

EAGLEHAWK NX Controller

Installation & Commissioning Instructions



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SAFETY INFORMATION

General Safety Information

- ▶ When performing any work, all instructions given by the manufacturer and in particular the safety instructions provided in these Installation and Commissioning Instructions are to be observed. Make sure that the local standards and regulations are observed at all times.
- ▶ The EAGLEHAWK NX System (including the EAGLEHAWK NX controller, Panel Bus I/O modules, manual disconnect modules, and auxiliary terminal packages) may be installed and mounted only by authorized and trained personnel.
- ▶ If the controller housing is damaged or missing, immediately disconnect it from any power.
- ▶ If the device is broken or defective, do not attempt to repair it yourself; rather, return it to the manufacturer.
- ▶ It is recommended that devices be kept at room temperature for at least 24 hours before applying power. This is to allow any condensation resulting from low shipping / storage temperatures to evaporate.
- ▶ The EAGLEHAWK NX System must be installed in such a manner (e.g., in a lockable cabinet) as to ensure that uncertified persons have no access to the terminals.
- ▶ In the case of vertical mounting on DIN rails, the EAGLEHAWK NX controller should be secured in place using a commercially-available stopper.
- ▶ If the EAGLEHAWK NX System is modified in any way, except by the manufacturer, all warranties concerning operation and safety are invalidated.
- ▶ Rules regarding electrostatic discharge should be followed.
- ▶ Use only accessory equipment which comes from or has been approved by Honeywell.

Information as per EN 60730

Purpose

The purpose of the device is: OPERATING CONTROL. The EAGLEHAWK NX controller is a multifunctional non-safety control device intended for HVAC in home (residential, commercial, and light-industrial) environments.

Construction

The EAGLEHAWK NX controller is an independently mounted electronic control unit with fixed wiring.

Mounting Method


The EAGLEHAWK NX controller is suitable for mounting as follows:

- ▶ in cabinets;
- ▶ in fuse boxes conforming with standard DIN43880, and having a slot height of max. 45 mm;
- ▶ in cabinet front doors (using accessory MVC-80-AC2);
- ▶ on walls (using accessory MVC-80-AC1).

Table 1. Information as per EN 60730

Shock protection	Class II
Pollution degree	2
Installation	Class 3
Rated impulse voltage	330 V for SELV, 2500 V for relay outputs
Automatic action	Type 1.C (micro-interruption for the relay outputs)
Software class	Class A
Ball-pressure test temperature	housing parts >75 °C terminals >125 °C

WEEE Directive

WEEE: Waste Electrical and Electronic Equipment Directive	
	<ul style="list-style-type: none"> ▪ At the end of the product life, dispose of the packaging and product in an appropriate recycling center. ▪ Do not dispose of the device with the usual domestic refuse. ▪ Do not burn the device.

Standards, Approvals, etc.

Degree of Protection: IP20 (mounted on walls, with two accessory MVC-80-AC1 covers) IP30 (mounted in cabinet doors, with accessory MVC-80-AC2)
Device meets EN 60730-1, EN 60730-2-9, UL60730, and UL916.
Refer to Code of Practice standards IEC 61000-5-1 and -2 for guidance.
The device complies with Ethernet Protocol versions IEEE802.3.
The device supports BACnet IP and BACnet MS/TP communications as per ANSI / ASHRAE 135-2012.

3RD-PARTY SOFTWARE LICENSES

This product contains software provided by third parties. See also EAGLEHAWK NX Controller – Third-Party Software Licenses (Product Literature No.: EN2Z-1041GE51).

SPECIFICATIONS OF CONTROLLER

Table 2. EAGLEHAWK NX specifications

Power supply	19 ... 29 VAC, 50/60 Hz or 20 ... 30 VDC
Power consumption	typically DC: 7 W; max. 9 W typically AC: 10 VA; max. 12 VA
Heat dissipation	Max. 9 W at DC power supply max. 9 W at AC power supply
Current consumption	typically DC: 300 mA; max. 375 mA typically AC: 400 mA; max. 500 mA
Ambient temperature	0 ... 40 °C (wall-mounting) 0 ... 50 °C (cabinet/door mounting)
Storage temperature	-20 ... +70 °C
Humidity	5 ... 95% r.h. non-condensing
Dimensions	See Fig. 21 and Fig. 22.
Degree of protection	IP20 (mounted on walls, with two accessory MVC-80-AC1 covers) IP30 (mounted in cabinet doors, with accessory MVC-80-AC2)
Fire class	V0
Weight	0.6 kg (excl. packaging)

SYSTEM OVERVIEW

Overview of Hardware

Table 3. Overview of models (hardware)

feature	description	max. cable length	order no.					
			without HMI			with HMI		
			CLNXEH SERIES00ND ²⁾	CLNXEH SERIES14ND ²⁾	CLNXEH SERIES26ND ²⁾	CLNXEH SERIES00D ²⁾	CLNXEH SERIES14D ²⁾	CLNXEH SERIES26D ²⁾
UI	NTC10kΩ / NTC20kΩ / 0...10V / slow BI, 0.4 Hz	400 m	0	4	8	0	4	8
	NTC10kΩ / NTC20kΩ / 0...10V fix pull-up / slow BI, 0.4 Hz	400 m	0	0	2	0	0	2
BI	open = 24 V / closed 2.0 mA / totalizer 15 Hz	400 m	0	4	4	0	4	4
AO	0..11 V (max. 1 mA)	400 m	0	2	4	0	2	4
BO	Relay N.O. contact: 3 A, 250 VAC, 30 VDC	400 m	0	3	4	0	3	4
	Relay N.O. contact (high in-rush): 10 A, 250 VAC, 30 VDC	400 m	0	1	1	0	1	1
	Relay N.O. contact with one common: 3 A, 250 VAC, 30 VDC	400 m	0	0	3	0	0	3
total I/Os		--	0	14	26	0	14	26
bus interfaces	RS485-1, isolated, BACnet MS/TP, Panel Bus, or Modbus RTU Master or Slave communication	¹⁾ 1200 m	1	1	1	1	1	1
	RS485-2, non-isolated, BACnet MS/TP, Panel Bus, or Modbus RTU Master or Slave communication (NOTE: It is imperative that the RS485-2 be powered by a power supply having the proper polarity. Failure to do so will make data transmission impossible.)	¹⁾ 1200 m	1	1	1	1	1	1
	Ethernet Interfaces (e-mail communication, browser access, BACnet IP communication, Niagara Network, Modbus TCP)	100 m	2	2	2	2	2	2
	USB 2.0 Device Interface (as Network Interface)	3 m	1	1	1	1	1	1
	USB 2.0 Host Interface (max. 200 mA)	3 m	1	1	1	1	1	1
	RS232 M-Bus communication via 15-meter-long PW3 / PW20 / PW60 converters	¹⁾ 1000 m	1	1	1	1	1	1
LEDs	power LED (green)	--	1	1	1	1	1	1
	status LED (red; indicates an active alarm; is controlled by Niagara Alarm System; is configurable)	--	1	1	1	1	1	1
	LED L1 (yellow; lit = Daemon starting; flashing = station starting; if L2 is also flashing, then the station has started)	--	1	1	1	1	1	1
	LED L2 (yellow; lit = platform has started / is reachable; flashing = station has started / is reachable)	--	1	1	1	1	1	1
	bus status LEDs (for isolated RS485-1 interface)	--	2	2	2	2	2	2
¹⁾ Depending upon bit rate. However, in the case of configuration of RS485-2 for Panel Bus, the communication rate is set to 115.2 kbps, and the max. cable length is hence 800 m. ²⁾ These are unlicensed hardware versions. It will therefore be necessary for you to purchase at least one of the basic licenses (BASIC LIC) listed in Table 19.								

System Architecture

An EAGLEHAWK NX System consists of the EAGLEHAWK NX controller and various Panel Bus I/O modules. The EAGLEHAWK NX controller provides interface connections, which allow connection to external systems (e.g., BACnet controllers). Via the IF-LON External Interface, the EAGLEHAWK NX can also communicate with LONWORKS systems, including CentraLine LONWORKS I/O Modules.

Auxiliary parts (see section "Extra Parts" on page 30) enable special features.

SUPERVISION AND ENERGY MANAGEMENT



ARENA NX



ARENA NX ENERGY



MOBILE

INTEGRATION AND HVAC PLANT CONTROL



HAWK 8000



EAGLEHAWK NX



EAGLE

ROOM MANAGEMENT



MERLIN

LYNX



SERVAL

LYNX



EASY CLICK
LIGHTING, SHADING, TEMP.



LIGHTING

LYNX



FIRE & SECURITY



VIDEO



HOTEL
RESERVATIONS

LEGACY HVAC



PANTHER

TIGER

LION

EXCEL 5000

FIELD DEVICES



SENSORS



METERS



THERMO-
STATS



VALVES AND
ACTUATORS



VARIABLE-SPEED
DRIVES

Fig. 1. NX – Niagara eXtended Integrated Building Management architecture

Bus and Port Connections

Overview

WARNING

Risk of electric shock or equipment damage!

- ▶ Do not touch any live parts in the cabinet!
- ▶ Disconnect the power supply before making connections to or removing connections from terminals of the EAGLEHAWK NX controller or Panel Bus I/O modules.
- ▶ Do not reconnect the power supply until you have completed installation.
- ▶ Due to the risk of short-circuiting (see Fig. 24), it is strongly recommended that the EAGLEHAWK NX controller be supplied with power from a dedicated transformer. However, if the EAGLEHAWK NX controller is to be supplied by the same transformer powering other controllers or devices (e.g., the PW M-Bus Adapter), care must be taken to ensure that correct polarity is observed.
- ▶ Observe the rules regarding electrostatic discharge.

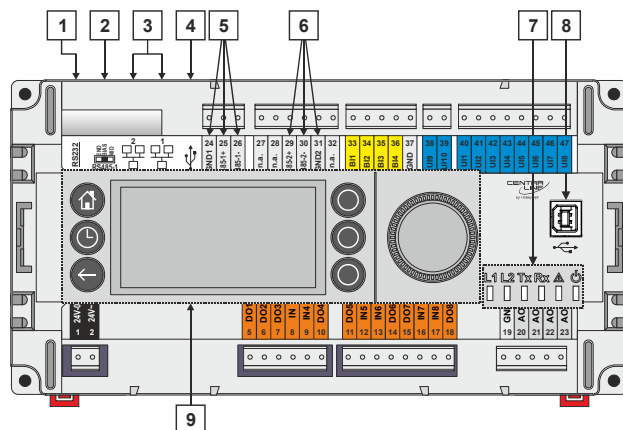


Fig. 2. Top view (with HMI and full complement of onboard I/Os)

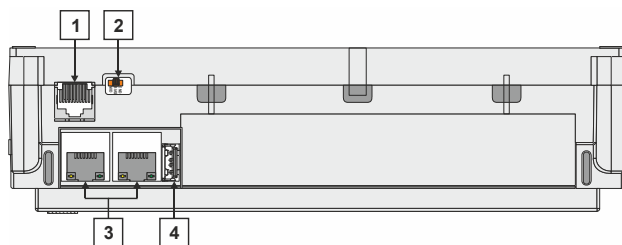


Fig. 3. Side view

Legend

- 1 RS232 / RJ45 socket (for connection of M-Bus and other RS232-based protocols; factory debugging)
- 2 Three-position slide switch (for setting bias and termination resistance of RS485-1)
- 3 Two Ethernet / RJ45 sockets (for BACnet IP communication); 10/100 Mbit/s; 1 "link" LED + 1 "activity" LED
- 4 USB 2.0 Host Interface (for connection of IF-LON2); max. 200 mA, high speed
- 5 RS485-1* (isolated; for BACnet MS/TP, Panel Bus, Modbus RTU communication, etc.)
- 6 RS485-2* (non-isolated; for BACnet MS/TP, Panel Bus, Modbus RTU communication, etc.)
- 7 LEDs
- 8 USB 2.0 Device Interface (for connection to COACH NX web browsers, and 3rd-party touch panels)
- 9 HMI (or RJ45 socket for connection of portable HMI)

*Modbus RTU Master/Slave communication is possible on the two RS485 interfaces.

WARNING

Risk of electric shock or equipment damage!

- ▶ It is prohibited to connect any of the RJ45 sockets of the EAGLEHAWK NX controller to a so-called PoE-enabled device ("Power over Ethernet").

RS232 / RJ45 Socket

Via its RS232 / RJ45 socket, the EAGLEHAWK NX controller can be connected (using an XW586 cable) to a PW M-Bus Adapter and thus to M-Bus networks. See also section "M-Bus Connection" on pg. 50.

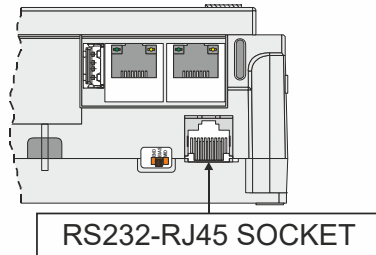


Fig. 4. RS232 / RJ45 socket

Configuring the RS232 Interface in COACH NX

When you configure the RS232 interface (for M-Bus) in COACH NX, the corresponding Port Name will appear as shown in Fig. 5.

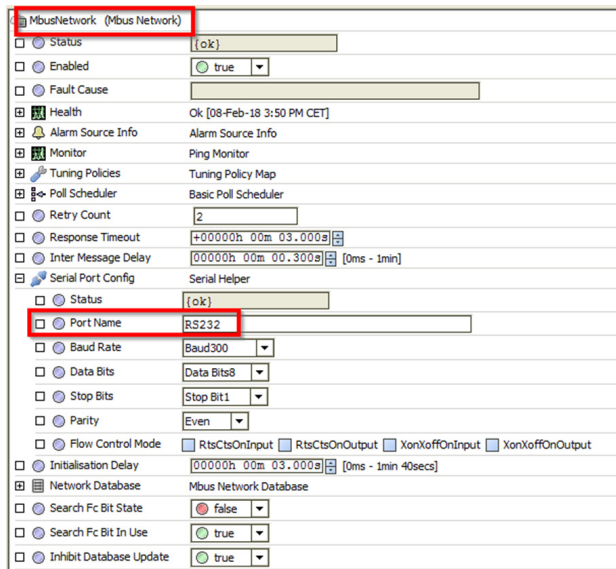


Fig. 5. Configuring the RS232 Interface in COACH NX

USB 2.0 Host Interface

Via its USB 2.0 Host interface, the EAGLEHAWK NX controller can be connected to, e.g., the IF-LON2 External Interface Adapter and thus to LONWORKS networks. Max. 200 mA, high speed. See also section "LonWorks Communications" on pg. 44.

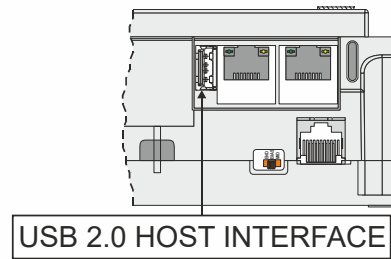


Fig. 6. USB 2.0 Host interface

USB 2.0 Device Interface

All models of the EAGLEHAWK NX controller are equipped with a USB 2.0 Device Interface at the front. This interface is for connection to COACH NX and web browsers, or 3rd-party touch panels.

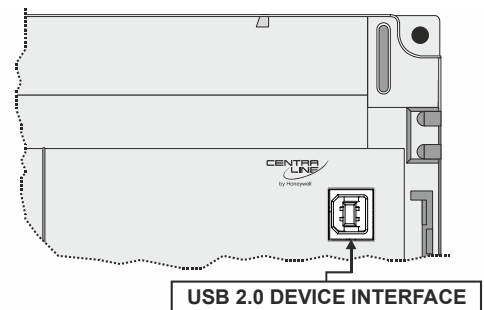


Fig. 7. USB 2.0 Device Interface

A standard USB type-B connector can be inserted into this USB 2.0 Device Interface. This USB 2.0 Device Interface is the recommended interface for connection to COACH NX.

Ethernet / RJ45 Sockets

General

The EAGLEHAWK NX controller is equipped with two Ethernet / RJ45 sockets, each featuring two LEDs.

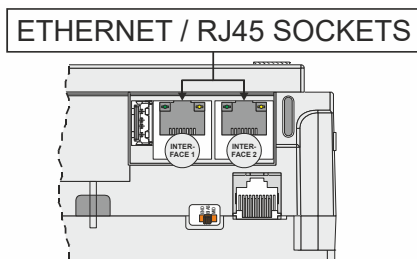


Fig. 8. Ethernet / RJ45 sockets

The two Ethernet / RJ45 sockets are 10/100-Mbit/s Ethernet interfaces permitting communication (as per IEEE 802.3) on any supported IP network, e.g.: BACnet (IP), FOX, etc.

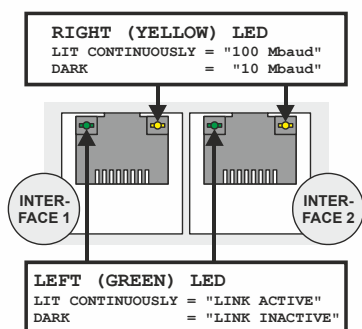


Fig. 9. Ethernet / RJ45 sockets

NOTE: The Ethernet / RJ45 sockets are usually earth-grounded. For additional information, see also "Appendix 1: Earth Grounding" on pg. 55.

The two Ethernet interfaces can be used in either of two different ways (the corresponding configuration is done in COACH NX):

- "Separated networks" (factory default).
- "Switch functionality."

See also the following two sections.

Separated Networks

The "separated networks" scenario is the factory default. In this scenario, each of the two Ethernet interfaces must be activated and located in a different subnet.

Switch Functionality

In this scenario, one of the two Ethernet interfaces is deactivated (using COACH NX – see section "Disabling an Ethernet Interface" below). The deactivated Ethernet interface will now function in the loop-through (daisy-chain) mode and can therefore be used to continue the data line.

The following limitations apply:

1. Only **daisy-chain** configurations are allowed.

2. A maximum of **five** Ethernet-capable devices (including EAGLEHAWK NX controllers) are allowed (failure to observe this limitation will result in signal delays and will degrade data transmission).
3. The maximum distance between any two of the Ethernet-capable devices in the daisy chain is **100 meters**.
4. Connect the devices using **CAT5** cable or better.

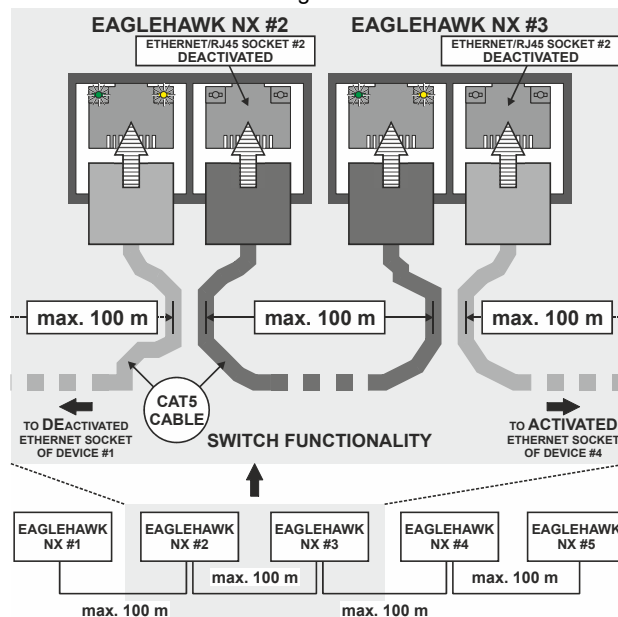


Fig. 10. Allowed Ethernet wiring topology ("switch functionality")

NOTE: During any power failure of the EAGLEHAWK NX, the switching functionality is inoperative.

Disabling an Ethernet Interface

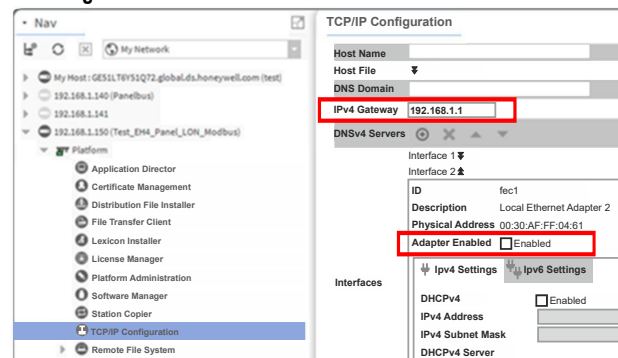


Fig. 11. Entering gateway address, disabling one of the two Ethernet interfaces in COACH NX

To ensure that the discovery of devices, datapoints, schedules, and histories does not fail, during configuration in COACH NX, you should enter a gateway address. If there is no gateway address physically given by the Network Setting, then enter a gateway address that relates to the IP address of the enabled Ethernet Interface. In Fig. 11, the gateway address is 192.168.1.1, hence the IP address of Ethernet adapter 1 must be in the range of 192.168.1.2 to 192.168.1.255.

Default IP Addresses of Ethernet Interfaces 1 and 2

In any case, the default IP address of Ethernet interface 1 is: 192.168.200.20, mask 255.255.255.0
and the default IP address of Ethernet interface 2 is: 192.168.201.20, mask 255.255.255.0

LEDs

The EAGLEHAWK NX controller features the following LEDs:

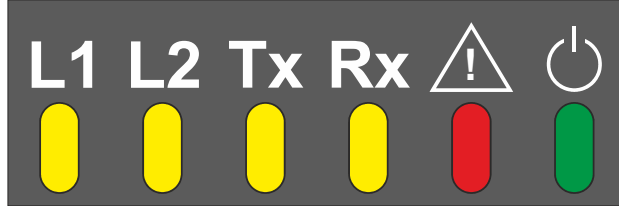


Fig. 12. EAGLEHAWK NX controller LEDs

Table 4. EAGLEHAWK NX controller LEDs

symbol	color	function, description
L1	yellow	Lit = Daemon starting; flashing = station starting; if L2 is also flashing, then the station has started.
L2	yellow	Lit = platform has started / is reachable; flashing = station has started / is reachable.
Tx	yellow	RS485-1 status LED indicating transmission of communication signals.
Rx	yellow	RS485-1 status LED indicating reception of communication signals.
	red	Indicates an active alarm; is controlled by Niagara Alarm System; is configurable.
	green	Power LED.

See also section "EAGLEHAWK NX Controller Troubleshooting" on page 53 for a detailed description of the behaviors of the LEDs and their meanings.

RS485 Interfaces

General

The EAGLEHAWK NX controller features two RS485 interfaces:

- RS485-1 (consisting of push-in terminals 24 [GND-1], 25, and 26) is isolated and can be used for any RS485-based communication protocol available within Niagara Ecosystems, e.g.: Panel Bus, BACnet MS/TP, etc.
- RS485-2 (consisting of push-in terminals 29, 30, and 31 [GND-2]) is non-isolated (i.e. GND-2 is internally connected with terminal 1 [24V-0]) and can be used for any RS485-based communication protocol available within Niagara Ecosystems, e.g.: Panel Bus, BACnet MS/TP, etc.

NOTE: It is imperative that the RS485-2 be powered by a power supply having the proper polarity. Failure to do so will make data transmission impossible.

Configuring the RS485 Interfaces in COACH NX

When you configure the two RS485 interfaces (for Modbus, BACnet MS/TP, or Panel Bus) in COACH NX, the corresponding Port Names will appear as shown in Fig. 13.

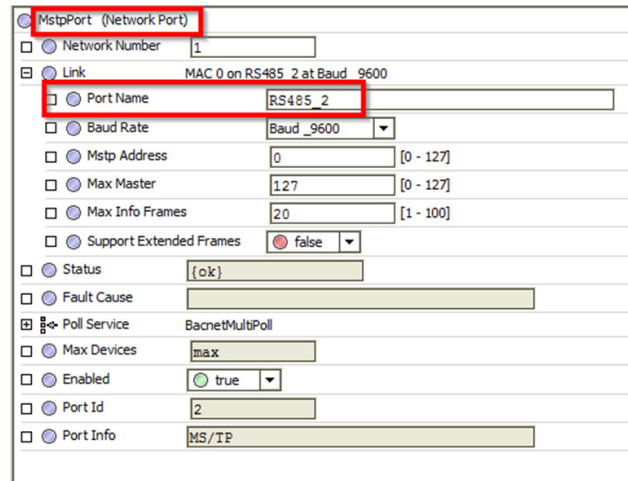


Fig. 13. Configuring the RS485 interfaces in COACH NX

RS485-1 Bias and Termination Resistors

RS485-1 is equipped with a three-position slide switch which can be used to switch its bias resistors OFF (position "MID" – this is the default), ON (position "BIAS"), and ON with an additional 150Ω termination resistor (position "END").

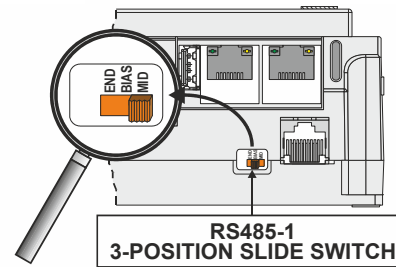


Fig. 14. RS485-1 three-position slide switch

The recommended slide switch setting depends upon the location and usage of the given EAGLEHAWK NX – see Fig. 15 through Fig. 17 and Table 5; it also depends upon the selected communication protocol (BACnet MS/TP, Panel Bus, or Modbus RTU Master communication, respectively).

Table 5. Recommended slide switch settings

setting	remarks
END	Controllers located on either end of bus should have this setting.
BIAS	In small bus networks, a min. of one and a max. of two controllers should have this setting.
MID	All other controllers (not set to "END" or "BIAS") on bus should have this setting (which is the default).

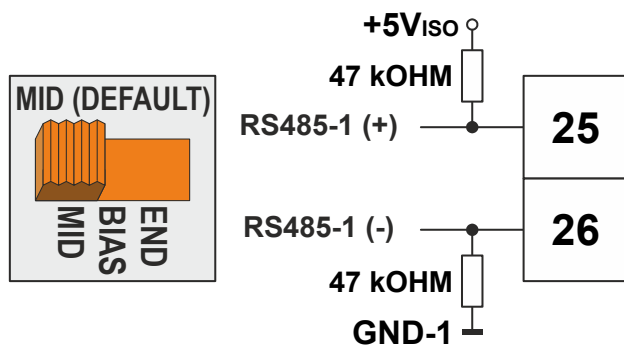


Fig. 15. RS485-1 three-position slide switch setting MID

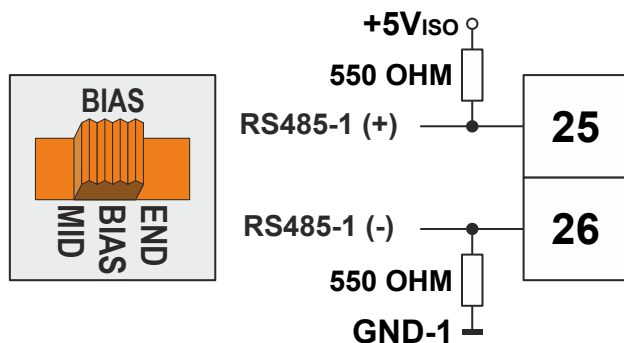


Fig. 16. RS485-1 three-position slide switch setting BIAS

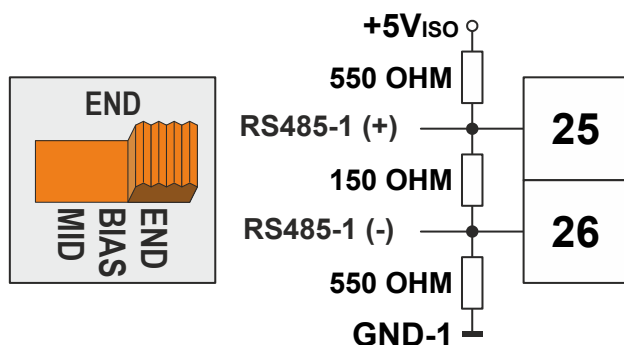


Fig. 17. RS485-1 three-position slide switch setting END

NOTE: All terminals are protected (up to 24 VAC) against short-circuiting and incorrect wiring – except when the 3-position slide switch is set to "END," in which case the terminals of the RS485-1 bus (24, 25, and 26) have no such protection. Higher voltages may damage the device.

NOTE: According to BACnet standards, a minimum of one and a maximum of two BACnet devices must have its/their bias resistors switched ON. In the case of the RS485-1 interface of the EAGLEHAWK NX, setting its slide switch to either "BIAS" or "END" fulfills this requirement.

RS485-2 Bias and Termination Resistors

The RS485-2 interface is not affected by the aforementioned three-position slide switch. The 550Ω bias resistors and 130Ω termination resistor of the RS485-2 are thus always ON.

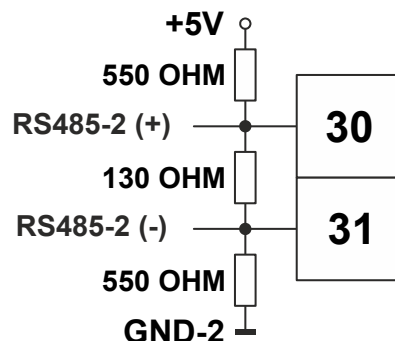


Fig. 18. RS485-2 bias and termination resistors

NOTE: GND-2 is internally connected with 24V-0 (terminal 1)

RS485 Standard

According to the RS485 standard (TIA/EIA-485: "Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems"), only one driver communicating via an RS485 interface may transmit data at a time. Further, according to U.L. requirements, each RS485 interface may be loaded with a max. of 32 unit loads. E.g., CentraLine devices have as little as ¼ unit load each, so that up to 128 devices can be connected.

BACnet MS/TP connections to the RS485 interfaces must comply with the aforementioned RS485 standard. Thus, it is recommended that each end of every connection be equipped with one termination resistor having a resistance equal to the cable impedance (120 Ω / 0.25 – 0.5 W).

RS485 systems frequently lack a separate signal ground wire. However, the laws of physics still require that a solid ground connection be provided for in order to ensure error-free communication between drivers and receivers – unless all of the devices are electrically isolated and no earth grounding exists.

IMPORTANT

In the case of new EAGLEHAWK NX controller installations, we strongly recommend using a separate signal ground wire. Doing otherwise may possibly lead to unpredictable behavior if other electrically non-isolated devices are connected and the potential difference is too high.

In the case of the installation of EAGLEHAWK NX controllers in already-existent RS485 two-wire systems (e.g., when replacing PANTHER and LION controllers with EAGLEHAWK NX controllers), not using a separate signal ground wire will probably have no undesirable effects.

The cable length affects the communication rate. Table 6 provides a few examples.

Table 6. Bit rate vs. max. cable length for RS485

Bit rate	Max. cable length (L)
9.6 - 76.8 kbps	1200 m
*115.2 kbps	800 m

* In the case of configuration of RS485-2 for Panel Bus, the communication rate is set to 115.2 kbps.

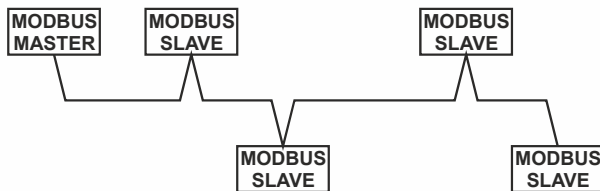
For information on wire gauge, max. permissible cable length, possible shielding and grounding requirements, and the max. number of devices which can be connected to a bus, refer to standard EIA-485.

Modbus Connection

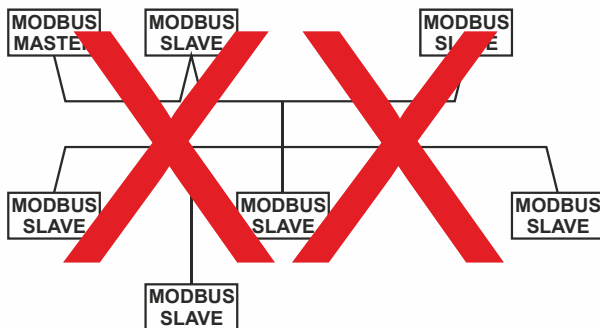
The EAGLEHAWK NX controller can function as a Modbus Master or Slave. In general, the RS485 wiring rules must be followed.

Wiring Topology

Only daisy-chain wiring topology is allowed.


Fig. 19. Allowed Modbus wiring topology

Other wiring topologies (e.g., star wiring, or mixed star wiring and daisy chain wiring) are prohibited; this is to avoid communication problems of the physical layer.


Fig. 20. Prohibited Modbus wiring topology (example)

Cables

See also section "EIA 485 Cable Specifications" on pg. 40.

Use shielded twisted pair cable J-Y-(St)-Y 4 x 2 x 0.8.

You **must** use three wires:

- One wire for Modbus +
- One wire for Modbus –
- One wire for the signal common

When using one pair for Modbus (+) and Modbus (-) and one wire of another pair for the signal common, CAT5 cable may also be used.

For connection details, see section "Modbus Connection" on pg. 48.

Shielding

Shielding is especially recommended when the Modbus cable is installed in areas with expected or actual electromagnetic noise. Avoiding such areas is to be preferred.

Use shielded twisted pair cable shielded twisted pair cable J-Y-(St)-Y 4 x 2 x 0.8 and connect the Modbus to a noise-free earth ground – only once per Modbus connection.

RS485 Repeaters

RS485 repeaters are possible, but have not been tested by Honeywell. Hence it is within responsibility of the installing / commissioning person to ensure proper function.

NOTE: Each Modbus segment will require its own line polarization and line termination.

Modbus Master Specifications

Modbus Compliance

As per the Modbus standard, the EAGLEHAWK NX controller is a conditionally compliant "regular" Modbus device.

The EAGLEHAWK NX controller differs from an unconditionally compliant "regular" Modbus device in that it does not support communication rates of 1.2, 2.4, and 4.8 kbps (because these communication rates are not market-relevant).

Physical Layer

2-wire serial line RS485 (EIA-485) (with additional common)

Communication rates: 9.6, 19.2, 38.4, 57.6, 76.8, and 115.2 kbps supported.

Max. number of devices: 32

Cable and wiring specifications: See section "Wiring and Set-Up" on pg. 20.

Communication Mode

Typically: Modbus Master.

Transmission Mode

RTU (Remote Terminal Unit) and (via Ethernet) TCP/IP.

Address Range

Modbus slaves can have an address between 1 and 247.

Discrete Inputs, Coils, Input Registers and Holding Registers can have an address between 1 and 65534.

Further Information

For further information, please refer to the Modbus Driver documentation (docModbus.pdf).

SET UP AND CONFIGURATION

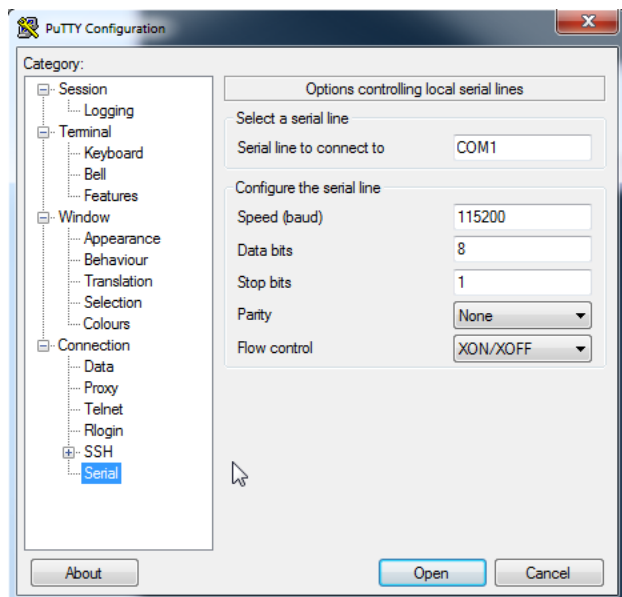
General

You can access the EAGLEHAWK NX controller via the RS232 interface using a terminal program (serial port) such as "PuTTY." This can be helpful in the following cases:

- When the EAGLEHAWK NX controller cannot be accessed via network. Solution: The network can be configured to the required settings (see step 6 below).
- When the EAGLEHAWK NX controller application or status is unknown Solution: The controller can be reset to the factory defaults (see step 7 below).

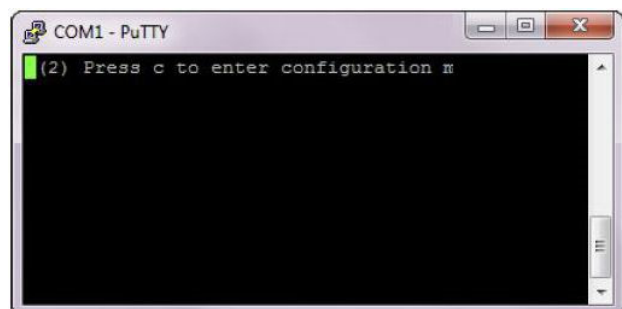
Before proceeding (see section "Procedure" below), you must first connect the RS232 interface of the EAGLEHAWK NX controller and the PC on which PuTTY is running using the following two cables connected end-to-end: XW586 and XW585.

The interface parameters for serial communication are as shown in the following screenshot:

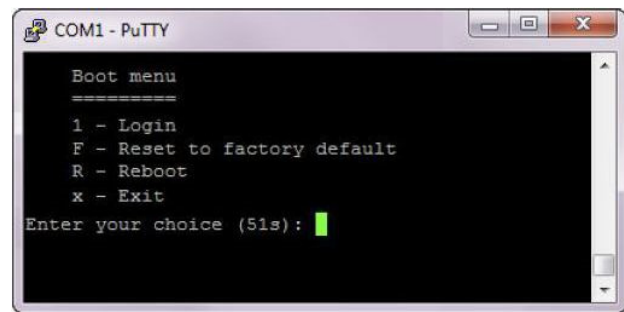


Procedure

1. Start PuTTY. As soon as the following line displays, press c.

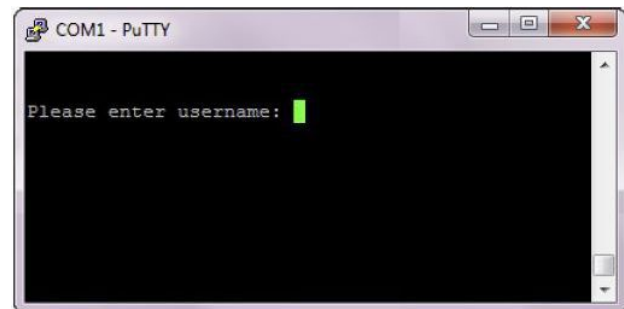


RESULT: The Boot menu displays.



2. To login and change the IP address and/ or configure further network settings, press 1.

RESULT: You will be asked to enter your username.



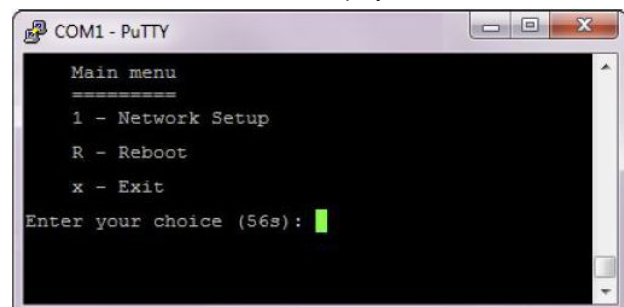
3. Enter the user name and press Enter.

RESULT: You will be asked to enter your password.



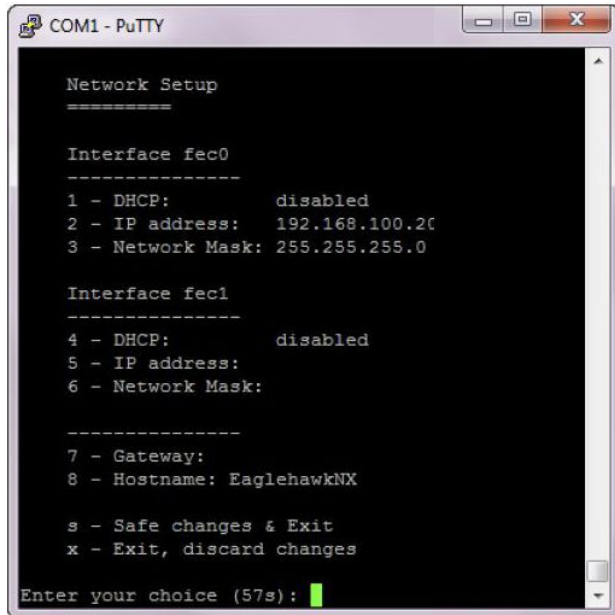
4. Enter the password and press Enter.

RESULT: The Main menu displays.



5. Press 1 in the Main menu.

RESULT: The Network Setup displays.



```
COM1 - PuTTY

Network Setup
=====

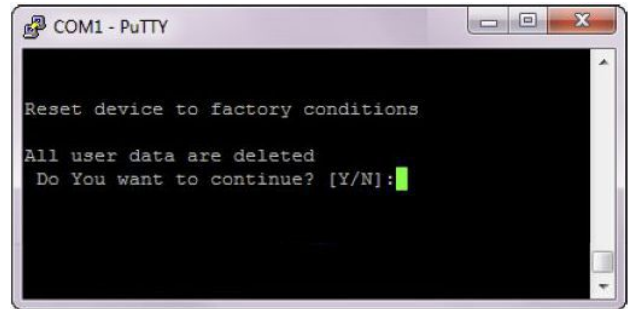
Interface fec0
-----
1 - DHCP:      disabled
2 - IP address: 192.168.100.20
3 - Network Mask: 255.255.255.0

Interface fec1
-----
4 - DHCP:      disabled
5 - IP address:
6 - Network Mask:

-----
7 - Gateway:
8 - Hostname: EaglehawkNX

s - Safe changes & Exit
x - Exit, discard changes

Enter your choice (57s):
```



```
COM1 - PuTTY

Reset device to factory conditions

All user data are deleted
Do You want to continue? [Y/N]:
```

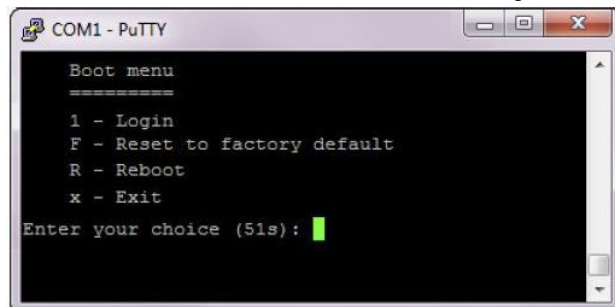
FINISHED!

6. Configure the network as desired by applying the available options displayed.
7. To reset the controller to factory defaults, press F in the Boot menu.

ATTENTION: Resetting the controller to its factory defaults will result in the following:

- The station will be deleted.
- The platform credentials will be deleted.
- The IP settings will be reset to the factory defaults (see section "Default IP Addresses of Ethernet Interfaces 1 and 2" on pg. 9).

RECOMMENDATION: Before leaving (closing) the terminal program, go to "Network Setup" and enter the desired IP settings.



```
COM1 - PuTTY

Boot menu
=====
1 - Login
F - Reset to factory default
R - Reboot
x - Exit

Enter your choice (51s):
```

8. Reset the controller by entering Y.

Configuring Ports to Enable Webserver Functions

The EAGLEHAWK NX controller provides webserver functionality, e.g., for using the CentralLine N4 Supervisor. In order to use webserver functions, the http and https standard port settings must be changed as follows:

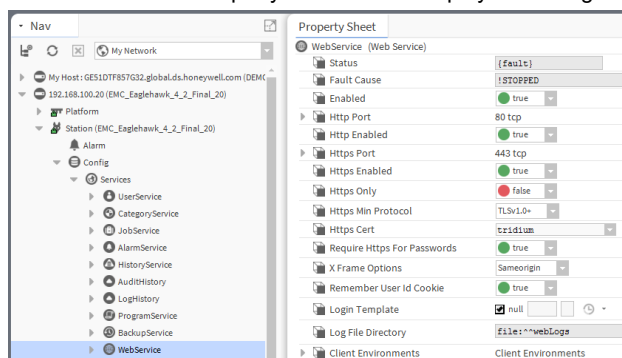
- http standard port 80 to 8080
- https standard port 443 to 8443

After the changes are done, the controller is reachable via both pairs of ports, i.e., via the old standard ports and via the newly set ports.

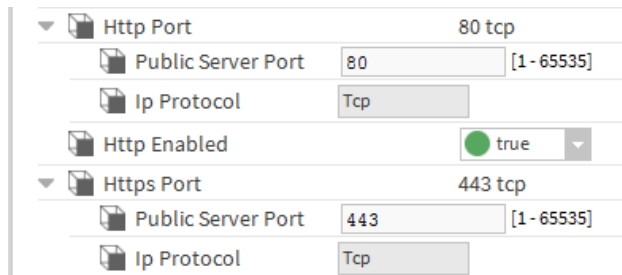
Procedure

1. In the COACH NX Nav tree, expand the Services folder, and then double-click WebService.

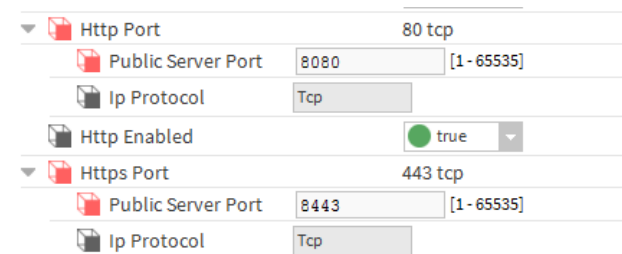
RESULT: The Property Sheet displays to the right.



2. Expand the Http Port and Https Port options.

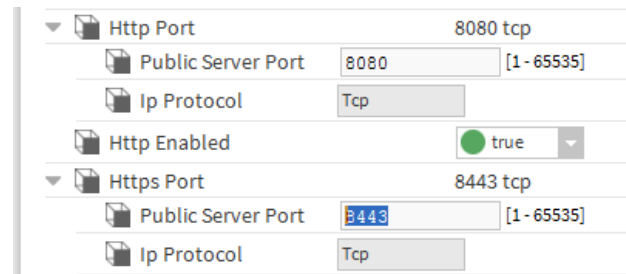


3. Change Http Port to 8080 and the Https Port to 8443.



4. Click the Save button at the bottom.

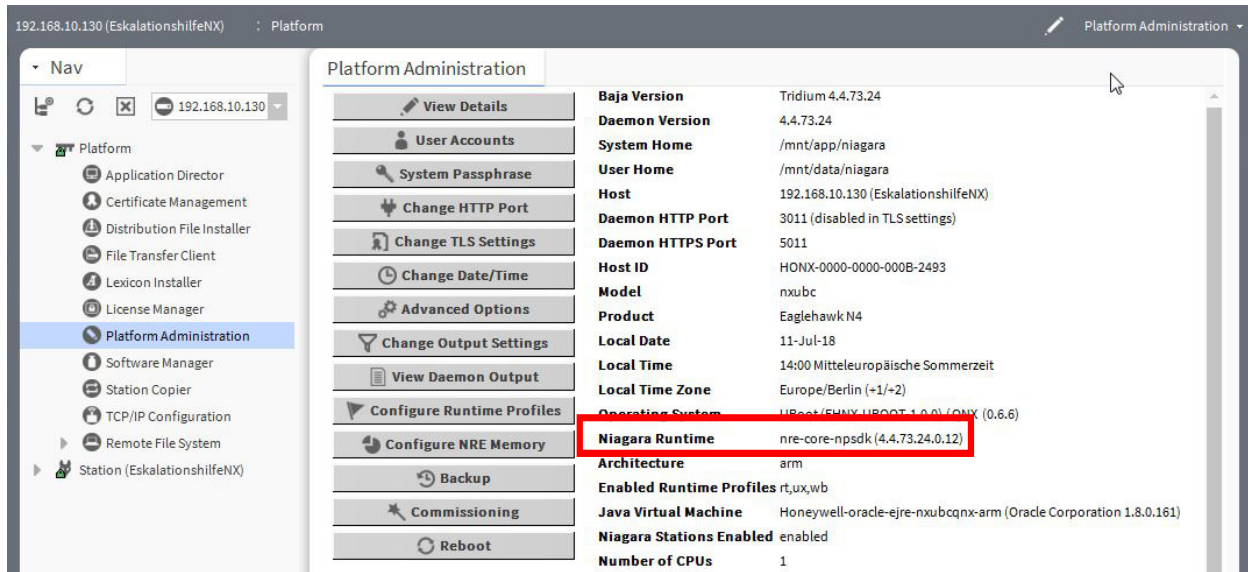
RESULT: The changed port settings are saved.



FINISHED!

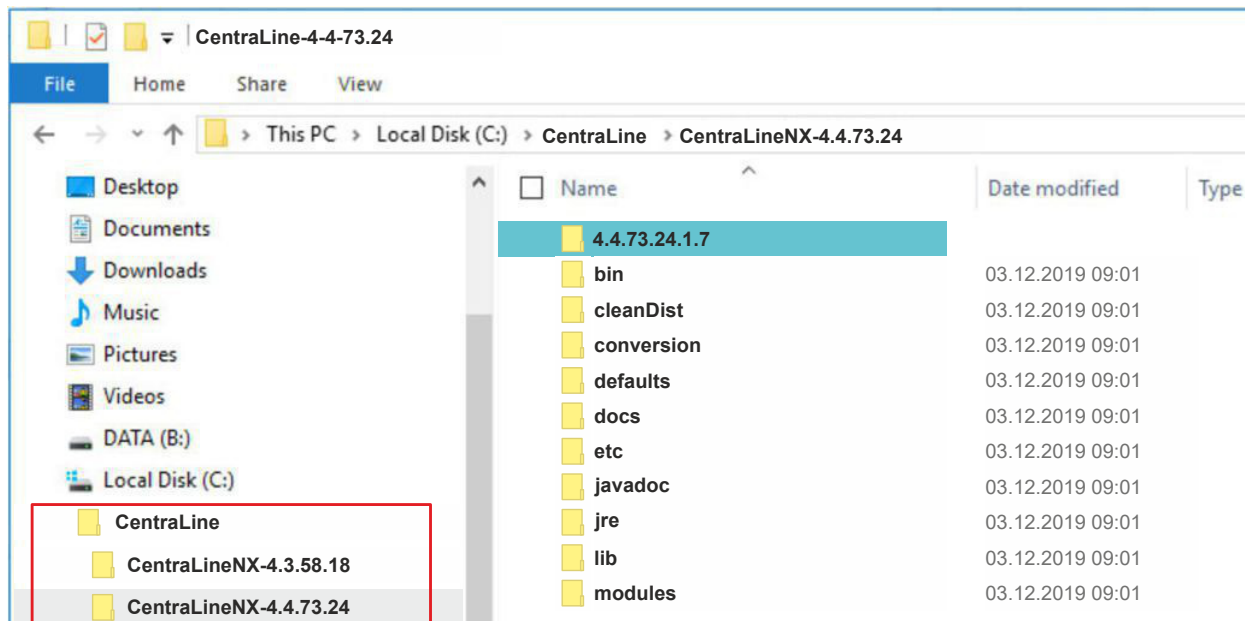
Firmware Update

1. Check the firmware version installed in your EAGLEHAWK NX as follows:
Open COACH NX, go to the Platform/Platform Administration, and check the version of the Niagara Runtime installed in the EAGLEHAWK NX.



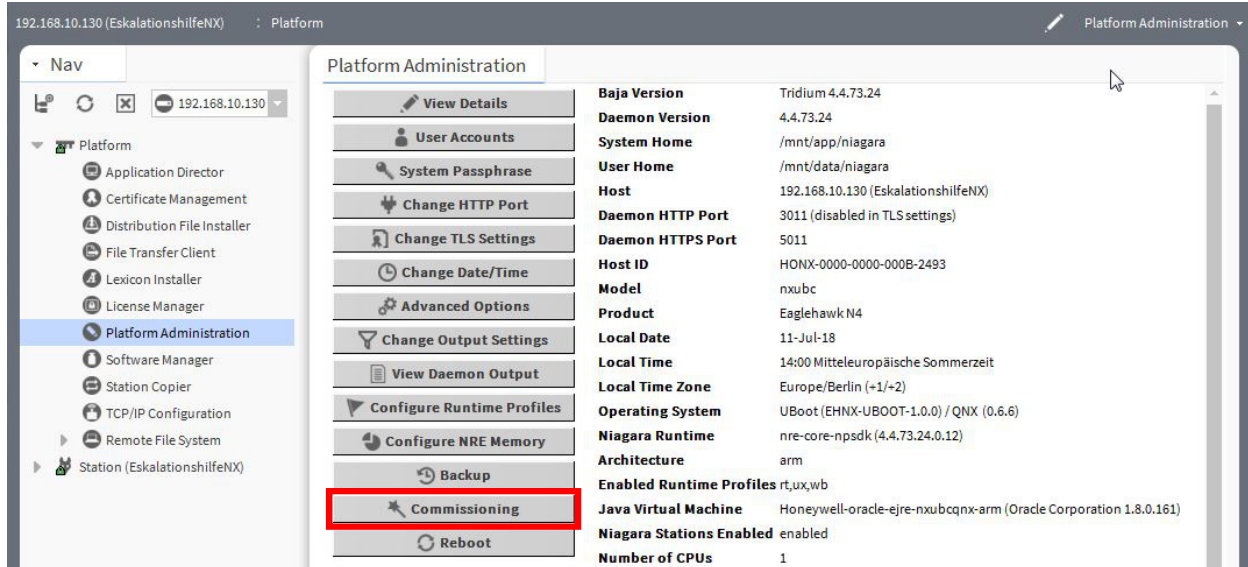
2. Close COACH NX.
3. Get the firmware upgrade package from the CentraLine Partnerweb. At present, this package is contained in EAGLEHAWKNX-SupportPackage_17July2018.zip.

4. Navigate with Windows Explorer to your installation folder. For version NX 4.4.73.24, the default folder is
c:\CentralLine\CentralLineNX-4.4.73.24



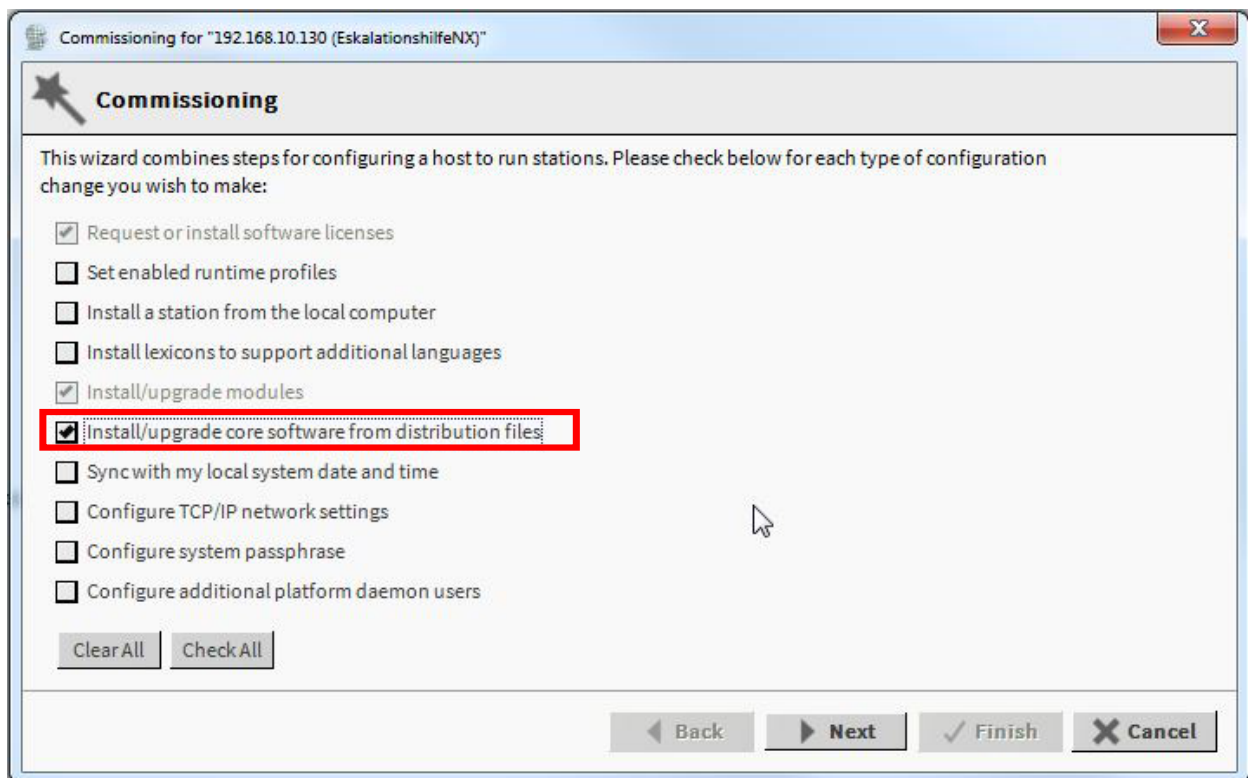
5. Double click the “Workbench User Home” link, you will be redirected to the user home
6. Navigate to <user home>/sw/inbox folder. Resulting path for 4.4. is:
C:\Users\<your username>\Niagara4.4\tridium\sw\inbox
7. Copy and paste all four firmware files (contained in the firmware upgrade package) into the aforementioned inbox.
8. Run the platform daemon.
9. Restart COACH NX.

10. Connect to the EAGLEHAWK NX and start the Commissioning Wizard.

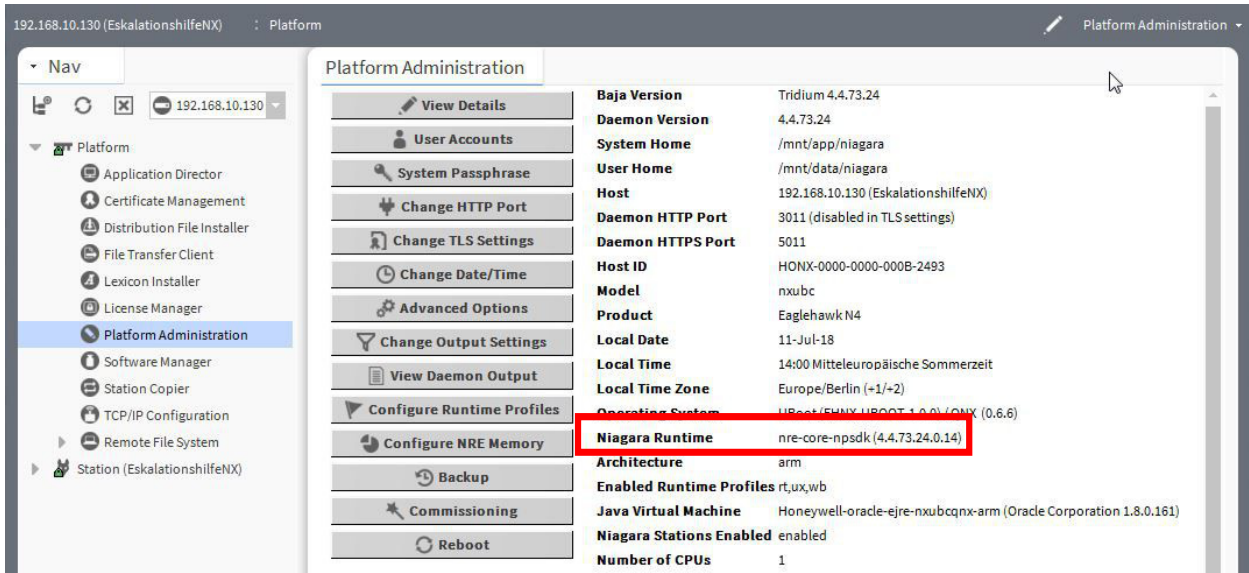


11. Deactivate all checkboxes; only Update Core Software needs to be selected.

12. Start the commissioning process.



13. After a successful update, the Platform Administration should show the new firmware version in the Niagara Runtime field:



FINISHED!

MOUNTING/DISMOUNTING

Before Installation

IMPORTANT

To allow the evaporation of any condensation resulting from low shipping / storage temperatures, keep the controller at room temperature for at least 24 h before applying power.

US requirement, only: This device must be installed in a UL-listed enclosure offering adequate space to maintain the segregation of line voltage field wiring and Class 2 field wiring.

In the case of vertical mounting on DIN rails, the EAGLEHAWK NX controller should be secured in place using a commercially-available stopper. See also the EAGLEHAWK NX - Mounting Instructions (MU1Z-1039GE51).

Dimensions

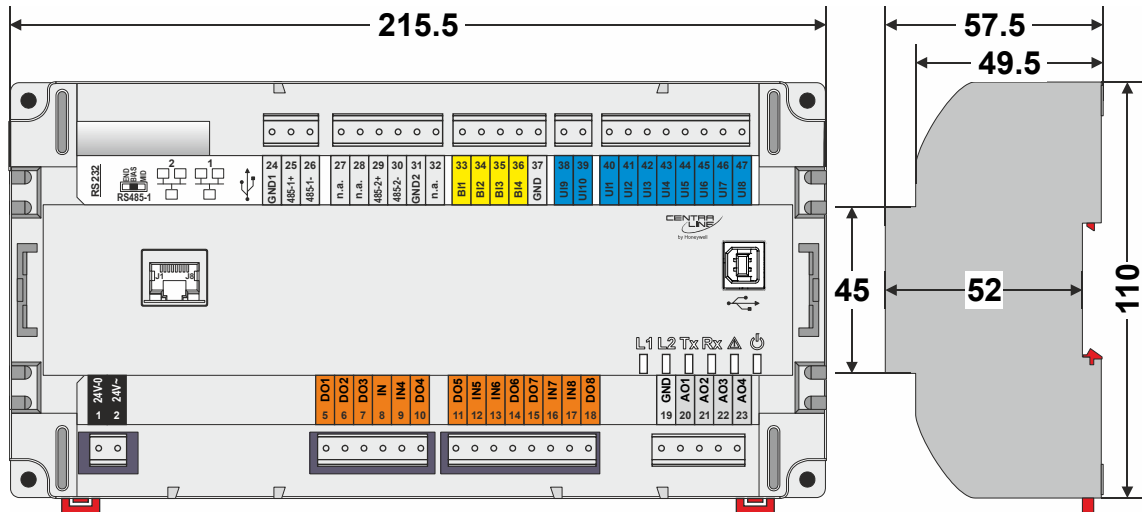


Fig. 21. EAGLEHAWK NX controller (w/o HMI but with RJ45 socket for connection of portable HMI, and with full complement of onboard I/Os), dimensions (in mm)

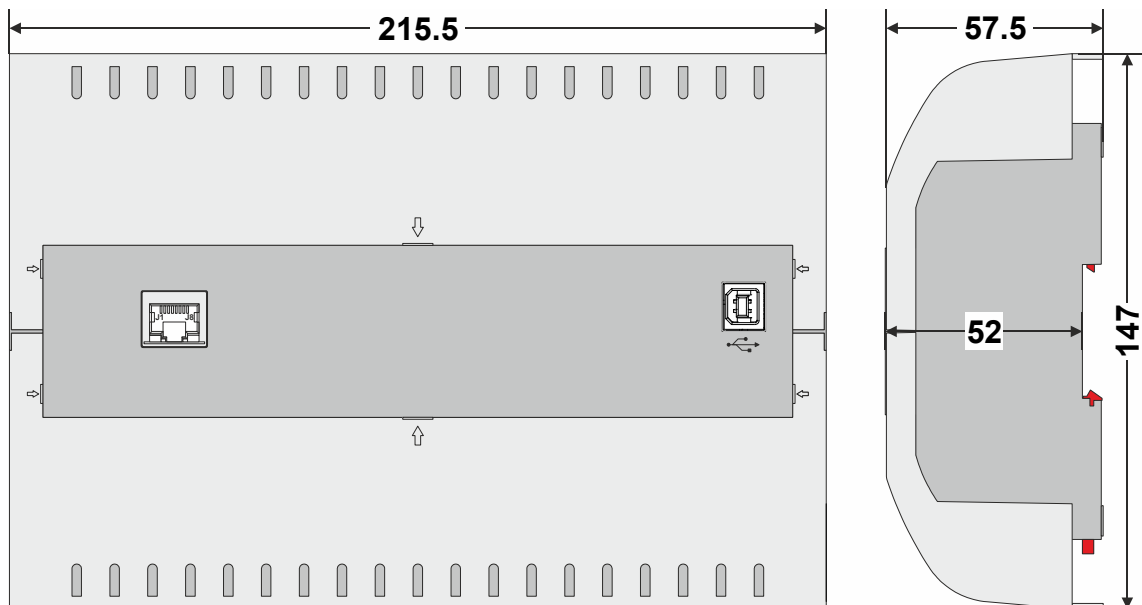


Fig. 22. EAGLEHAWK NX controller with covers, dimensions (in mm)

NOTE: Use of the covers (MVC-80-AC1) obstructs access to the Ethernet and USB 2.0 Host Interfaces and RS232 socket.

WIRING AND SET-UP

General Safety Considerations

- All wiring must comply with applicable electrical codes and ordinances, including VDE, National Electric Code (NEC) or equivalent, and any local regulations must be observed. Refer to job or manufacturer's drawings for details. Local wiring guidelines (e.g., IEC 364-6-61 or VDE 0100) may take precedence over recommendations provided here.
- Electrical work should be carried out by a qualified electrician.
- Electrical connections must be made at terminal blocks.
- For Europe, only: To comply with CE requirements, devices with a voltage in the range of 50 ... 1000 VAC or 75 ... 1500 VDC which are not provided with a supply cord and plug or with other means for disconnection from the supply having a contact separation of at least 3 mm in all poles must have the means for disconnection incorporated in the fixed wiring.



WARNING

Risk of electric shock or equipment damage!

- ▶ Observe precautions for handling electrostatic sensitive devices.
- ▶ Do not touch any live parts in the cabinet.
- ▶ Do not open the controller housing.
- ▶ Disconnect the power supply before making connections to or removing connections from terminals of the EAGLEHAWK NX controller and devices wired to it.
- ▶ Do not use spare terminals as wiring support points.
- ▶ To prevent risk of injury due to electrical shock and/or damage to the device due to short-circuiting, low-voltage and high-voltage lines must be kept separate from one another.
- ▶ All terminals are protected (up to 24 VAC) against short-circuiting and incorrect wiring (unless the 3-position slide switch is set to "END," in which case the terminals of the RS485-1 bus [24, 25, and 26] have no such protection). Higher voltages may damage the device.
- ▶ Do not reconnect the power supply until you have completed the installation.

Fusing Specifications

System Fusing

We recommend that the system be equipped with an external fuse.

Fusing of Active Field Devices

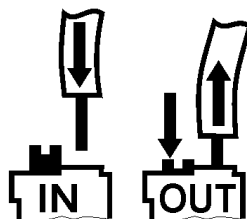
F2 (depends upon given load).

Lightning Protection

Please contact your local Honeywell representative for information on lightning protection.

Wiring Terminals

The EAGLEHAWK NX is equipped with push-in terminal plugs.



use Cu only

Fig. 23. Inserting/removing wires from push-in terminals

NOTE: With solid conductors, ferrules are prohibited.

NOTE: Use only one conductor per push-in terminal.

NOTE: If, nevertheless, two stranded wires are to be connected to a single push-in terminal, twin wire end ferrules must be used.

Table 7. EAGLEHAWK NX push-in terminal wiring specifications

plug gauge	0.2 ... 1.50 mm ²
solid conductor H05(07) V-K	0.2 ... 1.50 mm ²
stranded conductor H05(07) V-K	0.2 ... 1.50 mm ²
stranded conductor with wire end ferrules (w/o plastic collar)	0.2 ... 1.50 mm ²
stripping length	10.0 +1.0 mm

Terminal Assignment

Table 8. Terminal assignment

terminal no.	signal	Description	CLNXEHSE14xxx	CLNXEHSE26xxx	CLNXEHSE00xxx
1	24V-0	supply voltage (GND), int. connected with term. 31 and system GND (term. 19+37)	X	X	X
2	24V~	supply voltage (24V)	X	X	X
3,4	-	not used	-	-	-
5	BO1	Binary output 1. N.O. relay contact switching input power connected to terminal 8	-	X	-
6	BO2	Binary output 2. N.O. relay contact switching input power connected to terminal 8	-	X	-
7	BO3	Binary output 3. N.O. relay contact switching input power connected to terminal 8	-	X	-
8	IN1,2,3	Common relay contact for BO1, BO2, and BO3	-	X	-
9	IN4	Relay contact for BO4	X	X	-
10	BO4	Binary output 4. N.O. relay contact switching input power connected to terminal 9	X	X	-
11	BO5	Binary output 5. N.O. relay contact switching input power connected to terminal 12	X	X	-
12	IN5	Relay contact for BO5	X	X	-
13	IN6	Relay contact for BO6	X	X	-
14	BO6	Binary output 6. N.O. relay contact switching input power connected to terminal 13	X	X	-
15	BO7	Binary output 7. N.O. relay contact switching input power connected to terminal 16	X	X	-
16	IN7	Relay contact for BO7	X	X	-
17	IN8	Relay contact for BO8	-	X	-
18	BO8	Binary output 8. N.O. relay contact switching input power connected to terminal 17	-	X	-
19	GND	Ground terminal (see NOTE below)	X	X	-
20	AO1	Analog output 1	X	X	-
21	AO2	Analog output 2	X	X	-
22	AO3	Analog output 3	-	X	-
23	AO4	Analog output 4	-	X	-
24	GND-1	ref. GND of RS485-1 (isolated)	X	X	X
25	485-1+	"+" signal for RS485-1 (isolated)	X	X	X
26	485-1-	"-" signal for RS485-1 (isolated)	X	X	X
27,28	-	not used	-	-	-
29	485-2+	"+" signal for RS485-2 (non-isolated)	X	X	X
30	485-2-	"-" signal for RS485-2 (non-isolated)	X	X	X
31	GND-2	ref. GND of RS485-2, int. conn. with 24V-0 (term. 1) and system GND (term. 19+37)	X	X	X
32	-	not used	-	-	-
33	BI1	Binary input 1 (static dry contact) / pulse counter (fast totalizer)	X	X	-
34	BI2	Binary input 2 (static dry contact) / pulse counter (fast totalizer)	X	X	-
35	BI3	Binary input 3 (static dry contact) / pulse counter (fast totalizer)	X	X	-
36	BI4	Binary input 4 (static dry contact) / pulse counter (fast totalizer)	X	X	-
37	GND	Ground terminal (see NOTE below)	X	X	-
38	UI9	Universal input 9 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	-	X	-
39	UI10	Universal input 10 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	-	X	-
40	UI1	Universal input 1 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	X	X	-
41	UI2	Universal input 2 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	X	X	-
42	UI3	Universal input 3 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	X	X	-
43	UI4	Universal input 4 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	X	X	-
44	UI5	Universal input 5 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	-	X	-
45	UI6	Universal input 6 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	-	X	-
46	UI7	Universal input 7 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	-	X	-
47	UI8	Universal input 8 (for NTC10kΩ / NTC20kΩ / 0...10 V / slow BI)	-	X	-

NOTE: All AOs, UIs, and BIs share the same ground potential. It is thus possible to connect just one combined GND signal for all AOs, UIs, and BIs. Auxiliary terminals may be used if needed.

Power Supply

Powering EAGLEHAWK NX

Power is supplied via a removable terminal plug (attached to terminals 1 and 2).

The power supply of the EAGLEHAWK NX controller must conform to Safety Class II. To reduce overall current consumption, the EAGLEHAWK NX can be powered by a switch power supply (rather than by a transformer). See also Table 2 on pg. 3.

NOTE: Due to the risk of short-circuiting (see Fig. 24), it is strongly recommended that the EAGLEHAWK NX controller be supplied with power from a dedicated transformer. However, if the EAGLEHAWK NX controller is to be supplied by the same transformer powering other controllers or devices (e.g., the PW M-Bus Adapter), care must be taken to ensure that correct polarity is observed.

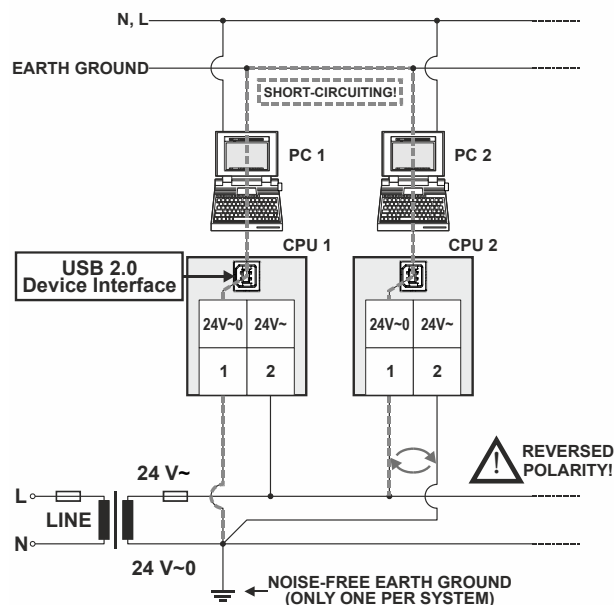


Fig. 24. Incorrect polarity → SHORT-CIRCUITING!

Transformer Data

In Europe, if the EAGLEHAWK NX is powered by transformers, then such transformers must be safety isolating transformers conforming to IEC61558-2-6. In the U.S. and Canada, if the EAGLEHAWK NX is powered by transformers, then such transformers must be NEC Class-2 transformers.

Table 9. 1450 series transformers data

part # 1450 7287	primary side	secondary side
-001	120 VAC	24 VAC, 50 VA
-002	120 VAC	2 x 24 VAC, 40 VA, 100 VA from separate transformer
-003	120 VAC	24 VAC, 100 VA, 24 VDC, 600 mA
-004	240/220 VAC	24 VAC, 50 VA
-005	240/220 VAC	2 x 24 VAC, 40 VA, 100 VA from separate transformer
-006	240/220 VAC	24 VAC, 100 VA, 24 VDC, 600 mA

Table 10. Overview of CRT Series AC/DC current

transformer	primary side	max. AC current	max. DC current
CRT 2	230 VAC	2 A	500 mA
CRT 6	230 VAC	6 A	1300 mA
CRT 12	230 VAC	12 A	2500 mA

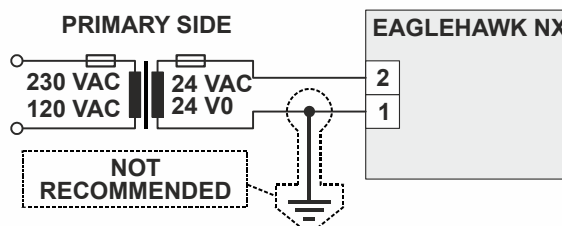


Fig. 25. Connection of EAGLEHAWK NX controller

RIN-APU24

The RIN-APU24 Uninterruptable Power Supply can be directly wired to an EAGLEHAWK NX controller.

See RIN-APU24 Uninterruptable Power Supply – Mounting Instructions (EN0B-0382GE51) for a detailed wiring diagram.

Powering Panel Bus I/O Modules and Field Devices

The EAGLEHAWK NX, Panel Bus I/O modules, and field devices can be powered by either separate transformers (see Fig. 27, and Fig. 28) or by the same transformer (see Fig. 29 on pg. 24).

NOTE: Use a min. distance of 10 cm between power cables and 0...10 V / sensor cables in order to prevent signal disturbances on the 0...10 V / sensor cables. See also section "Addressing Panel Bus I/O Modules" on page 38.

Powering Field Devices and EAGLEHAWK NX via Separate Transformers

- 24 V actuator connected to separate transformer.
- Field device located max. 400 m from EAGLEHAWK NX.

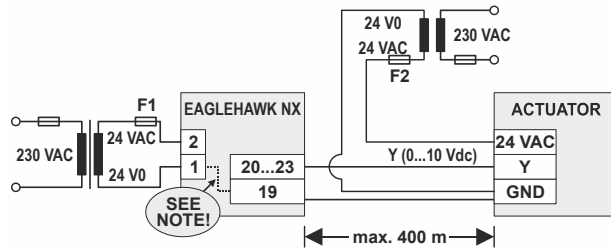


Fig. 26. Power supply of EAGLEHAWK NX and field devices by separate transformer

NOTE: The internal connection from 24 V0 to GND shown here is designed for max. 200 mA.

Powering Field Devices and Panel Bus I/O Module via Separate Transformers

- 24 V actuator connected to, e.g., an analog output module.
- Field device located 100 ... 400 m from the analog output module.

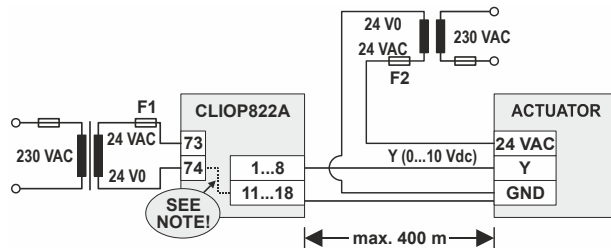


Fig. 27. Power supply via a separate transformer

NOTE: The internal connection from 24 V0 to GND shown here is designed for max. 200 mA.

Powering Field Devices via Panel Bus I/O Module

- 24 V actuator connected to, e.g., an analog output module.
- Field device located max. 100 m from the analog output module.

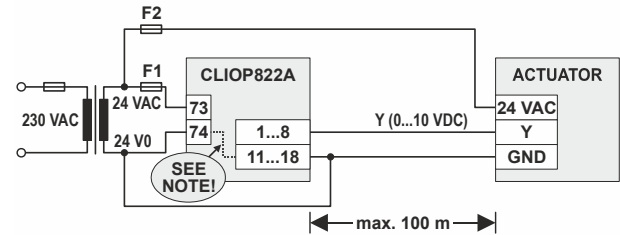


Fig. 28. Power supply via Panel Bus I/O Module

NOTE: The internal connection from 24 V0 to GND shown here is designed for max. 200 mA.

CLNXEH SERIES26xxx Connection Examples

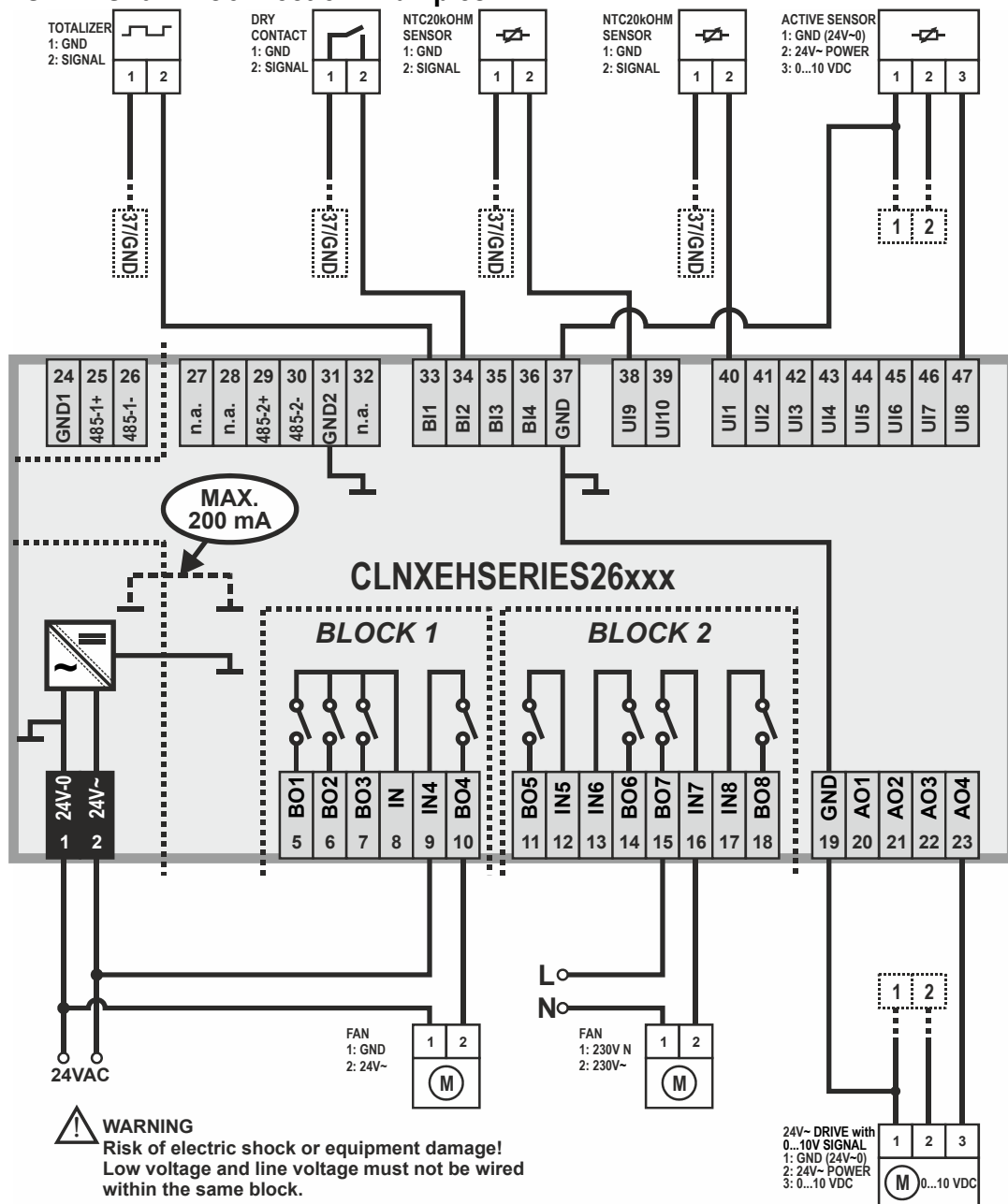


Fig. 29. CLNXEH SERIES26xxx connection example

For fusing specifications see section "Fusing Specifications" on page 20.

NOTE: Use a min. distance of 10 cm between power cables and 0...10 V / sensor cables in order to prevent signal disturbances on the 0...10 V / sensor cables.

NOTE: The internal connection from 24 V0 to GND shown here is designed for max. 200 mA.

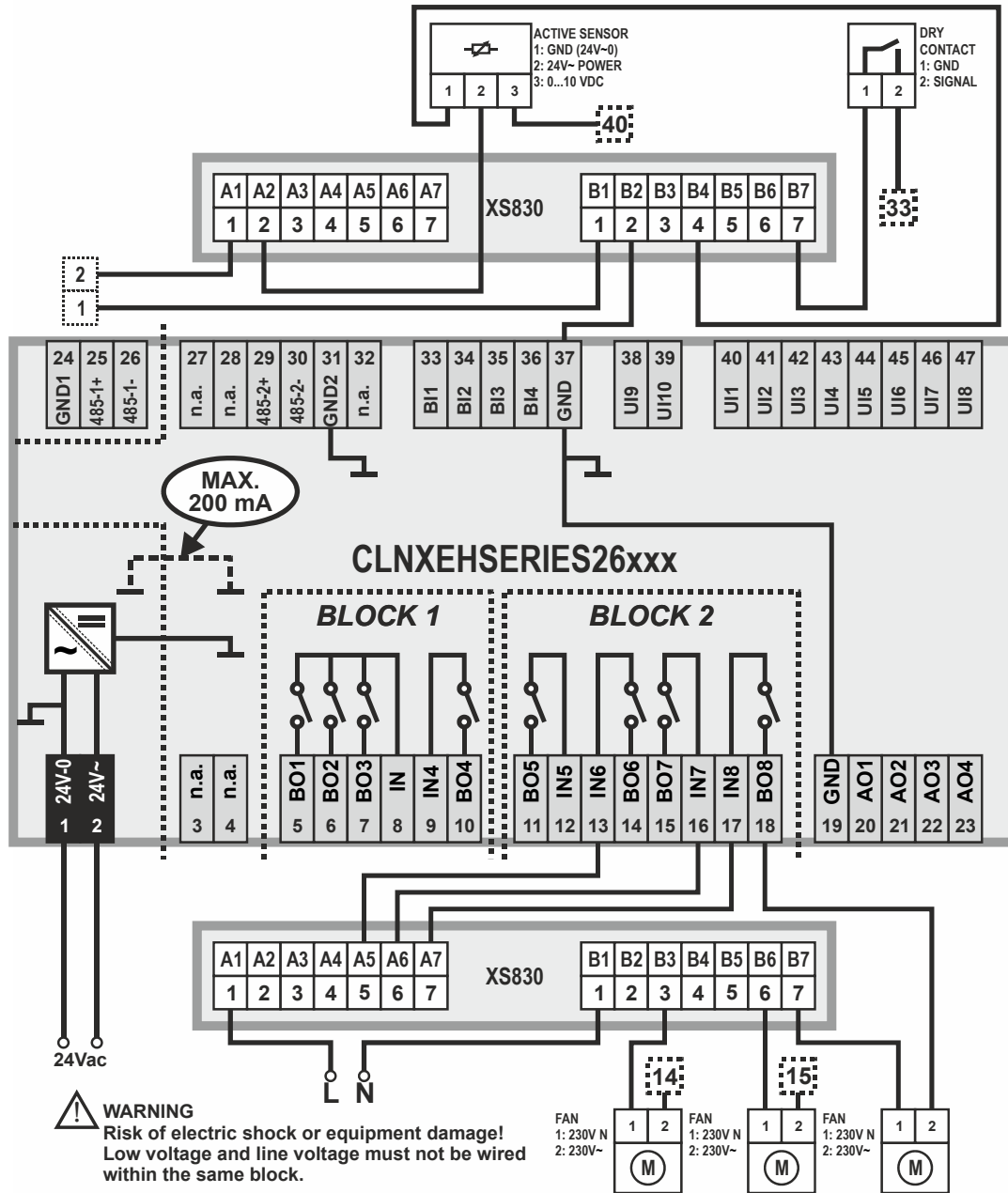


Fig. 30. CLNXEH SERIES26xxx connection example (with two XS830 Auxiliary Terminal Packages)

The XS830 and XS831 Auxiliary Terminal Packages are optional accessories which can be mounted onto the top and/or bottom of the EAGLEHAWK NX controller in order to equip them with additional terminals for the connection of, e.g., shields, sensors, GND, N, 230 V, or 24 V (but not earth!).

NOTE: Use a min. distance of 10 cm between power cables and 0...10 V / sensor cables in order to prevent signal disturbances on the 0...10 V / sensor cables.

NOTE: The internal connection from 24 V0 to GND shown here is designed for max. 200 mA.

Internal I/Os of the EAGLEHAWK NX

The CLNXEHSERIES00xxx is not equipped with inputs or outputs. The following sub-sections thus apply only to the CLNXEHSERIES14xxx and CLNXEHSERIES26xxx.

Universal Inputs

The CLNXEHSERIES26xxx is equipped with ten (CLNXEHSERIES14xxx: four) universal inputs (UIs) configurable (in COACH NX).

For information on the accuracy of the sensor inputs, their differential measurement error, the characteristics (i.e., resistances and resultant voltages in dependence upon temperature) of the various different sensor types which can be connected to them, and on the thresholds at which sensor failures are recognized, see section "Appendix 2" on pg. 57.

Table 11. Specifications of UIs

criteria	value
voltage input	<ul style="list-style-type: none"> UI1-UI10: 0 ... 10 VDC with pull-up resistor (default) UI1-UI8: 0...10 VDC w/o pull-up resistor UI1-UI8: 2...10 VDC w/o pull-up resistor
current input	<ul style="list-style-type: none"> UI1-UI10: 0 ... 10 VDC w/o pull-up resistor, external 499Ω resistor required to measure 0...20 mA UI1-UI8: 2...10 VDC w/o pull-up resistor, external 499Ω resistor required to measure 4...20 mA
supported sensor types	<ul style="list-style-type: none"> NTC10kΩ (-30...+100 °C) NTC20kΩ (-50...+150 °C) Slow binary input (static, dry-contact), 0.4 Hz
resolution	12-bit resolution
accuracy	±75 mV (0 ... 10 V)
protection	against short-circuiting, 24 VAC

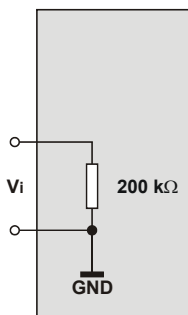


Fig. 31 Internal wiring of UI1-UI8 configured for voltage input (without pull-up resistor)

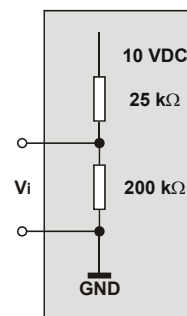


Fig. 32. Internal wiring of UI1-UI10 configured for input from NTC10kΩ / NTC20kΩ / voltage input (with pull-up resistor)

Slow Binary Input Specifications

When configured as slow binary inputs, the universal inputs of the EAGLEHAWK NX have the following specifications:

open contact	≥ 100 kΩ
closed contact	≤ 100 Ω

The polarity (normal = N.O. contact or reverse = N.C. contact) configuration defines if a logical 1 or a logical 0 is detected for a closed contact. This is done by selecting (in COACH NX) one of the following options:

normal (default)	closed external contact → state=1
	open external contact → state=0
reverse	closed external contact → state=0
	open external contact → state=1

Pulse Counter Specifications

Using COACH NX, the universal inputs of the EAGLEHAWK NX can be configured as pulse counters (totalizers).

If the duty cycle is 50% / 50%, the pulse counter supports up to 0.4 Hz. Counting is done on the rising edge.

Table 12. UIs of EAGLEHAWK NX configured as slow BIs

frequency	max. 0.4 Hz
pulse ON	min. 1.25 s
pulse OFF	min. 1.25 s
bounce	max. 50 ms

Analog Outputs

The CLNXEH SERIES26xxx is equipped with four (CLNXEH SERIES14xxx: two) analog outputs (AOs).

In the event of an application stop (e.g., during application download), the analog outputs assume the safety positions configured in COACH NX.

The analog outputs can be configured in COACH NX as binary outputs (with an output of 0 V or 10 V, as the case may be).

Table 13. Specifications of AOs

criteria	value
output type	<ul style="list-style-type: none"> 0...10 V (default) 2...10 V
max. output range	0 ... 11 VDC (1 mA)
min. resolution	8 bit
min. accuracy	± 150 mV
max. wire length	400 m
wire cross section	See Table 7 on pg. 20.
protection	against short-circuiting, 24 VAC

Binary Inputs / Pulse Counters

Both the CLNXEH SERIES26xxx and the CLNXEH SERIES14xxx are equipped with four binary inputs (static dry-contact inputs) / pulse counters (fast totalizers).

Table 14. Specifications of BIs

criteria	value
input type	<ul style="list-style-type: none"> binary input (static dry-contact) pulse counter (fast totalizer)
current rating (closed input)	2 mA
open contact voltage	24 VDC
protection	against short-circuiting, 24 VAC

Binary Input Specifications

The binary inputs of the EAGLEHAWK NX are static dry-contact inputs. This reduces the wiring effort, as it is then not necessary to distribute an auxiliary voltage signal.

open contact	≥ 3000 Ω (24 VDC on BI terminal)
closed contact	≤ 500 Ω (short-circuit current: 2.0 mA)

The polarity (normal = N.O. contact or reverse = N.C. contact) configuration defines if a logical 1 or a logical 0 is detected for a closed contact. This is done by selecting (in COACH NX) one of the following options:

normal (default)	closed external contact → state=1
	open external contact → state=0
reverse	closed external contact → state=0
	open external contact → state=1

Pulse Counter Specifications

Using COACH NX, the binary inputs of the EAGLEHAWK NX can be configured as pulse counters (fast totalizers) for operation in conjunction with devices equipped with an open collector output.

If the duty cycle is 50% / 50%, the pulse counter supports up to 15 Hz. Counting is done on the rising edge.

Table 15. BIs of EAGLEHAWK NX configured as fast totalizers

frequency	max. 15 Hz
pulse ON	min. 25 ms
pulse OFF	min. 25 ms
bounce	max. 5 ms

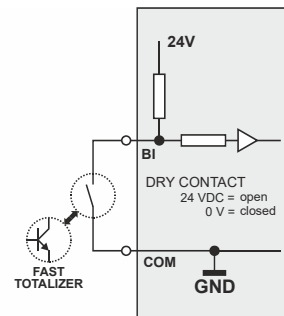


Fig. 33. Internal wiring of BI

Binary Outputs

The EAGLEHAWK NX features eight (CLNXEHSERIES26xxx) or four (CLNXEHSERIES14xxx) binary outputs arranged in two blocks (BO1...4 and BO5...8, respectively).

WARNING

Risk of electric shock or equipment damage!
Low voltage and line voltage must not be wired within the same block.

In the event of an application stop (e.g., during application download), the binary outputs assume the safety positions configured in COACH NX.

The polarity (normal = N.O. contact or reverse = N.C. contact) configuration defines if a relay is open or closed, depending upon whether there is a logical 1 or a logical 0. This is done by selecting (in COACH NX) one of the following options:

normal (default)	state=1 → relay contact is closed
	state=0 → relay contact is opened
reverse	state=0 → relay contact is closed
	state=1 → relay contact is opened

Table 16. Relay specifications of the EAGLEHAWK NX

	block 1		block 2
	BO1...3	BO4	BO5...8
contact volt. AC	5...253 V	5...253 V	5...253 V
contact volt. DC	5...30 V	20...30 V	5...30 V
max. contact current AC (resistive)	3 A	10 A	3 A
max. contact current AC (induct.)	0.3 A*	10 A	0.3 A*
max. contact current AC (induct.)	2 A**	10 A	2 A**
max. contact current DC	3 A	7 A	3 A
min. load	100 mA / 5 VDC	40 mA / 24 VDC	100 mA / 5 VDC
* typically 250,000 cycles; ** typically 50,000 cycles			

NOTE: The total max. sum load for all binary outputs (BO1...8) equals 14 A.

NOTE: Binary output 4 supports the switching of high in-rush currents (e.g., motors, incandescent lights, etc.). The max. allowed switch current is 80 A for a duration of max. 20 ms.

ENGINEERING, COMMISSIONING

Please refer also to CentraLine NX BACnet Utilities Driver - User Guide (Product Literature No.: EN2Z-1020GE51) for detailed information.

Required Preparations

In order to access (with a laptop or PC) the EAGLEHAWK NX controller via Ethernet/IP for the first time, the default passwords are used. For IP connections, you may employ any one of the following two options:

Option 1: USB 2.0 Device (recommended)

This USB 2.0 Device interface is the recommended interface for downloading applications and firmware via COACH NX. An "A-Male to B-Male" USB cable is required.

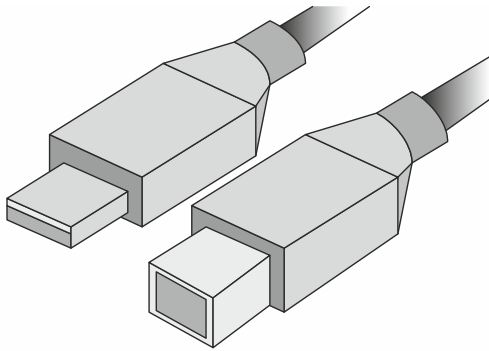


Fig. 34. A-male to B-male USB cable

For access via USB, the EAGLEHAWK NX controller has a permanent default IP address 192.168.255.241. Your PC's IP address must match the EAGLEHAWK NX controller's default IP address subnet: We recommend using DHCP or "Obtain an automatic IP address".

Option 2: Standard Ethernet Interface

The default IP address of Ethernet interface 1 is: 192.168.200.20

and the default IP address of Ethernet interface 2 is: 192.168.201.20

In any case, your PC's IP address must match the EAGLEHAWK NX controller's default IP address subnet (255.255.255.0).

Behavior of Outputs during Download



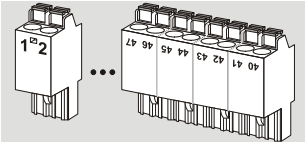
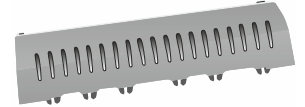
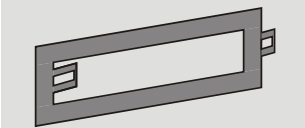
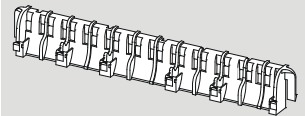
Table 17. Behavior of outputs during firmware download / application download

analog, binary, and floating outputs	output behavior during firmware download	output behavior during application download
outputs of Panel I/O modules (CLIOP82x)	As soon as "receive heartbeat" (the value of which CANNOT be altered using COACH NX) expires, outputs go to safety position.	As soon as "receive heartbeat" (the value of which CANNOT be altered using COACH NX) expires, outputs go to safety position.
outputs of LONWORKS I/O modules (CLIOL82x)	As soon as "receive heartbeat" (the value of which can be altered using COACH NX) expires, outputs go to safety position.	As soon as "receive heartbeat" (the value of which can be altered using COACH NX) expires, outputs go to safety position.
onboard I/Os	After the configured time-out, go to safety position.	After the configured time-out, go to safety position.

NOTE: These behaviors were determined using a test application with a cycle time of 10 seconds. A value update was triggered every 10 seconds.

EXTRA PARTS

Table 18. Extra parts

	order no.	description
	XS830	Set of ten terminals. Each package consists of two groups of nine internally connected push-in terminals, for distributing signals / power.
	XS831	Set of ten terminals. Each package consists of two groups of four pairs of push-in terminals (each with a 499 Ω resistor), for converting 0...20 mA signals into 0...10 VDC signals, and one push-in ground terminal per group.
	TPU-11-01	Removable terminal plugs, push-in type; complete set of 3 plugs (for terminals 1, 2, 24-32); for the CLNXEHSERIES00xxx.
	TPU-45-01	Removable terminal plugs, push-in type; complete set of 9 plugs (for terminals 1 - 47); for the CLNXEHSERIES14xxx and CLNXEHSERIES26xxx.
	MVC-80-AC1	Terminal cover (color: RAL9011); package of ten.
	MVC-80-AC2	Front door mounting accessory (color: RAL9011); package of 10.
	MVC-40-AC3	Strain relief; package of ten.

SOFTWARE LICENSES AND UPGRADES

EAGLEHAWK NX Basic Licenses

Every EAGLEHAWK NX controller must have a basic license. Select one of the options listed in the table below.

Table 19. EAGLEHAWK NX Basic licenses

CentraLine order no.	Contents	Comments
CLNXEH-BASLIC	100 global points; 255 Panel Bus points; initial SMA	Onboard IOs are counted in the Panel Bus license.
CLNXEH-BASLIC-5Y	100 global points; 255 Panel Bus points; 5-year SMA	Onboard IOs are counted in the Panel Bus license.
CLNXEH-BASSPLIC	50 global points; 100 Panel Bus points; initial SMA	Onboard IOs are counted in the Panel Bus license.
CLNXEH-BASSMLIC	100 global points; initial SMA	Does not contain Panel Bus. Onboard IOs are part of the global capacity. As soon as a Panel Bus license is added, the onboard IOs will be switched to Panel Bus.
CLNXEH-BASROOMLIC*	100 global points; no initial SMA	
CLNXEH-BASLIC5005Y	500 global points; 100 Panel Bus points; 5-year SMA	Onboard IOs are counted in the Panel Bus license.
CLNXEH-DEMO	Demo license	1-year demo license; 25,000 global points; 10,000 history extensions; unlimited Panel Bus points

*Will be phased out in January 2021.

The basic licenses (**but not the demo license**) can be upgraded. See the following sections "EAGLEHAWK NX Point Upgrade Licenses" and "EAGLEHAWK NX SMA Licenses."

EAGLEHAWK NX Point Upgrade Licenses

EAGLEHAWK NX basic licenses (**but not the CLNXEH-BASROOMLIC and demo license**) can be upgraded with any of the following upgrade licenses in Table 6. For old EAGLEHAWK NX basic licenses and the CLNXEH-BASROOMLIC see Table 7.

NOTE: The upgrade licenses for new and old licenses are not compatible! The license models CLNXEHLIC and CLNXEHROOMLIC can therefore be upgraded only with the options listed in Table 7.

Table 20. EAGLEHAWK NX Point upgrade licenses for CLNXEH-BASLIC, CLNXEH-BASLIC-5Y, CLNXEH-BASSPLIC, CLNXEH-BASSMLIC, CLNXEH-BASLIC5005Y

CentraLine order no.	Description
CLNXEH-DEVICE-UP-1	EAGLEHAWK NX plus 50 global points upgrade
CLNXEH-DEVICE-UP-2	EAGLEHAWK NX plus 100 global points upgrade
CLNXEH-DEVICE-UP10	EAGLEHAWK NX plus 500 global points upgrade
CLNXEH-DEVICE-UP25	EAGLEHAWK NX plus 1,250 global points upgrade
CLNXEH-DEVICE-UP50	EAGLEHAWK NX plus 2,500 global points upgrade
CLNXEHBP100UP	Upgrade license for 102 Panel Bus points
CLNXEHBP255UP	Upgrade license for 255 Panel Bus points

Table 21. EAGLEHAWK NX Point upgrade licenses for CLNXEH-BASROOMLIC (model CLNXEHROOMLIC) and EAGLEHAWK controllers delivered till December 2019 (model CLNXEHLIC)

CentraLine order no.	Description
CLNXEH-OLDLIC-UP-1	EAGLEHAWK NX plus 50 global points upgrade
CLNXEH-OLDLIC-UP-2	EAGLEHAWK NX plus 100 global points upgrade
CLNXEH-OLDLIC-UP10	EAGLEHAWK NX plus 500 global points upgrade
CLNXEH-OLDLIC-UP25	EAGLEHAWK NX plus 1,250 global points upgrade
CLNXEH-OLDLIC-UP50	EAGLEHAWK NX plus 2,500 global points upgrade
CLNXEHPB100UP	Upgrade license for 102 Panel Bus points
CLNXEHPB255UP	Upgrade license for 255 Panel Bus points
CLNXEHRBAC250UP*	Upgrade license for 250 BACnet room points
CLNXEHLON250UP*	Upgrade license for 250 LONWORKS room points

EAGLEHAWK NX controllers licensed with CLNXEHLIC and CLNXEH-BASROOMLIC are the only licenses compatible with the BACnet license (CLNXEHRBAC250UPLIC) and the LONWORKS license (CLNXEHLON250UPLIC). We have stopped delivering licensed controllers with CLNXEHLIC in January 2020. CLNXEH-BASROOMLIC will be phased out in January 2021. All the licenses in your software stock can still be used according to the above assignment rules.

EAGLEHAWK NX Upgrade Licenses

The following licenses can be assigned to the EAGLEHAWK NX only once.

Table 22. EAGLEHAWK NX upgrade licenses

CentraLine order no.	Description
CLNX-DR-MFID	NX FIDELIO DRIVER
CLNX-DR-SMS-ALM	NX SMS DRIVER

EAGLEHAWK NX SMA Licenses

The EAGLEHAWK NX basic licenses CLNXEH-BASLIC, CLNXEH-BASLIC-5Y, CLNXEH-BASSPLIC, CLNXEH-BASSMLIC, CLNXEH-BASLIC5005Y can be upgraded with any of the following SMA licenses.

The number of points is taken into consideration at the moment of licensing. If you have a valid SMA and you upgrade with a number of points exceeding the SMA, the licenses will run until your SMA expires. If you extend your SMA after expiration, you will have to buy the SMA to reflect the new number of global points.

See following table.

CLNXEH-BASROOMLIC (model CLNXEHROOMLIC) and EAGLEHAWK controllers delivered till December 2019 (model CLNXEHLIC) can be upgraded only with SMA starting from CLNX-SMA-0005-1YR and continuing to CLNX-SMA-0100-5YR.

Table 23. EAGLEHAWK NX SMA licenses

Centraline order no.	Description	Comments
CLNX-SMA-0001-1YR	1YR S/W UPDATE FOR 000 – 049 PTS	Available only for CLNXEH-BASLIC, CLNXEH-BASLIC-5Y, CLNXEH-BASSPLIC, CLNXEH-BASSMLIC, CLNXEH-BASLIC5005Y
CLNX-SMA-0001-3YR	3YR S/W UPDATE FOR 000 – 049 PTS	
CLNX-SMA-0001-5YR	5YR S/W UPDATE FOR 000 – 049 PTS	
CLNX-SMA-0002-1YR	1YR S/W UPDATE FOR 50 – 100 PTS	
CLNX-SMA-0002-3YR	3YR S/W UPDATE FOR 50 – 100 PTS	
CLNX-SMA-0002-5YR	5YR S/W UPDATE FOR 50 – 100 PTS	
CLNX-SMA-0005-1YR	1YR S/W UPDATE FOR 100 – 499 PTS	Available for all basic licenses above and CLNXEH-BASROOMLIC (model CLNXEHROOMLIC) and EAGLEHAWK controllers delivered till December 2019 (model CLNXEHLIC)
CLNX-SMA-0005-3YR	3YR S/W UPDATE FOR 100 – 499 PTS	
CLNX-SMA-0005-5YR	5YR S/W UPDATE FOR 100 – 499 PTS	
CLNX-SMA-0010-1YR	1YR S/W UPDATE FOR 500 – 1249 PTS	
CLNX-SMA-0010-3YR	3YR S/W UPDATE FOR 500 – 1249 PTS	
CLNX-SMA-0010-5YR	5YR S/W UPDATE FOR 500 – 1249 PTS	
CLNX-SMA-0025-1YR	1YR S/W UPDATE FOR 1250 – 4999 PTS	
CLNX-SMA-0025-3YR	3YR S/W UPDATE FOR 1250 – 4999 PTS	
CLNX-SMA-0025-5YR	5YR S/W UPDATE FOR 1250 – 4999 PTS	
CLNX-SMA-0100-1YR	1YR S/W UPDATE FOR 5000 – 9999 PTS	
CLNX-SMA-0100-3YR	3YR S/W UPDATE FOR 5000 – 9999 PTS	
CLNX-SMA-0100-5YR	5YR S/W UPDATE FOR 5000 – 9999 PTS	

EAGLEHAWK NX Energy Manager License

The EAGLEHAWK NX Energy Manager license is not yet supported by the new online licensing portal. Instead, the licensing must be obtained via Niagara Central.

Table 24. EAGLEHAWK NX Energy Manager license

Centraline order no.	Description
CLNXEMC12	ENERGYVISION BASE LIC 12 METER PTS

EAGLEHAWK NX E-Signature, Camera-, Niagara Analytics, JSON, and Cloud Drivers

All of the following licenses are supported by the online licensing portal.

Table 25. Licenses supported by the online licensing portal

Centraline order no.	License key	Description
CLNX-C-ESIG-250	ESIGN-EC-N4-250	E-SIGNATURE 250 SECURED POINTS
CLNX-C-ESIG-UNL	ESIGN-EC-N4-UNL	E-SIGNATURE UNLIMITED SECURED POINTS
CLNX-C-ESIG-UP250	ESIGN-EC-N4-UP-250	E-SIGNATURE 250 SECURED POINT UPGRADE
CLNX-C-NA-100	NA-EC-N4-100	ANALYTICS FOR 100 POINTS EHNX; HAWK8
CLNX-C-NA-250	NA-EC-N4-250	ANALYTICS FOR 250 POINTS EHNX; HAWK8
CLNX-C-NA-500	NA-EC-N4-500	ANALYTICS FOR 500 POINTS EHNX; HAWK8
CLNX-C-NA-1000	NA-EC-N4-1000	ANALYTICS FOR 1000 POINTS EHNX; HAWK8
CLNX-C-DR-AXIS-8	DR-AXIS-8	AXIS 8 CAMERA DRIVER EHNX; HAWK8
CLNX-C-DR-MLS-8	DR-MLS-8	MILESTONE 8 CAMERA DRIVER EHNX; HAWK8
CLNX-C-DR-JSON	DR-JSON	JSON INTEGRATION EHNX; HAWK8
CLNX-S-NCLOUD-S500	DR-NCLOUD-SEN500	NIAGARA CLOUD SENTIENCE 500 POINTS
CLNX-S-NCLOUDS1000	DR-NCLOUD-SEN1000	NIAGARA CLOUD DRIVER 1000 POINTS
CLNX-S-NCLOUDS2500	DR-NCLOUD-SEN2500	NIAGARA CLOUD DRIVER 2500 POINTS
CLNX-S-NCLOUD-S10K	DR-NCLOUD-SEN10000	NIAGARA CLOUD DRIVER 10000 POINTS

PANEL BUS CONNECTION

The EAGLEHAWK NX controller features two RS485 interfaces to which Panel Bus modules can be connected: RS485-1 (consisting of push-in terminals 24 [GND-1], 25, and 26) and/or RS485-2 (consisting of push-in terminals 29, 30, and 31 [GND-2]).

NOTE: GND-2 is internally connected with 24V-0 (terminal 1)

Overview of Panel Bus I/O Modules

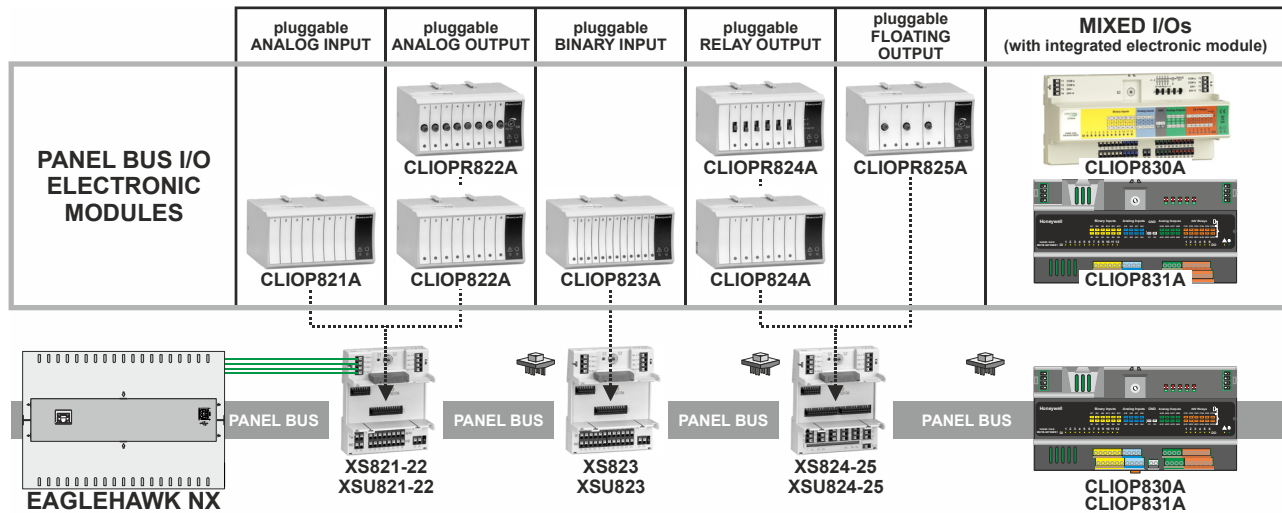


Fig. 35. Overview of Panel Bus I/O Modules

Panel Bus Considerations

- **RS485-1 (isolated)**
 - Max. Panel Bus length:
 - 40 meters. Any type of cabling and topology (including star and loop topology) possible. No additional end termination permitted.
 - 1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps) (see also section "RS485 Standard" on pg. 10). Mandatory twisted-pair or telephone cable and daisy chain topology. The EAGLEHAWK NX must be positioned at one end of the Panel Bus, and an end termination (120 Ω) at the other end. Further, the three-position slide switch (see Fig. 14 on pg. 9) must be set to "END."
- **RS485-2 (non-isolated)**
 - Max. Panel Bus length:
 - 40 meters. Any type of cabling and topology (including star and loop topology) possible. No additional end termination permitted.
 - 1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps) (see also section "RS485 Standard" on pg. 10). Mandatory twisted-pair or telephone cable and daisy chain topology. The EAGLEHAWK NX controller must be positioned at one end of the Panel Bus, and an end termination (120 Ω) at the other end.
 - Must not extend beyond a single building or building floor
- **Max. no. of Panel Bus I/O modules per RS485 interface**
 - Max. no. of Panel Bus I/O modules of a given model: 16
 - Total max. no. of Panel Bus I/O modules: 64
- **Max. no. of Panel Bus I/O modules per EAGLEHAWK NX**
 - Max. no. of Panel Bus I/O modules of a given model: 32
 - Total max. no. of Panel Bus I/O modules: 128
- **Max. no. of hardware I/O points per EAGLEHAWK NX: 1000** (given a polling rate of 2 seconds; see also section "Controller Performance" on pg. 52)

Refer to CentralLine I/O Modules - Installation & Commissioning Instructions (EN1Z-0973GE51) for more information about connection, current requirements, power supply, overvoltage protection, cable specifications, fusing, effects of manual overrides, etc. of Panel Bus I/O modules and field devices connected to them.

Connecting Contr. via RS485-2 to Panel Bus

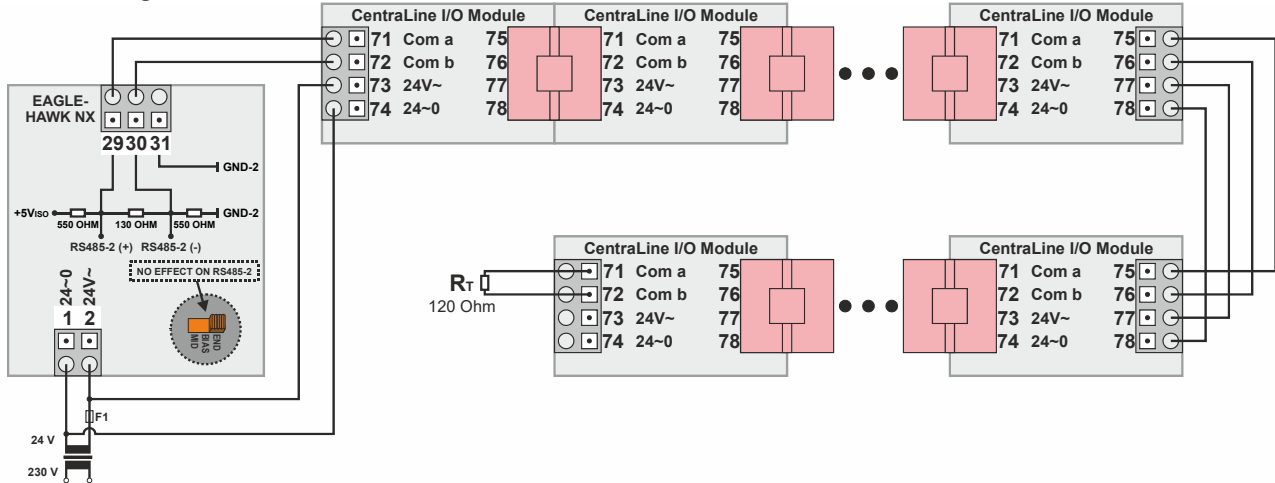


Fig. 38. Connecting an EAGLEHAWK NX controller via its RS485-2 interface to a Panel Bus (single transformer)

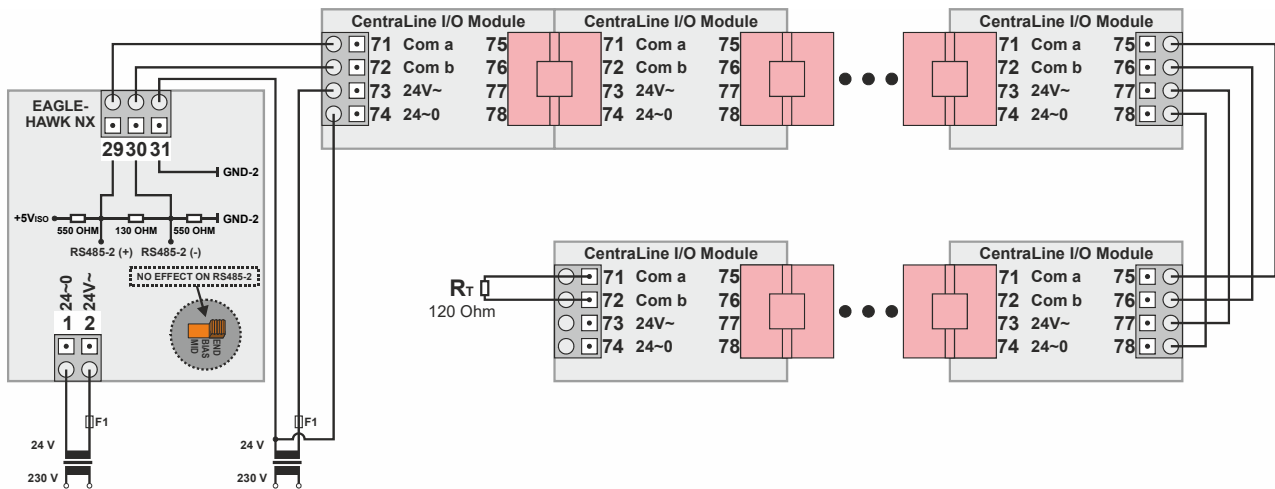


Fig. 39. Connecting an EAGLEHAWK NX controller via its RS485-2 interface to a Panel Bus (two transformers)

Addressing Panel Bus I/O Modules

Each Panel Bus I/O Module must be addressed manually using its HEX switch (S2). The HEX switch setting is defined using the COACH NX engineering tool.

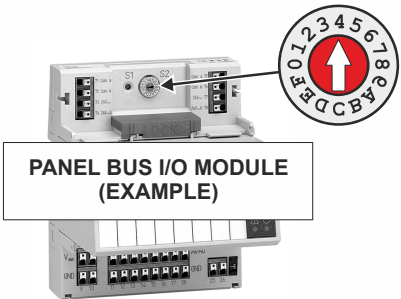


Fig. 40. Location of HEX switch on Panel Bus I/O Module

NOTE: A HEX switch setting of "0" corresponds to an address in COACH NX of "1," a setting of "1" corresponds to an address of "2," and so on.

During commissioning, a max. of 16 Panel Bus I/O Modules of each type (AI, DO, etc.) can be assigned addresses. In doing so, no two modules of the same type (e.g., no two Analog Input Modules, no two Digital Output modules, etc.) may be assigned the same address. See also Fig. 41.

NAME	MODEL	ADDRESS
CLIOP831_A1	CLIOP830/831 (Mixed...)	01 (addr.Switch = 0)
CLIOP831_A2	CLIOP830/831 (Mixed...)	02 (addr.Switch = 1)
CLIOP824_A8	CLIOP824 (Relay...)	01 (addr.Switch = 0)

Fig. 41. HEX switch setting and corresponding address

Failing to observe this requirement will cause a "Fail [date] timeout" error message to appear in the "Health" column, and the device status "down" to appear in the "Status" column. This same error message will likewise appear if an address is assigned to a module with which the controller cannot, for any reason (e.g., due to defective wiring, or because the module has not been physically installed, etc.), communicate.

Automatic Updating of Panel Bus I/O Module Firmware

The firmware of the Panel Bus I/O modules is part of the EAGLEHAWK NX firmware. The EAGLEHAWK NX controller will thus automatically update the firmware of the Panel Bus I/O modules as soon as it detects an older version in them.

CleanDist

The number of EAGLEHAWK NX CleanDist files has been enhanced to now *three* CleanDist files. These CleanDist files allow each user to individually clean up the respective EAGLEHAWK NX controller according to his individual requirements.

CleanDist 1:

Deletes station and all of the modules.

CleanDist 2:

Deletes station, modules, system passphrase, username, and password.

Also resets the IP address to its default, i.e., for

Ethernet interface 1: 192.168.200.20, mask 255.255.255.0

and for

Ethernet interface 2: 192.168.201.20, mask 255.255.255.0

CleanDist 3:

Deletes station, modules, system passphrase, username and password, license, and certificates.

Also resets the IP address to its default, i.e., for

Ethernet interface 1: 192.168.200.20, mask 255.255.255.0

and for

Ethernet interface 2: 192.168.201.20, mask 255.255.255.0

Additionally, CleanDist3 will reset the installed firmware to the Factory Firmware Version 4.4.92.2.1.04.1.

Factory Firmware Scope:

The factory firmware allows the engineer to access all engineering tool (COACH NX) versions since 4.4...

This prevents a version conflict between the engineering tool and the controller during commissioning.

The introduction of this basic firmware became necessary because the EAGLEHAWK NX controller cannot be downgraded in terms of firmware.

The basic firmware does not allow a station to be started and must therefore be updated with the appropriate firmware by the Commissioning Wizard. This is the same procedure used with the HAWK 8000 controllers.

Table 26. CleanDist options

Which element should be deleted?	CleanDist 1	CleanDist 2	CleanDist 3
Station	X	X	X
Module	X	X	X
System passphrase	--	X	X
User and password	-	X	X
IP address	-	X	X
License and certificates	-	-	X
Firmware	-	-	X
			↓
			factory default

Cable Specifications

Panel Bus I/O Modules

When checking the length of the power supply cable, the connection cables to all Panel Bus I/O Modules must be taken into account.

Table 27. Power supply cable specifications

max. length	3 m (from transformer to final module)
cross section	min. 0.75 mm ² (AWG 18)

EIA 485 Cable Specifications

The following cable specification is valid for all EIA 485 buses (e.g., Panel Bus, Modbus, and BACnet MS/TP).

Table 28. EIA 485 cable specifications

max. length	1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps).
cable type	twisted pair, shielded (foil or braided shields are acceptable)
characteristic impedance	100...130 Ω
distributed capacitance between conductors	Less than 100 pF per meter (30 pF per foot)
distributed capacitance between conductors and shield	Less than 200 pF per meter (60 pF per foot)

The following cables fulfill this requirement:

- AWG 18;
- shielded, twisted pair cable J-Y-(St)-Y 4 x 2 x 0.8;
- CAT 5,6,7 cable (use only one single pair for one bus);
- Belden 9842 or 9842NH.

Tuning Panel Bus Communication

The default polling interval for all Panel Bus points is set to "normal = 10s". Data from the field is thus updated every 10s. Write commands are sent without time delay.

It is recommended that you update the polling interval of those points requiring more-frequent updating (see Fig. 42).

IMPORTANT

For EAGLEHAWK NX, the fastest poll rate is 200 milliseconds.

Do NOT set a faster poll rate, as this may overload the CPU in larger systems.

The screenshot displays the 'Property Sheet' for 'PanelbusNetwork' (Panelbus Network). The 'Poll Scheduler' section is expanded, showing the following settings:

Property	Value
Status	{ok}
Enabled	true
Fault Cause	
Health	Ok [05-Jul-18 8:50 AM GMT]
Alarm Source Info	Alarm Source Info
Monitor	Panelbus Ping Monitor
Tuning Policies	Tuning Policy Map
Poll Scheduler	Basic Roll Scheduler
Poll Enabled	true
Fast Rate	00000h 00m 01.000s [1ms-+inf]
Normal Rate	00000h 00m 10.000s [1ms-+inf]
Slow Rate	00000h 01m 00.000s [1ms-+inf]
Statistics Start	04-Jul-2018 01:00 PM GMT
Average Poll	87.13ms
Busy Time	0% (10sec/71402sec)
Total Polls	122 over 10sec
Dibs Polls	0% (1/122)
Fast Polls	0% (0/122)
Normal Polls	99% (121/122)
Slow Polls	0% (0/122)
Dibs Count	current=0 average=0
Fast Count	current=0 average=0
Normal Count	current=0 average=0
Slow Count	current=0 average=0
Fast Cycle Time	average = 1000ms
Normal Cycle Time	average = 1016ms
Slow Cycle Time	average = 1000ms

Fig. 42. Editing the standard polling interval in "Poll Scheduler" of Property Sheet of PanelbusNetwork

You can assign different poll intervals to individual points in the Panel Bus Point Discovery Dialog (see Fig. 43).

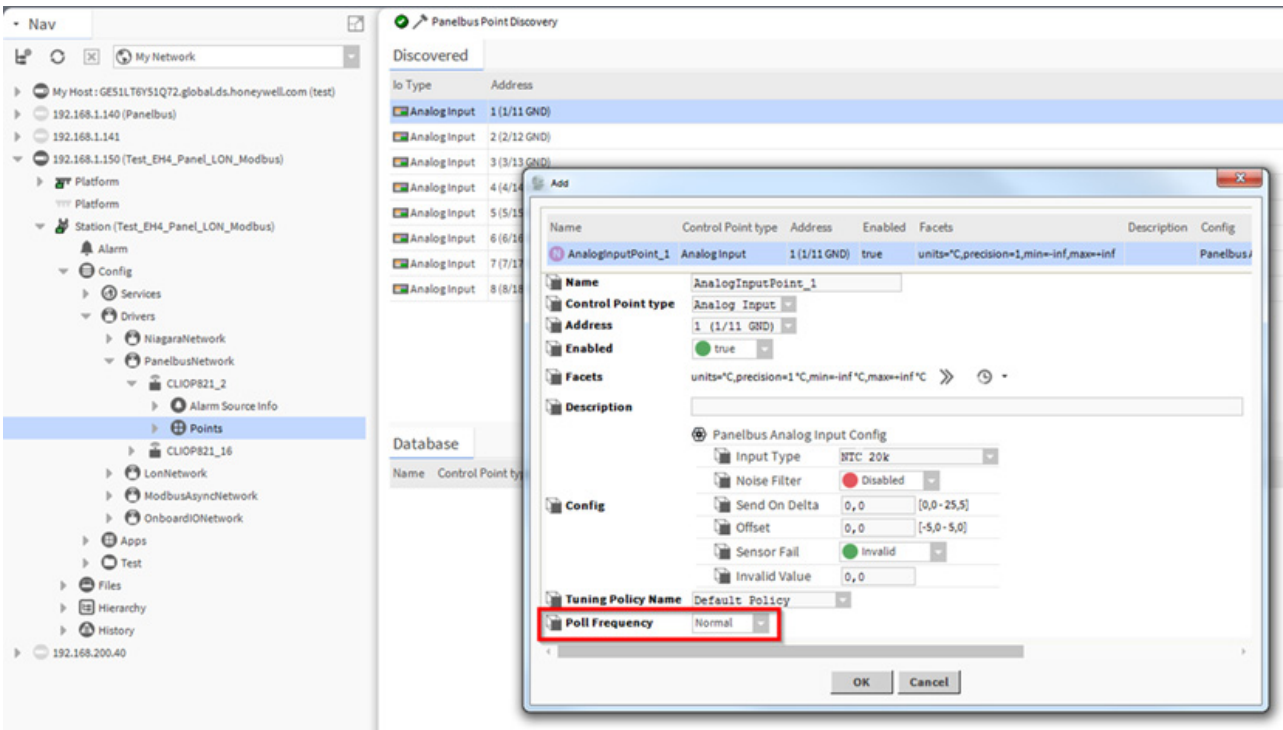


Fig. 43. Assigning different poll intervals to individual points in the Panel Bus Point Discovery Dialog

Field Devices

Depending on the distance from the controller, field devices can be supplied with power by the same transformer used for the Panel Bus I/O Modules, or by a separate transformer, using cables as specified in Table 29.

Table 29. Power / communication cable specifications

type of signal	cross-sectional area	
	≤ 100 m (Fig. 28) single transformer	≤ 400 m (Fig. 27) sep. transformers
24 VAC power	1.5 mm ² (16 AWG)	not allowed for > 100 m (300 ft)
0...10 V signals	0.081 – 2.08 mm ² (28 – 14 AWG)	

For wiring field devices, see section "Powering Panel Bus I/O Modules and Field Devices" on page 23.

Routing Cables to Field Devices

Route low-voltage signal and output cables to field devices separately from mains cables.

Table 30. Minimum distances to power mains cables

cable	min. distance
shielded	10 mm (0.4 in.)
unshielded	100 mm (4 in.)

All low-voltage signal and output cables should be regarded as communication circuits in accordance with VDE 0100 and VDE 0800 (or NEC or other equivalent).

- If the general guidelines for cable routing are observed, it is not necessary to shield field device signal and power supply cables.
- If, for whatever reason, the routing guidelines cannot be observed, the field device signal and power supply cables must be shielded.
 - Shielding of cables leading to field devices must be grounded only at one end.
 - Do not connect the shield to the EAGLEHAWK NX controller.

LONWORKS COMMUNICATIONS

General Information

The EAGLEHAWK NX can be connected to LONWORKS networks. This requires the use of an IF-LON (see section "IF-LON" below), which is then plugged into to the EAGLEHAWK NX controller's USB 2.0 Host Interface (see also section "USB 2.0 Host Interface" on pg. 7).

This permits individual EAGLEHAWK NX controllers to be connected / disconnected from the LONWORKS network without disturbing the operation of other devices.

The LONWORKS network is insensitive to polarity, eliminating the possibility of installation errors due to miswiring.

Different network configurations (daisy-chain, loop, and star configurations, or any combination thereof) are possible (see also Excel 50/500 LONWORKS Mechanisms Interface Description, EN0B-0270GE51).



Fig. 44. IF-LON2

See also IF-LON2 – Mounting Instructions (Product Literature no.: MU1B-0545GE51).

Depending upon the chosen network configuration, one or two terminations may be required.

The following LONWORKS termination module is available:

- LONWORKS connection / termination module (mountable on DIN rails and in fuse boxes), order no.: **XAL-Term2**

Connecting to a LONWORKS Network

IMPORTANT

Do not bundle wires carrying field device signals or LONWORKS communications together with high-voltage power supply or relay cables. Specifically, maintain a min. separation of 3 inches (76 mm) between such cables. Local wiring codes may take precedence over this recommendation.

IMPORTANT

Try to avoid installing in areas of high electromagnetic noise (EMI).

Cable Types

The unit must be wired to the LONWORKS network using either

- level IV 22 AWG (Belden part number 9D220150)
- or
- plenum-rated level IV 22 AWG (Belden part number 9H2201504) non-shielded, twisted-pair, solid-conductor wire.

When possible, use Honeywell AK3781, AK3782, AK3791, or AK3792 cable (US part numbers). See Excel 50/5000 LONWORKS Mechanisms, EN0B-0270GE51, for details, including maximum lengths.

Use wire with a minimum size of 20 AWG (0.5 mm²) and a maximum size of 14 AWG (2.5 mm²).

IF-LON2

Optionally, communication with physical I/O modules, with room and zone controllers, and with CentralLine PANTHER, TIGER, and LION controllers can utilize LonTalk.

The IF-LON is equipped with a free-topology transceiver (FTT10A) for communication (at a data transmission rate of 78 kbps) on LONWORKS® networks (using the LonTalk protocol).

The LONWORKS network is insensitive to polarity, eliminating the possibility of installation errors due to miswiring. Different network configurations (daisy-chain, loop, and star configurations, or any combination thereof) are possible. See Excel 50/5000 LONWORKS Mechanisms (EN0B-0270GE51) for details.

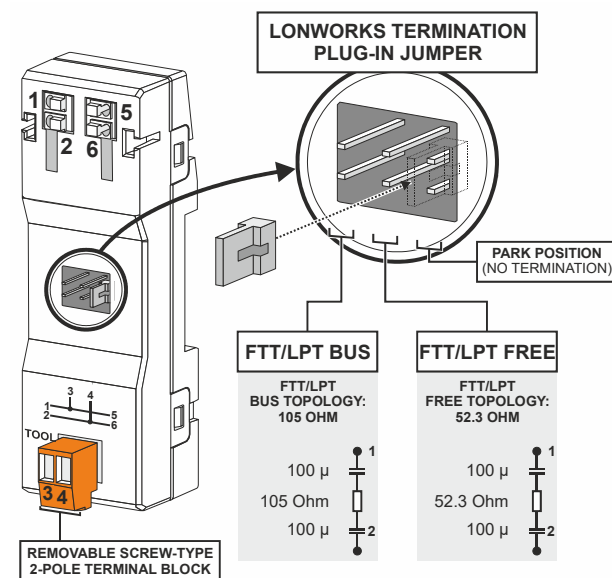


Fig. 45. LONWORKS connection and termination module

BACNET MS/TP BUS CONNECTION

The EAGLEHAWK NX controller features two RS485 interfaces to which BACnet MS/TP devices can be connected: RS485-1 (consisting of push-in terminals 24 [GND-1], 25, and 26) and/or RS485-2 (consisting of push-in terminals 29, 30, and 31 [GND-2]).

NOTE: GND-2 is internally connected with 24V-0 (terminal 1)

BACnet MS/TP Bus Considerations

- **RS485-1 (isolated)**
 - Max. BACnet MS/TP bus length: 1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps) (see also section "RS485 Standard" on pg. 10).
 - Use only shielded, twisted-pair cable and daisy-chain topology.
 - Must conform to EIA-RS485 cabling guidelines (see section "EIA 485 Cable Specifications" on pg. 40).
- **RS485-2 (non-isolated)**
 - Max. BACnet MS/TP bus length: 1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps) (see also section "RS485 Standard" on pg. 10).
 - Use only shielded, twisted-pair cable and daisy-chain topology.
 - Ground noise should not exceed the EIA-485 common mode voltage limit.
 - Must conform to EIA-RS485 cabling guidelines.
 - Should not extend beyond a single building.

Connecting Contr. via RS485-1 to BACnet MS/TP Bus

With regards to Fig. 46 through Fig. 48, please note the following:

NOTE: Always power each EAGLEHAWK NX controller and the connected BACnet MS/TP modules via separate transformers.

NOTE: For "L," see section "RS485 Standard" on pg. 10.

NOTE: If any of the devices are electrically isolated, it is recommended that those devices be connected to signal ground. See section "RS485 Standard" on pg. 10.

Example 1: Single EAGLEHAWK NX Controller and Connected BACnet Modules (with inserted termination resistor)

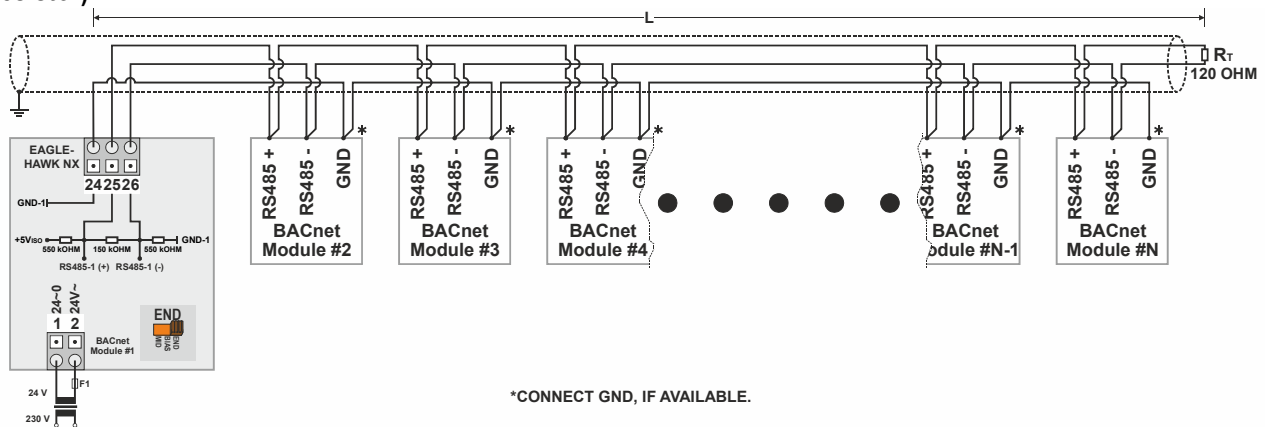


Fig. 46. Connection of a single EAGLEHAWK NX controller via its RS485-1 interface to a BACnet MS/TP Bus

The termination resistor must be inserted directly into the terminals of the last BACnet MS/TP module.

Example 2: Multiple EAGLEHAWK NX Controllers and Connected BACnet Modules

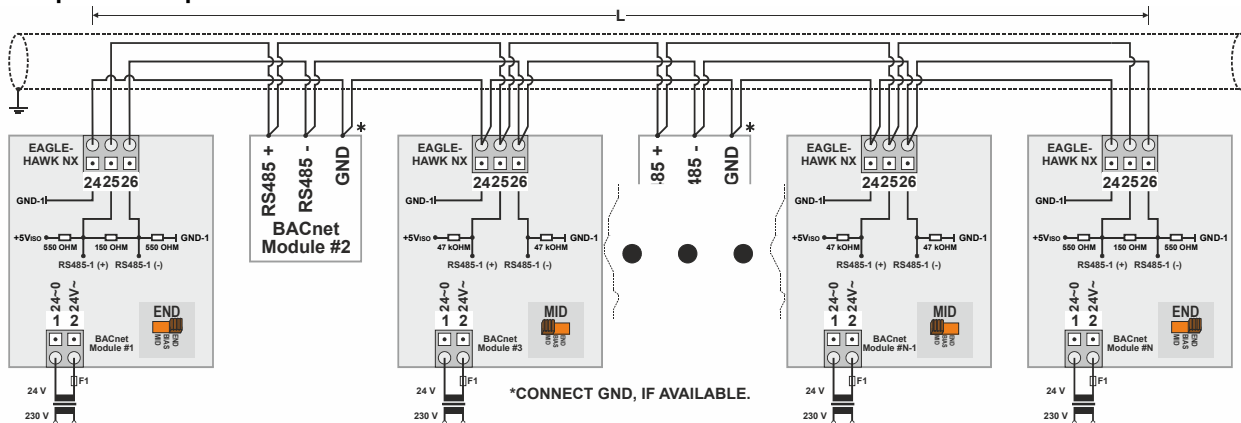


Fig. 47. Connection of multiple EAGLEHAWK NX controllers via their RS485-1 interfaces to a BACnet MS/TP Bus

Example 3: Multiple EAGLEHAWK NX Controllers and Connected BACnet Modules (with inserted termination resistor)

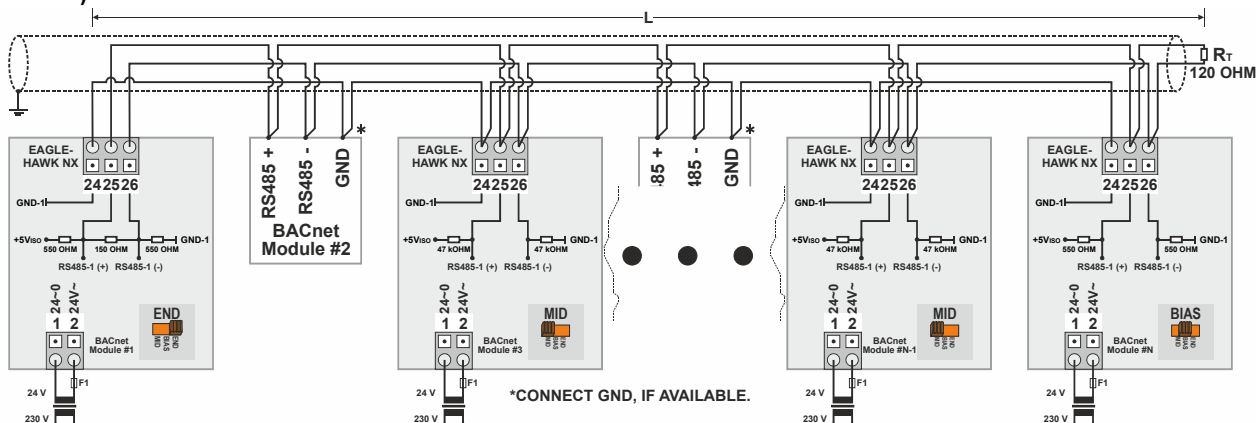


Fig. 48. Connection of multiple EAGLEHAWK NX controllers via their RS485-1 interfaces to a BACnet MS/TP Bus

The termination resistor must be inserted directly into the terminals of the last BACnet MS/TP module (in this example, that is the rightmost EAGLEHAWK NX, the 3-position slide switch of which has been set to "BIAS.")

Connecting Contr. via RS485-2 to BACnet MS/TP Bus

With regards to Fig. 49 and Fig. 50, please note the following:

NOTE: Always power each EAGLEHAWK NX controller and the connected BACnet MS/TP modules via separate transformers.

NOTE: For "L," see section "RS485 Standard" on pg. 10.

NOTE: If any of the devices are electrically isolated, it is recommended that those devices be connected to signal ground. See section "RS485 Standard" on pg. 10.

NOTE: Between devices equipped with non-isolated RS485 bus interfaces, potential differences of max. ± 7 V are allowed. Further, this bus should not extend beyond a single building.

Example 1: Single EAGLEHAWK NX Controller and Connected BACnet Modules (with inserted termination resistor)

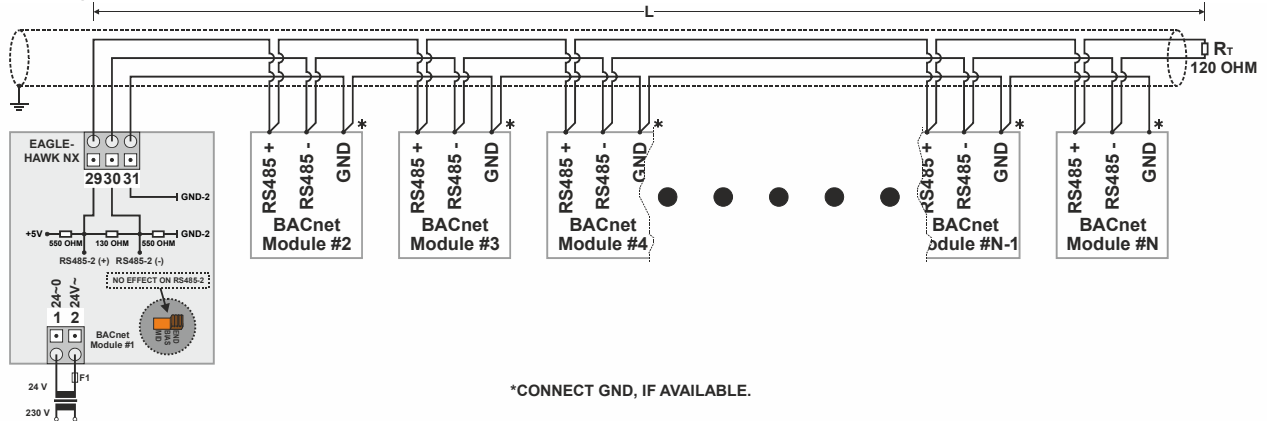


Fig. 49. Connection of a single EAGLEHAWK NX controller via its RS485-2 interface to a BACnet MS/TP Bus

The termination resistor must be inserted directly into the terminals of the last BACnet MS/TP module.

Example 2: Multiple EAGLEHAWK NX Controllers and Connected BACnet Modules

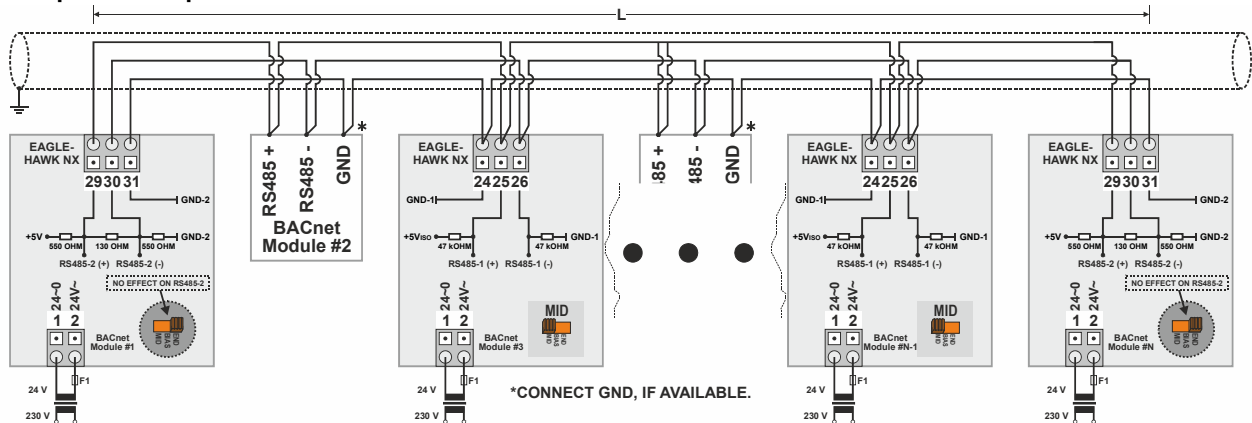


Fig. 50. Connection of multiple EAGLEHAWK NX controllers via their RS485-2 interfaces to a BACnet MS/TP Bus

MODBUS CONNECTION

The EAGLEHAWK NX controller supports both Modbus RTU master and Modbus RTU slave functionality.

Modbus slaves can be connected to either or both of the two onboard RS485 interfaces: RS485-1 (consisting of push-in terminals 24 [GND-1], 25, and 26) or RS485-2 (consisting of push-in terminals 29, 30, 31 [GND-2]).

NOTE: GND-2 is internally connected with 24V-0 (terminal 1)

Modbus Considerations

- **RS485-1 (isolated)**
 - Max. Modbus length: 1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps) (see also section "RS485 Standard" on pg. 10).
 - Use only shielded, twisted-pair cable and daisy-chain topology.
 - Must conform to EIA-RS485 cabling guidelines (see section "EIA 485 Cable Specifications" on pg. 40).
- **RS485-2 (non-isolated)**
 - Max. Modbus length: 1200 meters (9.6 – 78.8 kbps) or 800 meters (115.2 kbps) (see also section "RS485 Standard" on pg. 10).
 - Use only shielded, twisted-pair cable and daisy-chain topology.
 - Ground noise should not exceed the EIA-485 common mode voltage limit.
 - Must conform to EIA-RS485 cabling guidelines (see section "EIA 485 Cable Specifications" on pg. 40).
 - Should not extend beyond a single building.
- **Max. no of Modbus devices per EAGLEHAWK NX RS485 interface: 32 (including the EAGLEHAWK NX, itself, which is counted twice)**

Connecting Contr. via RS485-1 to Modbus

With regards to Fig. 51, please note the following:

NOTE: Always power each EAGLEHAWK NX controller and the connected Modbus slaves via separate transformers.

NOTE: For "L," see section "RS485 Standard" on pg. 10.

NOTE: If any of the devices are electrically isolated, it is recommended that those devices be connected to signal ground. See section "RS485 Standard" on pg. 10.

Example: EAGLEHAWK NX Modbus Master Controller and Connected Modbus Slaves (with inserted termination resistor)

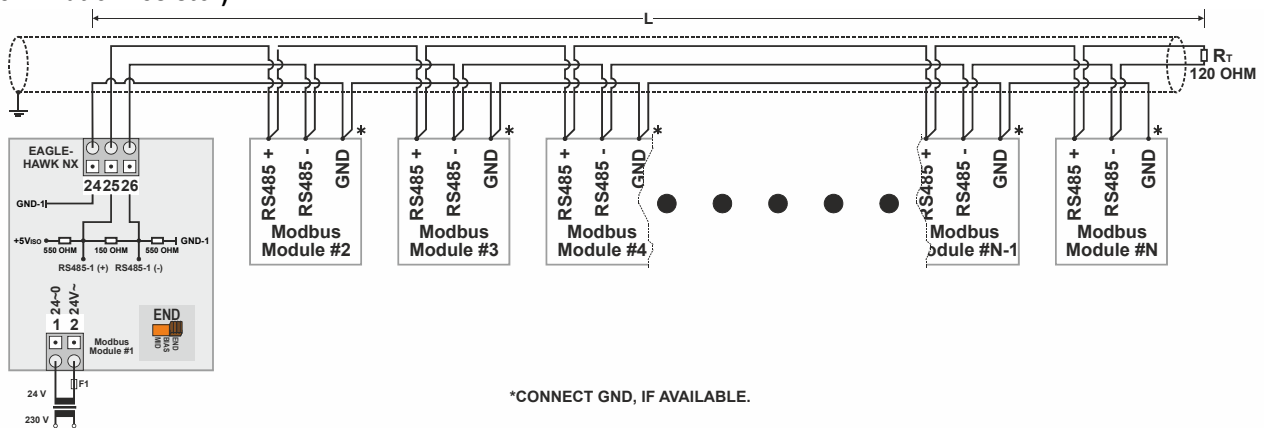


Fig. 51. Connection of an EAGLEHAWK NX Modbus master controller via its RS485-1 interface to a Modbus with slaves
The termination resistor must be inserted directly into the terminals of the last Modbus slave.

NOTE: In this example, any or all of the Modbus RTU slaves depicted here can be EAGLEHAWK NX Modbus RTU slaves. In such cases, an EAGLEHAWK NX Modbus RTU slave positioned at the end of the Modbus (as "Modbus Module #N") must have its 3-position slide switches set to "End" (see Fig. 17) (the insertion of the aforementioned termination resistor is then unnecessary) and any EAGLEHAWK NX Modbus RTU slaves positioned elsewhere on the Modbus must have their 3-position slide switch set to "Mid" (see Fig. 15).

Connecting Contr. via RS485-2 to Modbus

With regards to Fig. 52, please note the following:

NOTE: Always power each EAGLEHAWK NX controller and the connected Modbus slaves via separate transformers.

NOTE: For "L," see section "RS485 Standard" on pg. 10.

NOTE: If any of the devices are electrically isolated, it is recommended that those devices be connected to signal ground. See section "RS485 Standard" on pg. 10.

NOTE: Between devices equipped with non-isolated RS485 bus interfaces, potential differences of max. ± 7 V are allowed. Further, this bus should not extend beyond a single building.

Example: EAGLEHAWK NX Modbus Master Controller and Connected Modbus Slaves (with inserted termination resistor)

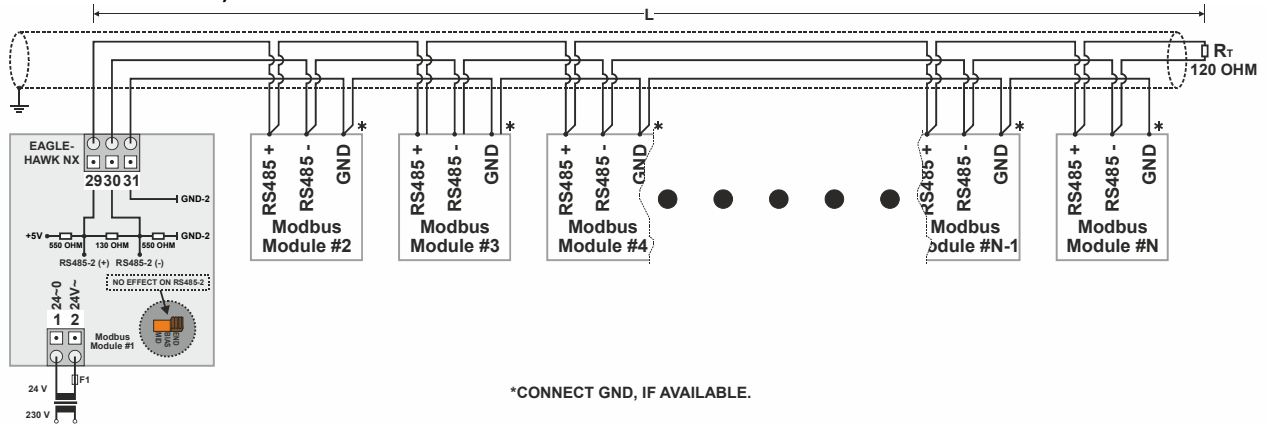


Fig. 52. Connection of an EAGLEHAWK NX Modbus master controller via its RS485-2 interface to a Modbus with slaves

The termination resistor must be inserted directly into the terminals of the last Modbus slave.

NOTE: In this example, a maximum of one of the Modbus RTU slaves can be an EAGLEHAWK NX Modbus RTU slave – which must then be positioned at the end of the Modbus (as "Modbus Module #N"); the insertion of the aforementioned termination resistor is then unnecessary.

M-BUS CONNECTION

The EAGLEHAWK NX controller supports M-Bus Master functionality via its onboard RS232 / RJ45 socket. It uses standard PW3/PW20/PW60 converters to connect to the M-Bus devices.

M-Bus Considerations

Max. no. of M-Bus devices per EAGLEHAWK NX: 60.

Bus Length

- Max. M-Bus length: 350 meters from PW3 / PW20 / PW60, at communication rates of 9.6 kbps or slower with shielded, twisted pair cable: J-Y-(St)-Y 4 x 2 x 0.8.
- The M-Bus can be extended to 1,000 meters, depending upon the communication rate, and provided that the following electrical limitations are observed:
 - Bus voltage must at no point fall below 12 VDC
 - Maximum cable capacitance of 180 nF

For bus length extension, M-Bus repeaters can be used, but have not been tested by Honeywell. Hence, it is the responsibility of the installing / commissioning personnel to ensure proper functioning.

Wiring Topology

M-Bus meters are connected to the bus cable in parallel.

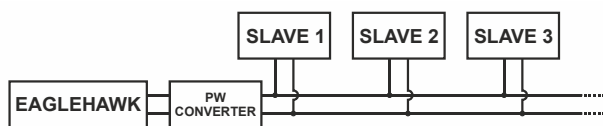


Fig. 53. Allowed M-Bus wiring topology

Cabling EAGLEHAWK NX to PW3/PW20/PW60

- Use the XW586 cable between the RS232 / RJ45 socket of the EAGLEHAWK NX and the PW adapters.
- The XW586 cable has a length of 1.8 m, and the pin-out listed in Table 32.
- In case a third-party cable is used instead of the XW586 cable, the third-party cable must have a max. length of 15 meters and a max. cable capacitance of 2,500 pF.

Table 31. EAGLEHAWK NX RS232 / RJ45 socket specifications

RJ45 plug, pin no.	RS232 function
1	
2	RxD
3	TxD
4	
5	GND
6	
7	
8	

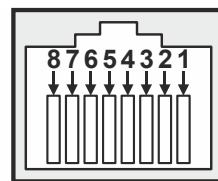


Fig. 54. EAGLEHAWK NX RS232 / RJ45 socket

Table 32. RS232-to-PW cable specifications

RJ45 plug, pin no.	RS232 function	9-Pin sub-D connector pin no.
1	DCD	1
2	RxD	2
3	TxD	3
4	DTR	4
5	GND	5
6	DSR	6
7	RTS	7
8	CTS	8
--	Not used	9

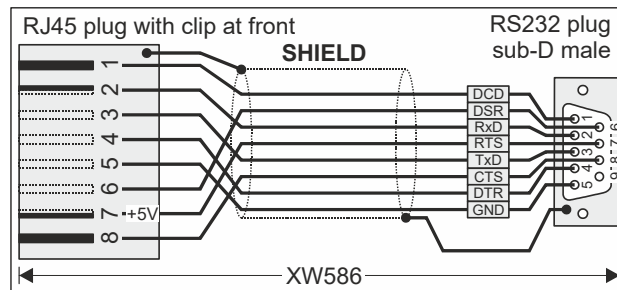


Fig. 55. XW586 power / communication cable details

Cabling PW3/PW20/PW60 to M-Bus

- Use shielded, twisted pair cable J-Y-(St)-Y 4 x 2 x 0.8.
- Shielding is especially recommended when the M-Bus cable is installed in areas with expected or actual electro-magnetic noise. Avoiding such areas is to be preferred.
- Connect the shield to a noise-free earth ground – only once per M-Bus connection.
- Power the EAGLEHAWK NX controller and the PW M-Bus Adapter with separate transformers – see WARNING below.

NOTE: If, alternatively, only a single transformer is available, when connecting a laptop, PC, web browser, CL-Touch, or 3rd-party touch panel to the USB 2.0 Device Interface on the front of the EAGLEHAWK NX controller, use an optical isolator for the USB connection or substitute an M-Bus Mikro-Master USB (Relay GmbH, D-33106 Paderborn) for the PW M-Bus Adapter.

M-Bus Connection Procedure

1. Install the PW M-Bus Adapter on DIN rail. Insert a screwdriver into the slot in the DIN rail clamp on the underside of the PW and pry downward to loosen clamp until the unit snaps onto the rail.

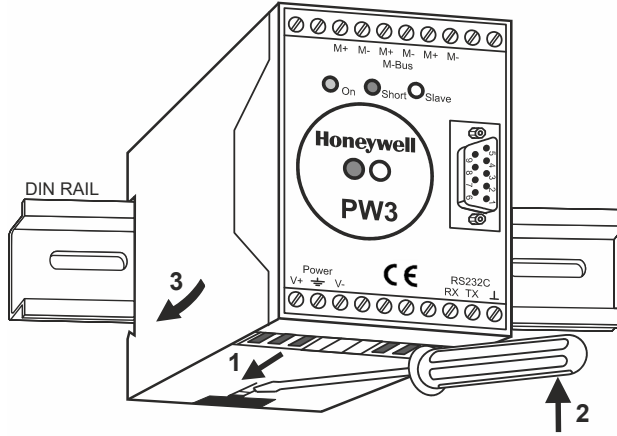


Fig. 56. Mounting of PW (PW3 shown here)

2. Connect the M-Bus devices to the PW M-Bus Adapter. All M+ and M- terminals are connected in parallel in the PW M-Bus Adapter.

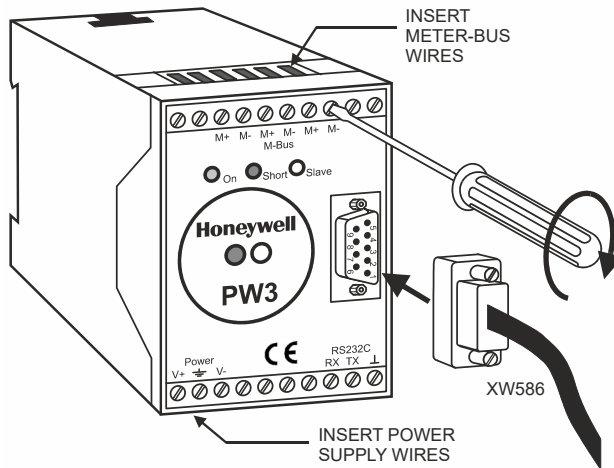


Fig. 57. PW M-Bus adapter connections

3. Connect the PW M-Bus Adapter to the RS232 / RJ45 socket of the EAGLEHAWK NX using the XW586 cable.

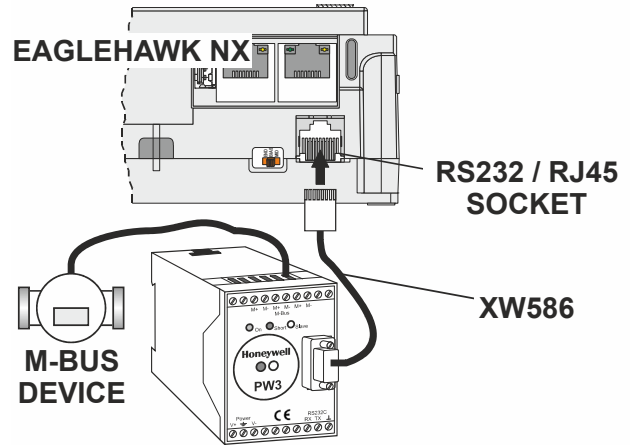


Fig. 58. Connecting the EAGLEHAWK NX to the PW M-Bus adapter

4. Connect 24 V power to the M-Bus Adapter.

WARNING

Risk of electric shock or equipment damage!

- Due to the risk of short-circuiting (see Fig. 24), it is strongly recommended that the EAGLEHAWK NX controller be supplied with power from a dedicated transformer. However, if the EAGLEHAWK NX controller is to be supplied by the same transformer powering other controllers or devices (e.g., the PW M-Bus Adapter), care must be taken to ensure that correct polarity is observed.

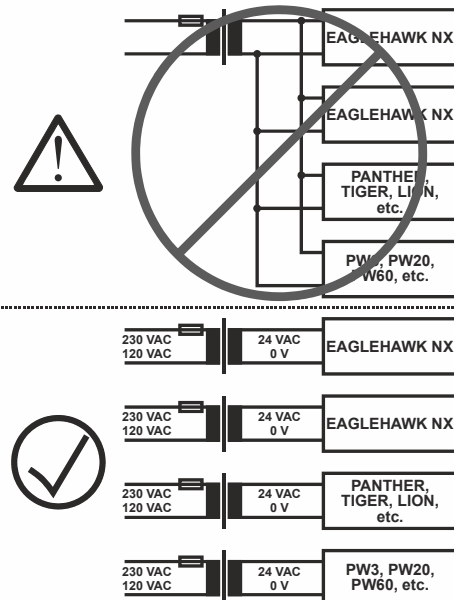


Fig. 59. Connecting power to the PW M-Bus adapter

CONTROLLER PERFORMANCE

The controller performance has been tested in two test scenarios.

NOTE: These are example scenarios. It is therefore, of course, possible for you to use any other mix of Panel Bus points and BACnet MS/TP points as long as the maximum number of hardware I/O points (see section "Panel Bus Considerations" on pg. 35) is observed.

Table 33. Performance test 1 (simple statement for the COV updates, no HVAC application)

	no. of modules	no. of hardware I/O points	points in PX pages	freq. of value changes	histories enabled	CPU usage	test result
Panel Bus (via RS485-1)	46 ^(A)	491	491 ^(B)	2 sec (poll rate)	--	30% (occasionally: 50%)	OK for non-critical applications ^(C)
BACnet MS/TP (via RS485-2)	13	559	559 ^(D)	2 sec (COV)	500		

^(A) 9x CLIOP821A, 9x CLIOPR822A, 9x CLIOP823A, 9x CLIOPR824, 5x CLIOPR825, 5x CLIOP830A

^(B) Four (4) PX pages: AI, AO, BI, and BO points each in a dedicated PX page per point type

^(C) About 0.5% of the BACnet MS/TP point updates are occasionally delayed.

^(D) One (1) PX page with all points

Table 34. Performance test 2

	COV frequency	max. no. of COV updates per min. across RS485-1 and RS485-2 together	CPU usage	test result
BACnet MS/TP at 38,500 bps	4 sec	4,000	25...35% (occasionally: 60%)	OK

TROUBLESHOOTING


EAGLEHAWK NX Controller Troubleshooting

The following LEDs of the EAGLEHAWK NX controller can be used for troubleshooting purposes:

- Power LED (green)
- Status LED (red)
- L1 and L2 LEDs (yellow)
- Tx (sending data on RS485-1) and Rx (receiving data on RS485-1) LEDs


Power LED (green) of EAGLEHAWK NX

Table 35. EAGLEHAWK NX controller power LED

case	power LED 	meaning	remedy
1	ON	Normal operation.	No action necessary.
2	OFF	Power supply not OK.	<ul style="list-style-type: none"> ► Check power supply voltage. ► Check wiring. ► If problem persists, replace hardware.


Status LED (red) of EAGLEHAWK NX

Table 36. EAGLEHAWK NX controller status LED

case	status LED 	meaning	remedy
1	OFF after power-up	Normal operation.	No action necessary.
2	ON continuously after power-up	– Indicates an active alarm; is controlled by Niagara Alarm System; is configurable.	<ul style="list-style-type: none"> ► Try powering down and then powering up the EAGLEHAWK NX controller. ► If problem persists, replace hardware.


L1 LED

Table 37. EAGLEHAWK NX controller bus L1 LED

case	bus LED 	meaning	remedy
1	ON continuously after power-up	Normal operation; Daemon starting.	No action necessary.
2	Flashes constantly	Station starting; if L2 is also flashing, then the station has started.	No action necessary.
3	OFF	Severe software problems.	► Contact TAC.


L2 LED

Table 38. EAGLEHAWK NX controller bus L2 LED

case	bus LED 	meaning	remedy
1	ON continuously after power-up	Platform has started / is reachable.	No action necessary.
2	OFF	Station is not running.	<ul style="list-style-type: none"> ► Start station (enable auto start). ► Contact TAC.
3	Flashing	Station has started.	No action necessary.

Tx and Rx LEDs

Table 39. EAGLEHAWK NX controller bus LEDs Tx and Rx

case	bus LEDs 	meaning	remedy
1	Both Tx and Rx are flashing	Normal operation; RS485-1 is functioning properly.	<p>No action necessary.</p> <ul style="list-style-type: none"> ► In case of communication problems, check settings (communication rate, parity, etc.).
2	Both Tx and Rx are OFF	No communication on RS485-1.	<ul style="list-style-type: none"> ► Switch ON communication on RS485-1. L1 should then flash. Further handling like case 4 (below).
3	Rx is flashing and Tx is OFF	Communication on RS485-1 has been switched OFF, but the EAGLEHAWK NX is receiving data from other controllers.	<ul style="list-style-type: none"> ► Switch ON communication on RS485-1. If this proves unsuccessful, the hardware may be defective.
4	Tx is flashing and Rx is OFF	The EAGLEHAWK NX controller is attempting to establish communication on RS485-1, but there is no answer.	<ul style="list-style-type: none"> ► The communication rate (kbps) on RS485-1 has not been correctly set; other controllers on the bus may have been incorrectly assigned the same device number; wiring problem or hardware defect.

Panel Bus I/O Module Troubleshooting

Please refer to CentraLine I/O Modules - Installation & Commissioning Instructions (EN1Z-0973GE51) for more information about Panel Bus I/O module troubleshooting.

APPENDIX 1: EARTH GROUNDING

EAGLEHAWK NX Systems and SELV

In order to avoid distribution of noise or earth ground potential differences over networks or other connections, the EAGLEHAWK NX controller is designed to be in compliance with SELV (Safety Extra-Low Voltage).

Furthermore, SELV offers the greatest possible safety against electrical impact.

To support SELV, all Honeywell external (CRT series) or internal transformers comply with standard EN60742.

Earth grounding is therefore not recommended.

EAGLEHAWK NX Systems and Standard EN60204-1

However, if compliance with EN60204-1 is required, note the following:

General Information about EN60204-1

EN60204-1 defines electrical safety for a complete application / machine including controllers, sensors, actuators and any connected/controlled electrical device.

EN60204-1 requires controllers to be powered by PELV (Protective Extra-Low Voltage) and earth grounding of the secondary side of the used transformers or earth grounding of the system ground.

Earth grounding is prescribed to prevent unexpected start-up of connected rotating/moving machines due to an insulation fault and double earth grounding somewhere in the plant.

In order to fulfill PELV (if earth grounding is prohibited), the use of an earth leakage monitor is also possible.

When is EN60204-1 Applicable to EAGLEHAWK NX Systems?

- **Safety against electrical impact**
 - EN60204-1 is not mandatory; this is because electrical safety is provided by the use of SELV and transformers according to standard EN60742.
- **Safety against unexpected start-up of rotating/moving machines**
 - If the application/plant does not contain machines that can be harmful to the operator due to an unexpected start-up, the standard EN60204-1 is not applicable.

If such machines are encountered, then EN60204-1 must be followed. Grounding is required.

Earth Grounding of EN60204-1 Applicable Systems

NOTE: We strongly recommend that each CPU be supplied with electricity from its own dedicated transformer.

- ▶ If system protective earth grounding is planned, use a cable as short as possible for grounding: min. 1.5 mm² (16 AWG).
- ▶ For connection details, refer to the following examples.

Example 1

The following explains how to connect and earth multiple CPUs (e.g., multiple EAGLEHAWK NX controllers, PANTHERs, TIGERs, LIONs, etc. or any combination thereof) earth-grounded as per EN60204-1.

NOTE: Use a noise-free earth ground inside the cabinet.

NOTE: If a field device that prohibits earth grounding is connected to the system ground, an isolation monitoring device must be used instead of earth grounding.

- ▶ Connect earth ground to the respective terminal of the CPU, see Fig. 60.

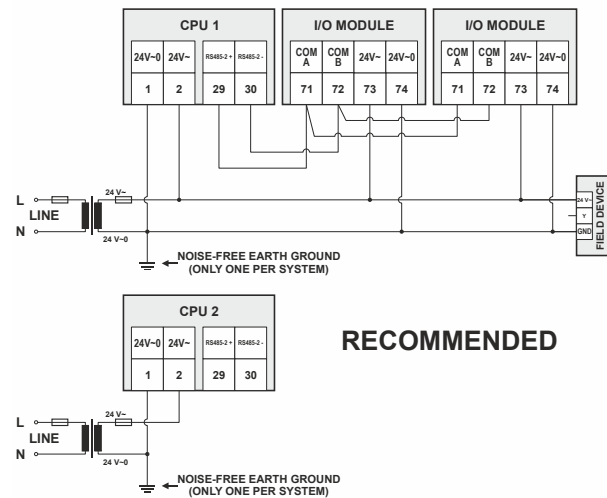


Fig. 60. Connecting and earthing multiple CPUs (RECOMMENDED USE OF SEPARATE TRANSFORMERS)

Example 2

When connecting multiple CPUs to a single transformer, it is imperative that the polarity of the power supply terminals of the CPUs and the polarity of the transformer always correspond (namely: 24V-0 of the transformer must always be connected to 24V-0 of the CPU, and 24V~ of the transformer must always be connected with 24V~ of the CPU).

Depending upon the individual CPU, the numbering of the corresponding two terminals may possibly deviate from the norm (which is usually "terminal 1 = 24V-0" and "terminal 2 = 24V~"). In the following example, CPU 3 has a deviating numbering and must be connected accordingly.

NOTE: When using a single transformer for several CPUs, each CPU ground must be wired separately to the star-point.

NOTE: If the field device transformer is physically far away from the CPUs, earth grounding must still be performed for the controller.

NOTE: Use one star-point to split power for multiple CPUs and field devices.

- Connect earth ground to the proper terminal of the CPU, see Fig. 61.

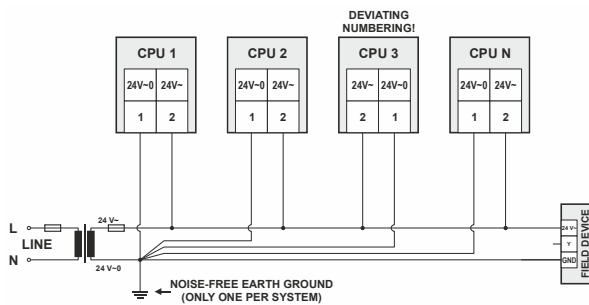


Fig. 61. Connecting and earthing multiple CPUs

APPENDIX 2

Sensor Input Accuracy

The internal sensor inputs of the EAGLEHAWK NX controller support both NTC10kΩ and NTC20kΩ sensors (see also section "Universal Inputs" on page 26). The following table lists the typical minimum accuracies of the hardware and software for temperature sensors.

Table 40. Accuracies of internal NTC20kΩ sensor inputs of the EAGLEHAWK NX

range	measurement error (excl. sensor characteristics)	
	NTC10kΩ sensors ⁽¹⁾	NTC20kΩ sensors
-50 ... -20 °C (-58 ... -4 °F)	≤ 5.0 K	≤ 5.0 K
-20 ... 0 °C (-4 ... +32 °F)	≤ 1.0 K	≤ 1.0 K
0 ... 30 °C (32 ... 86 °F)	≤ 0.5 K	≤ 0.3 K
30 ... 70 °C (86 ... 158 °F)	≤ 0.5 K	≤ 0.5 K
70 ... 100 °C (158 ... 212 °F)	≤ 1.0 K	≤ 1.0 K
100 ... 130 °C (212 ... 266 °F)	--	≤ 3.0 K
130 ... 150 °C (266 ... 302 °F)	--	≤ 5.5 K
150 ... 400 °C (302 ... 752 °F)	--	--

⁽¹⁾ NTC10kΩ specified for -30 ... +100 °C, only.

NOTE: This is the accuracy of the internal sensor input (hardware + software [linearization]), only. This table does not include the characteristics of the sensors, themselves (see section "Sensor Characteristics" below). If a different sensor or sensor accuracy is required, one may instead use the inputs of, e.g., a connected Panel I/O module.

Recognition of Sensor Failure of Sensor Inputs

The thresholds at which sensor failures – i.e., sensor breaks (SB) and short-circuits (SC) – are recognized depends upon the given sensor type. In the event of a recognized sensor failure, the sensor inputs assume the safety values configured in COACH NX. Table 41 lists the measurement ranges and the corresponding thresholds for the recognition of sensor failure for the various different sensor types:

Table 41. Thresholds for short-circuit (SC) and sensor-break (SB) recognition

I/O configuration	measurement range	recognition thresholds
2...10 V	2...10 V / 4...20 mA (without pull-up)	SC: < 1.5 V / 3 mA; SB: no recognition
NTC10kΩ	-30 ... +100 °C	SC: < 20 Ω; SB: < -70 °C
NTC20kΩ	-50 ... +150 °C	SC: < 20 Ω; SB: < -70 °C

NOTE: In the case of temperatures lying *outside* the aforementioned ranges, the lowest/highest value *within* the range, instead, will be communicated. Thus, a temperature of -51 °C will be communicated as "-50 °C."

Sensor Characteristics

The characteristics (resistance in relation to temperature) of the sensors and the resultant voltage are listed on the following pages. The stated values do not include failures due to: sensor failures; wiring resistance or wiring failures; misreadings due to a meter connected to measure resistance or voltage at the input.

NTC 20 k Ω (same voltages for inputs of Panel Bus I/O Modules and onboard inputs of EAGLEHAWK NX)

Temp. [°C]	Resistance [k Ω]	Terminal voltage [V]	Temp. [°C]	Resistance [k Ω]	Terminal voltage [V]	Temp. [°C]	Resistance [k Ω]	Terminal voltage [V]	Temp. [°C]	Resistance [k Ω]	Terminal voltage [V]
-50.0	1659	8.78	6.0	51.1	6.20	62.0	4.18	1.41	118.0	0.64	0.252
-49.0	1541	8.77	7.0	48.5	6.10	63.0	4.03	1.37	119.0	0.63	0.245
-48.0	1432	8.76	8.0	46.0	6.00	64.0	3.88	1.32	120.0	0.61	0.238
-47.0	1331	8.75	9.0	43.7	5.90	65.0	3.73	1.28	121.0	0.59	0.231
-46.0	1239	8.74	10.0	41.6	5.80	66.0	3.59	1.24	122.0	0.57	0.225
-45.0	1153	8.72	11.0	39.5	5.70	67.0	3.46	1.20	123.0	0.56	0.219
-44.0	1073	8.71	12.0	37.6	5.59	68.0	3.34	1.16	124.0	0.54	0.213
-43.0	1000	8.70	13.0	35.7	5.49	69.0	3.21	1.13	125.0	0.53	0.207
-42.0	932	8.69	14.0	34.0	5.38	70.0	3.10	1.09	126.0	0.51	0.201
-41.0	869	8.67	15.0	32.3	5.28	71.0	2.99	1.06	127.0	0.50	0.196
-40.0	811	8.66	16.0	30.8	5.17	72.0	2.88	1.02	128.0	0.49	0.191
-39.0	757	8.64	17.0	29.3	5.07	73.0	2.78	0.991	129.0	0.47	0.186
-38.0	706	8.62	18.0	27.9	4.96	74.0	2.68	0.960	130.0	0.46	0.181
-37.0	660	8.60	19.0	26.6	4.85	75.0	2.58	0.929	131.0	0.45	0.176
-36.0	617	8.58	20.0	25.3	4.75	76.0	2.49	0.900	132.0	0.43	0.171
-35.0	577	8.56	21.0	24.2	4.64	77.0	2.41	0.872	133.0	0.42	0.167
-34.0	539	8.54	22.0	23.0	4.53	78.0	2.32	0.844	134.0	0.41	0.162
-33.0	505	8.52	23.0	22.0	4.43	79.0	2.24	0.818	135.0	0.40	0.158
-32.0	473	8.49	24.0	21.0	4.32	80.0	2.17	0.792	136.0	0.39	0.154
-31.0	443	8.47	25.0	20.0	4.22	81.0	2.09	0.767	137.0	0.38	0.150
-30.0	415	8.44	26.0	19.1	4.12	82.0	2.02	0.744	138.0	0.37	0.146
-29.0	389	8.41	27.0	18.2	4.01	83.0	1.95	0.720	139.0	0.36	0.142
-28.0	364	8.38	28.0	17.4	3.91	84.0	1.89	0.698	140.0	0.35	0.139
-27.0	342	8.35	29.0	16.6	3.81	85.0	1.82	0.676	141.0	0.34	0.135
-26.0	321	8.32	30.0	15.9	3.71	86.0	1.76	0.655	142.0	0.33	0.132
-25.0	301	8.28	31.0	15.2	3.62	87.0	1.70	0.635	143.0	0.32	0.128
-24.0	283	8.25	32.0	14.5	3.52	88.0	1.65	0.616	144.0	0.32	0.125
-23.0	266	8.21	33.0	13.9	3.43	89.0	1.59	0.597	145.0	0.31	0.122
-22.0	250	8.17	34.0	13.3	3.33	90.0	1.54	0.578	146.0	0.30	0.119
-21.0	235	8.13	35.0	12.7	3.24	91.0	1.49	0.561	147.0	0.29	0.116
-20.0	221	8.08	36.0	12.1	3.15	92.0	1.44	0.544	148.0	0.29	0.113
-19.0	208	8.04	37.0	11.6	3.06	93.0	1.40	0.527	149.0	0.28	0.110
-18.0	196	7.99	38.0	11.1	2.97	94.0	1.35	0.511	150.0	0.27	0.107
-17.0	184	7.94	39.0	10.7	2.89	95.0	1.31	0.496			
-16.0	174	7.89	40.0	10.2	2.81	96.0	1.27	0.481			
-15.0	164	7.83	41.0	9.78	2.72	97.0	1.23	0.466			
-14.0	154	7.78	42.0	9.37	2.64	98.0	1.19	0.452			
-13.0	146	7.72	43.0	8.98	2.57	99.0	1.15	0.439			
-12.0	137	7.66	44.0	8.61	2.49	100.0	1.11	0.425			
-11.0	130	7.60	45.0	8.26	2.42	101.0	1.08	0.413			
-10.0	122	7.53	46.0	7.92	2.34	102.0	1.05	0.401			
-9.0	116	7.46	47.0	7.60	2.27	103.0	1.01	0.389			
-8.0	109	7.39	48.0	7.29	2.20	104.0	0.98	0.378			
-7.0	103	7.32	49.0	7.00	2.14	105.0	0.95	0.367			
-6.0	97.6	7.25	50.0	6.72	2.07	106.0	0.92	0.356			
-5.0	92.3	7.17	51.0	6.45	2.01	107.0	0.90	0.346			
-4.0	87.3	7.09	52.0	6.19	1.94	108.0	0.87	0.336			
-3.0	82.6	7.01	53.0	5.95	1.88	109.0	0.84	0.326			
-2.0	78.2	6.93	54.0	5.72	1.82	110.0	0.82	0.317			
-1.0	74.1	6.85	55.0	5.49	1.77	111.0	0.79	0.308			
0.0	70.2	6.76	56.0	5.28	1.71	112.0	0.77	0.299			
1.0	66.5	6.67	57.0	5.08	1.66	113.0	0.75	0.290			
2.0	63.0	6.58	58.0	4.88	1.61	114.0	0.73	0.282			
3.0	59.8	6.49	59.0	4.69	1.56	115.0	0.70	0.274			
4.0	56.7	6.40	60.0	4.52	1.51	116.0	0.68	0.266			
5.0	53.8	6.30	61.0	4.35	1.46	117.0	0.66	0.259			

NTC10kΩ (same voltages for inputs of Panel Bus I/O Modules and onboard inputs of EAGLEHAWK NX)

Temp. [°C]	Resistance [kΩ]	Terminal voltage [V]	Temp. [°C]	Resistance [kΩ]	Terminal voltage [V]	Temp. [°C]	Resistance [kΩ]	Terminal voltage [V]	Temp. [°C]	Resistance [kΩ]	Terminal voltage [V]
-30	177	7.904	13	17.252	3.894	56	2.878	1.023	99	0.7	0.276
-29	166.35	7.848	14	16.46	3.792	57	2.774	0.990	100	0.68	0.265
-28	156.413	7.790	15	15.708	3.690	58	2.675	0.959			
-27	147.136	7.730	16	14.995	3.591	59	2.579	0.928			
-26	138.47	7.666	17	14.319	3.492	60	2.488	0.898			
-25	130.372	7.601	18	13.678	3.396	61	2.4	0.870			
-24	122.8	7.534	19	13.068	3.300	62	2.316	0.842			
-23	115.718	7.464	20	12.49	3.207	63	2.235	0.815			
-22	109.089	7.392	21	11.94	3.115	64	2.158	0.790			
-21	102.883	7.318	22	11.418	3.025	65	2.083	0.765			
-20	97.073	7.241	23	10.921	2.937	66	2.011	0.740			
-19	91.597	7.161	24	10.449	2.850	67	1.943	0.718			
-18	86.471	7.080	25	10	2.767	68	1.877	0.695			
-17	81.667	6.996	26	9.572	2.684	69	1.813	0.673			
-16	77.161	6.910	27	9.165	2.603	70	1.752	0.652			
-15	72.932	6.821	28	8.777	2.524	71	1.694	0.632			
-14	68.962	6.731	29	8.408	2.447	72	1.637	0.612			
-13	65.231	6.639	30	8.057	2.372	73	1.583	0.593			
-12	61.723	6.545	31	7.722	2.299	74	1.531	0.575			
-11	58.424	6.448	32	7.402	2.228	75	1.481	0.557			
-10	55.321	6.351	33	7.098	2.159	76	1.433	0.541			
-9	52.399	6.251	34	6.808	2.091	77	1.387	0.524			
-8	49.648	6.150	35	6.531	2.025	78	1.342	0.508			
-7	47.058	6.047	36	6.267	1.962	79	1.299	0.493			
-6	44.617	5.943	37	6.015	1.900	80	1.258	0.478			
-5	42.317	5.838	38	5.775	1.840	81	1.218	0.464			
-4	40.15	5.732	39	5.546	1.781	82	1.179	0.450			
-3	38.106	5.624	40	5.327	1.724	83	1.142	0.436			
-2	36.18	5.516	41	5.117	1.669	84	1.107	0.423			
-1	34.363	5.408	42	4.917	1.616	85	1.072	0.411			
0	32.65	5.299	43	4.726	1.564	86	1.039	0.399			
1	31.027	5.189	44	4.543	1.514	87	1.007	0.387			
2	29.494	5.079	45	4.369	1.465	88	0.976	0.375			
3	28.047	4.969	46	4.202	1.418	89	0.947	0.365			
4	26.68	4.859	47	4.042	1.373	90	0.918	0.354			
5	25.388	4.750	48	3.889	1.329	91	0.89	0.344			
6	24.166	4.641	49	3.743	1.286	92	0.863	0.334			
7	23.01	4.532	50	3.603	1.244	93	0.838	0.324			
8	21.916	4.423	51	3.469	1.204	94	0.813	0.315			
9	20.88	4.316	52	3.34	1.166	95	0.789	0.306			
10	19.898	4.209	53	3.217	1.128	96	0.765	0.297			
11	18.968	4.103	54	3.099	1.092	97	0.743	0.289			
12	18.087	3.998	55	2.986	1.057	98	0.721	0.280			

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