



greenBOX Nxt, Ecogate Gates, Volt Sensors, And Power MASTER VFD: **Quick Installation Guide**

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This is a short installation guide. To fully understand system safety and functionality please read the full user guide of greenBOX Nxt, Power MASTER VFD. Do not use the Ecogate system until you have thoroughly read and understand the safety instructions completely (including the separate safety instructions for dust collector, fan, transport, gates, greenBOX and all other parts of the ventilation system). Failure to comply can result in an accident or personal injury.

Introduction

This document is a quick installation guide for the greenBOX Nxt, Ecogate Gates, and Volt Sensors, and Power MASTER VFD. It provides step-by-step instructions for installing and connecting the components of a dust collection control system.

- **Installing greenBOX Nxt:** Mount the unit on a wall, connect power and network cables.
- **Ecogate Interface Board Terminals:** Understand the Modbus ports for connecting gates and VFDs, and additional terminals for relays, inputs, and status lights.
- **Connecting Ecogate MASTER Cable:** Use pluggable connectors to connect the cable to greenBOX Nxt Modbus ports.
- **Connecting Gates in Daisy-Chain:** Connect gates using Ecogate MASTER cables and double ferrules, ensuring proper shielding and securing cables.
- **Connecting Last Gate and Terminating Resistor:** Connect the last gate with a terminating resistor jumper to prevent signal interference.
- **Connecting Workstation Activity Sensor:** Use Ecogate Volt Sensors to signal workstation activity and connect them to the gate's "Signal" input.
- **Connecting Status LED Light:** Install the light, understand its indicators, and optionally connect the buzzer.
- **Connecting Power MASTER control cables:** Modbus cable from greenBOX, dust collector Start/Stop, and Enable signal
- **Checking Terminating Resistor Status:** Use an ohmmeter to verify the terminating resistor status at gates and greenBOX Nxt.

One Minute Installation Videos are Available at Youtube

To help you quickly understand the greenBOX setup process, we've created a series of short, step-by-step instructional videos on YouTube. Happy watching!

- ▶ How to Mount the GreenBox on the Wall | Ecogate Installation Guide
- ▶ greenBOX Nxt Terminals and Connections Explained | Ecogate Setup Guide
- ▶ How to Connect the Ecogate Master Cable to GreenBox NXT | Ecogate Setup Guide
- ▶ Connecting greenBOX Cables by Using Conduits
- ▶ Daisy-Chain Ecogate Smart Gates | Ecogate Wiring Tutorial
- ▶ Connecting the Last Smart Gate in Daisy-Chain | Ecogate Guide
- ▶ Ecogate Power Master VFD - Overview of terminals PX1, PX2 and PX3
- ▶ How to Connect a Workstation Activity Sensor to Smart Gate | Ecogate Guide
- ▶ Setting Up LED Status Lights on GreenBox NXT | Ecogate Guide
- ▶ Ensuring Reliable Modbus Communication | Ecogate Terminating Resistor Guide

Content

Introduction..... 1

One Minute Installation Videos are Available at Youtube..... 2

1. Install greenBOX Nxt on the Wall..... 4

2. Overview of greenBOX Interface Board Terminals..... 5

3. Connecting Ecogate MASTER Cable To greenBOX Nxt Modbus Port..... 7

4. Connecting Gates In Daisy-Chain Using Ecogate MASTER Cable..... 9

5. Connecting Last Gate in Daisy-Chain with Terminating Resistor..... 11

6. Connecting Workstation Activity Sensor to the Gate..... 13

7. Connecting Green-Orange-Red Status LED Light to greenBOX..... 15

8. Connecting the Power MASTER VFD Control Wiring..... 17

9. How To Check If Terminating Resistor at Gate and at greenBOX Nxt is On..... 29

1. Install greenBOX Nxt on the Wall

1. **Install greenBOX Nxt** in a convenient location for monitoring dust collection system performance.
2. **Mount the greenBOX Nxt unit** on an indoor wall at eye level for easy viewing and touchscreen operation.
3. **Attach the wall mounting frame** to the wall.
4. **Secure the greenBOX Nxt to the frame** using the enclosure sockets and three screws inside the cabinet.
5. **Connect a 120V AC power supply** to the greenBOX Nxt using a separate circuit with a dedicated breaker. This prevents other equipment failures from affecting dust collection.
6. **Connect a local network (LAN) Ethernet CAT5 or CAT6 cable** to the greenBOX Nxt for remote access and support.

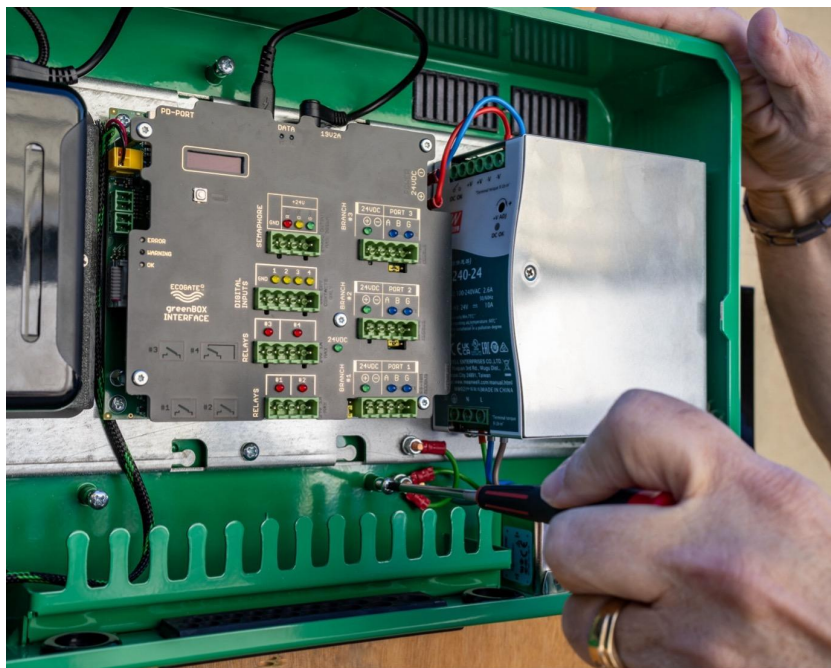


Fig 1: Release the three screws inside the enclosure to detach the greenBOX Nxt unit from the wall mount.

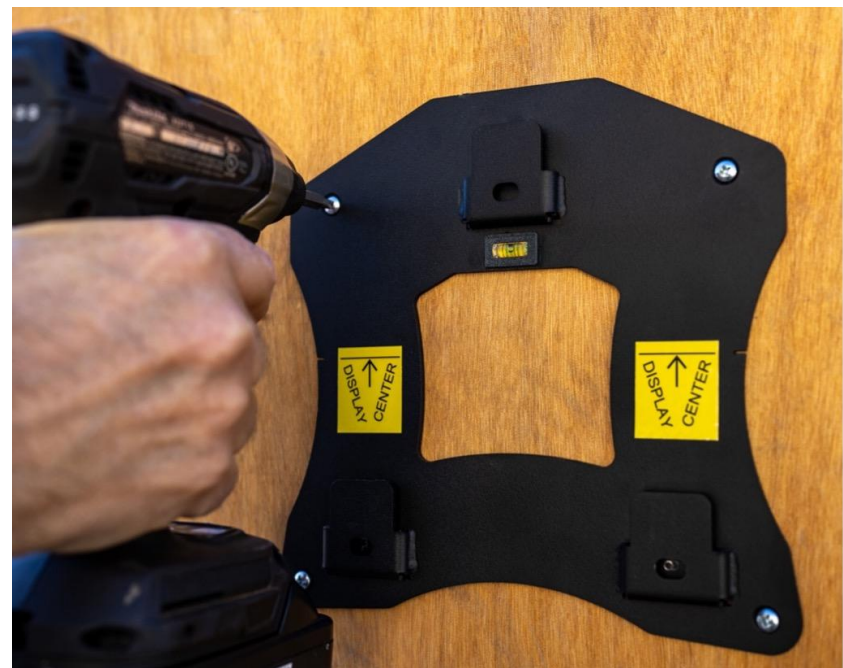


Fig 2: Secure the wall mount holder using four screws (not included).

2. Overview of greenBOX Interface Board Terminals

Ecogate Interface Board Terminals

1. Modbus Ports:

- Connect Ecogate gates and Power MASTER VFDs to the greenBOX Nxt Modbus ports.
- Each port supports up to 24 gates in a daisy-chain configuration.
- Three Modbus ports are available (#1, #2, #3).
- If you don't need all ports for the gates, you can dedicate one port to VFDs.
- VFDs can be added to gate daisy-chains if all ports are needed.
- **Important:** The first and last devices in each Modbus daisy-chain must have a terminating resistor switched ON.
- Blue terminating resistors on the greenBOX Nxt interface board are factory-enabled at ON position.
- Add a terminating resistor jumper (included in plastic box) to the last gate in each daisy-chain.

2. Additional Terminals:

- Terminals for relay outputs, digital inputs, and LED status light are available.
- Digital input and relay contact functions are user-programmable (optional).
- **Recommended:** Use the LED status light for system monitoring:
 - Green: All systems OK
 - Orange: Warning (for example filter pressure reached warning level)
 - Red: System error

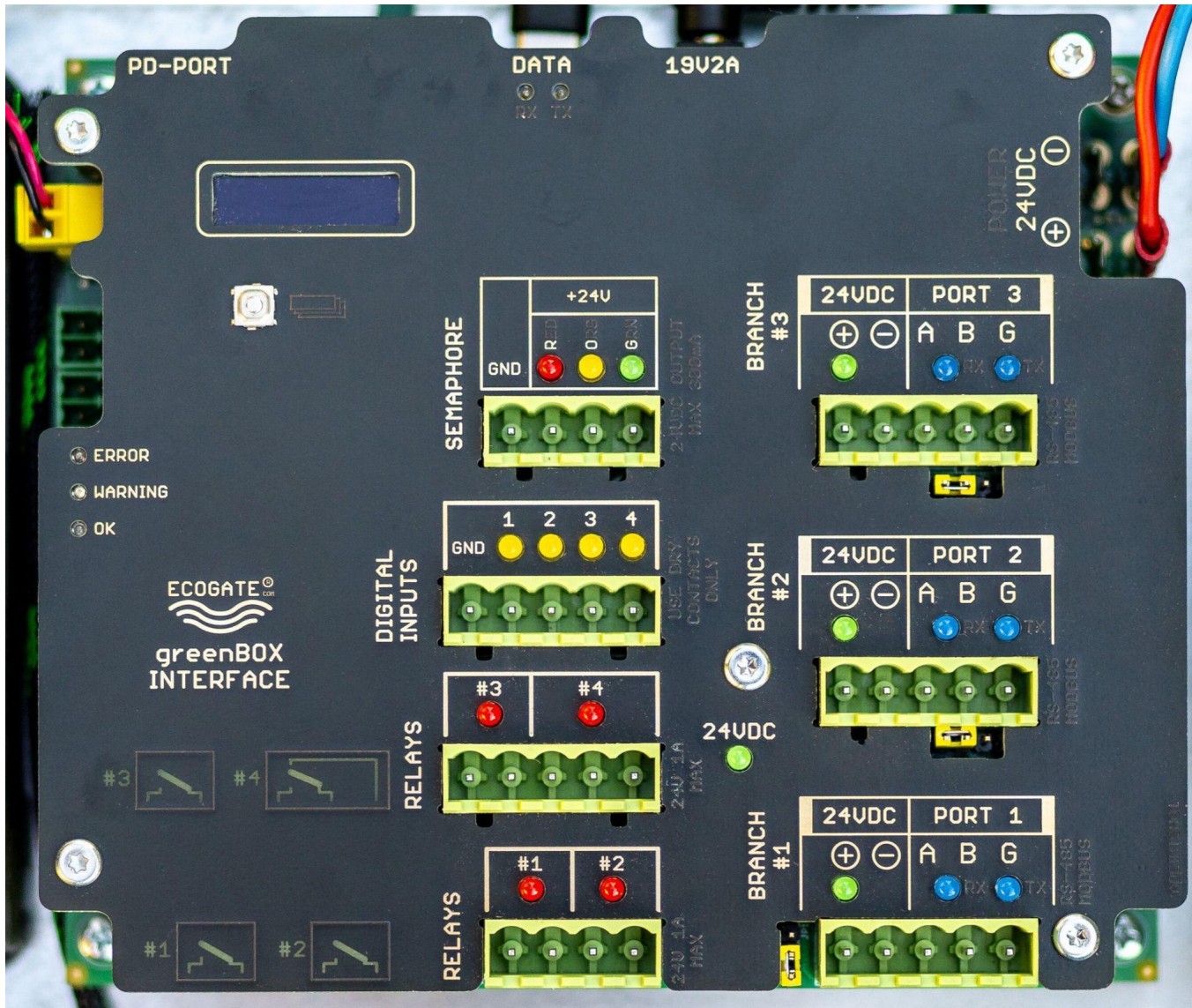


Fig. 3: Three Modbus ports on right side labeled #1, #2, and #3 are used for connection of gates and VFDs in daisy-chain

3. Connecting Ecogate MASTER Cable To greenBOX Nxt Modbus Port

Use included pluggable Phoenix screw connectors to connect the Ecogate MASTER cable to the greenBOX Nxt Modbus ports. Each connector has five terminals, arranged as follows:

- **+24V DC:** Red wire
- **-24V DC:** Black wire
- **Modbus A wire (positive):** Blue wire
- **Modbus B wire (negative):** White wire
- **Shielding:** Silver uninsulated wire

The shielding wire is connected at the greenBOX and within the daisy-chain, but it is NOT connected to the gate or VFD. This prevents double grounding issues that can disrupt Modbus communication.

Connecting greenBOX Nxt (Max, Master) Cables by Using Conduits

Connecting greenBOX Cables by Using Conduits

Conduits are occasionally required for Ecogate system installations in prisons, schools, and military facilities. greenBOX control units feature pre-drilled holes for $\frac{3}{4}$ " conduit connectors, which are sealed with silicone plugs when not in use. The greenBOX Nxt has two such holes, while the greenBOX Max and Master units have four. These conduit connector holes are located on the bottom of the enclosure.

Important Note: The greenBOX is not designed as an electrical panel. Do not drill additional holes for conduit connectors, as metal shavings can cause shorts in the power supply, interface board, or NUC computer motherboard. Creating additional holes in the cabinet will automatically void the greenBOX warranty.

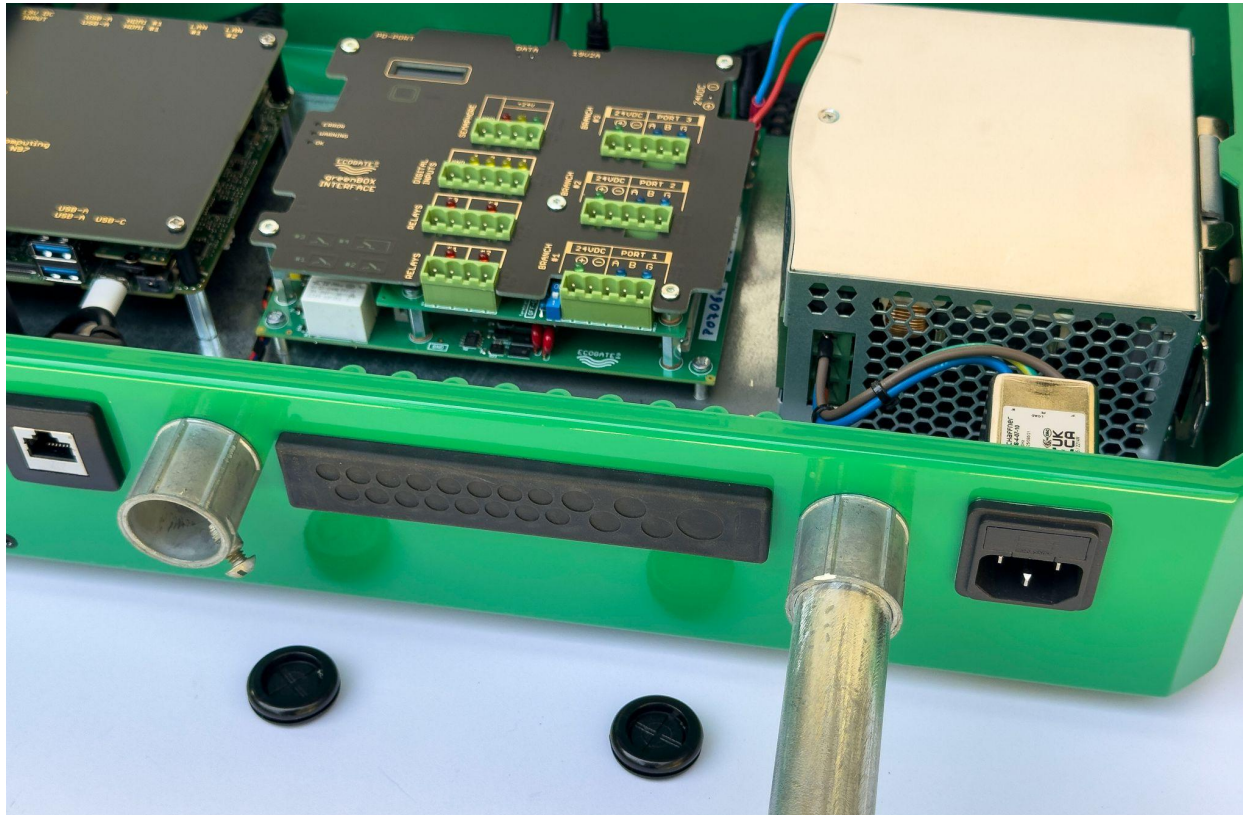


Fig. 4: illustrates the removal of the silicone plugs and the installation of the $\frac{3}{4}$ " conduit connectors.

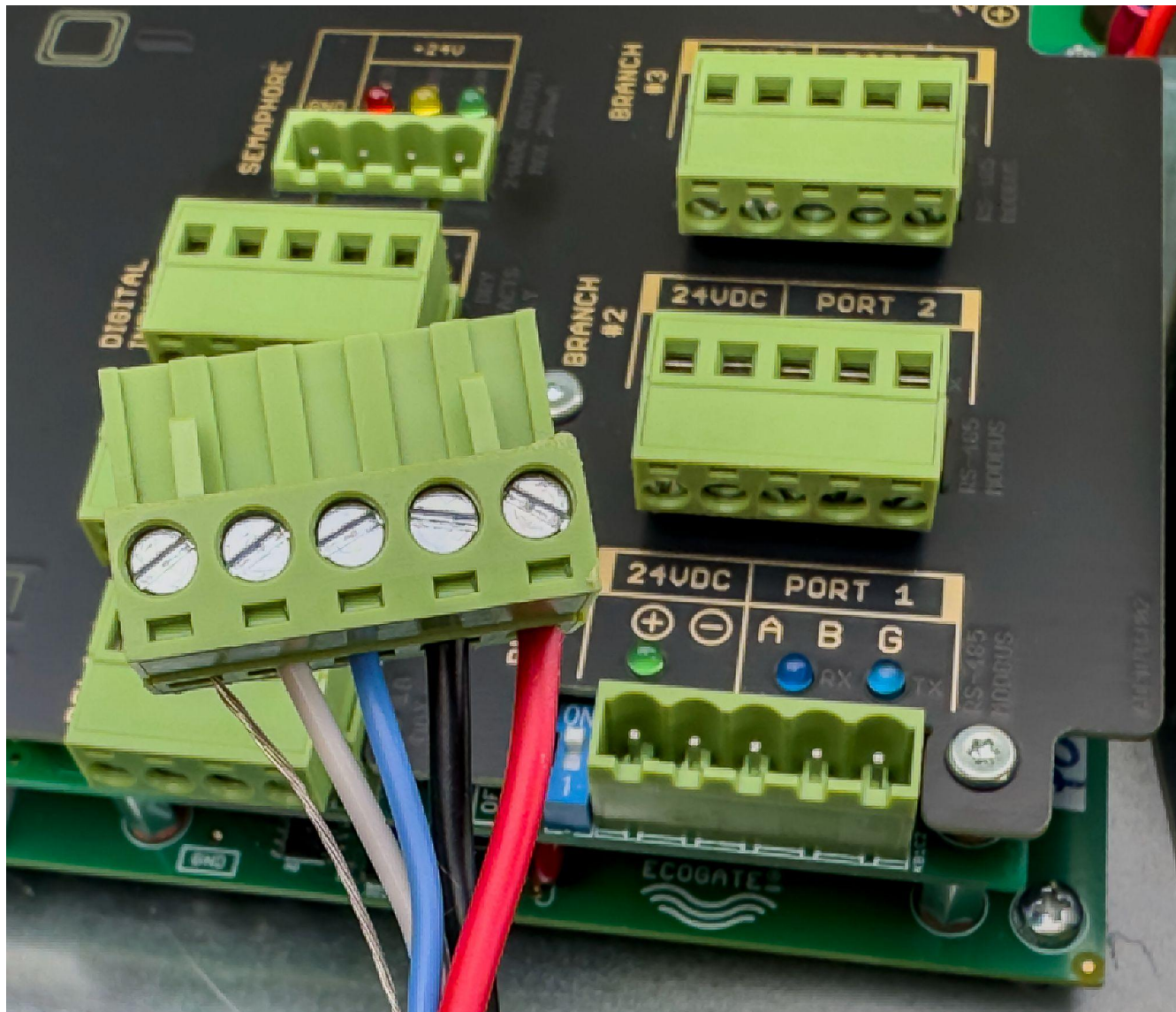


Fig. 5: Ecogate MASTER Cable connection to greenBOX Nxt,
Blue Terminating Resistor switch on left side of terminal is set to On (top)

4. Connecting Gates In Daisy-Chain Using Ecogate MASTER Cable

To connect gates in a daisy-chain, you'll need to connect two Ecogate MASTER cables to the gate connectors. Each gate has three Phoenix screw connectors (24V DC power, Modbus, and workstation activity signal), each with a different size to prevent errors and accommodate various wire sizes. Use double ferrules to connect two wires to each terminal:

1. **24V DC Connection:**
 - a. Use a black double ferrule for AWG16 wires (model TE1508).
 - b. Since AWG14 wires from the Ecogate MASTER cable won't fit this ferrule, cut half the strands before crimping.
 - c. Larger double ferrule for AWG14 wires won't fit the Phoenix screw terminal.
2. **Modbus A and B Wires:**
 - a. Use a white double ferrule for AWG22 wires (model TE0508).
3. **Shielding Wire:**
 - a. Do not connect the bare shielding wire to the gate to avoid double grounding.
 - b. Connect the shielding of both cables using a white ferrule for AWG22 wire (model E0508).
 - c. Ensure the shielding doesn't touch the metal gate enclosure.
4. **Secure the Cables:**
 - a. Use cable ties to secure the cable to the gate motor enclosure, preventing accidental disconnection.

Advantage of Daisy-Chained Cables: Even if terminals are disconnected from a gate, the power supply and Modbus communication to other gates in the daisy-chain remain uninterrupted.

You need:

1. **Black double ferrule for AWG16 wires (model TE 1508)**, two per gate
2. **White double ferrule for AWG22 wires (model TE0508)**, two per gate
3. **White ferrule for AWG22 wire (model E0508)**, one per gate
4. **Cable tie 4" long**, two per gate

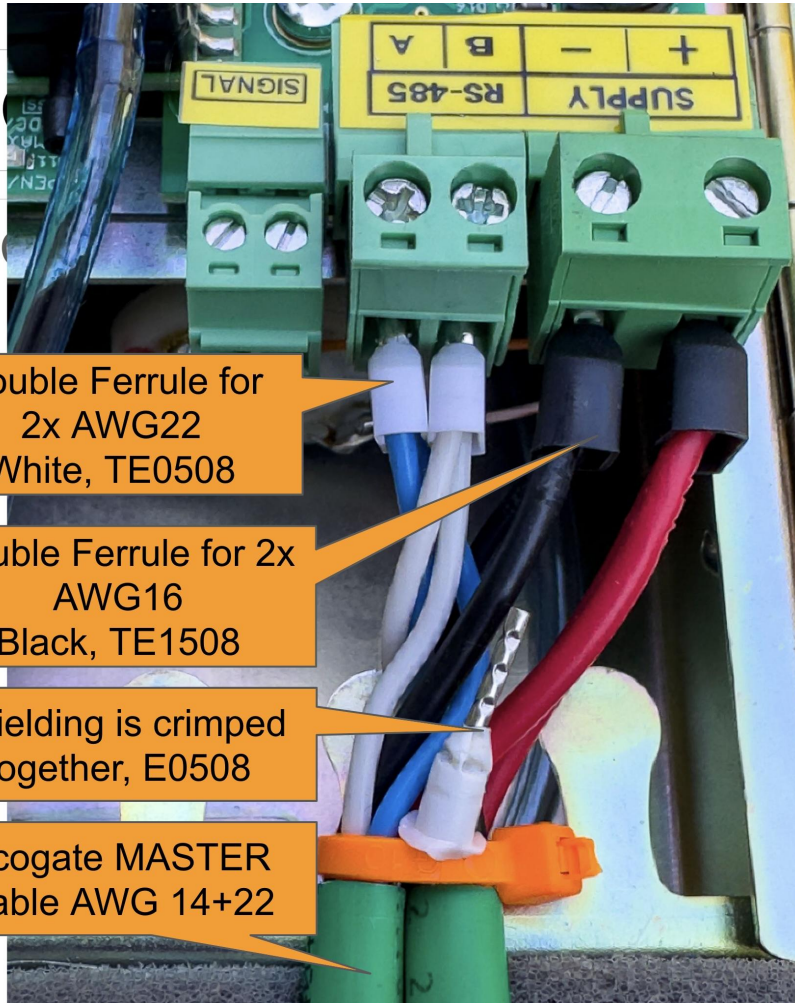
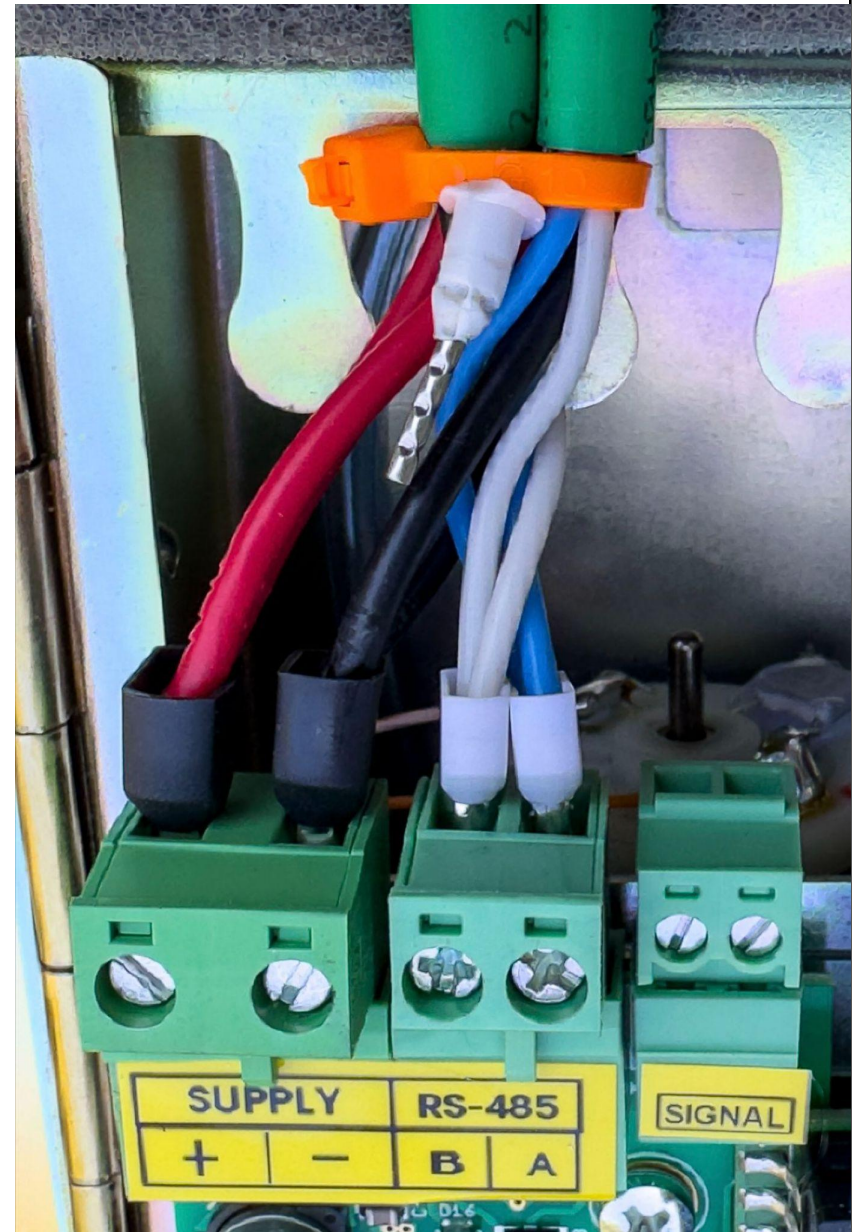


Fig. 6: Connecting gates in daisy-chain using Ecogate MASTER Cable and utilizing double ferrules

Fig. 7: +24V DC = Red wire, -24V DC= Black wire, Modbus A wire (positive) = Blue wire, Modbus B wire (negative) = White wire



5. Connecting Last Gate in Daisy-Chain with Terminating Resistor

Connecting the last gate is simplified as it requires only one Ecogate MASTER cable. Connect the wires to the two Phoenix screw connectors:

- **+24V DC:** Red wire
- **-24V DC:** Black wire
- **Modbus A wire (positive):** Blue wire
- **Modbus B wire (negative):** White wire
- **Shielding:** Cut the silver uninsulated wire; it is not connected.
- Use cable tie to secure the cable to the gate motor enclosure, preventing accidental disconnection.

Terminating Resistor Jumper

The last gate in the daisy-chain requires a terminating resistor jumper. This jumper activates the terminating resistor on the PCB board. Without it, the cable end reflects the Modbus signal, causing interference that hinders communication quality and system reliability.

Terminating resistor jumpers are standard computer-type jumpers included with each greenBOX Nxt. Install them at the end of every Modbus daisy-chain.

6. Connecting Workstation Activity Sensor to the Gate

Workstation Activity Sensor Recommendation

We recommend Ecogate Volt Sensors for workstation activity signals. They offer easy installation and require no settings, unlike current sensors. Connect the Volt sensor input to the circuit that activates when the workstation needs dust collection. For complex CNC machines, consult your local maintenance head for assistance. For simple workstations like table saws, connect the sensor input in parallel to the saw motor.

Two Volt Sensor Models

- **AC-DC Volt Sensor:** Input voltage range: 24-230 VAC or DC
- **AC Volt Sensor:** Input voltage range: 120-690 VAC

Volt Sensor AC Connection Notes:

1. When connecting the Volt sensor input to AC power, connect it between two phase wires OR between a phase wire and neutral. For safety, never connect it between a phase wire and ground.
2. For safety, use Ecogate Sensor wire to connect the Volt sensor. This cable is insulated for 600V, suitable for installation inside workstation electrical panels where voltages are typically 230V or 460V.

Volt Sensor Connection

- **Input:** Connect to the workstation circuit that activates when dust collection is required.
- **Output:** Connect to the gate's "Signal" input (polarity independent).

Volt Sensor Troubleshooting

- **Active Input:** If the Volt sensor's input is active, the "IN" indicator will be lit.
- **Active Output:** If the output is connected to a powered gate and the input is active, the "OUT" indicator will be lit. Additionally, the yellow "SNS" indicator on the gate board will be lit.

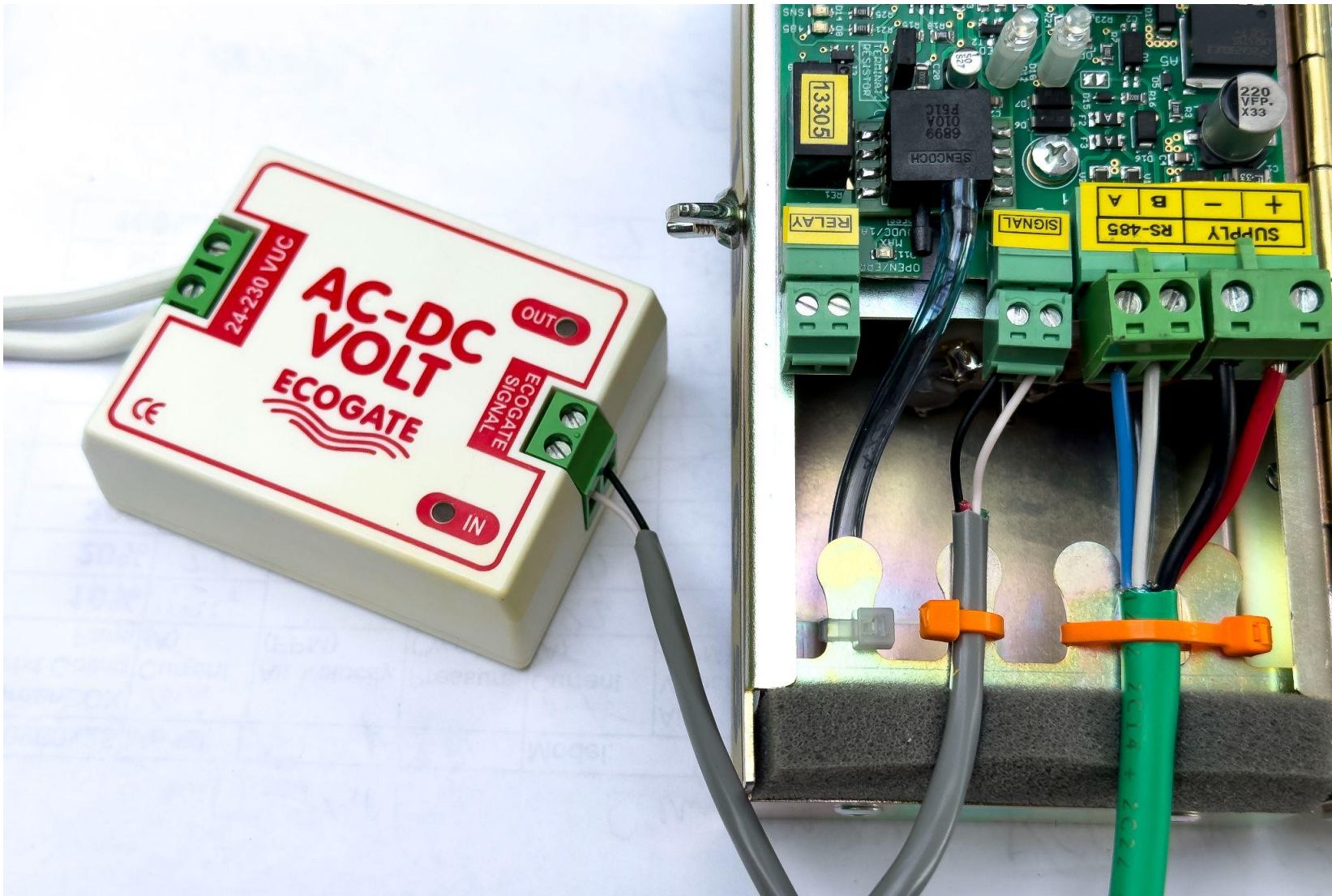


Fig. 10: Input of the Volt Sensor (on left) is connected to the circuit that is active when workstation needs dust collection, output is connected to the gate "Signal" input (polarity independent)

7. Connecting Green-Orange-Red Status LED Light to greenBOX

1. **Install the status light** in a visible location for easy system monitoring.
2. **Light Indicators:**
 - Green: All systems OK
 - Orange: Warning (e.g., filter pressure)
 - Red: System error
3. **Optional Buzzer:**
 - The status light includes a built-in buzzer.
 - Connect or disconnect the buzzer based on your preference (gray wire).

Connection and Setup Notes

1. **Individual Outputs:** Green, orange, and red outputs provide 24V DC (max current is limited to 0.37A).
2. **Ground:** The common black wire is ground.
3. **Buzzer Connection:** Connect the gray buzzer wire in parallel with the red light.
4. **Steady/Flashing Light Selector:** Twist individual LED light covers counterclockwise to access the steady/flashing light selector.

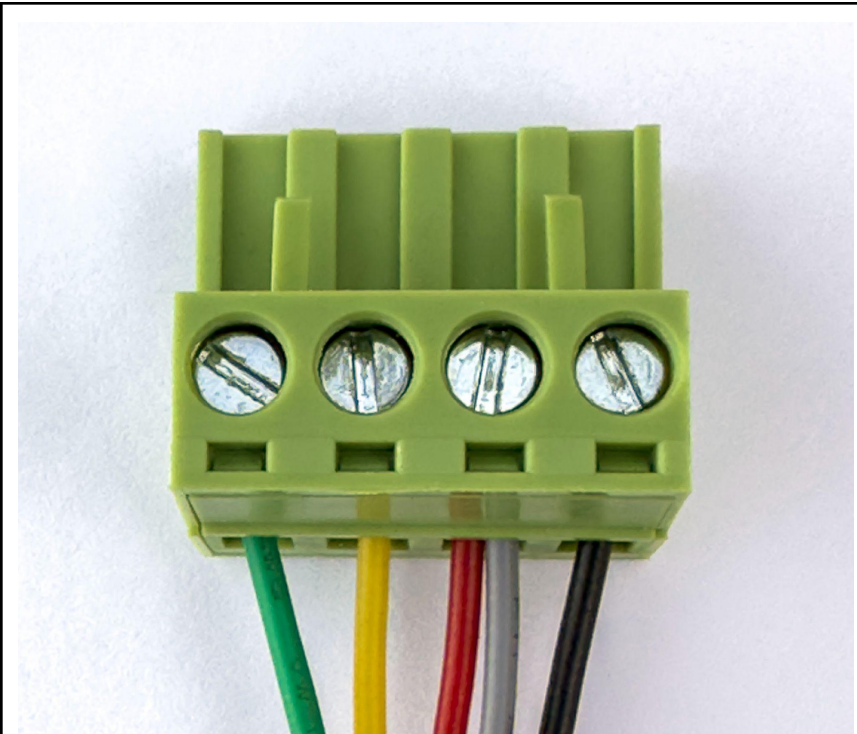
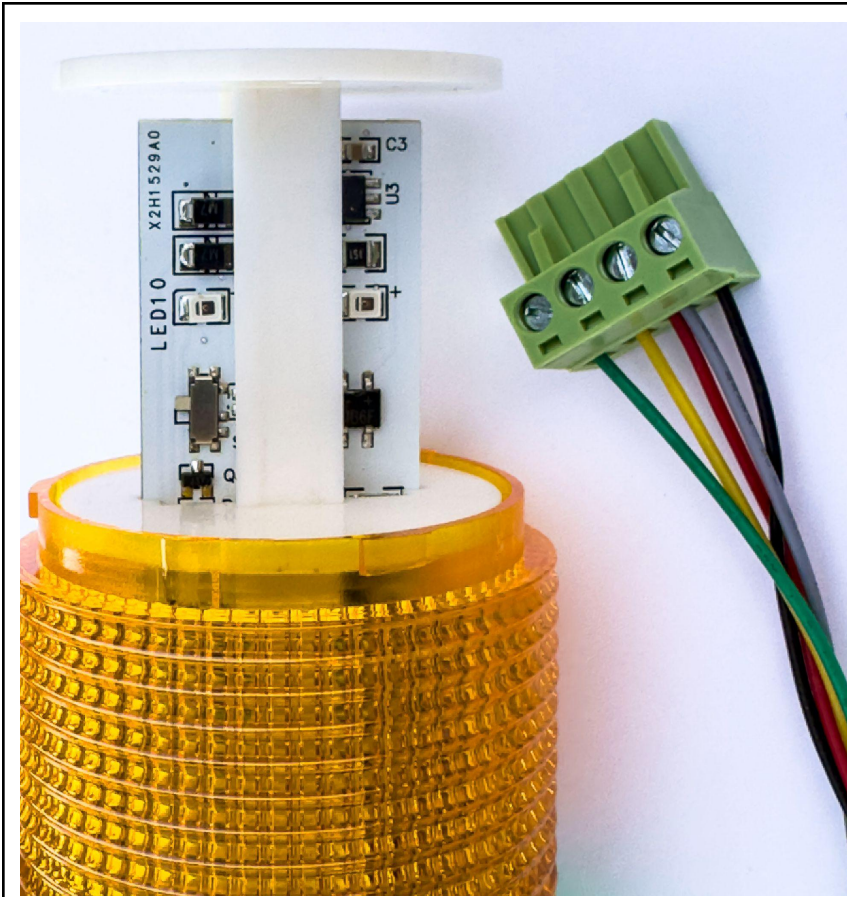


Fig. 11: Twist LED light cover counterclockwise to access the steady/flashing light selector.

Fig. 12: Status light wires from left: Green, Orange, Red + gray Buzzer, Black ground.

8. Connecting the Power MASTER VFD Control Wiring

Refer to the separate Power MASTER VFD User and Installation Guide for instructions on connecting 3-phase power to the VFD and fan motor.

This chapter focuses on the low-voltage control wiring for your Power MASTER VFD. We've designed the VFD with pluggable screw terminals and clear labels to make this process as straightforward as possible.

Terminal Layout (Right to Left):

- **PX1:** Connects to the greenBOX Nxt via the Ecogate MASTER cable (Modbus communication)
- **PX2:** For automatic start/stop of the dust collector (optional)
- **PX3:** Connects to various safety devices (including the dust collector's ENABLE signal)

Safety note: usually all these control wires are using 24V DC but some dust collectors control panels could use 120V/230/460/575 V AC for dust collector Start, Stop, and Enable functions. Follow all safety standards to avoid an accident or personal injury.

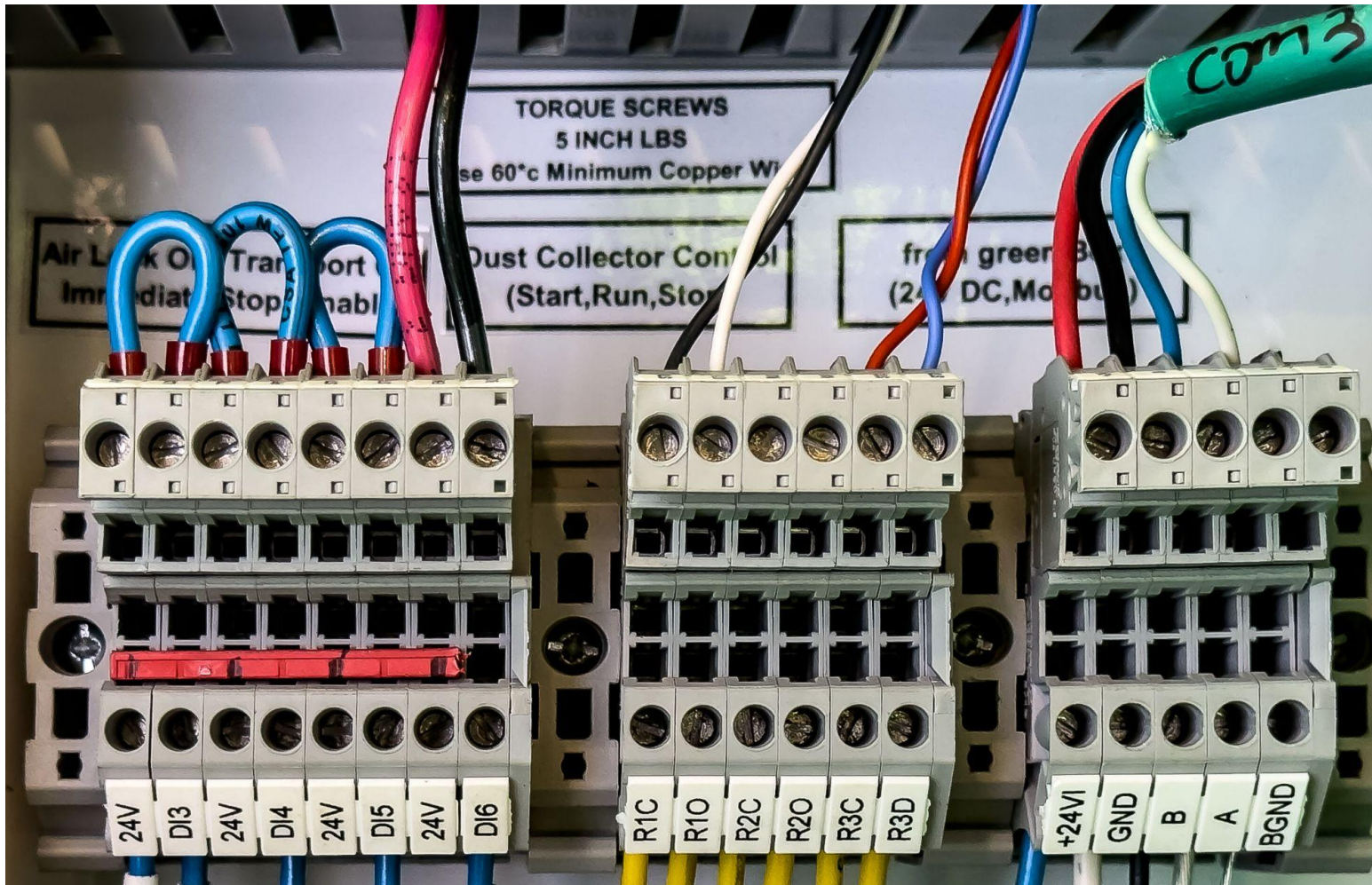


Fig. 13: From right to left: PX1 terminal (Modbus connection from greenBOX), PX2 (for automatic Start & Stop of the dust collector), and PX3 (all customer safeties can be connected here, including Enable signal from the dust collector). Note: description at bottom of terminals are names of the VFD signals, where each wire is connected to - these are not Ecogate terminals.

PX1 Terminal: Connecting the Ecogate MASTER Cable

1. Locate the 5-wire Ecogate MASTER cable coming from the greenBOX Nxt.
2. Connect the cable to the PX1 terminal, matching the wire colors to the terminal labels:
 - +24V DC (RED)
 - -24V DC (BLACK)
 - Modbus A (BLUE)
 - Modbus B (WHITE)
 - Shielding (bare wire) - **Important:** Leave the shielding wire unconnected at the VFD's G terminal. It should only be connected at the greenBOX end.

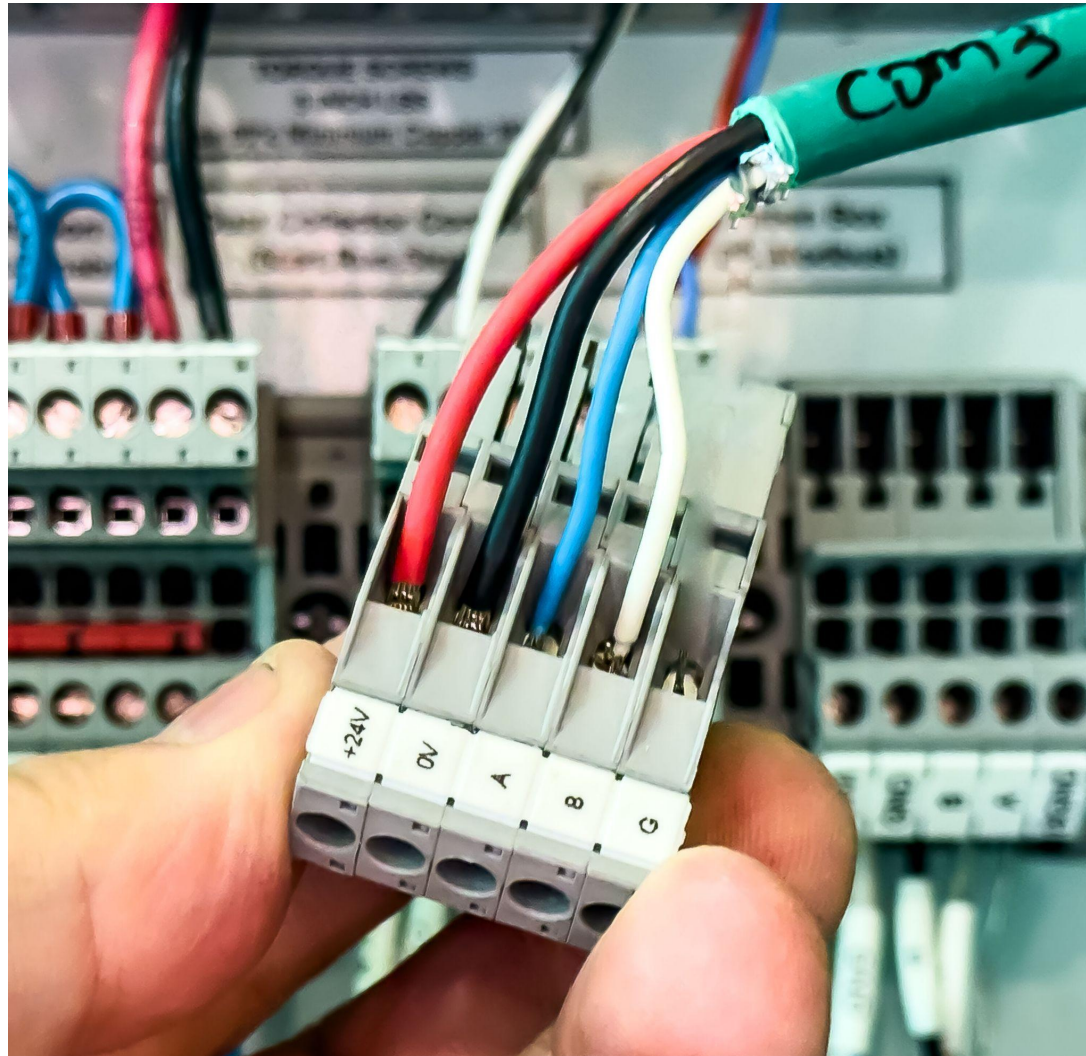


Fig. 14: from left to right: +24V DC (RED), -24V DC (BLACK), Modbus A (BLUE), Modbus B (WHITE), and shielding. Note that shielding is not connected to the G terminal on the right side (it should be connected at greenBOX terminal).

- **Note:** The VFD's Modbus terminating resistor is enabled by default. If your VFD is *not* the last device in the Modbus network, you'll need to disable this resistor using the J3 DIP switch (see instructions at the end of this chapter).
- **Important:** Always follow the labels on top of the terminals when connecting wires. The labels at the bottom of the terminals refer to internal VFD signals and are not relevant to this installation.

PX2 Terminal: Automatic Dust Collector Start/Stop (Optional)

This terminal allows you to automate your dust collection system, reducing manual intervention and saving energy.

- **How it Works:** The VFD uses dry contacts (START and STOP) to interface with the dust collector's PLC control panel.
- **Wiring:**
 - Connect the VFD's START wire in parallel with the dust collector's START button.
 - Connect the VFD's STOP wire in series with the dust collector's STOP button.
- **Note:** If your dust collector has a dedicated remote start input, you can use the VFD's RUN wires instead of the START/STOP wires.
- **Skipping Automation:** If you prefer to control the dust collector manually (not recommended), you can leave the PX2 terminal unconnected.

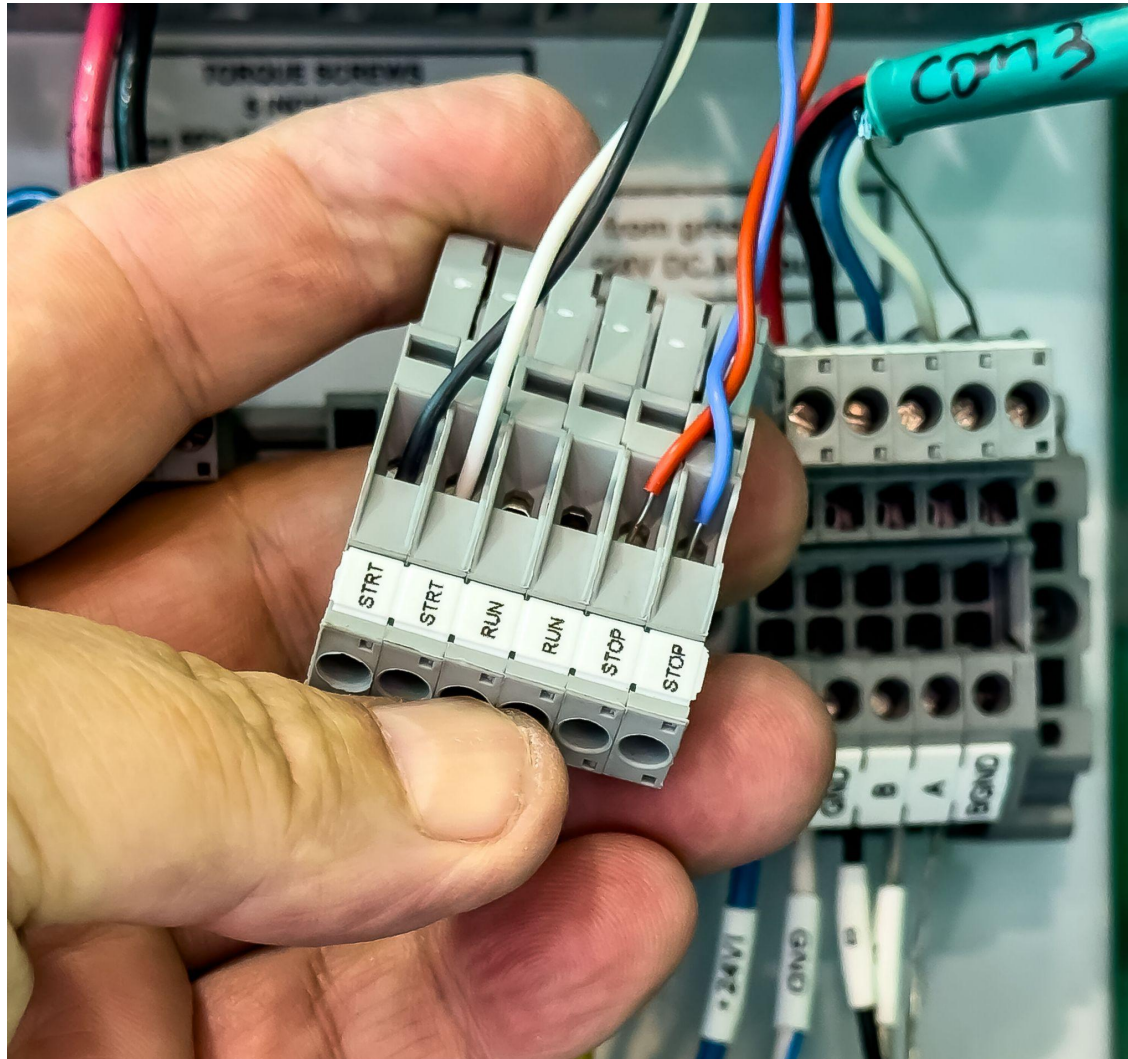


Fig. 15: to Start and Stop the dust collector automatically the dry NO contact START (labeled STRT - STRT) on the left should be connected in parallel to the dust collector PLC START button. The Dry NC contact STOP (labeled STOP - STOP) on right should be connected in series with the dust collector PLC STOP button.

PX3 Terminal: Connecting Safety Devices

The PX3 terminal is dedicated to "customer safeties" - devices that will shut down the dust collector in case of a problem. Examples include:

- Spark detection systems
- Abort gates
- Non-return valves
- Fire/blast detection sensors
- Fire alarms
- Dust collector error signals

Mandatory Connection: One safety connection is required from the dust collector's PLC. This ENABLE signal tells the VFD that the dust collector is running safely.

- **Wiring:** Connect the PLC's dry contact output to the VFD's ENABLE input.
- **How it Works:**
 - When the dust collector is OK, the PLC's contact is closed, and the VFD runs the fan.
 - If the PLC detects a problem, the contact opens, and the VFD stops the fan.

Additional Safety Inputs: The PX3 terminal has three more inputs for additional safety devices.

- **Important:** By default, these inputs have blue jumpers installed. You must remove the jumper before connecting a safety device.
- **STOP Input:** This input is for critical safety systems (like a fire alarm). If this input is triggered, the VFD will require a manual reset at the control panel.
- **AIR-LCK and TRN-PRT Inputs:** These inputs function similarly to the ENABLE input but provide more detailed information on the VFD display in case of a shutdown.

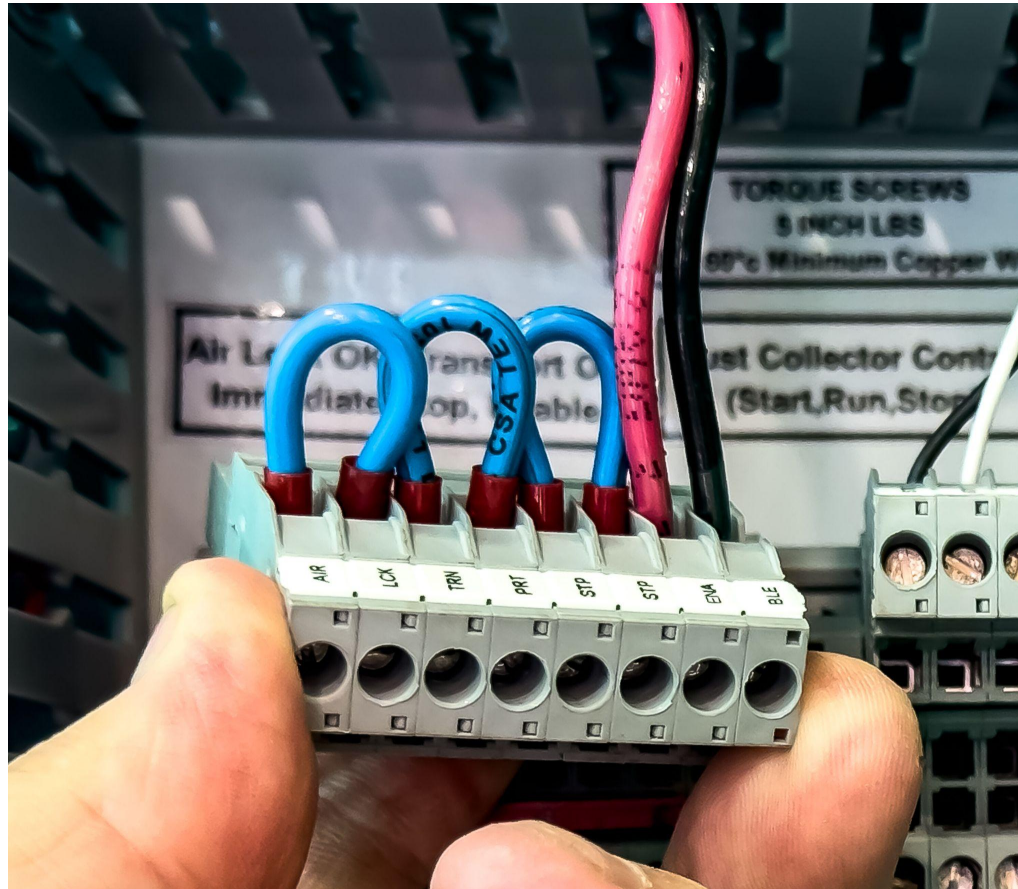


Fig. 16: the terminal PX3 allows to connect up to four “customer safeties”, one is mandatory - from the dust collector PLC. If the dust collector is running OK (meaning without any issues) the dry contact (output from dust collector PLC) is closed, in case there are any issues this contact should open. It is connected to the PX3 terminal ENA-BLE on the right side.

Using Current Sensors for Airlock and Transport Fan: For simpler dust collectors without a PLC, you can use current sensors with dry contact outputs to monitor the airlock and transport fan. Connect these sensors to the AIR-LCK and TRN-PRT inputs.

Switching Off the VFD's Modbus Terminating Resistor

The Power MASTER VFD's Modbus terminating resistor is *enabled* (On) by default. However, if your VFD is **not** the last device in your Modbus network, you must disable this resistor to prevent communication issues. Here's how:

1. Prepare the VFD:

- **Disconnect Power:** Turn off the power to the VFD.
- **Disconnect from greenBOX:** Unplug the PX1 terminal (this cuts power to the VFD's processor).
- **Wait for Discharge:** Wait for 5 minutes to allow the VFD's capacitor to discharge completely.

2. Access the J3 DIP Switch:

- **Remove VFD Cover:** Locate the two star screws on the bottom left and right of the VFD. Unscrew them and remove the plastic cover.
- **Find J3 Switch:** Look for the J3 DIP switch below the green Analog Output terminal and the gray Modbus terminal. You'll see two switches in the opening: J3 on top and J6 on the bottom.

3. Set the Switch to "Off":

- **Identify Position:** The white selector on the J3 switch indicates the current setting:
 - **Right:** Resistor is ON
 - **Left:** Resistor is OFF
- **Move Selector:** Slide the white selector to the left to turn the resistor OFF.

4. Verify (Optional):

- If you want to double-check your work, you can use an ohmmeter (with the VFD power still off):
 - **Resistor OFF:** You should measure a high resistance of about 168 kOhm between the Modbus A and B terminals.

- **Resistor ON:** The resistance will be much lower, around 158 Ohm.

5. Reassemble:

- Once the resistor is set correctly, replace the VFD's plastic cover and secure it with the screws.
- Reconnect the PX1 terminal and restore power to the VFD.

Remember: You only need to disable the terminating resistor if your VFD is *not* the last device in your Modbus network. If you're unsure, refer to the full VFD documentation or contact Ecogate support.

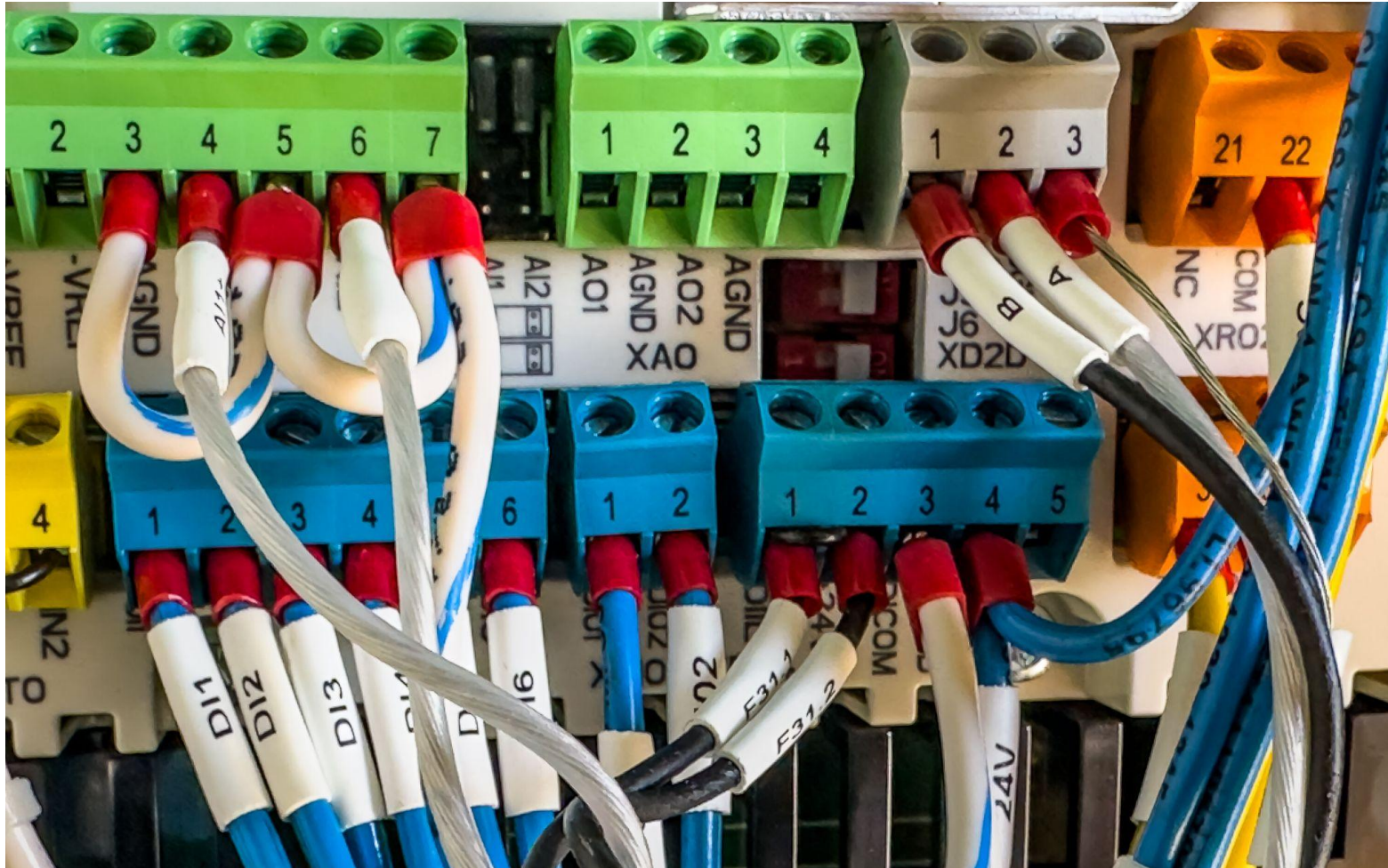


Fig. 17: To access terminating resistor J3 switch: remove gray plastic cover of the VFD, locate J3 switch below the green Analog Output terminal and gray Modbus terminal. There are two switches in the opening: J3 on top, J6 at bottom. Top J3: if white selector is on right, it is ON, and OFF if it is on left.

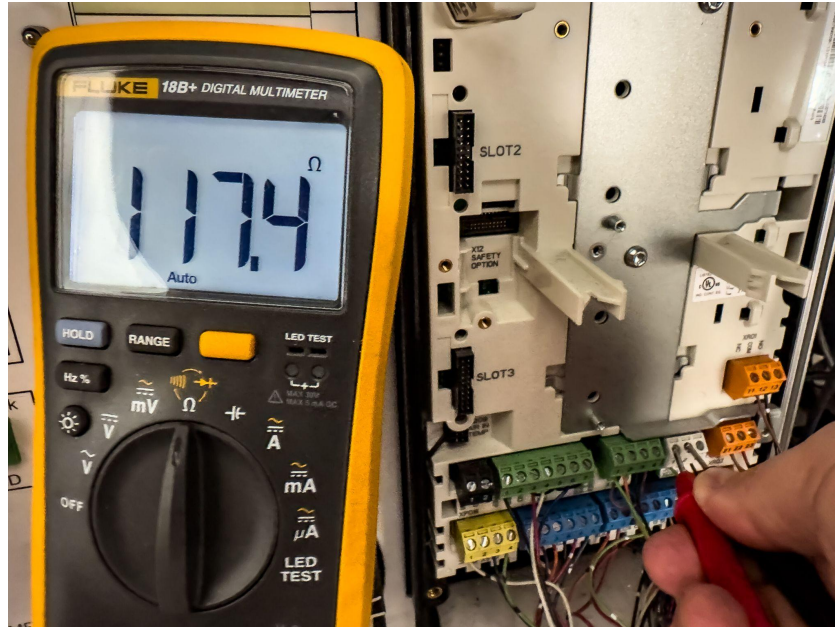


Fig. 18: with terminating resistor ON resistance between Modbus A and B terminals is about 117 ohm

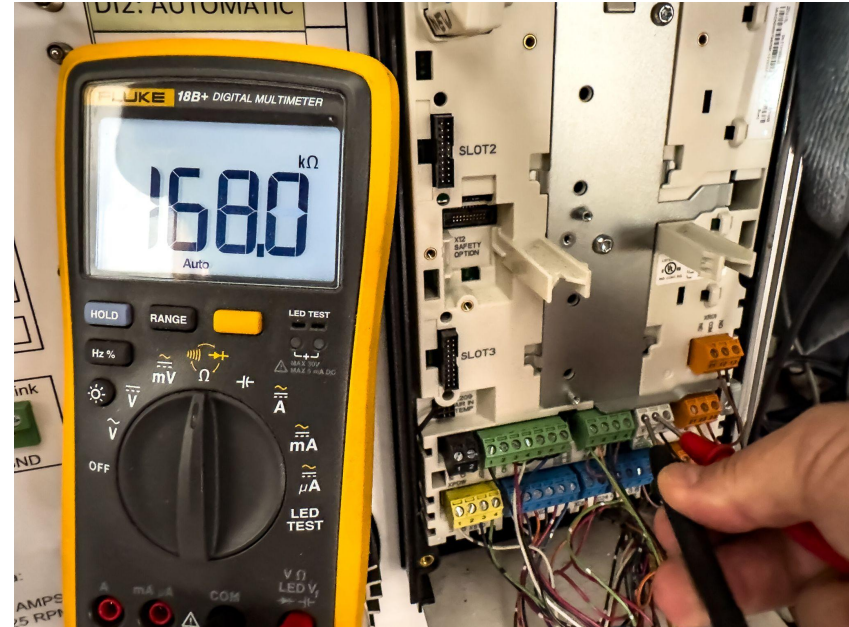


Fig. 19: with terminating resistor OFF resistance between Modbus A and B terminals is about 168 kohm

9. How To Check If Terminating Resistor at Gate and at greenBOX Nxt is On

Verifying Terminating Resistor Status

The first and last devices in a Modbus daisy-chain (greenBOX Nxt, gates, VFDs) must have a terminating resistor enabled. This prevents signal reflection and interference, ensuring reliable communication.

To check the terminating resistor status using an ohmmeter:

1. **Disconnect the 120V AC power supply.**
2. **Gate:**
 - Connect the ohmmeter between the gate's Modbus A and B wires.
 - **OFF:** Resistance measures approximately 73 kOhm (73,000 Ohm).
 - **ON:** Resistance measures approximately 226 Ohm.
3. **greenBOX Nxt:**
 - Connect the ohmmeter between the greenBOX Nxt's Modbus A and B wires.
 - **OFF:** Resistance measures approximately 20.75 kOhm (20,750 Ohm).
 - **ON:** Resistance measures approximately 0.543 kOhm (543 Ohm).

Checking Daisy-Chained Gates

If you're unsure if the terminating resistor is connected to the last gate:

1. **Disconnect the Ecogate Master cable** from the greenBOX port.
2. **Measure resistance** between Modbus A and B wires of the cable by using an ohmmeter.
 - **200-300 Ohm:** Terminating resistor is connected.
 - **700 Ohm or higher:** Terminating resistor is NOT connected (parallel resistance of gates without a terminating resistor is approximately 2 kOhm for 10 gates, 1 kOhm for 20 gates, and 700 Ohm for 30 gates).

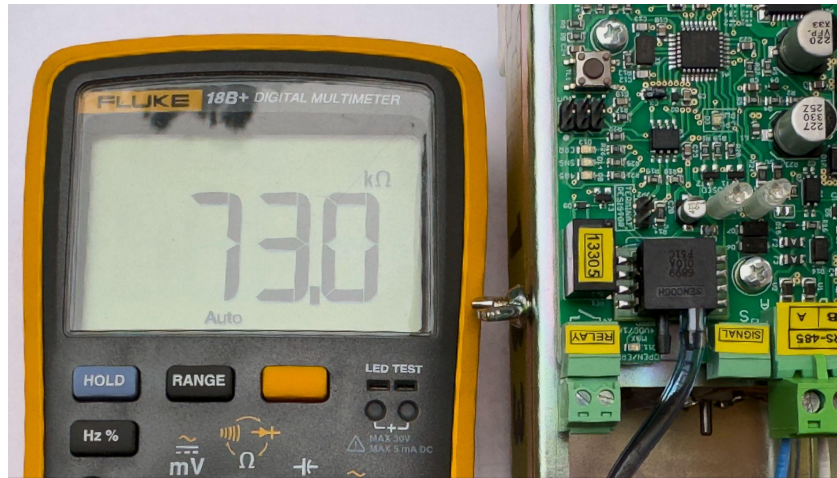


Fig. 20: Gate TR OFF - Resistance measures approximately 73 kOhm

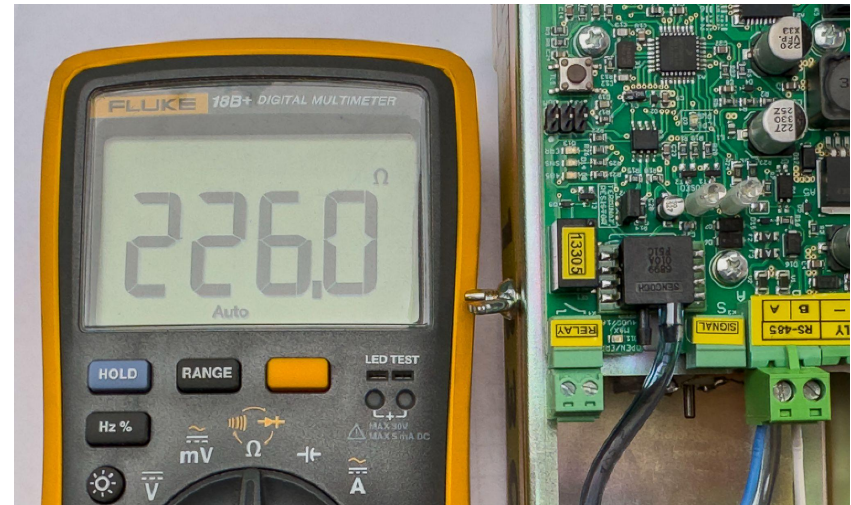


Fig 21: Gate TR ON - Resistance measures approximately 226 Ohm

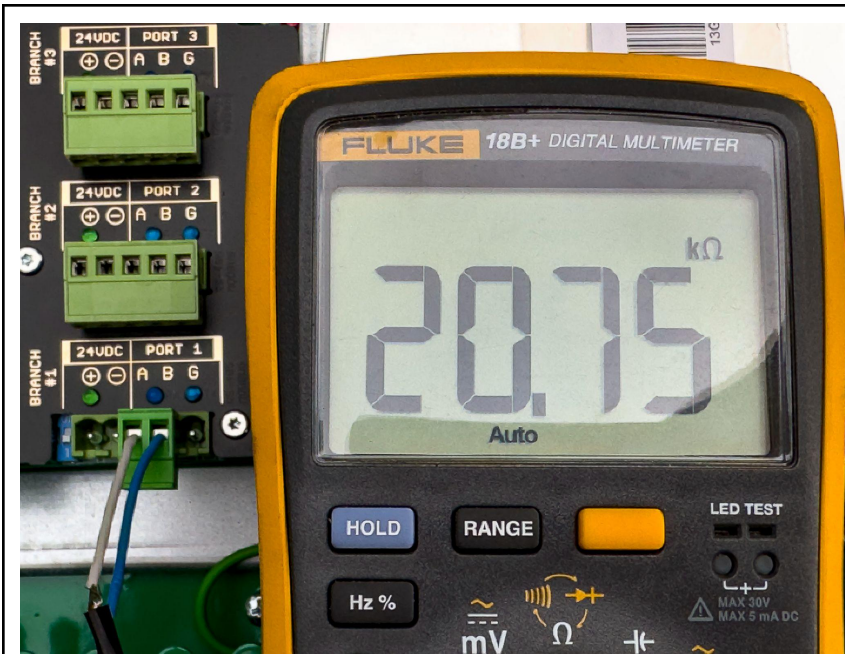


Fig. 22: Nxt TR OFF - Resistance measures approximately 20.75 kOhm

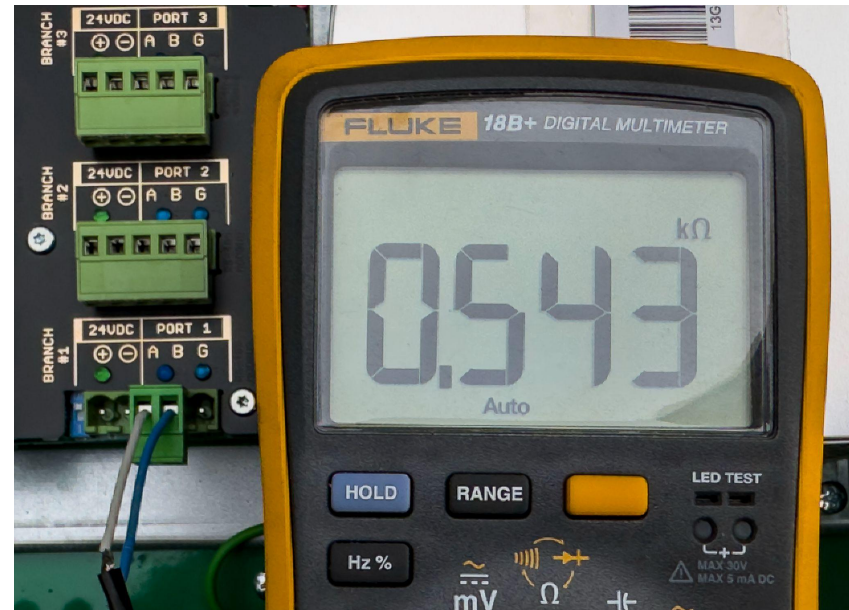


Fig. 23: Nxt TR ON - Resistance measures approximately 0.543 kOhm