General Safety Instructions

WARNING! All electrical installation and maintenance work on the drive should be carried out by qualified electricians.

The drive and adjoining equipment must be properly earthed.

Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The motor cable terminals of the drive are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the drive from external control circuits even when the drive mains power is shut off. Exercise appropriate care when working with the unit. Neglecting these instructions can cause physical injury and death.

WARNING! There are several automatic reset functions in the drive. If selected, they reset the unit and resume operation after a fault. These functions should not be selected if other equipment is not compatible with this kind of operation, or dangerous situations can be caused by such action.

More Warnings and Notes are printed at appropriate instances along the text.

Table of Contents

Appendix A – Technical Data

Appendix B – Ambient Conditions

Chapter 1 – Introduction to This Guide

Overview

This chapter contains a description of the *Installation and Start-up Guide* for the NBCI-02 Bus Connection Interface Module.

Intended Audience

The Guide is intended for the people who are responsible for installing, commissioning and using an NBCI-02 Module with an ABB drive. The reader is expected to have a basic knowledge of electrical fundamentals, electrical wiring practices, the drive, and the use of the drive control panel.

What This Guide Contains

The installation and start-up of the NBCI-02 Bus Connection Interface Module are introduced in this Guide.

It is assumed that the drive is installed and ready to operate before starting the installation of the adapter module. For more information on the installation and start-up procedures of the drive, please refer to its user documentation.

Safety Instructions are featured in the first few pages of this Guide. Safety Instructions describe the formats for various warnings and notations used within this Guide. This chapter also states the safety instructions which apply to the installation and operation of the NBCI-02 Module.

Chapter 1 – Introduction to This Guide contains a short description of the Guide.

Chapter 2 – Overview contains a description of the NBCI-02 Bus Connection Interface Module and the panel link; a delivery checklist; and warranty information.

Chapter 3 – Mechanical Installation contains placing and mounting instructions for the module.

Chapter 4 – Electrical Installation contains wiring, bus termination, and earthing instructions.

Chapter 5 – Fault Tracing presents the panel link faults with possible causes and remedies.

Appendix A contains Technical Data.

Appendix B contains a specification of the ambient conditions allowed during transportation, storage and use of the NBCI-02.

Chapter 2 – Overview

Overview

This chapter contains a description of the panel bus and the NBCI-02 Bus Connection Interface Module; a delivery checklist; and warranty information.

The Panel Bus

The panel bus is a serial communication bus that uses the RS-485 physical interface. The panel bus employs the Modbus protocol at a transfer rate of 9600 bit/s (max.). Using the panel bus, it is possible to:

- Install the Control Panel (or a PC with an RS-232/485 converter) at a distance of up to 1200 metres from the drive(s)
- Control, supervise and program any drive on the panel bus at a time
  Note: *This function is not supported by ACC 600 (ACS 600 CraneDrive) or ACF 600 (ACS 600 Pump and Fan Drive).*
- Obtain a galvanically isolated connection between the drive and the panel bus.

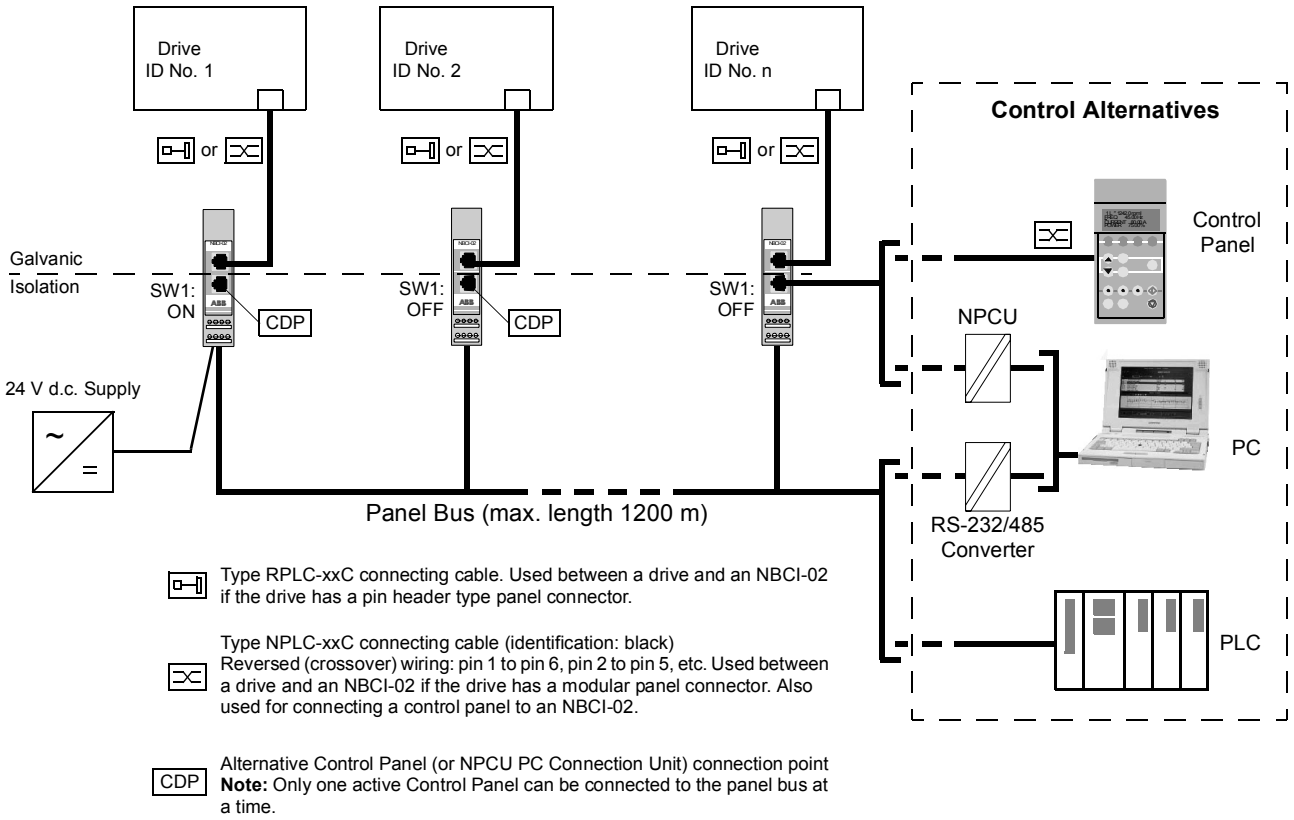
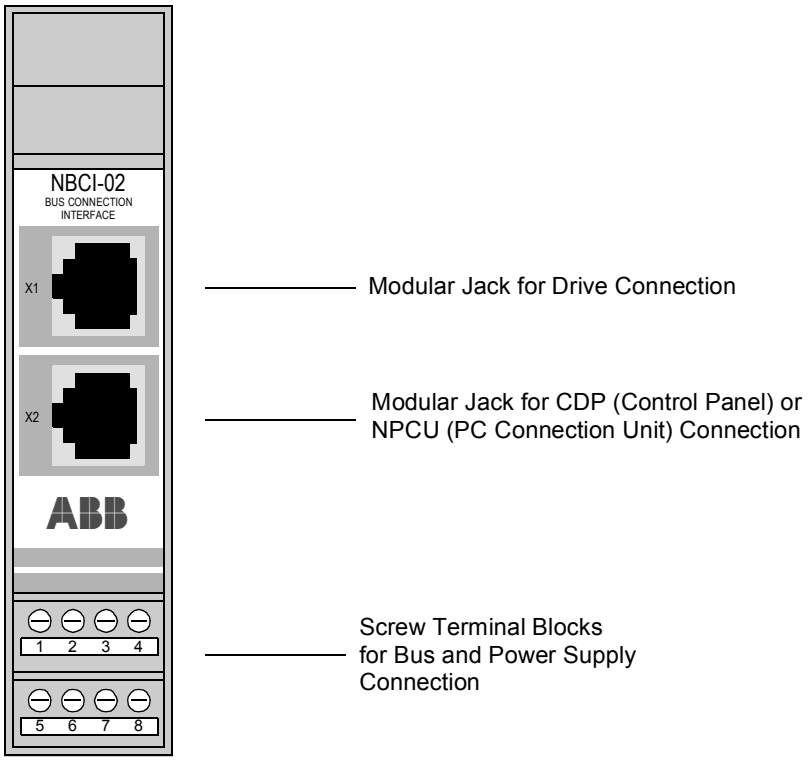


Figure 1 Panel bus construction.

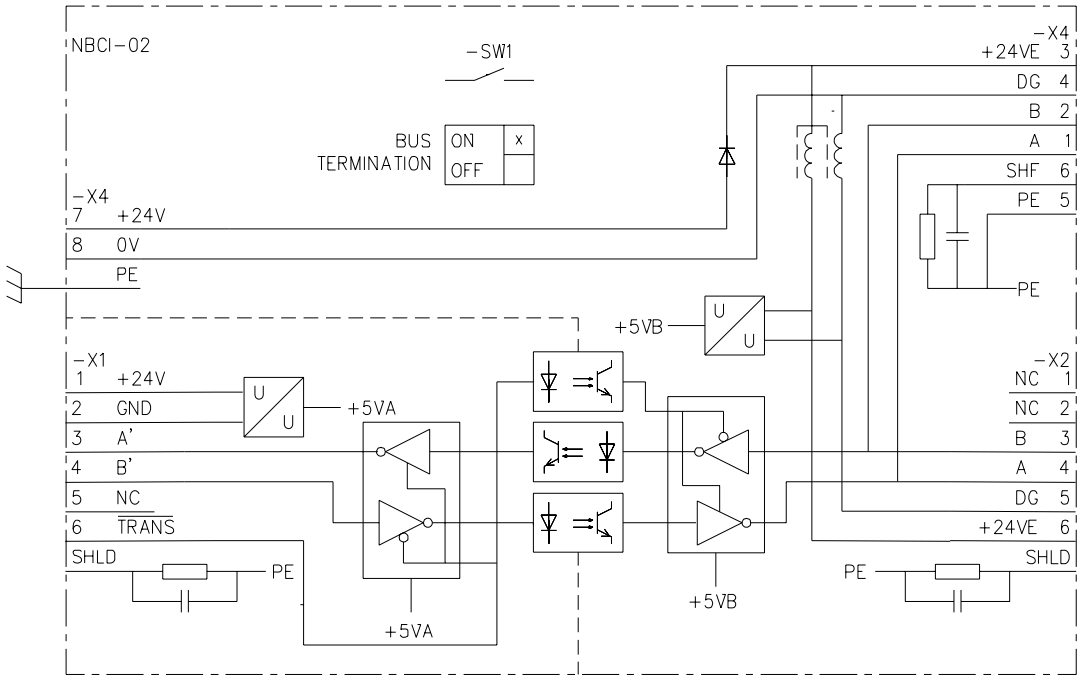
The NBCI-02 Module

The NBCI-02 Bus Connection Interface Module is an optional device for ABB drives, providing a galvanic isolation between the panel bus and the panel link of the drive. The NBCI-02 is used to connect a drive to the panel bus, in turn controlled by a CDP 312 Control Panel or a Modbus controller (PLC or PC). PC connection usually requires an RS-232/485 converter, available as NPCU-01.

The NBCI-02 is mounted onto a standard mounting rail inside or outside the drive unit, depending on drive type and configuration. See the drive documentation for module placement options.



Block Diagram



Compatibility

The NBCI-02 is compatible with:

- ACS800
- ACS 600, ACN 600, ACP 600
- ACC 600*, ACF 600*
  **ACC 600 and ACF 600 do not support the use of one Control Panel to control multiple drives.*
- ACS 1000
- DCS 500B.

Delivery Checklist

The NBCI-02 Bus Connection Interface Module package contains:

- NBCI-02 Bus Connection Interface Module
- One 2-metre cable (RPLC-02C), with one modular connector and one crimp connector
- One 2-metre cable (NPLC-02C) and one 0.5-metre cable (NPLC-00C); both with shielded six-pole male modular telephone connectors (reversed/crossover connection; black)
- Mounting rail
- This manual.

Warranty and Liability Information

The warranty for your ABB drive and options covers manufacturing defects. The manufacturer carries no responsibility for damage due to transport or unpacking.

In no event and under no circumstances shall the manufacturer be liable for damages and failures due to misuse, abuse, improper installation, or abnormal conditions of temperature, dust, or corrosives, or failures due to operation above rated capacities. Nor shall the manufacturer ever be liable for consequential and incidental damages.

The period of manufacturer's warranty is 12 months, and not more than 18 months, from the date of delivery.

Extended warranty may be available with certified start-up. Contact your local distributor for details.

Your local ABB Drives company or distributor may have a different warranty period, which is specified in their sales terms, conditions, and warranty terms.

If you have any questions concerning your ABB drive, contact your local distributor or ABB Drives office.

The technical data and specifications are valid at the time of printing. ABB reserves the right to subsequent alterations.

Chapter 3 – Mechanical Installation

Overview

This chapter contains module mounting instructions. Depending on the drive, the module can be installed either inside or outside the drive housing or cabinet. See the user's manual of the drive for module placement options.

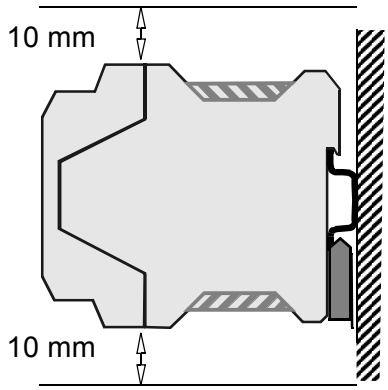
Mounting Outside the Drive

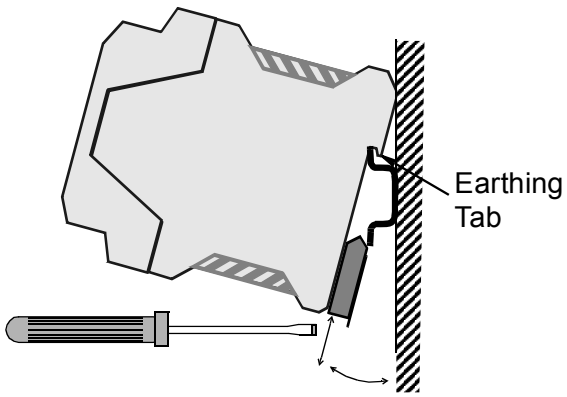
Choose the location for the module. Note the following:

- The cabling instructions in Chapter 4 must be followed.
- The ambient conditions should be taken into account (see Appendix B). The degree of protection of the module is IP 20.
- Observe the free space requirements for the module (see the figure below) and the drive (see the drive documentation).
- Module earth is connected to the mounting rail by means of an earthing tab (see the figure below). The mounting rail onto which the option module is to be mounted must be earthed to a noiseless earth. If the rail is not mounted on a properly earthed base, a separate earthing conductor must be used. The conductor must be as short as possible and its cross-sectional area must be 6 mm^2 at least. ***Note:*** No solid copper conductor may be used (stranded wire allowed only).

Mounting instructions:

1. Switch off all dangerous voltages in the enclosure that the module is to be mounted in.
2. Fasten the rail and ensure the proper earthing as described above.
3. Push the module onto the rail. The module can be released by pulling the locking spring with a screwdriver (see below).





Mounting Inside the Drive

The work inside the drive should be carried out by a qualified electrician only.

WARNING! Pay attention to the slowly discharging voltage of the capacitor bank and the voltages that are connected from external control circuits to the inputs and outputs of the drive.

WARNING! Do not touch the printed circuit boards. The integrated circuits are extremely sensitive to electrostatic discharge.

Mounting instructions:

1. Stop the drive.
2. Switch off the power supply of the drive and all dangerous voltages connected to the inputs and outputs.
3. Wait for five minutes to ensure that the capacitors in the intermediate circuit have discharged.
4. Remove the front cover of the drive.
5. Ensure that the mains cable, motor cable and capacitor bank (UDC+ and UDC–) are not powered.
6. Locate the position for the module (see the drive documentation). Fasten the mounting rail to its place if not already installed. Observe the free space requirements for the module (see the figure above).
7. Push the module onto the rail. The module can be released by pulling the locking spring with a screwdriver (see the figure above).

Chapter 4 – Electrical Installation

Overview

This chapter contains instructions for panel bus wiring, termination and earthing.

WARNING! Before installation, switch off the drive power supply. Wait for five minutes to ensure that the capacitor bank of the drive is discharged. Switch off all dangerous voltages connected from external control circuits to the inputs and outputs of the drive.

Bus Wiring

Arrange the bus cables as far away from the drive power cables as possible. Avoid parallel runs; cables should cross at right angles. Use bushings at cable entries.

The panel bus cable should be RS-485 compatible twin twisted pair cable with a common screen, e.g. NK Cables JAMAK; Lappkabel 0035160 R+T; Belden 9842. (See also section ***Power Supply for the Modules*** later in this chapter.)

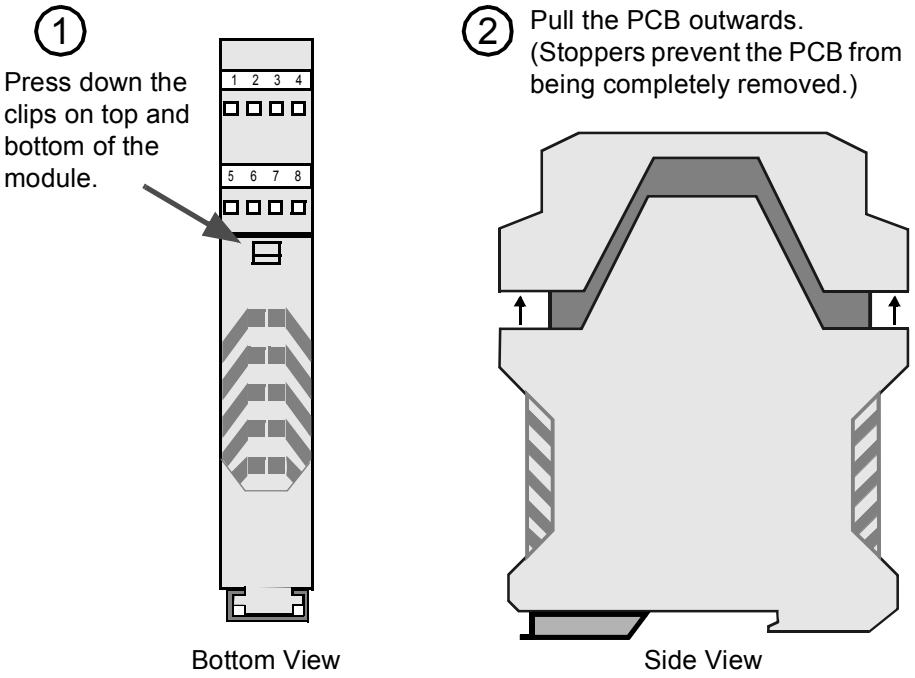
Cable Earthing

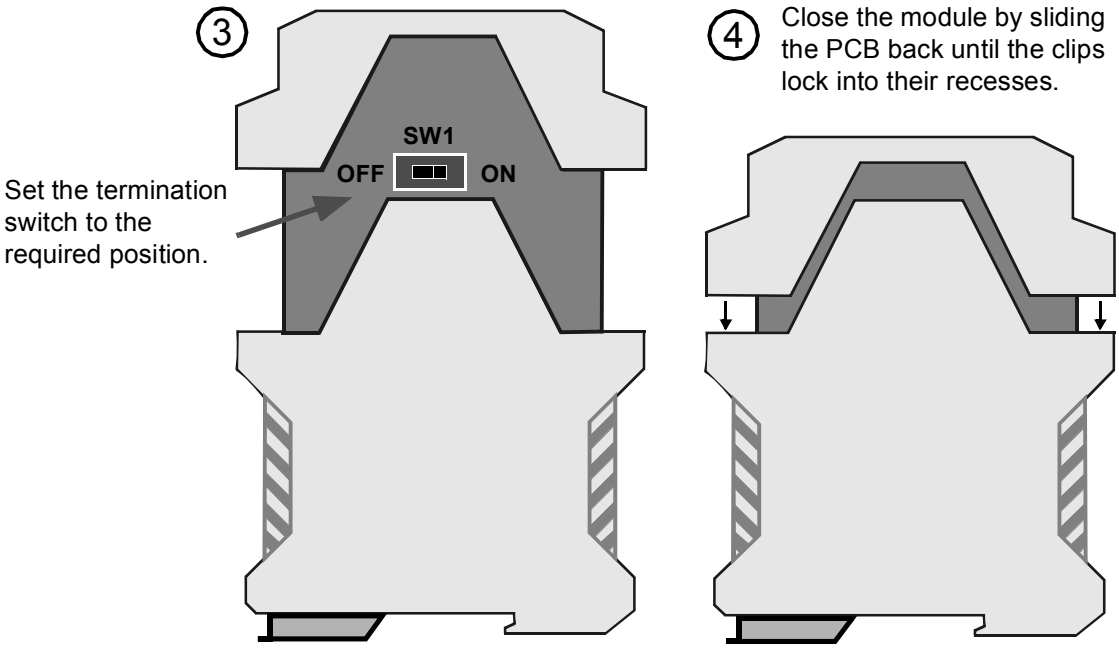
The panel bus cable screen may be connected to the PE terminal at one module only. At other modules, the cable screen is to be connected to the SHF terminal.

Bus Termination

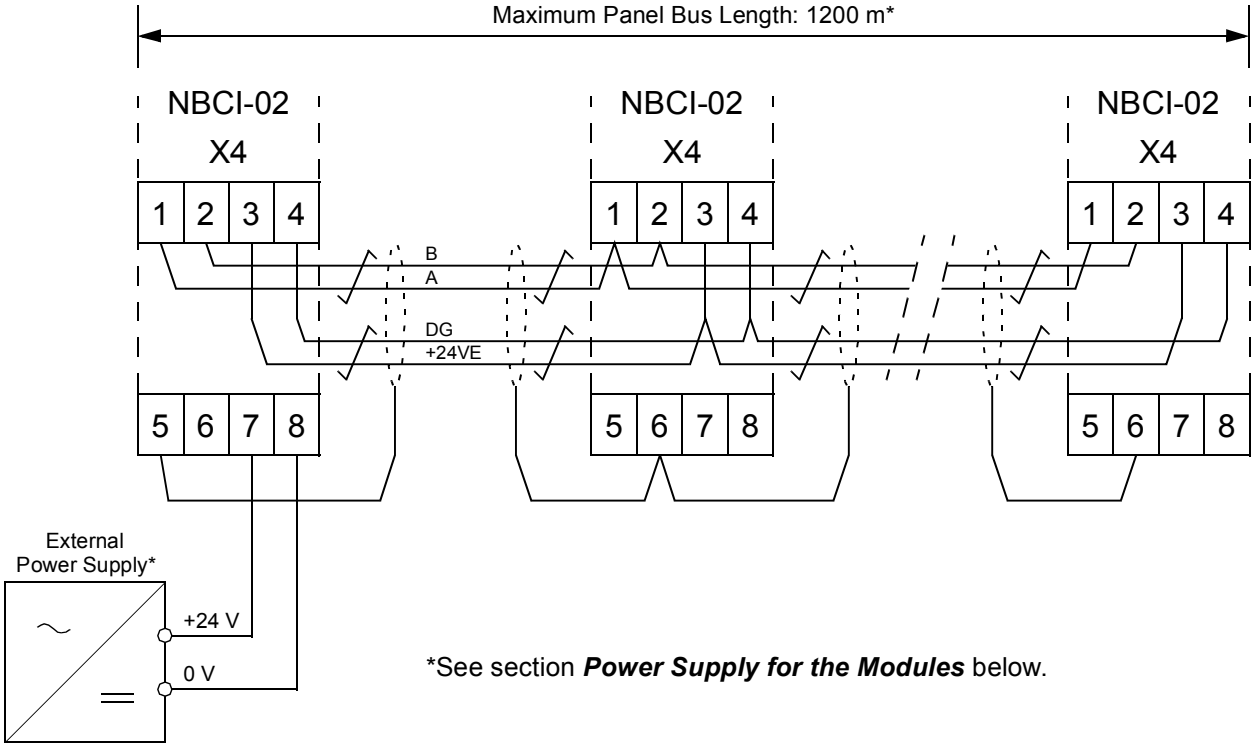
The built-in terminating resistors must be switched on if the NBCI-02 module is installed at the end of the bus. Otherwise the resistors must be switched off. Terminating resistors prevent signal reflections from the bus cable ends.

The termination switch is located inside the NBCI-02 module. The module has to be opened in order to change the selection of the bus termination switch. Follow the instructions given below.


1
Press down the clips on top and bottom of the module.
1 2 3 4
5 6 7 8
Bottom View
2
Pull the PCB outwards. (Stoppers prevent the PCB from being completely removed.)
Side View

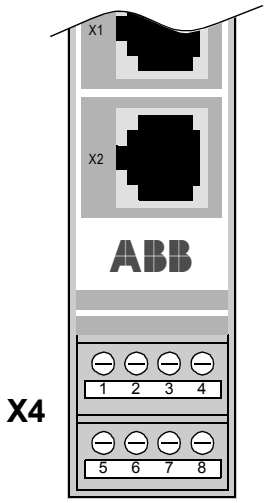

3
Set the termination switch to the required position.
SW1
OFF
ON
4
Close the module by sliding the PCB back until the clips lock into their recesses.

Panel Bus Wiring Diagram



*See section ***Power Supply for the Modules*** below.

Terminal Block X4 Designations



X4

X4		Description
1	A	RS-485 bus wires.
2	B	
3	+24VE	Power supply link between all modules on the panel bus. Twisted pair. (See also section ***Power Supply for the Modules***.)
4	DG	
5	PE	Earth. For earthing the panel bus cable screen. **Used at one module only.**
6	SHF	Shield (Filtered). Cable screen AC earthing (via an RC filter). **Used at all modules except one.**
7	+24V	24 V d.c. ± 10% external power supply connection. **Used at one module only. The power is not to be taken from a drive since the bus connection requires galvanic isolation.**
8	0V	

Note: The pin designations for modular jacks X1 and X2 are given in ***Appendix A – Technical Data***.)

Power Supply for the Modules

The modules on the panel bus are powered from an external 24 V d.c. (± 10%) power supply. The power is connected to one module on the bus and distributed to all others via the bus cable.

Note: The power is not to be taken from a drive since the bus connection requires galvanic isolation between the bus and the drives.

Note: At long distances between the power supply and the modules, the voltage drop caused by the resistance of the cable has to be taken into account. The voltage between terminals X4:3 and X4:4 of each module should be 20 V minimum. In case the voltage is below 20 V, do one of the following:

- Use a cable with larger conductor area
- Use a cable with extra twisted pairs; connect two or more pairs in parallel for the power supply line
- Provide a separate power supply cable with larger conductor area
- Divide the panel bus into segments, then provide each segment with a separate power supply.

Drive and Control Panel Connections

The drive is connected to the NBCI-02 (modular jack X1) with a flat oval telecommunications cable. (Consult the drive documentation as to the corresponding connector inside the drive.) If the drive has a pin header type panel connector, an RPLC-xxC cable is used; if the drive has a modular panel connector, an NPLC-xxC cable is used. An NPLC-xxC cable is also used to connect the Control Panel to one of the alternative connection points indicated in Figure 1.

The NBCI-02 package contains one RPLC-02C, one NPLC-02C, and one NPLC-00C cable.

Type NPLC-xxC cables have a reversed (crossover) wiring (pin 1 to pin 6, pin 2 to pin 5, etc.). However, the cables used for connecting drives in parallel must have a straight- through wiring (pin 1 to pin 1, pin 2 to pin 2, etc.). Cables with a straight-through wiring are available separately as NPLC-xxS in lengths of 0.5, 1 and 2 metres.

Note: The length for each flat oval cable should not exceed 3 metres.

Note: Do not connect the drive to modular jack X2, or the Control Panel to modular jack X1.

Chapter 5 – Fault Tracing

The table below lists some problems that may arise during the commissioning or use of the NBCI-02, together with the most likely causes and remedies.

Problem	**Cause**	**Remedy**
Control Panel display is blank.	No external 24 V d.c. power supply connected to terminal block X4.	Check external power supply and wiring (see Chapter 4).
	Control Panel connected to NBCI-02 modular jack X1.	Connect Control Panel to modular jack X2.
Control Panel constantly indicates a communication fault.	Drive not powered.	Switch on drive.
	Incorrect bus cable wiring.	Check bus cable wiring (Chapter 4).
Control Panel indicates a communication fault at regular intervals.	Interference.	Check bus termination (should be ON on the modules at each panel bus end, OFF on other modules).
		Check bus cable earthing.
		Check bus cable routing (parallel runs with power and control cables should be avoided)
Drive indicates a communication fault.	Communication lost with, or not established with, the Control Panel	Any of the above.
	Communication lost with, or not established with, the Modbus Controller.	Check communication parameter settings (baudrate, parity, node no., etc.).
		Check bus cable wiring between control system and NBCI-02.
		Check that the bus master is communicating at regular intervals with the drive.

Appendix A – Technical Data

Panel Bus

Compatible Devices: All devices compatible with the RS-485 physical interface

Maximum Number of Stations: 31 (with CDP control); 247 (with a Modbus controller)

Medium: Twin twisted pair RS-485 cable, common screen

- Termination: built in the NBCI-02 Module
- Specifications:

Parameter	Value
Impedance	100 to 130 Ω (f > 100 kHz)
Capacitance	< 60 pF/m
Conductor Resistance	< 140 Ω/km
Conductor area	> 0.20 mm^2 or 24 AWG

- Maximum Bus Length: 1200 m. (At long distances, cable resistance must be taken into account. See Chapter 4.)

Topology: Multi-drop

Serial Communication Type: Asynchronous, half Duplex

Transfer Rate: ≤ 9.6 kbit/s

Protocol: Modbus RTU

NBCI-02

Enclosure: Plastic, dimensions 100 × 22.5 × 115 mm (H × W × D); degree of protection IP 20

Mounting: Onto a standard mounting rail

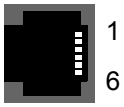
Current Consumption: 20 mA at 24 V d.c.

Connectors:

- Modular jack (X1) for connection to the drive
- Modular jack (X2) for connection to the CDP Control Panel (or NPCU PC Connection Unit)

X1	
1	+24V
2	GND
3	A’
4	B’
5	Not connected
6	$\overline{\text{TRANS}}$

X2	
1	Not connected
2	Not connected
3	B
4	A
5	DG
6	+24VE



- Two Combicon MSTBT 2,5/4-ST (4-pole, cross-section 2.5 mm^2 max.) screw terminal blocks for panel bus and power supply connection:

X4		Description
1	A	RS-485 bus wires.
2	B	
3	+24VE	Power supply link between all modules on the panel bus. Twisted pair. (See also section ***Power Supply for the Modules***.)
4	DG	
5	PE	Earth. For earthing the panel bus cable screen. **Used at one module only.**
6	SHF	Shield (Filtered). Cable screen AC earthing (via an RC filter). **Used at all modules except one.**
7	+24V	24 V d.c. ± 10% external power supply connection. **Used at one module only. The power is not to be taken from a drive since the bus connection requires galvanic isolation.**
8	0V	

General:

- All materials are UL/CSA approved
- Complies with EMC Standards EN 50081-2 and EN 50082-2

Appendix B – Ambient Conditions

Ambient Conditions, Operation

Ambient operating conditions refer to the conditions the module is subjected to when installed for stationary use.

Air Temperature: 0 to +50 °C

Relative Humidity: 5 to 95 %, no condensation allowed. Maximum allowed relative humidity is 60 % in the presence of corrosive gases.

Contamination Levels:
Chemical gases: IEC 721-3-3, Class 3C2
Solid particles: IEC 721-3-3, Class 3S2

Installation Site Altitude: 0 to 2000 m. If installation site is above 2000 m, contact local ABB representative.

Vibration: Max 0.3 mm (2 to 9 Hz), max 1 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 70 m/s^2, 22 ms (IEC 68-2-27)

Ambient Conditions, Storage

Ambient storage conditions refer to the conditions the module is subjected to during storage in the protective package.

Temperature: -40 to +70 °C.

Relative Humidity: Less than 95 %, no condensation allowed

Atmospheric Pressure: 70 to 106 kPa

Vibration: Max 0.3 mm (2 to 9 Hz), max 1 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 100 m/s^2, 11 ms (IEC 68-2-27)

Ambient Conditions, Transportation

Ambient transportation conditions refer to the conditions the module is subjected to during transportation in the protective package.

Temperature: -40 to +70 °C

Relative Humidity: Less than 95 %, no condensation allowed.

Atmospheric Pressure: 60 to 106 kPa

Vibration: Max 3.5 mm (2 to 9 Hz), max 15 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 100 m/s^2, 11 ms (IEC 68-2-27)

Bump: Max 300 m/s^2, 6 ms (IEC 68-2-29)

Free Fall: 250 mm

NBCI-02/EN
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