Rotem
Trio
Controller

Installation Manual

Rotem Trio

Poultry Controller

P/N: 116899

Munters

Rotem Trio Controller

Installation Manual

Rev 2.1, 05/2025

Software Ver: 8.5.29-2.0

This manual for use and maintenance is an integral part of the apparatus together with the attached technical documentation.

Munters reserves the right to effect modifications to the apparatus in accordance with technical and legal developments.

Index

1 Introduction

1.1 Disclaimer

Munters reserves the right to make alterations to specifications, quantities, dimensions etc. for production or other reasons, subsequent to publication. The information contained herein has been prepared by qualified experts within Munters. While we believe the information is accurate and complete, we make no warranty or representation for any particular purposes. The information is offered in good faith and with the understanding that any use of the units or accessories in breach of the directions and warnings in this document is at the sole discretion and risk of the user.

1.2 Introduction

Congratulations on your excellent choice of purchasing a Rotem Trio Controller and Rotem Trio Expansion 70!

In order to realize the full benefit from this product it is important that it is installed, commissioned and operated correctly. Before installation or using the controller, this manual should be studied carefully. It is also recommended that it is kept safely for future reference. The manual is intended as a reference for installation, commissioning and day-to-day operation of the Munters Controllers.

1.3 Notes

Date of release: Jan 2020

Munters cannot guarantee to inform users about the changes or to distribute new manuals to them.

2 Precautions

CAUTION *Protection provided by the equipment can be impaired if the equipment is used in a manner not specified by the manufacturer!*

CAUTION *There is a risk of explosion if the lithium battery is replaced with an incorrect type. Replace the battery using the same type and manufacturer only.*

- Protection Against Corrosion
- Electrical Guidelines
- Grounding Sensors
- Reducing Interference
- Filtering
- Checking the CMOS RTC Batteries Level
- Safety Precautions - Details
- Grounding the Controller
- Locking the Trio
- Product Symbols

2.1 Protection Against Corrosion

To prevent against corrosion of electrical components:

- Installation location: If possible, install the Trio in a well-ventilated area.
- Keep the Trio closed at all times when a litter or passel is present in the building. In situations where maintenance or repairs are required, close the controller when you finish the work.
- After running the cables through the knockouts, seal the holes with a silicon sealant. If you use silicon sealant with acetic acid cure, keep the controller open and ventilated until cured. Otherwise, the acetic acid will attack metal components, including circuitry.
- When splicing sensors to longer wires, ensure that the splice is **waterproof**. Use adhesive lined heat shrink (marine grade) to make waterproof connections.
- Use shielded wiring for low level signals. For buried wiring (building to building runs) use high grade jell filled cables that are impervious to moisture.

2.2 Electrical Guidelines

- If this unit is installed in an electrical closet, ensure that no contactors are in that closet. Placing this unit in proximity to contactors results in severe signal interference.
- Review the guidelines given in the Precautions and Safety Precautions sections. These are vital to ensuring both personal safety and proper controller functioning.

2.3 Grounding Sensors

- Every low power device (digital, analog, or communication) must have a shield cable connected to the unit ground strip.

2.4 Reducing Interference

- Avoid mixing high voltage wiring with sensor and low voltage wiring.
- Keep the controller as far as possible from heavy contactor boxes and other sources of electrical interference.
- Do not connect communication wire shields, which go from one house to another at both ends. Connect them at one end only. Connection at both ends can cause ground loop currents to flow, which reduce reliability.
- The communication COM wiring is not the shield wire! The COM, RX and TX wires must connect to each other at all controllers.
- Refer to Safety Precautions - Details, page 12 for more information.

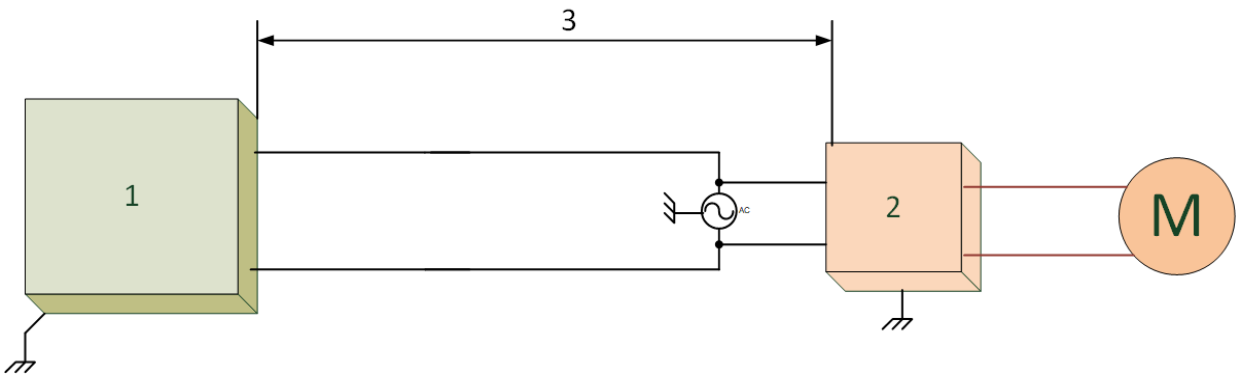
2.5 Filtering

If this installation includes a power inverter to drive variable speed fans, install an EMI filter in front of the inverter, according to the specifications provided by the inverter manufacturer. Refer to the inverter documentation.

Frequency inverters can cause severe electrical and electromagnetic interference. Therefore, when employing a frequency inverter, it is critical that you carefully follow the manufacturer's installation instructions.

In particular verify:

- That the cable shielding between the inverter and any motor meets industry standards
- Proper grounding of the inverter's chassis and motor power cable
- Proper grounding of low voltage cable shield wire
- That the controller and inverter cables are kept in separate conduits or wire bundles



1. Controller
2. Inverter
3. Place the controller at least five meters from the inverter.

2.6 Checking the CMOS RTC Batteries Level

- Display Board Battery
- Main Board Battery

2.6.1 Display Board Battery

On the Trio Controller Display Board (refer to Figure 13) is a CMOS Battery. This CMOS battery keeps the CPU's real-time clock running when the power is off.

Check the battery once a year. The output must be 2.7 volts (minimum). Authorized personnel only must replace the battery if the output is below the minimum required level or every five years. **Use a RENATA-CR2450N battery only.**

If the CMOS battery output is below the required minimum, an icon  appears on the touch screen and on the TrioAir app.

CAUTION *If the CMOS battery output is below the required minimum, in the event of a power failure the user will have to reset the time and date when power is reapplied.*

2.6.2 Main Board Battery

On the Trio Controller Main Board is a CMOS Battery. This battery is located behind the Scale Card (refer to Figure 14). This CMOS battery keeps the board's real-time clock running when the power is off.

Do not test this battery. If the CMOS battery output is below the required minimum, Trio sends an alarm to everyone on the contact list. In this event, an authorized technician must replace the battery with a **RENATA-CR2450N battery only.**

CAUTION *If the CMOS battery output is below the required minimum, in the event of a power failure the user will have to reset the time and date when power is reapplied.*

Warning: It is very important to reset the growth date to the required day.

2.7 Safety Precautions - Details

CAUTION *An authorized electrician must install these units. Disconnect the power to avoid electrical shock and damage.*

NOTE *Installation Category (Over voltage Category) II*

- The power supply to the controller should be protected by a 10 amp circuit breaker.
- All electrical connections should comply with National Electrical code (NEC).

2.8 Grounding the Controller

- Ground Rods
- Ground Wire
- Ground Clamps
- What Should Be Grounded?
- Lightening Protection
- Power Line Protection

2.8.1 GROUND RODS

Ground rods are used to efficiently connect the system to earth where current may be dissipated in the soil.

1. Material: Ground rods should be copper clad or galvanized steel.

2. Diameter: Minimum 5/8", preferably 3/4". Generally the larger the rod diameter, the lower it's resistance to current flow.

3. Length: Minimum 2.5 meters (8 feet), preferably 3-meter (10-foot). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.

4. Single grounding: It is important that there is only one grounding location where a rod or series of rods are connected to each other using a ground wire.

5. Independent ground rods will increase the risk of current, from a lightning strike for example, being dissipated through one rod and reentering the system through an adjacent rod.

6. Location: Close to the main circuit breaker panel and in moist soil. For example in an area that is usually wet from a drip or a low spot where water drains. Make sure the area is well protected from damage by lawnmowers, tractors, etc.'.

7. Rod installation: Drive the rod into the earth until about 10 cm (4 inches) is left above grade. If it is impossible to drive the rod to the proper depth, it is acceptable to lay the rod horizontally, 80 cm (2.5 feet) below grade.

8. In case the rod is exposed to damage, for example by lawnmowers or tractors it can be installed in a hole, about 20 cm (8 inches) deep so that the rod is about 10 cm under grade and 10 cm above hole level.

NOTE The National Electric Code (NEC) mandates two ground rods unless you can show less than 10 ohms resistance with one rod.

2.8.2 Ground Wire

The ground wire is a large copper wire that connects the main circuit breaker panel to the ground rod.

1. Material: Ground rods should be copper clad or galvanized steel.
2. Diameter: Typically, 16 mm (6-gauge) copper wire is sufficient. If the wire run is greater than 20 feet, 20 mm (4-gauge) wire should be used.
3. Length: Minimum 2.5 meters (8 feet), preferably 3-meter (10-foot). A longer ground rod will reach a soil with higher moisture content. Moist soil carries current much better than drier soil.
4. The ground wire should be protected from damage by lawnmowers, tractors, etc. It should be buried at a minimum of 15 cm (6 inches) under grade for protection and enter the house as soon as possible. It is important that the wire not be cut; it should remain continuous.

2.8.3 Ground Clamps

Ground wires should not be merely wrapped around a ground rod. Ground clamps are used to attach a ground wire to a ground rod. The most common clamp is known as an acorn clamp. Make sure the ground clamps you select are rated for outdoor use. Do not use pipe clamps rated for inside water lines or hose clamps to attach the ground wire.

2.8.4 What Should Be Grounded?

Any equipment that is or could become energized, even accidentally, should be grounded. Current from lightning, strikes objects in a random fashion. Accounts of lightning strikes reveal scenarios most of us could not predict.

Electric circuits should be wired with a 3-wire conductor consisting of hot, neutral, and grounding wires. The grounding wire should be attached cleanly and securely to devices or systems to be grounded. The other end of the grounding wire should be attached to the ground bus on the main panel.

2.8.5 Lightening Protection

Because of the potential for lightning damage to electronic devices, Munters recommends supplying lightning protection on both the power supply and the communication terminals (if used).

2.8.6 POWER LINE PROTECTION

The RPLP-1 provides lightning protection to the controllers. Refer to the RPLP-1 documentation for detailed wiring instructions. While no lightning protection is perfect, the RPLP-1 significantly enhances the reliability of built-in lightning protection. In addition, Munters recommends using an isolation transformer in front of the RPLP-1 to help block lightning and other transients.

NOTE Common surge protectors provide little additional protection and may trip unnecessarily.

An isolation transformer preceding the RPLP-1 provides significant additional protection against lightning.

2.9 Locking the Trio

Ensure that the units remain locked to prevent unauthorized access to internal components.

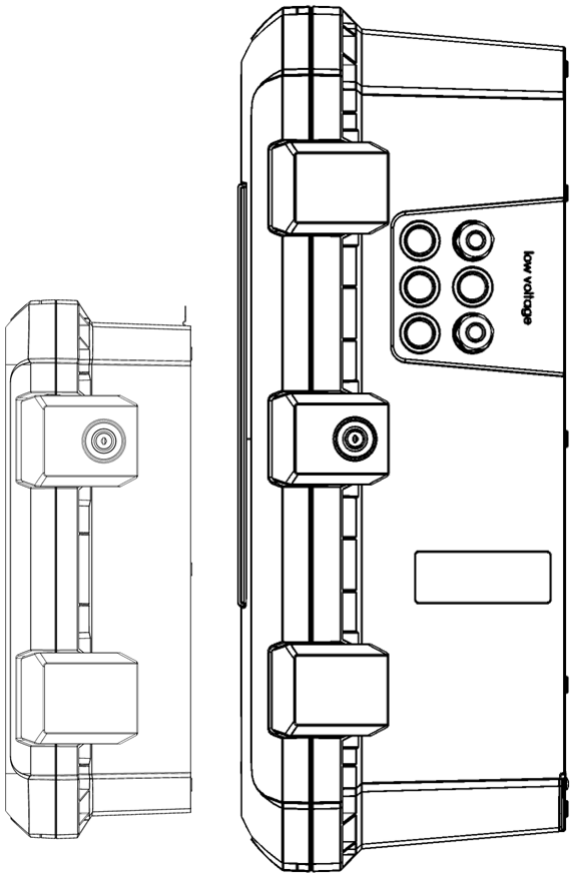


Figure 1: Trio Locks

2.10 Product Symbols

The following labels appear on your controller:

 : Caution! Hazardous voltage

 : Caution: Refer to the manual

 : Main Protective Earthing Terminal

CAUTION *IF THE UNIT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.*

3 Unit Installation

The following sections detail how to mount and wire the Rotem Trio Controller and Rotem Trio Expansion 70.

Figure 2: Rotem Trio Expansion 70

Figure 3: Rotem Trio Controller

NOTE *Munters recommends that a trained technician perform the following operations.*

- What Comes in the Package
- Mounting the Units
- Layouts
- Rotem Trio Expansion 70 Wiring Diagrams
- Rotem Trio Controller Wiring Diagrams
- Termination
- Pressure Sensor Hoses
- Tech Support/Wi-Fi

3.1 What Comes in the Package

In all standard orders, additional components are shipped with Trio Controller and Trio Expansion 70.

- Trio Controller
- Expansion 70

3.1.1 TRIO CONTROLLER

- Trio Metal Bracket
- Six RTS Sensors
- Air pressure hoses
- Four screws (used for mounting the controller)
- Lock key (two copies)
- Quick Guide

3.1.2 EXPANSION 70

- Six long screws
- Six short screws
- Mounting brackets
- Relay labels
- Communication cable
- Lock key (two copies)

3.2 Mounting the Units

- Knockouts
- Hanging the Rotem Trio Controller Unit
- Hanging the Rotem Trio Expansion 70 Unit

3.2.1 KNOCKOUTS

- On the bottom of the Rotem Trio Expansion 70 are knockouts used to route the **high voltage cables**.

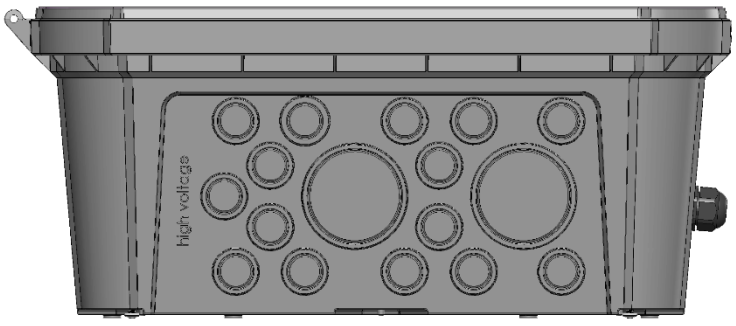


Figure 4: Rotem Trio Expansion 70High Voltage Knockouts

- On the side of the Rotem Trio Expansion 70 are knockouts used to route the **low voltage cables**.

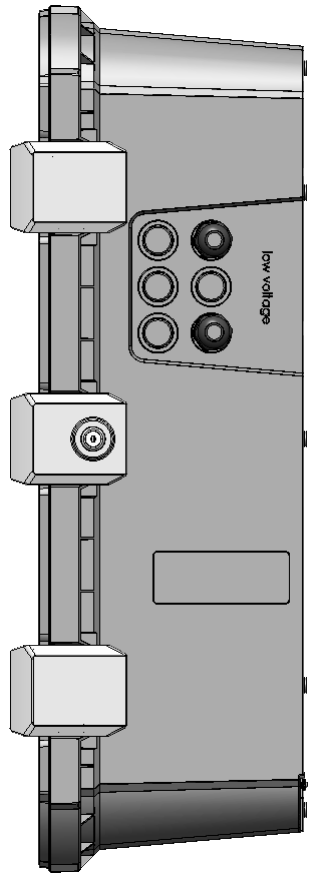


Figure 5: Rotem Trio Expansion 70 Low Voltage Knockouts

CAUTION *Run low voltage cables through one knockout and high voltage relay cables through a separate knockout. Do not place them in the same knockout!*

- On the bottom of the Rotem Trio Controller are knockouts used to route the cables plus one designated communication port.

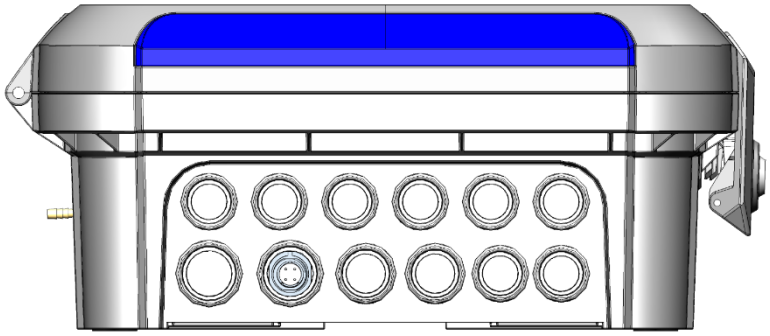


Figure 6: Rotem Trio Controller Knockouts

- Using a screwdriver and a hammer, gently apply pressure to the knockouts.
- **Only open the holes that you require**.
- Munters recommends removing the knockouts before mounting the unit.

3.2.2 HANGING THE ROTEM TRIO CONTROLLER UNIT

1. Attach the bracket to the wall (using the supplied screws).

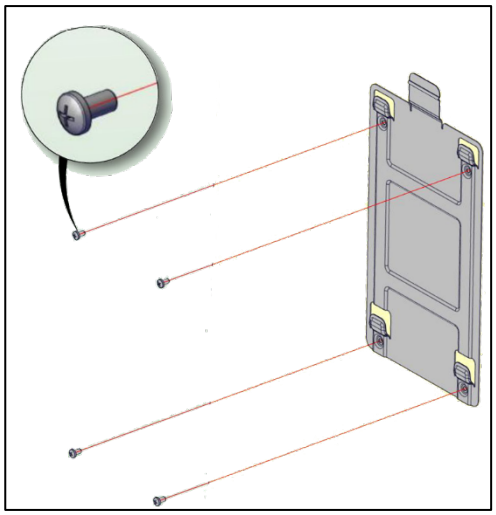


Figure 7: Hang the Bracket

2. Hang the Trio on the bracket.

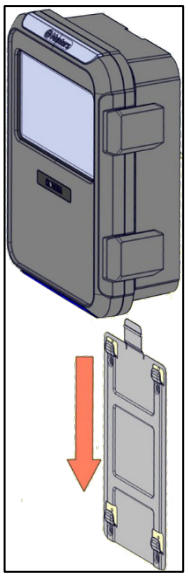


Figure 8: Hanging the Unit

3. Close the Trio enclosure lid carefully and tightly. Use RTV silicon or equivalent sealant to seal the cable holders.

CAUTION *Munters strongly recommends that you seal all entry spots with RTV silicon. Failure to do so can lead to damage to the unit.*

4. After installation is completed, operate the Trio for a few hours and re-check for proper operation.

3.2.3 HANGING THE ROTEM TRIO EXPANSION 70 UNIT

Rotem Trio Expansion 70 comes with two hanging brackets.

➲ **Hang the Rotem Trio Expansion 70 on a wall capable of supporting the unit's weight! (31 pounds).**

1. Use the supplied (long) screws to attack the bracket to the wall.

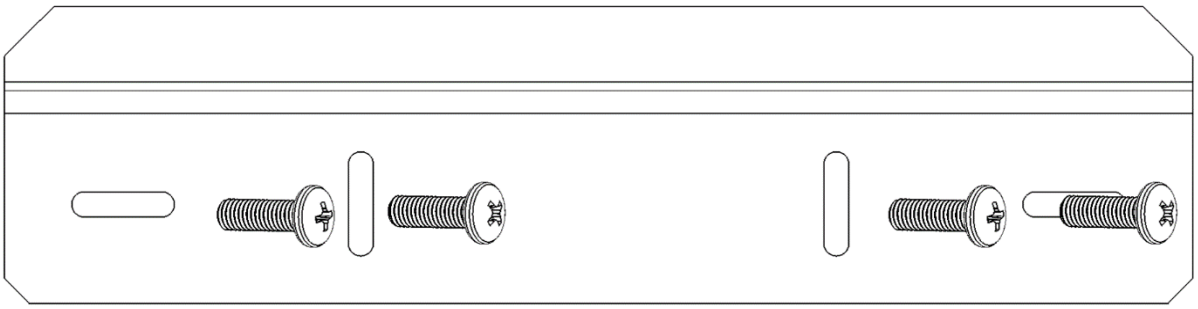


Figure 9: Wall bracket

2. Attach to the Rotem Trio Expansion 70:
   - the second hanging bracket

- the securing brackets

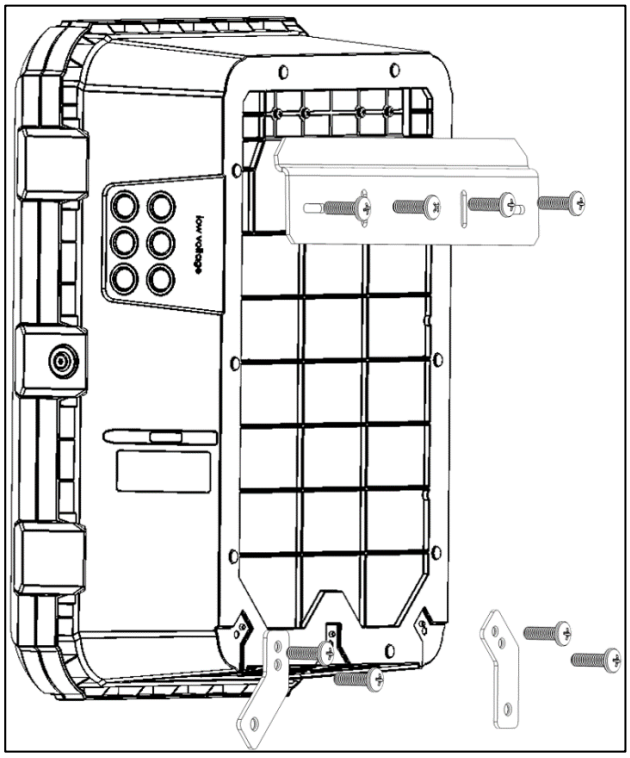


Figure 10: Unit brackets

3. Hang the Rotem Trio Expansion 70 on the wall bracket.
4. Use the supplied short screws to adhere the securing brackets to the wall.

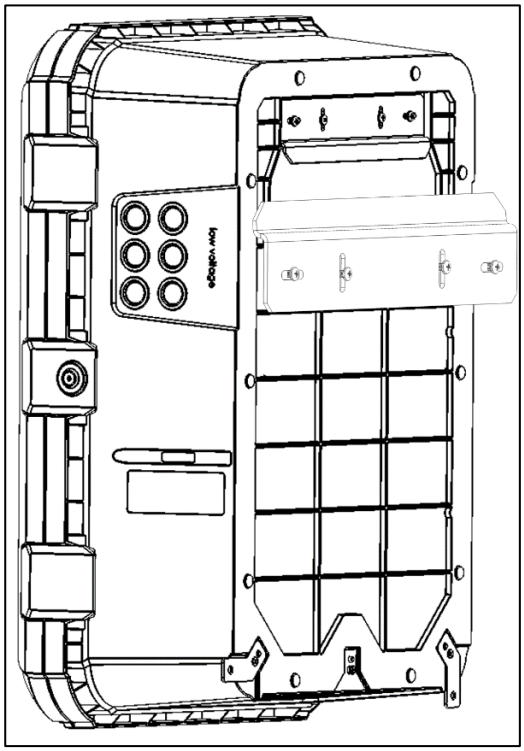


Figure 11: Mounting Completed

3.3 Layouts

- Rotem Trio Expansion 70 Board Layout
- Rotem Trio Controller Board Layout
- Devices Specifications

3.3.1 ROTEM TRIO EXPANSION 70 BOARD LAYOUT

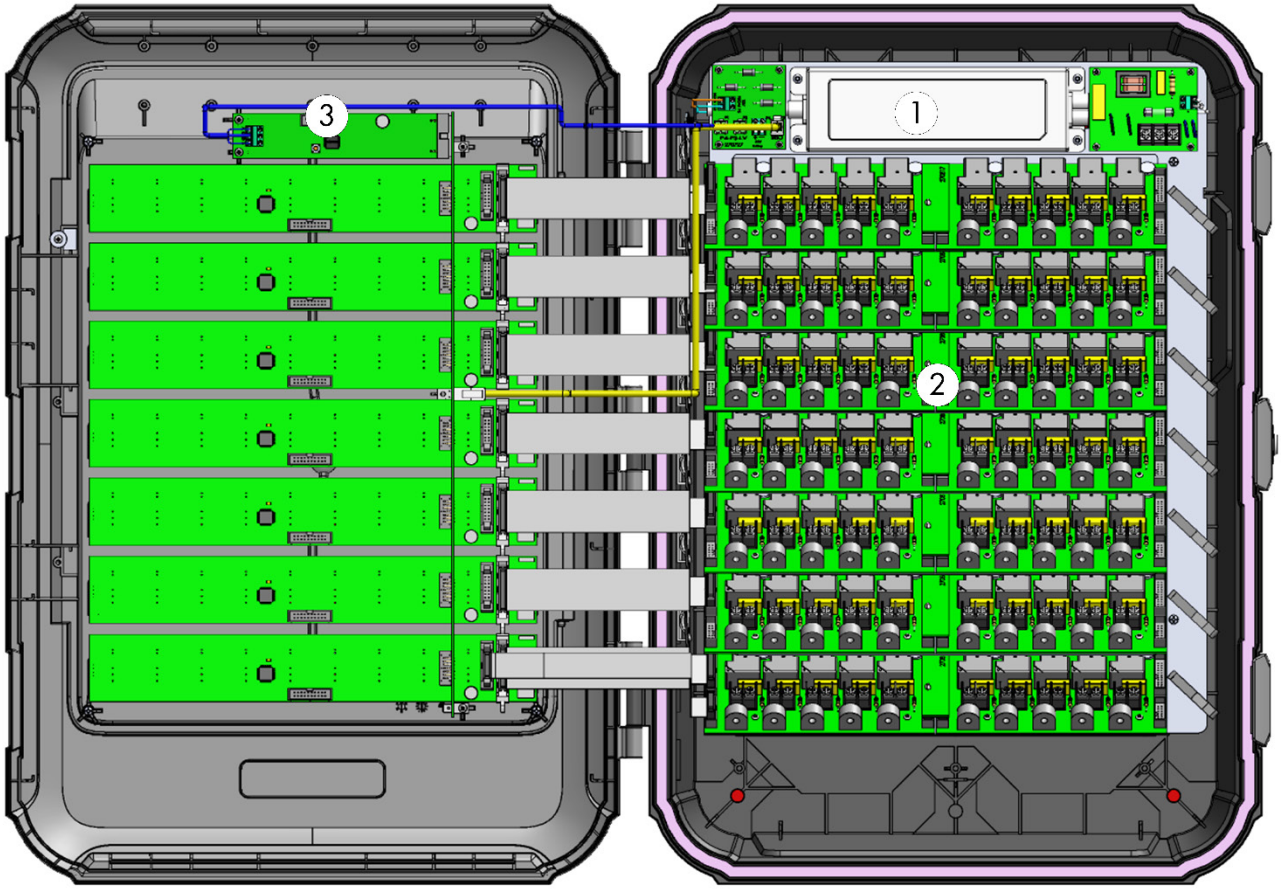


Figure 12: Rotem Trio Expansion 70 Board Layout

Table 1: Rotem Trio Expansion 70 Display layout key

Number	Description
1	Power supply
2	Relay cards (Normally Open, Normally Closed, Winch)
3	Communication card

3.3.2 ROTEM TRIO CONTROLLER BOARD LAYOUT

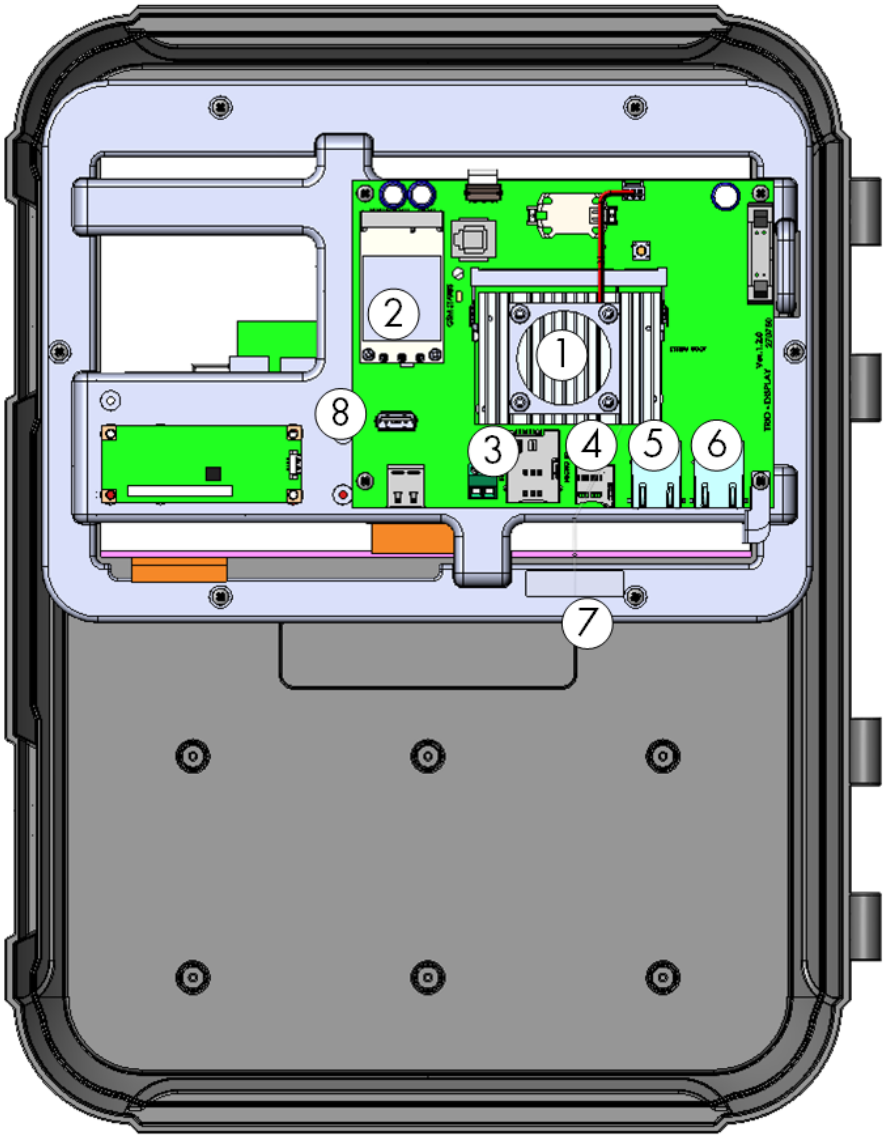


Figure 13: Rotem Trio Controller Display Board Layout

Table 2: Rotem Trio Controller Display layout key

Number	Description
1	Heat sink and fan
2	Cell modem
3	SIM card port
4	SD card port
5	Ethernet port (internal)
6	Ethernet port (router cable)
7	Wi-Fi antenna
8	USB port (used for software upgrades)

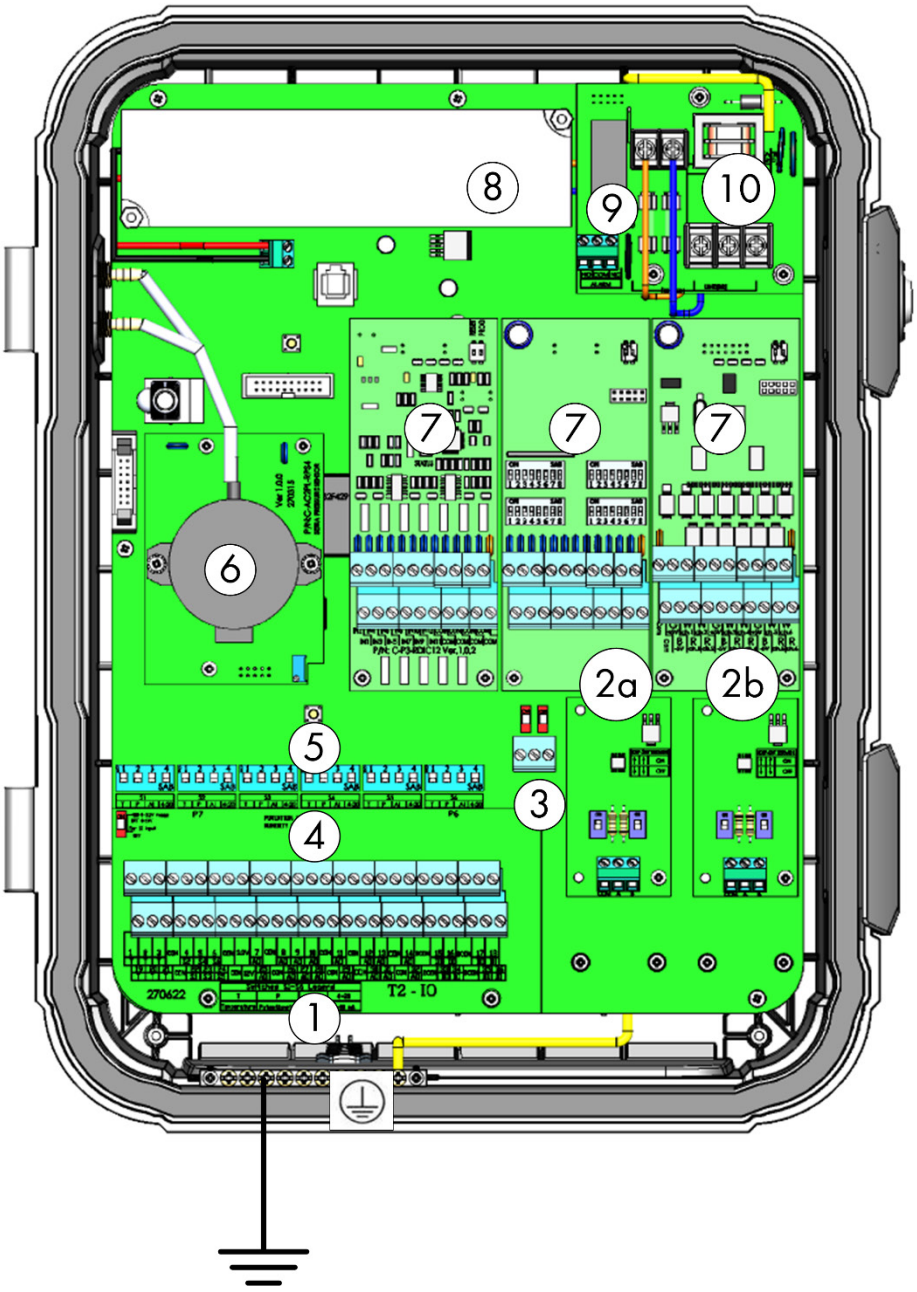


Figure 14: Rotem Trio Controller Main Board Layout

Table 3: Rotem Trio Controller Board layout key

Number	Description
1	Ground strip
2a	Communication card to external devices (for example RLED or RSU)
2b	Communication card to Rotem Trio Expansion 70
3	Trio Expansion communication ports
4	Input ports (see below for break down)
5	Dipswitches
6	Static pressure sensor

Number	Description
7	Analog Input/Digital Input/Scale Card (any combination) • 2 analog input • 1 digital input • 1 scale card *NOTE The CMOS battery is located under the card on the left.*
8	Power supply
9	Alarm relay
10	Power ports

Table 4: Input ports details

Function	Number of ports
Analog Input	
• Dedicated RTS ports	6
• Temperature/0-3V/4-20mA/Potentiometer	6
Digital Input ports	6
Analog Output ports	16

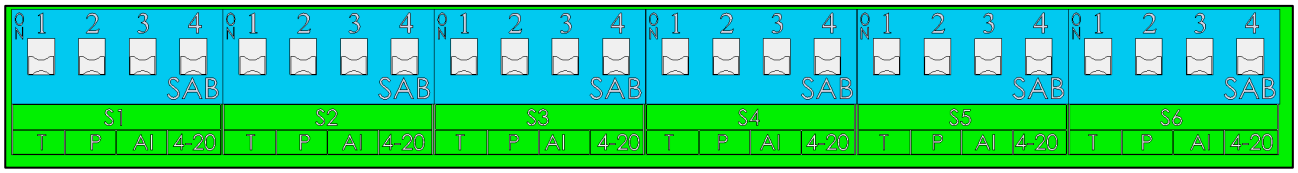


Figure 15: Dipswitches, expanded

- **One dipswitch only** in each set is raised.
- Only raise a dipswitch if a device is wired to an **S port**.

3.4 Rotem Trio Expansion 70 Wiring Diagrams

- Power
- High Voltage Relays

3.4.1 POWER

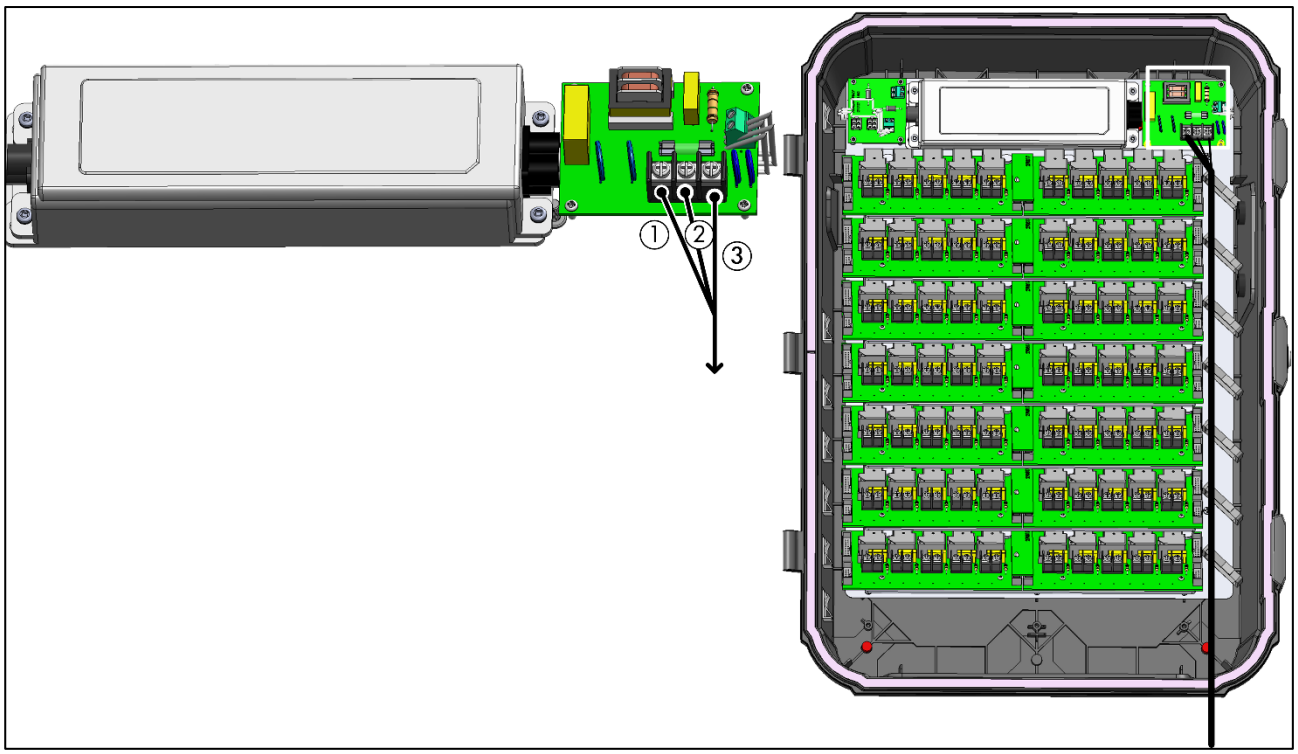


Figure 16: Rotem Trio Expansion 70 Power Supply Wiring Diagram

Number	Description
1	Ground
2	L1
3	L2

3.4.2 HIGH VOLTAGE RELAYS

This procedure details how to connect output relays to high voltage devices.

1. Connect the control phase commons to the relays' contacts (the common wire to all relays with the same function).

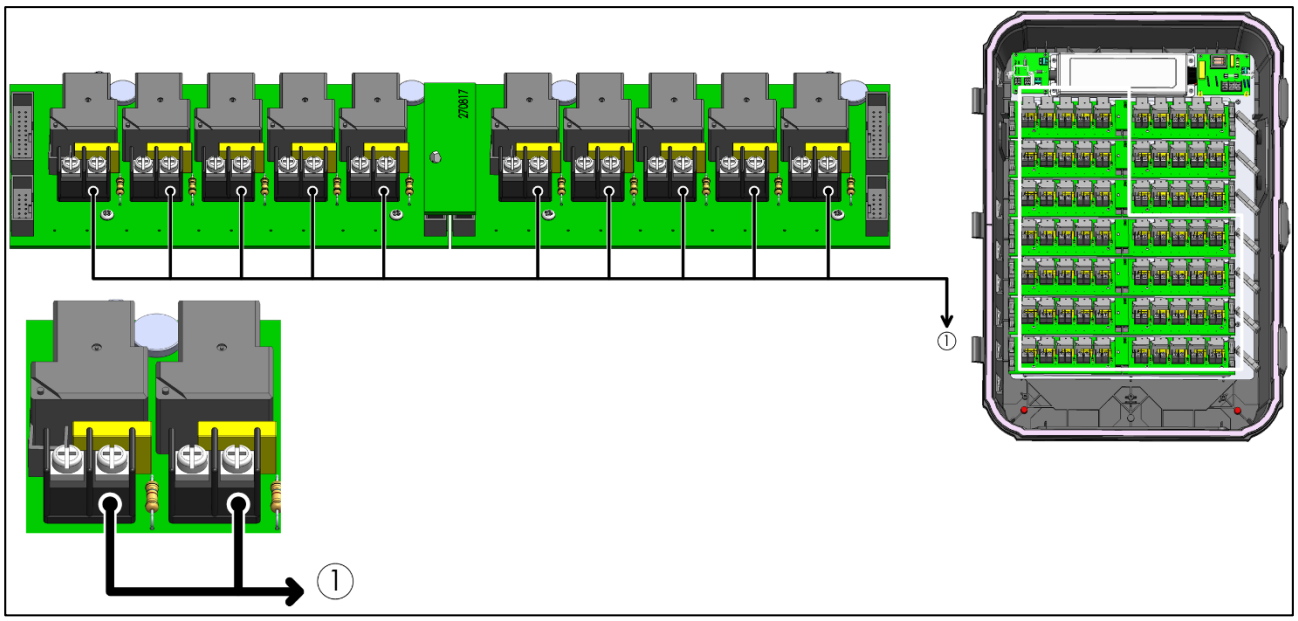


Figure 17: Control Phase Commons

Table 5: Control Phase Commons layout key

Number	Description
1	Phase common

2. Connect the relay cables to each device.

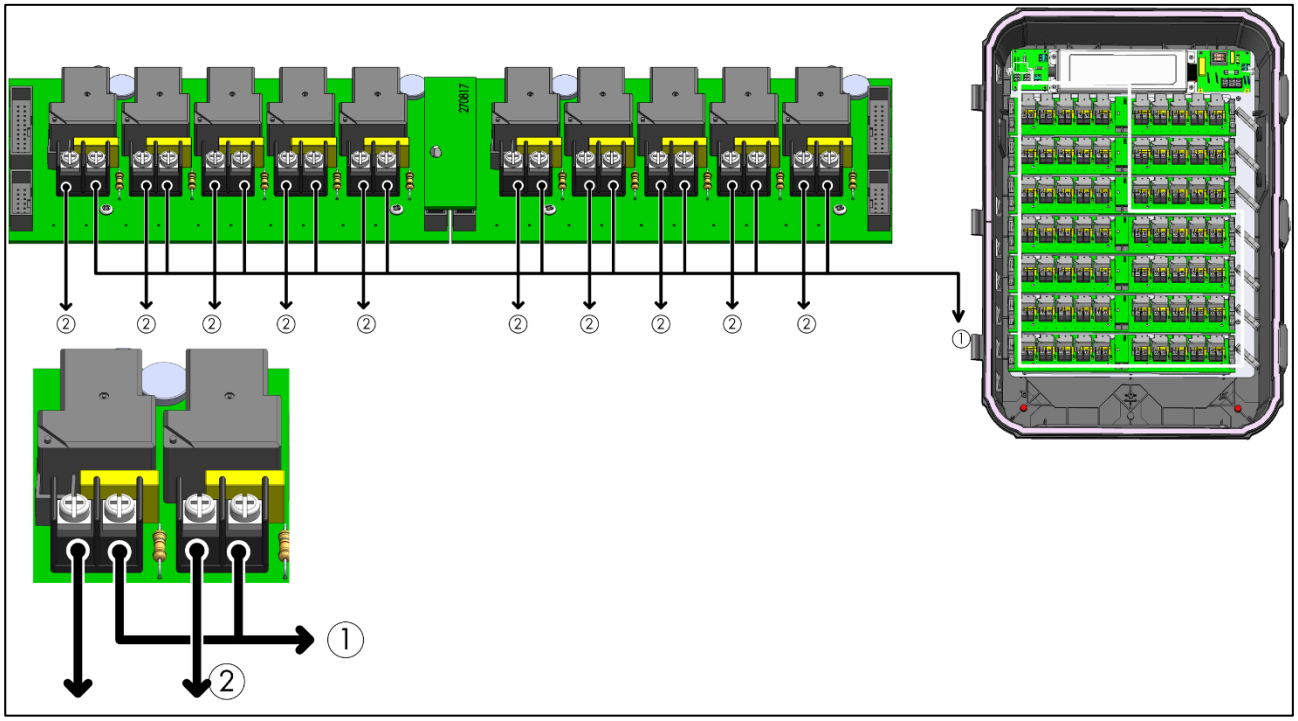


Figure 18: Relay Cable Connections

Table 6: Relay Cable layout key

Number	Description
1	Phase common
2	Cable to device

3.4.3 WINCH CARD WIRING

Use the relays on the right-hand side only. Winch cards are equipped with two Normally Close relays.

1. Connect separate control phase commons for each inlet or curtain.

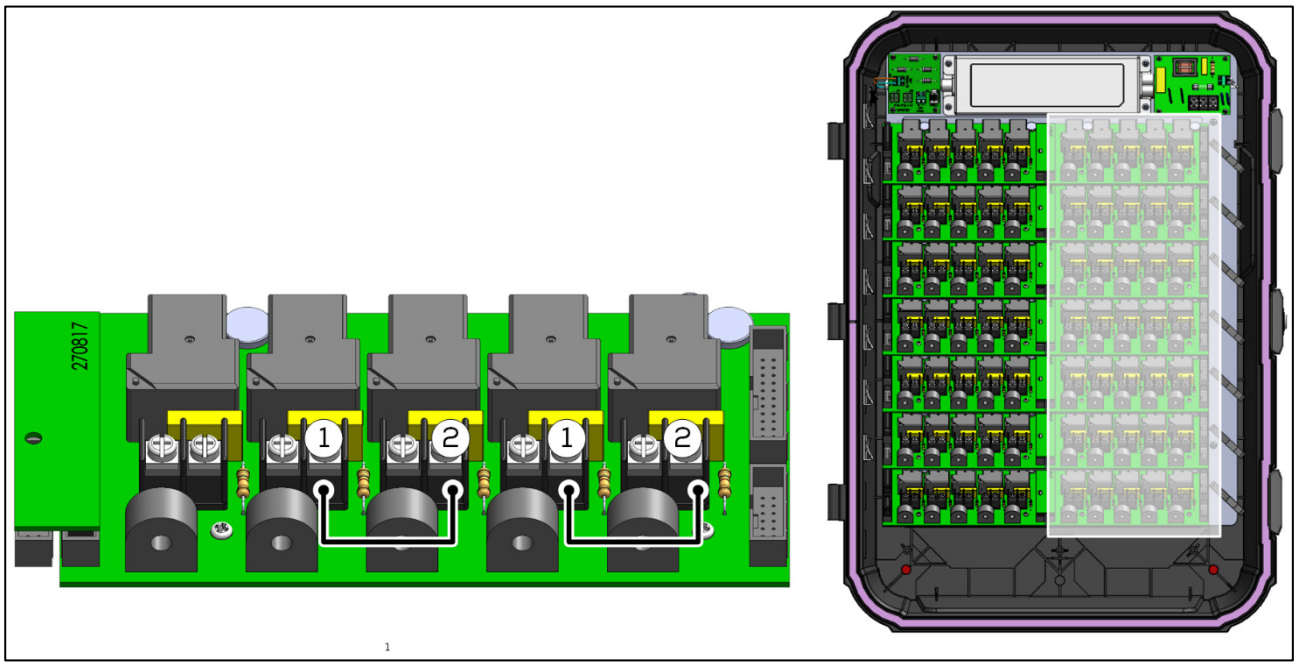


Figure 19: Winch Card Control Phase Commons

Figure 19 Key	
1	Open curtain (Normally Open Relay)
2	Close curtain (Normally Open Relay)

3. Connect the output wires to the required device.

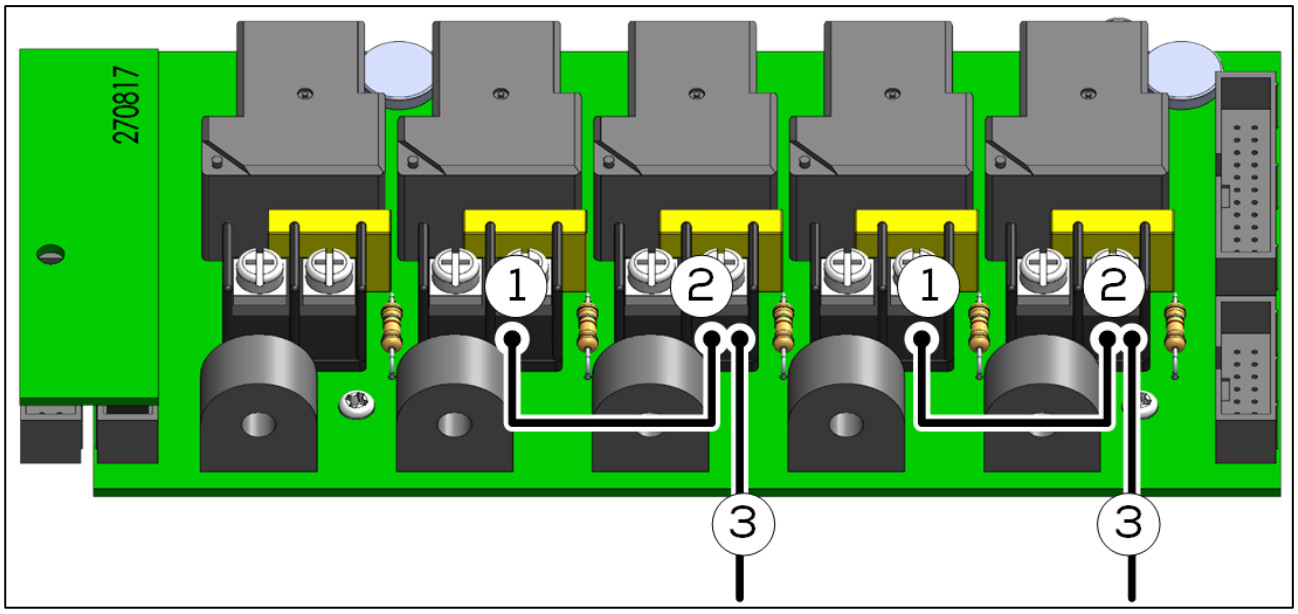


Figure 20: Connecting the Output Wire to Inlets/Curtains

Figure 20 Key	
1	Open curtain (Normally Closed (NC) relay is wired to the opening gear)
2	Close curtain (Normally Open (NO) relay is wired to the opening gear)
3	Connect control phase wire to L1 or L2 power port OR RBU device.

3.4.4 Completing the Wiring

1. Locate the bag of stickers placed on the inside of the controller door.
2. On the sticker below each relay, write the name of the device connected to the relay.

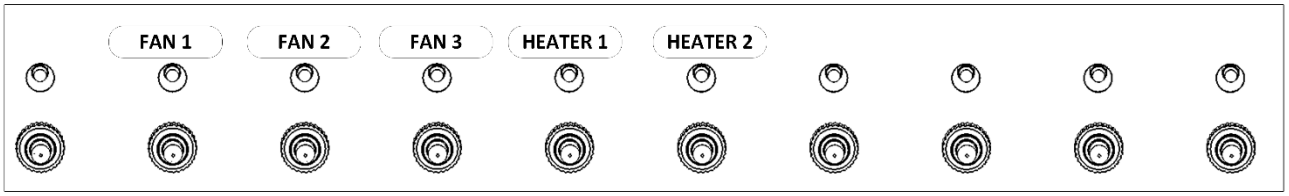


Figure 21: Controller labels

3.5 Rotem Trio Controller Wiring Diagrams

- Alarms and Power
- Internet Connection
- Rotem Trio Expansion 70 – Rotem Trio Controller Communication
- Board Wiring
- Card Wiring
- Trio RPS
- RSU Wiring

Rotem Trio Controller supports two different type of input cards:

- Dedicated analog input/analog output/digital input ports (Board Wiring, page 32)
- Optional analog input cards/digital input card/scale card (Card Wiring, page 45)

3.5.1 ALARMS AND POWER

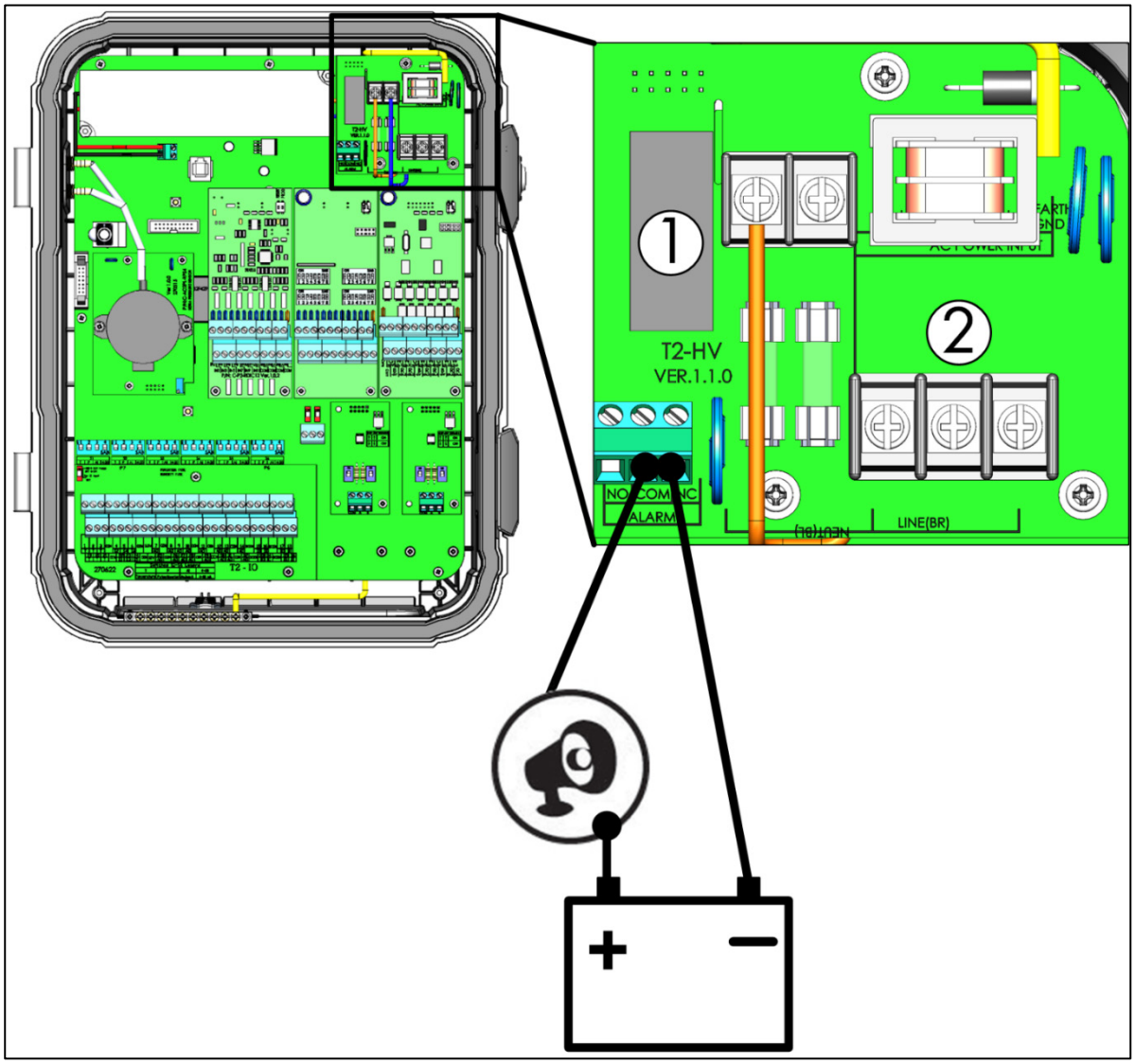


Figure 22: Alarm relay and power ports

Table 7: Alarm relay and power layout key

Number	Description
1	Alarm relay
2	Power ports

- Connect the light or siren device to the alarm relay.

3.5.2 INTERNET CONNECTION

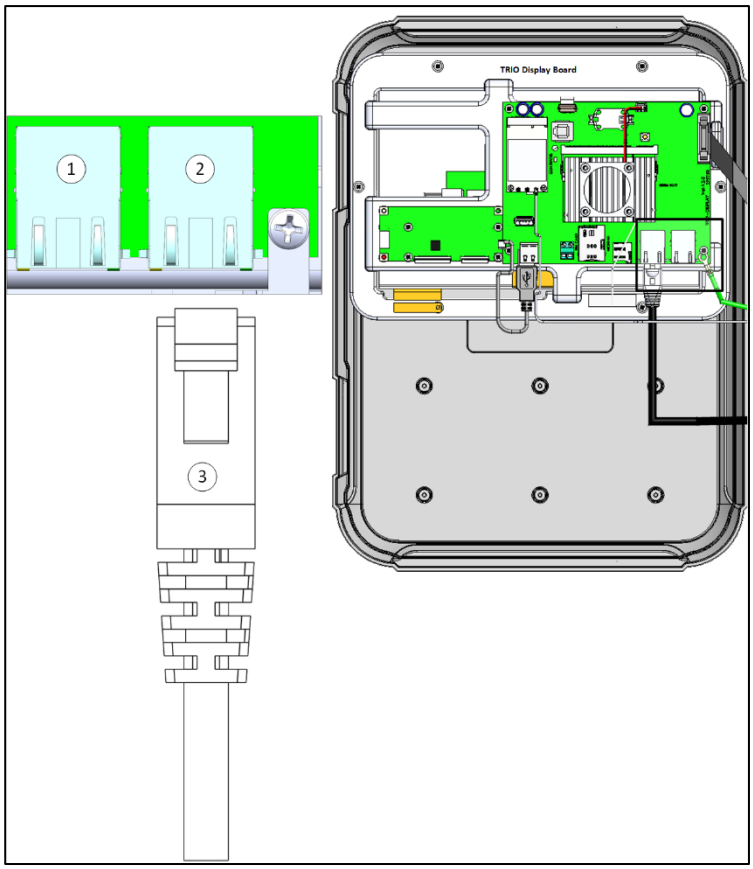


Figure 23: Ethernet port

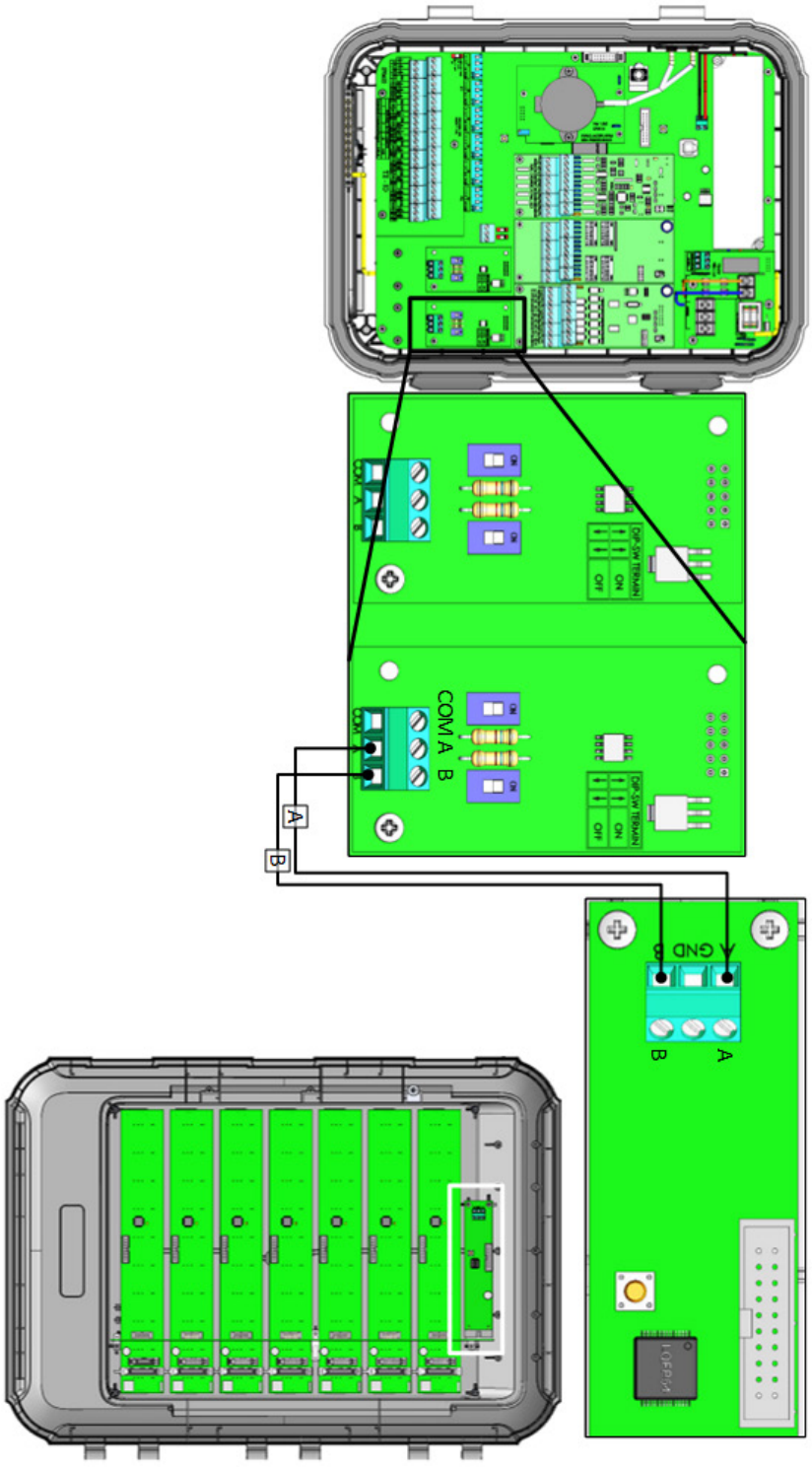
CAUTION *Connect the internet cable to port 2. Do not connect the cable to port 1.*

Number	Description
1	Internal port (do not use this port)
2	Ethernet port
3	RJ-45 cable

3.5.3 ROTEM TRIO EXPANSION 70 – ROTEM TRIO CONTROLLER COMMUNICATION

- RS-485 Wiring
- Cable Connection

3.5.3.1 RS-485 Wiring



The cable between the controller and the expansion unit should be a 4 wire twisted shielded cable (22 or 24 AWG).

- A - A
- B - B

NOTE *After wiring the Controller to the Expansion, perform a Reset Factory Default (System › General Settings › About › Reset Factory Settings).*

Figure 24: Rotem Trio Expansion 70 – Rotem Trio Controller RS-485 Wiring

3.5.3.2 Cable Connection

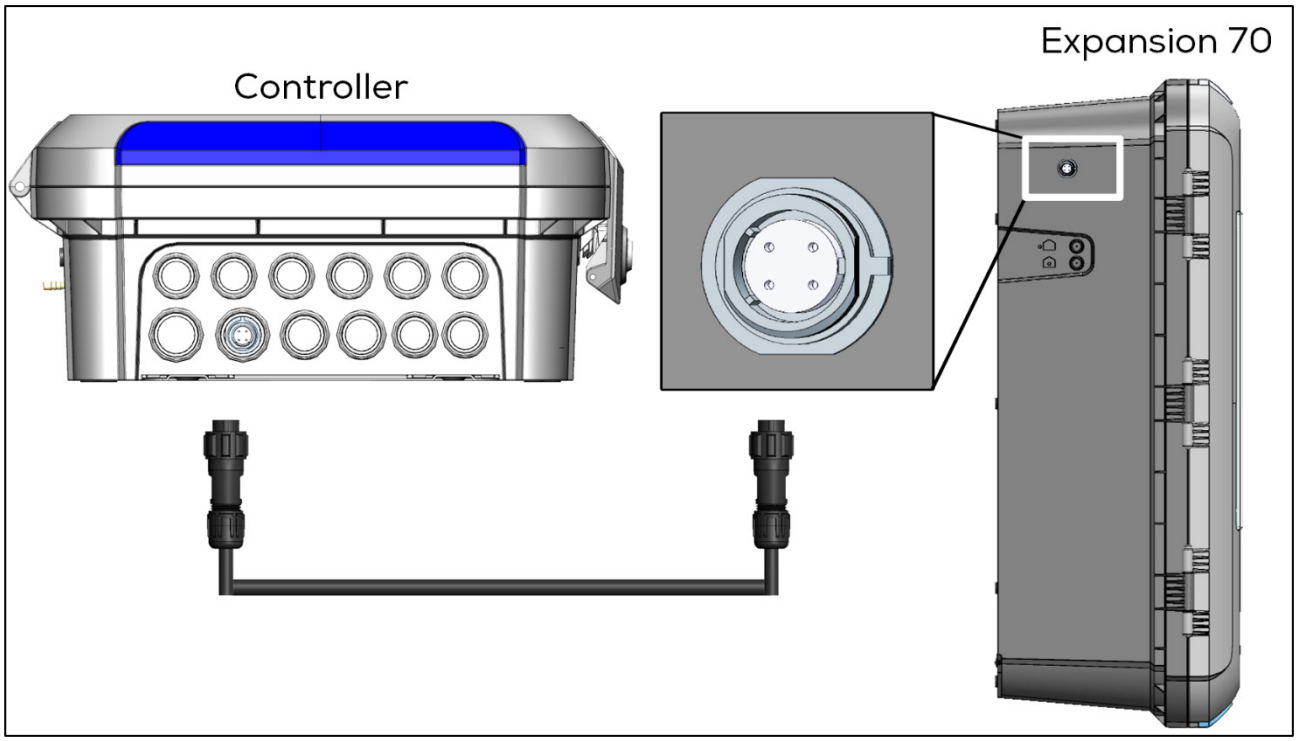


Figure 25: Rotem Trio Expansion 70 – Rotem Trio Controller Cable Connection

3.5.4 BOARD WIRING

- Analog Output Devices
- Digital Input Devices
- Analog Input Devices

3.5.4.1 Analog Output Devices

Trio supports analog control over a variety of devices. Connect analog output devices to an AO and a COM port. Do not connect the devices to a DCOM port!

CAUTION *Ground these devices!*

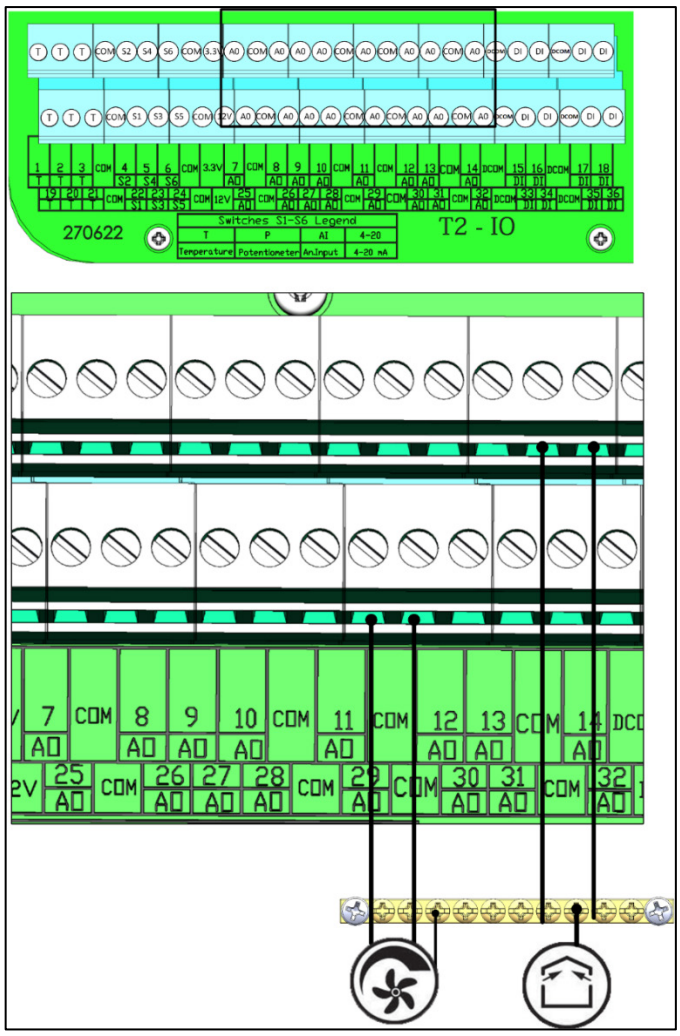


Figure 26: Analog Output devices (examples)

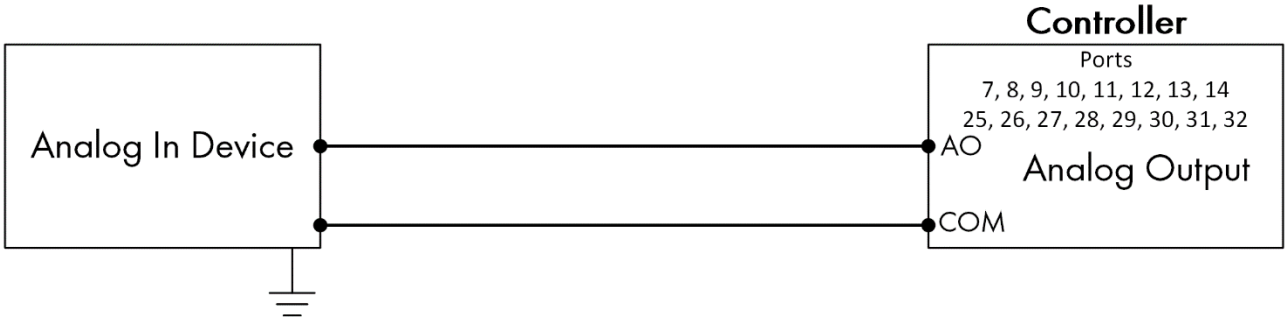


Figure 27: Analog Device Wiring Schematic

3.5.4.2 Digital Input Devices

Connect digital input devices to a DI and a DCOM port. **Ground these devices!**

CAUTION ***Do not connect the devices to a COM port!***

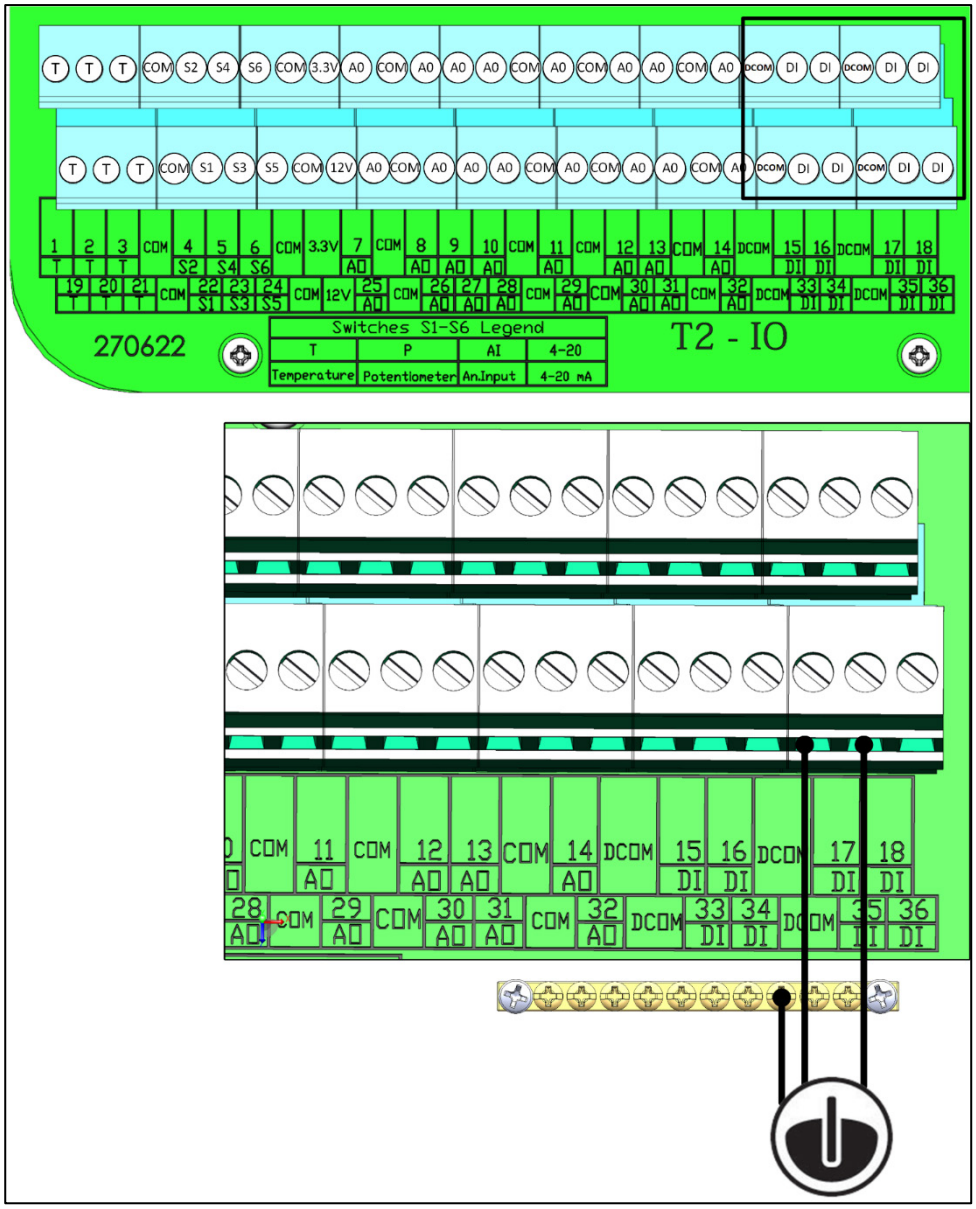


Figure 28: Board Wiring: Digital Input devices (example)

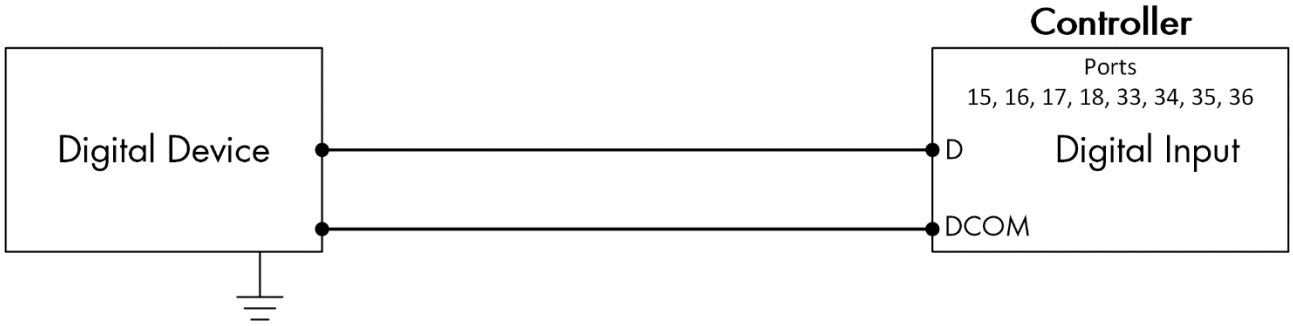


Figure 29: Digital Device Wiring Schematic

3.5.4.3 Analog Input Devices

- CO2 Sensor Wiring
- Temperature Sensor Wiring
- Humidity Sensor Wiring
- Potentiometer Wiring
- Ammonia Sensor Wiring
- WOD Water Pressure Sensor Wiring
- Light Sensor Wiring

3.5.4.3.1 CO2 Sensor Wiring

Refer to the CO2 Sensor Manual for details on installing this unit.

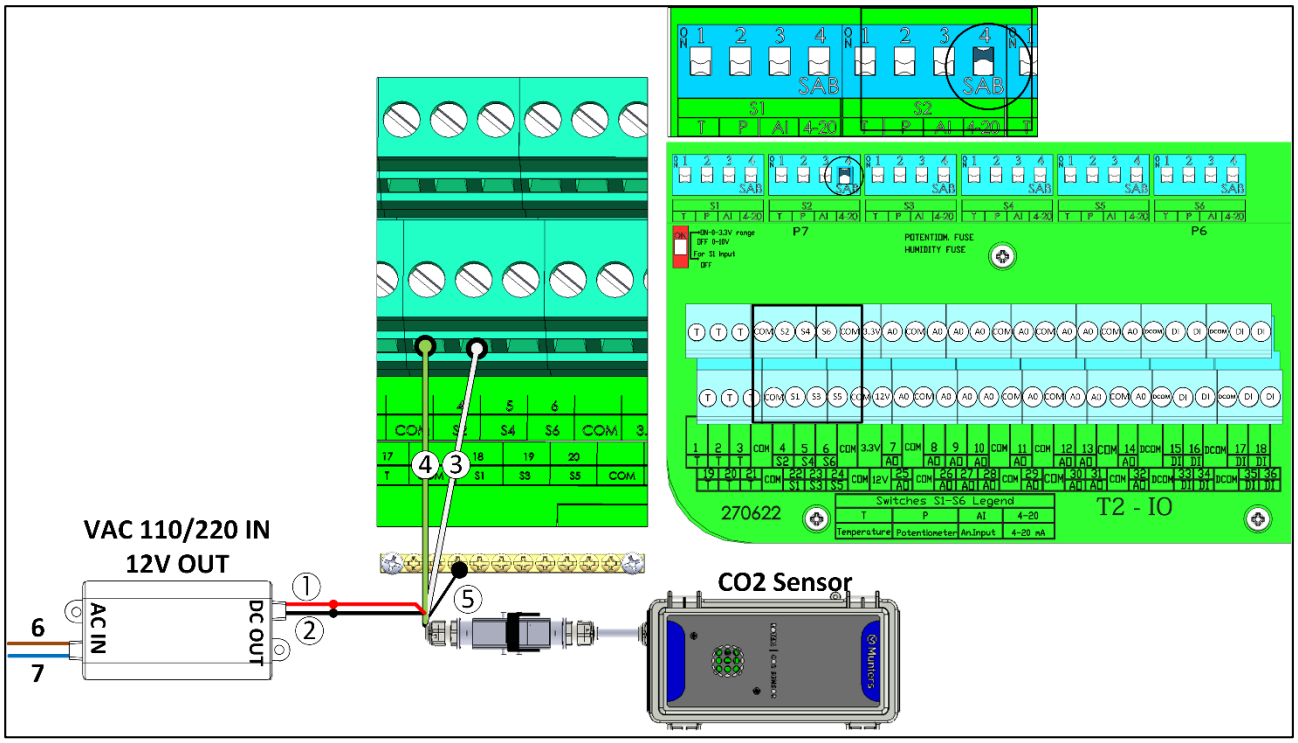


Figure 30: Board Wiring: CO2 Sensor

Number	Function
1	S port
2	COM port
3	Shield wire
4	Brown wire: phase
5	Blue wire: neutral
6	Red wire: +12VDC
7	Black wire: -12VDC

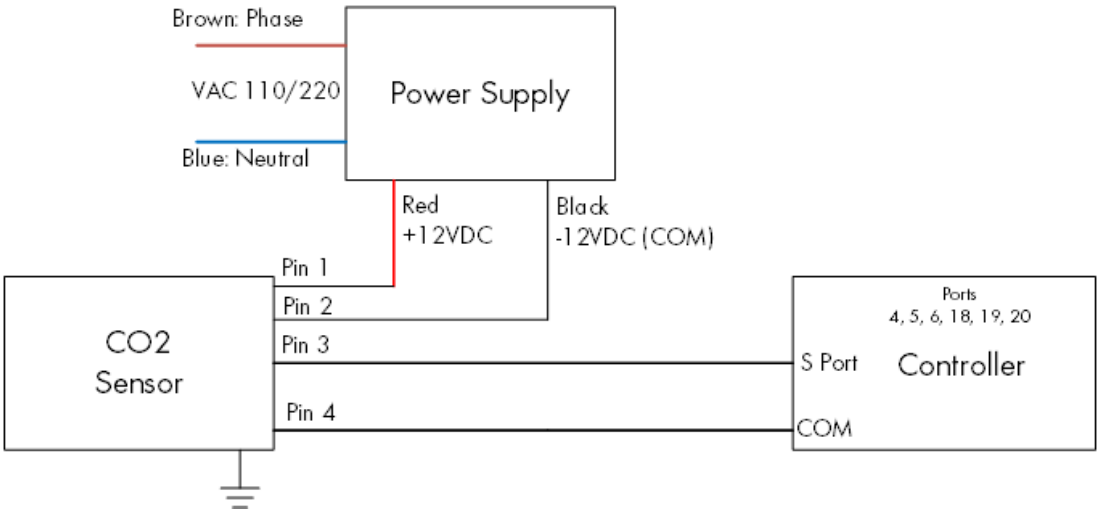


Figure 31: CO2 Sensor Wiring Schematic

CAUTION ***Ground these devices!***

CAUTION *Do not connect the devices to a DCOM port!*

3.5.4.3.2 Temperature Sensor Wiring

Refer to the RTS-2 Manual for details on this sensor.

- Note:
  - Wire all designated T ports before wiring the RTS sensors to the S ports.
  - Connect the black wire to a COM port, not a DCOM port.

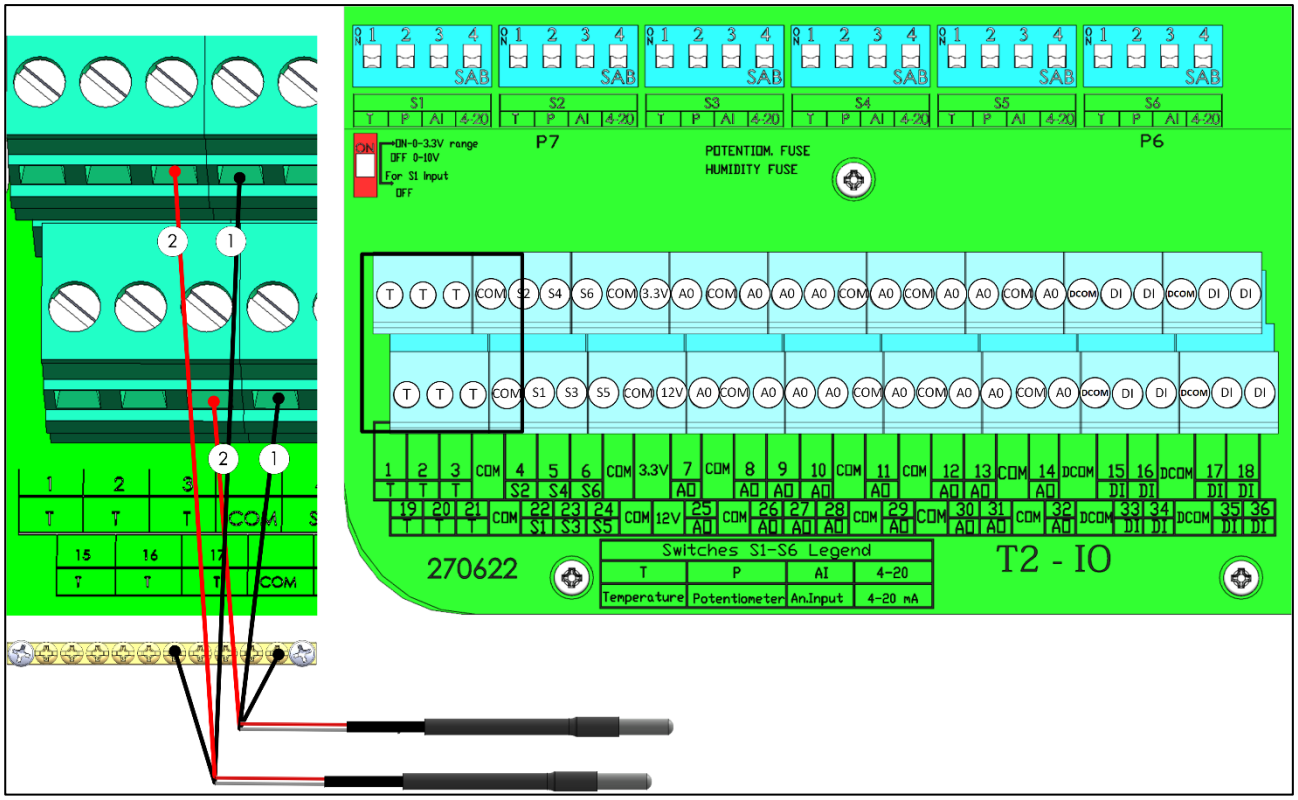


Figure 32: Board Wiring: RTS Wiring

Number	Function
1	COM port (black wire)
2	T port (red wire)

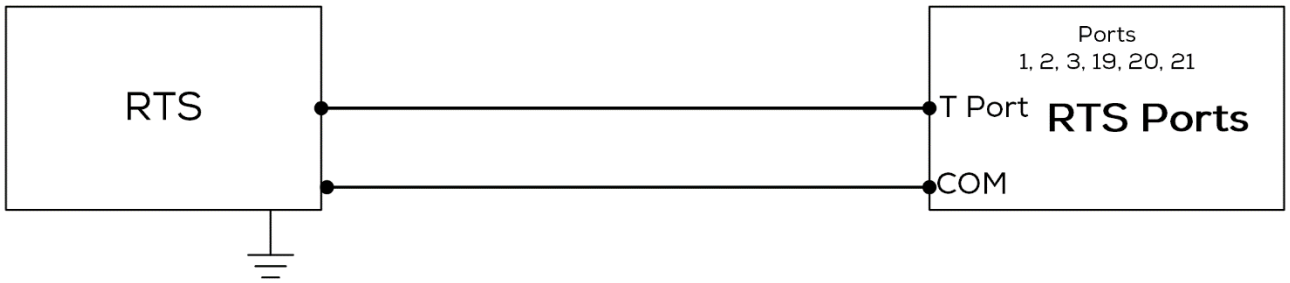


Figure 33: RTS Wiring Schematic

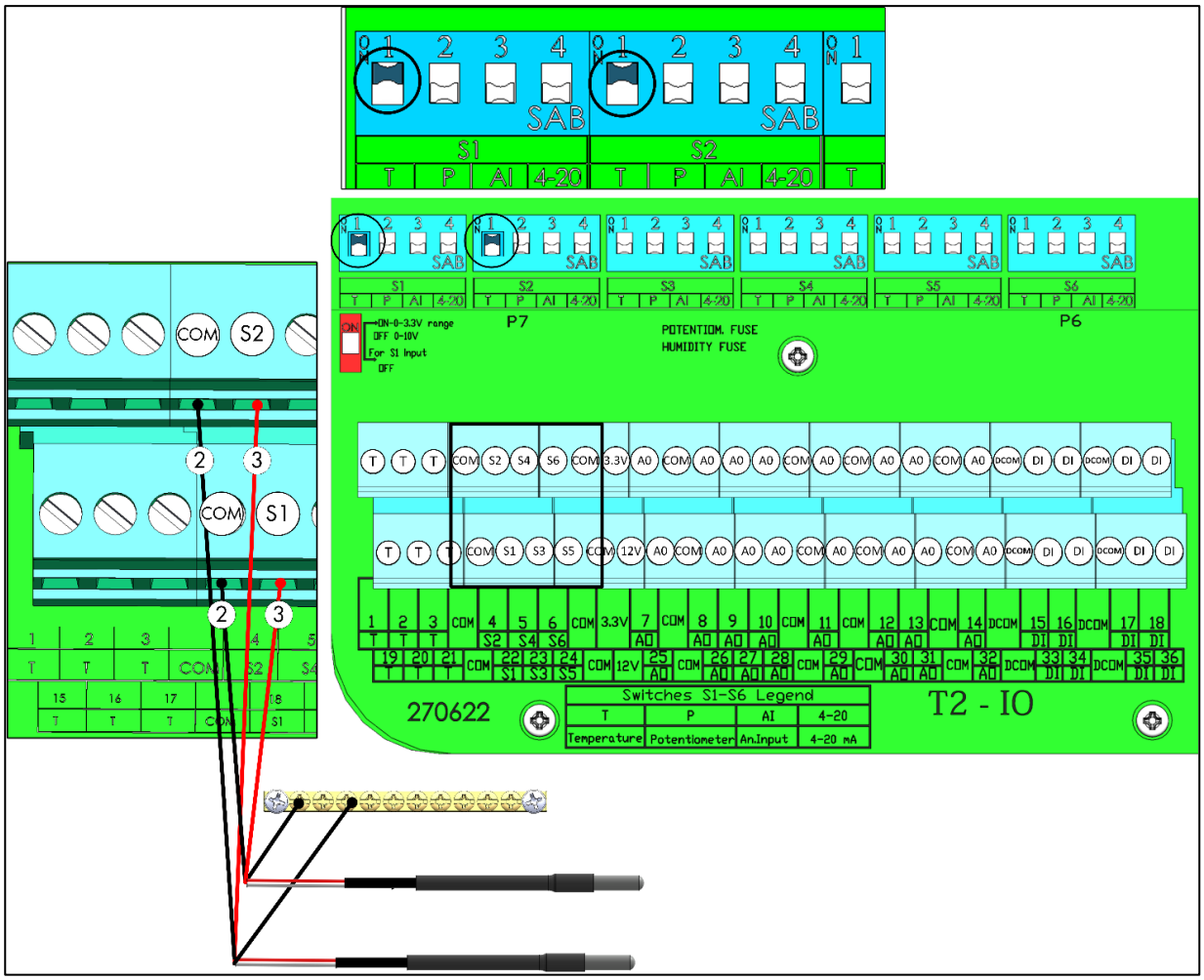


Figure 34: RTS S Port Wiring

Number	Function
2	COM port (black wire)
3	S port (red wire)

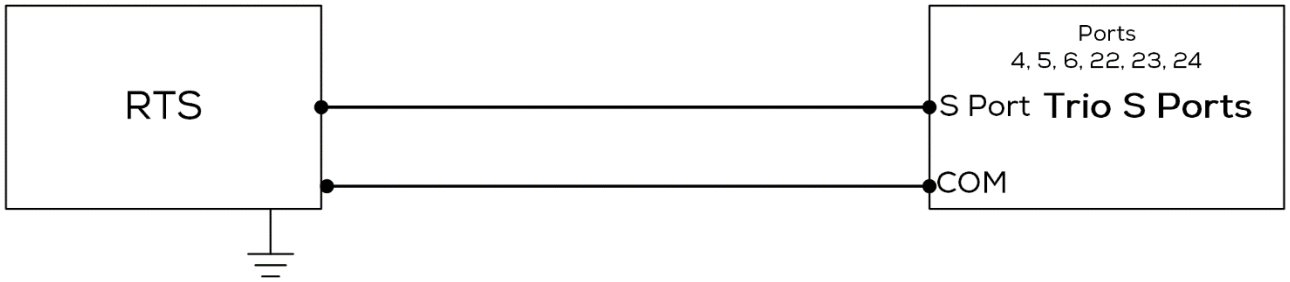


Figure 35: RTS S Port Wiring Schematic

- Connect each RTS sensor to a:
  - T port
  - COM port
  - Grounding strip!

3.5.4.3.3 Humidity Sensor Wiring

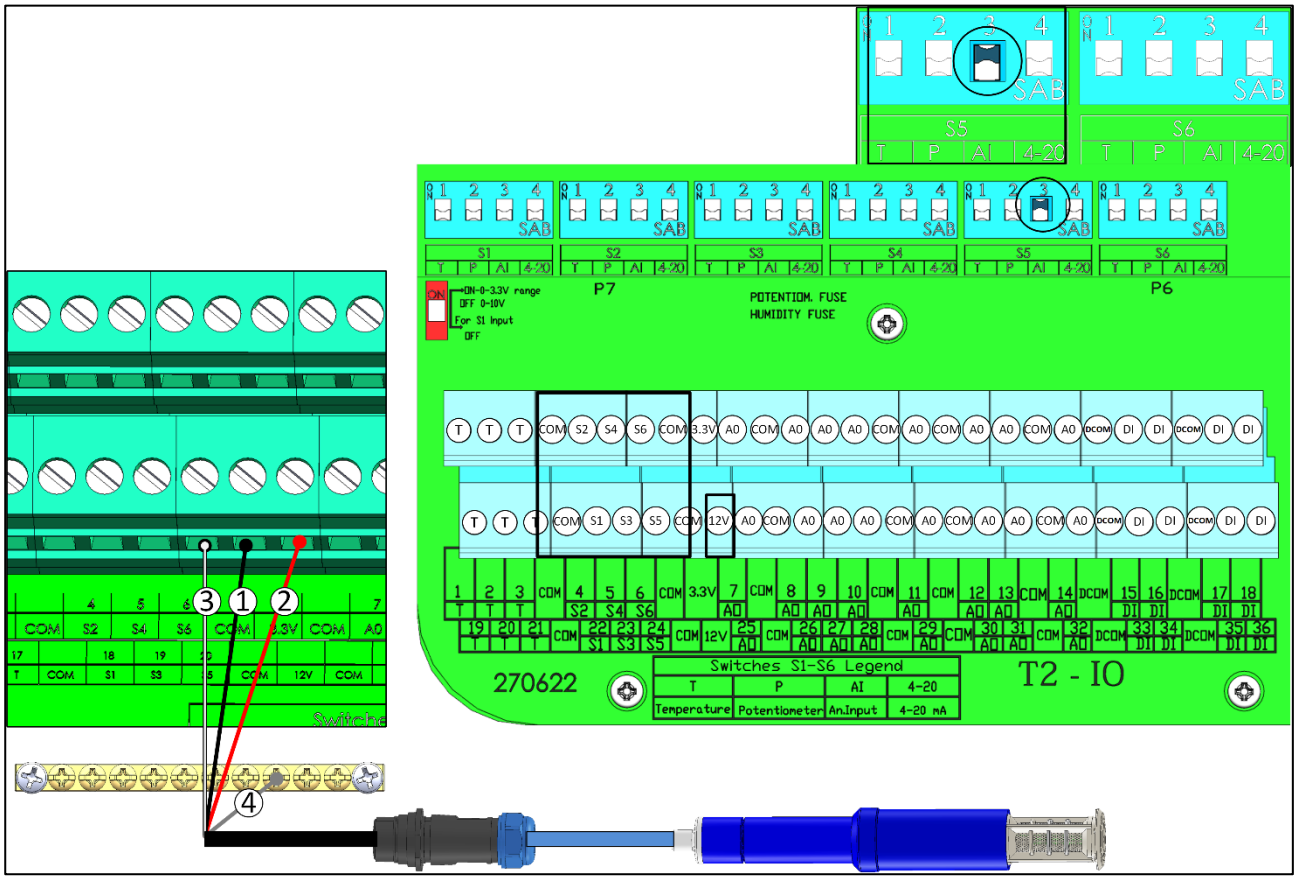


Figure 36: RHS+ Wiring

Number	Function
1	COM port (black wire)
2	12V (red wire)
3	S port (white wire)
4	Shield wire

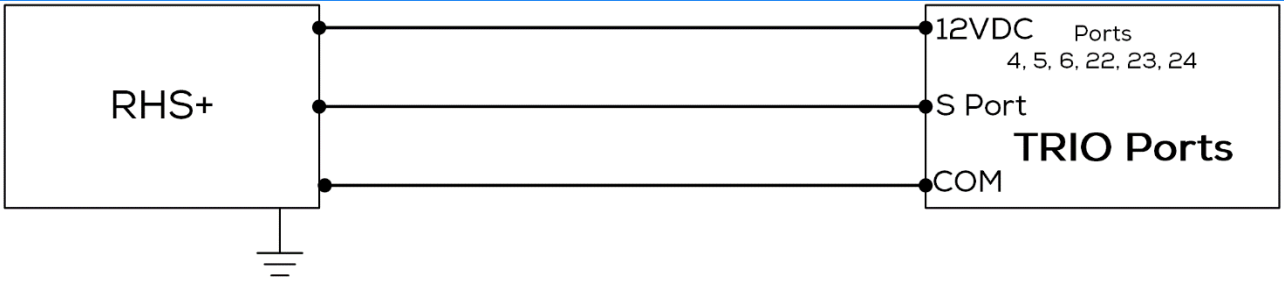


Figure 37: RHS+ Wiring Schematic

- Connect each RHS+ sensor to a:
  - S port. In the corresponding dipswitch, raise dipswitch 3 (analog input).
  - COM port. Do not connect it to a DCOM port.
  - 12VDC port.
  - Grounding strip!

3.5.4.3.4 Potentiometer Wiring

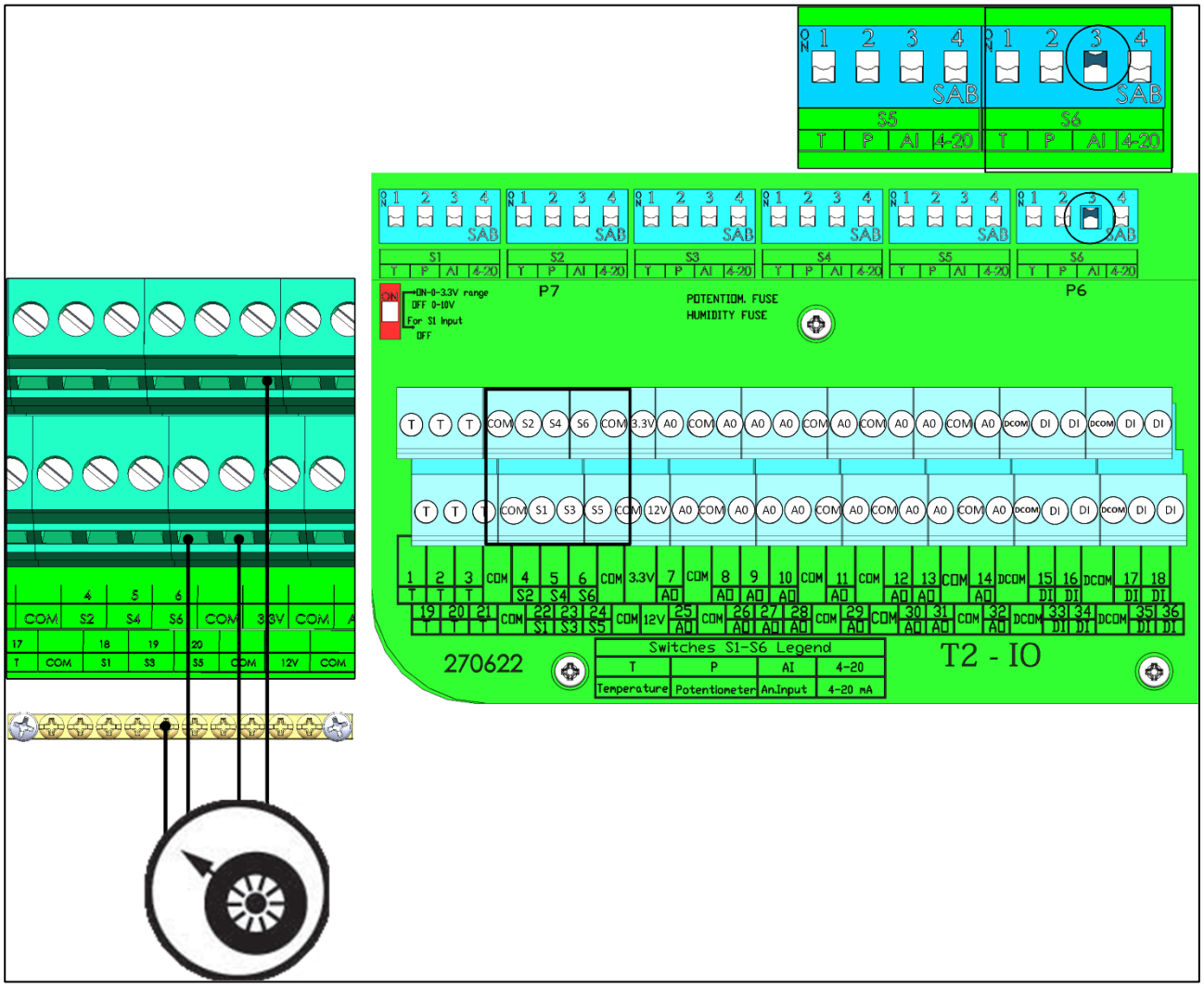


Figure 38: Potentiometer Wiring

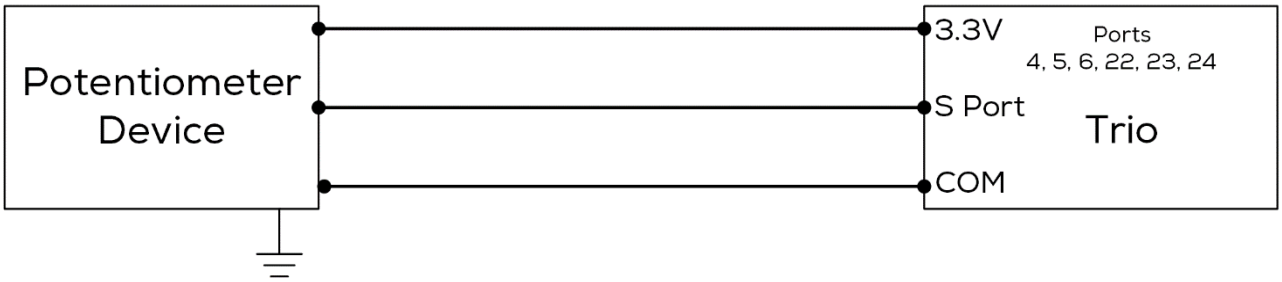


Figure 39: Potentiometer Wiring Schematic

- Connect each potentiometer to a:
  - S port. In the corresponding dipswitch, raise dipswitch 2 (potentiometer).
  - COM port. Do not connect it to a DCOM port.
  - 3.3V port.

3.5.4.3.5 Ammonia Sensor Wiring

Refer to the Ammonia Sensor manual for further information.

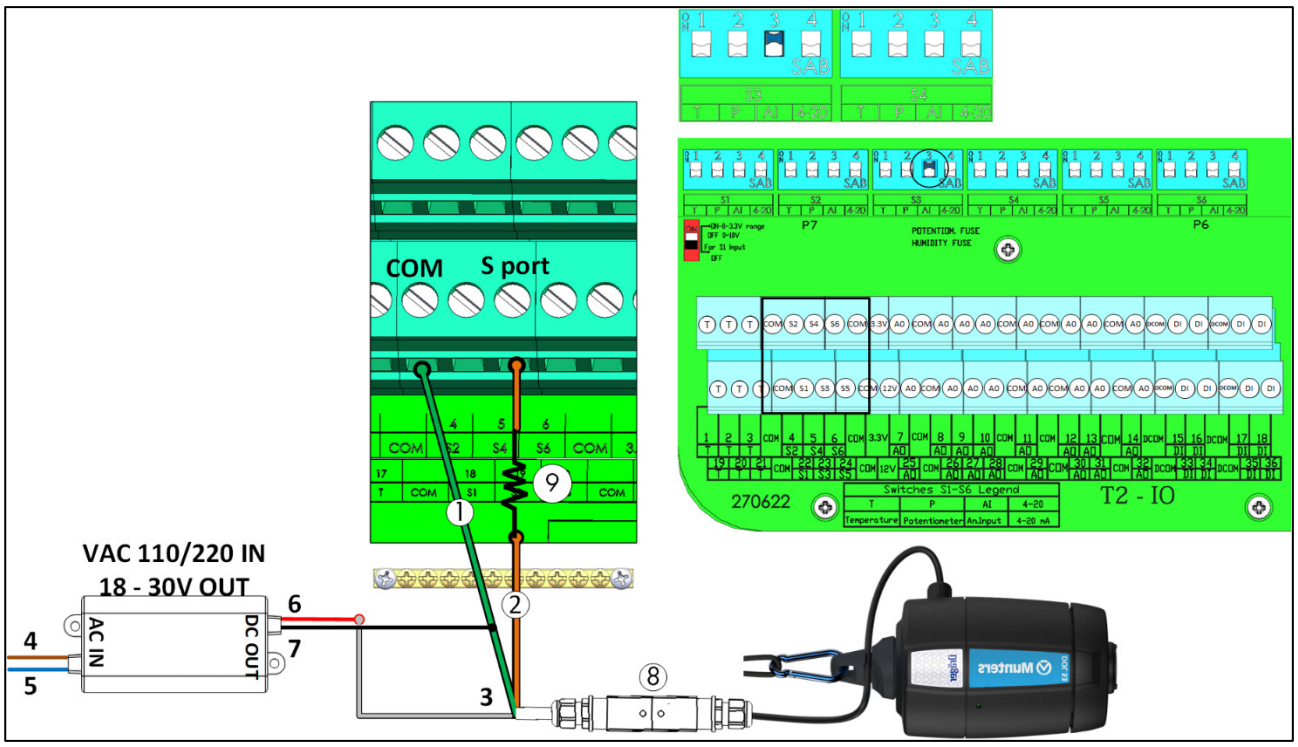


Figure 40: Board Wiring: Ammonia Sensor Wiring (WOD sensor installed)

Number	Function
1	COM port (Green wire)
2	S2 – S6 port (Brown wire)
3	White wire
4	Phase (Brown wire)
5	Neutral (Blue wire)
6	18-30VDC (Red wire)
7	COM (Black wire). Do not connect it to a DCOM port.
8	Quick Connector
9	20.3 kohm resistor (Note: The resistor comes supplied with the sensor but must be installed on-site)

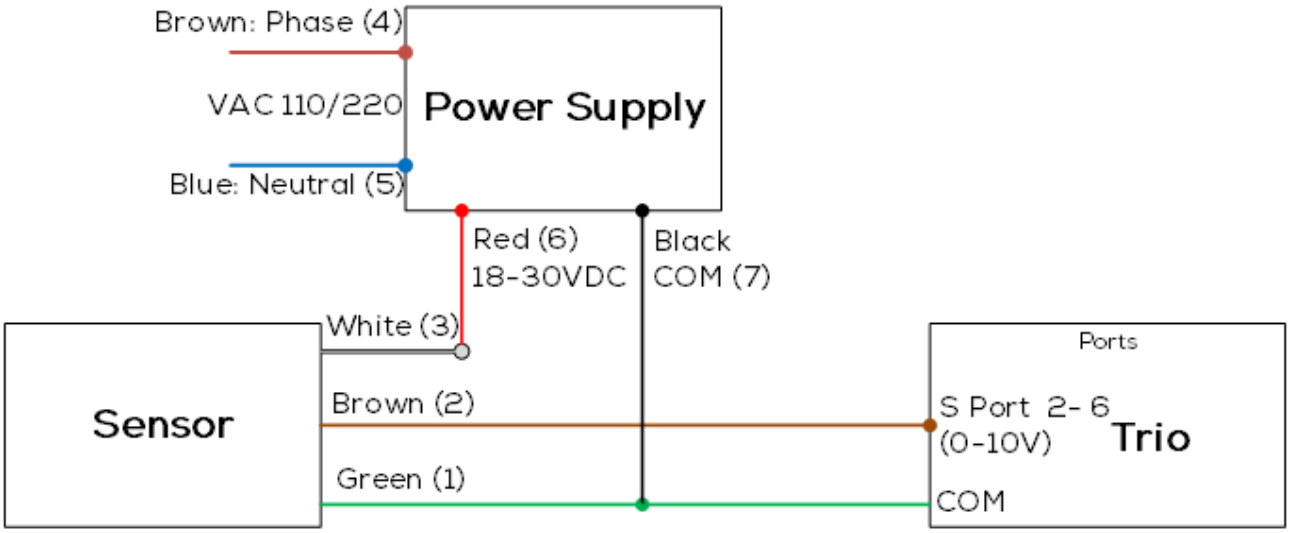


Figure 41: Ammonia Wiring Schematic

3.5.4.3.6 WOD Water Pressure Sensor Wiring

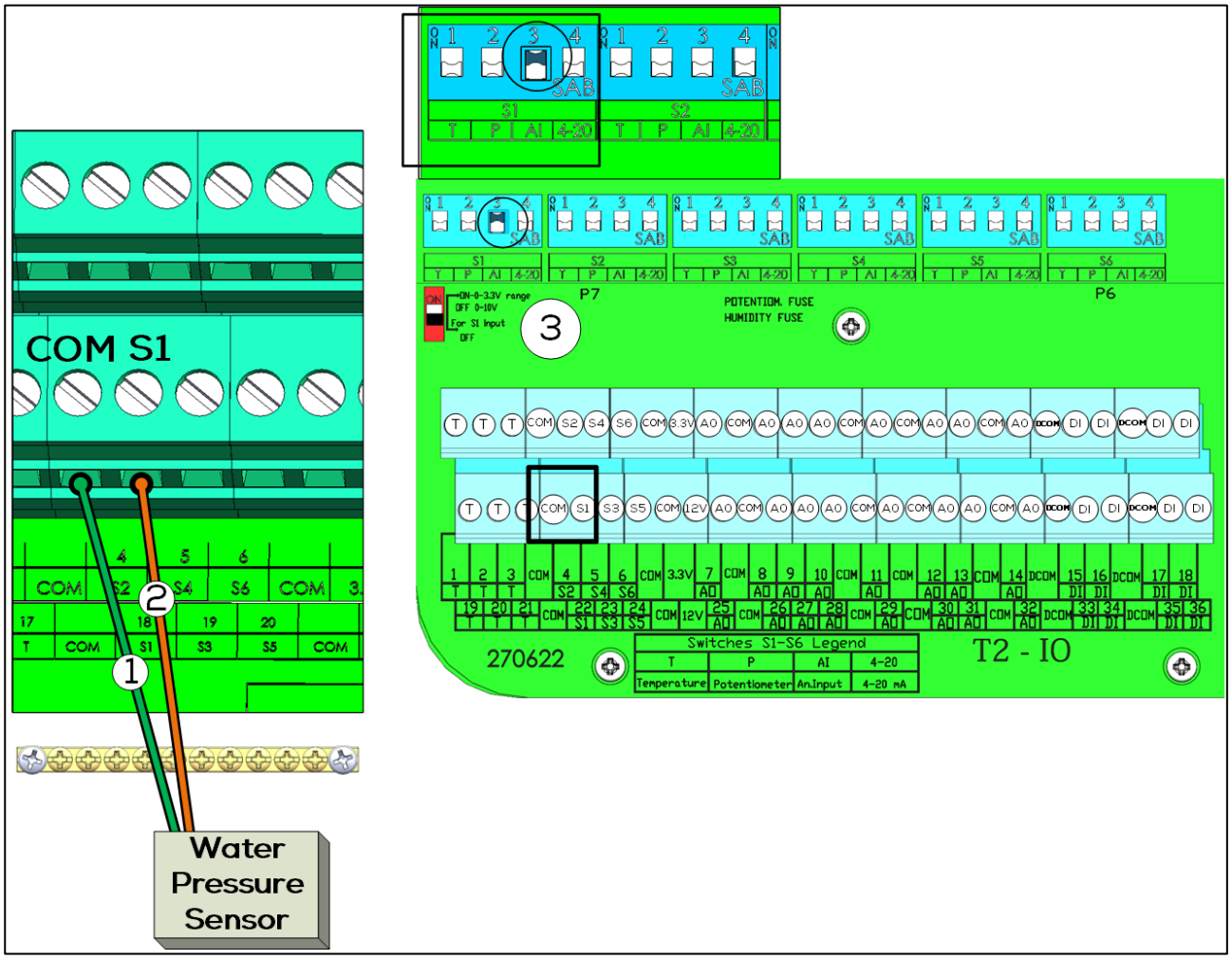


Figure 42: Board Wiring: WOD Water Pressure Sensor Wiring

Number	Function
1	COM port (Green wire)
2	S1 port (Brown wire) (The WOD Water Pressure sensor must be connected to the S1 port only).
3	Power switch

Figure 43: WOD Sensor Wiring Schematic

3.5.4.3.7 Light Sensor Wiring

Refer to the RLS Manual for more information.

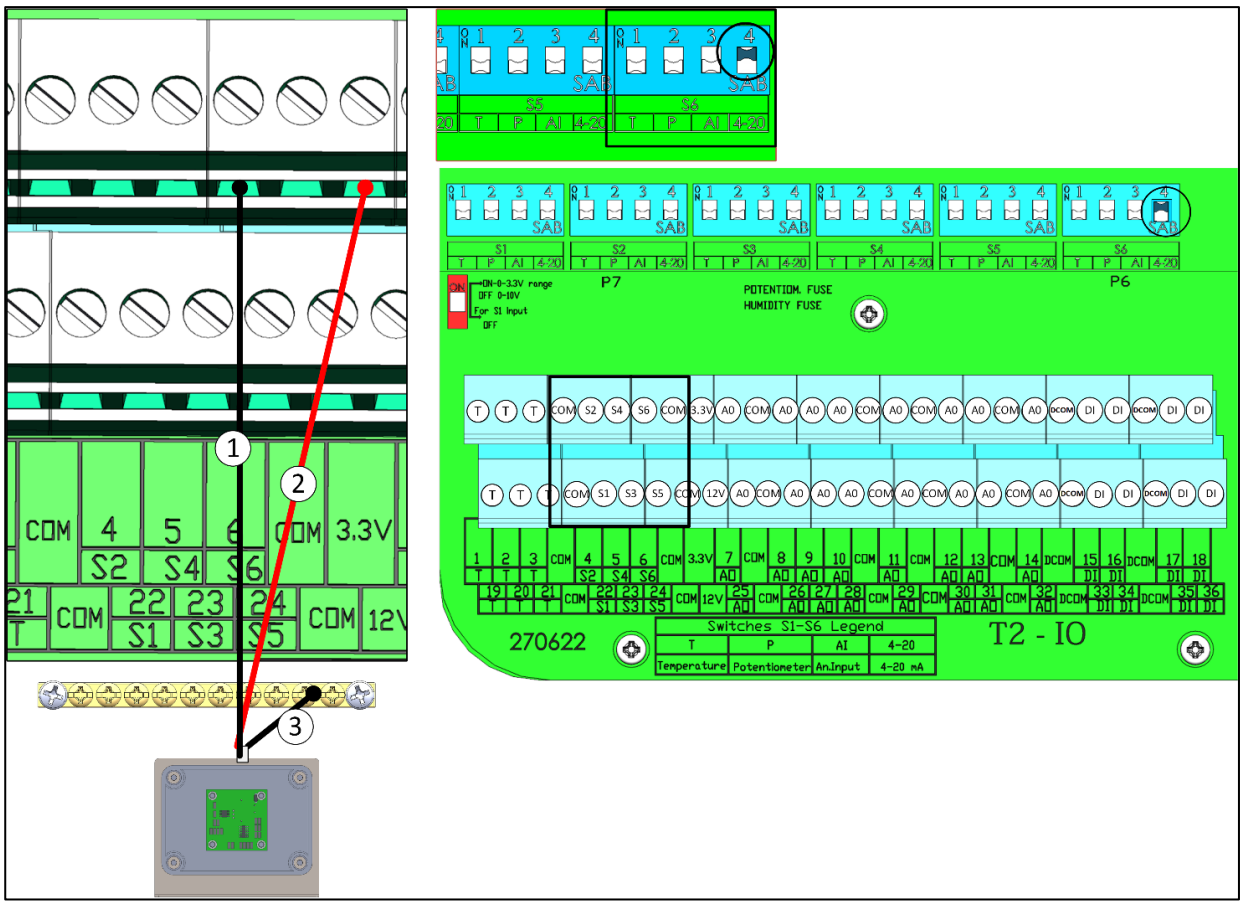


Figure 44: Light Switch Wiring

Number	Function
1	S port (black wire)
2	12V (red wire)
3	Shield wire

- Connect each RLS sensor to a:
  - S port. In the corresponding dipswitch, raise dipswitch 4 (4 -20 mA).
  - 12VDC port.
  - Grounding strip!

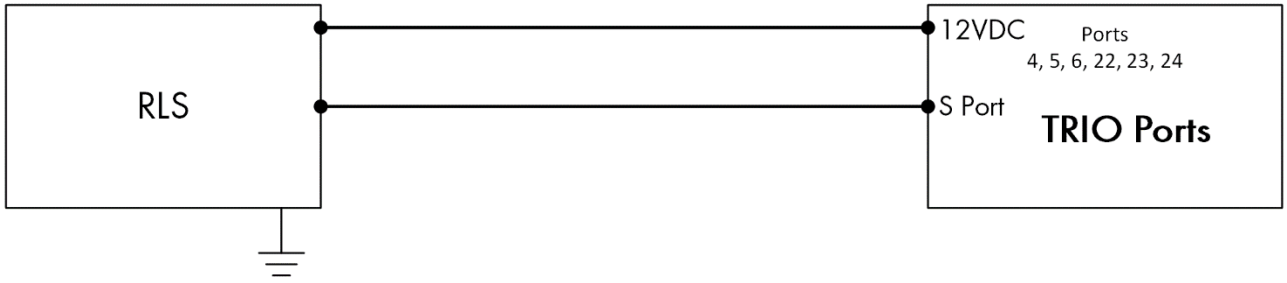


Figure 45: RLS Wiring Schematic

3.5.5 CARD WIRING

- Analog Output Devices
- Digital Input Devices
- Analog Input Devices
- Scale Card Devices

3.5.5.1 Analog Output Devices

Rotem Trio Controller's analog output card (C-P3-RAOC10) supports 10 outputs used to drive external units controlled by 0 – 10 VDC. The analog outputs card includes surge and lightening protection circuits and does not require external protections.

- Connect each device to an input port and a COM port.

CAUTION *Connect every analog output device's shield to the controller's safety ground!*

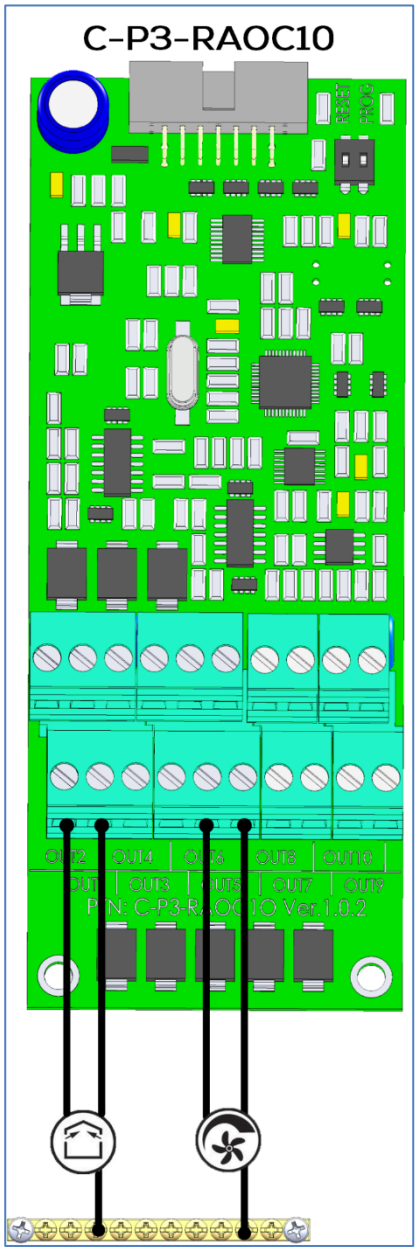


Figure 46: RAOC-10 Wiring

3.5.5.2 Digital Input Devices

- It is possible to connect the common of several sensors to the same connector. However, Munters recommends spreading the commons in an even manner.
- The Digital Input Card includes surge and lightening protection circuits and does not require external protections.
- Connect every device to an input port and a COM port.

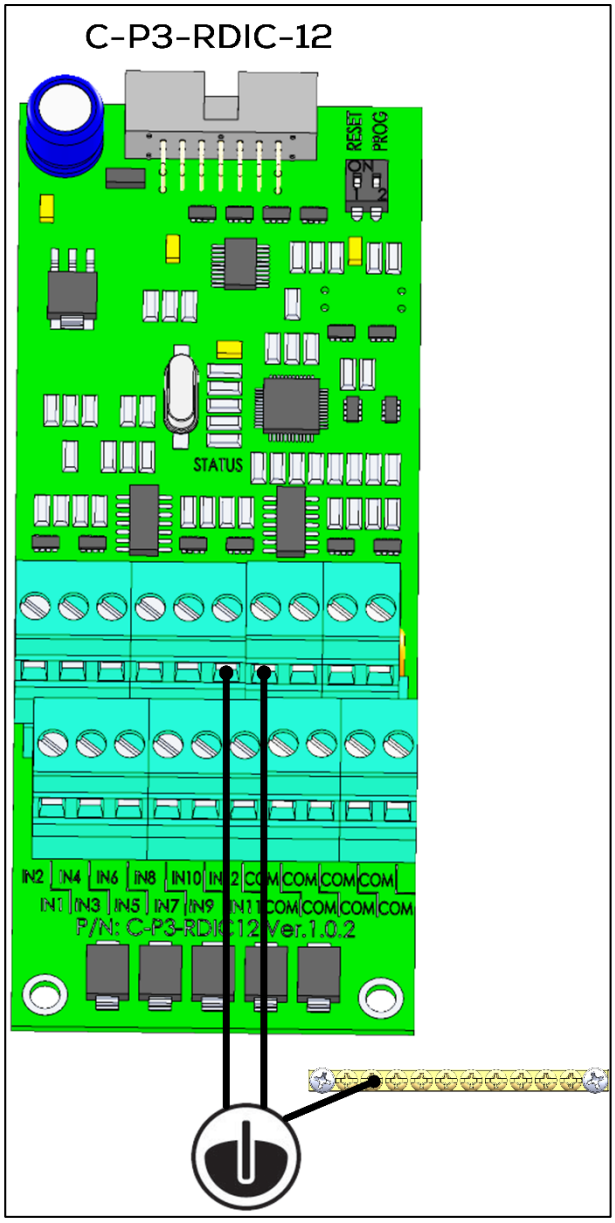


Figure 47: Digital Card Wiring

CAUTION *Connect every digital output device's shield to the controller's safety ground!*

3.5.5.3 Analog Input Devices

Rotem Trio Controller's analog input card (P/N: C-P3-RAIC12) supports up to 12 analog devices. The analog input cards include of surge and lightening protection circuits and do not require additional external protections.

- Use 22 AWG or lower, shielded cable only!
- **Connect every analog input device's shield to the controller's safety ground!**
- Every COM input is correct and more than one sensor can be connected to a COM input.

- Analog Card DIP Switches
- CO2 Sensor Wiring
- Temperature Sensor Wiring
- Humidity Sensor Wiring
- Potentiometer Device Wiring
- Ammonia Sensor Wiring
- Light Sensor Wiring

3.5.5.3.1 Analog Card DIP Switches

The RAIC-12 has the following ports:

- **T1 – T8**: Eight dedicated temperature sensor inputs
- **IN1 – IN4**: Four input ports defined using dip switches
- Four **COM** ports
- **+12V**: Two dedicated humidity sensor voltage (12V) ports
- **3.3V**: Two dedicated potentiometer voltage (3.3V) ports

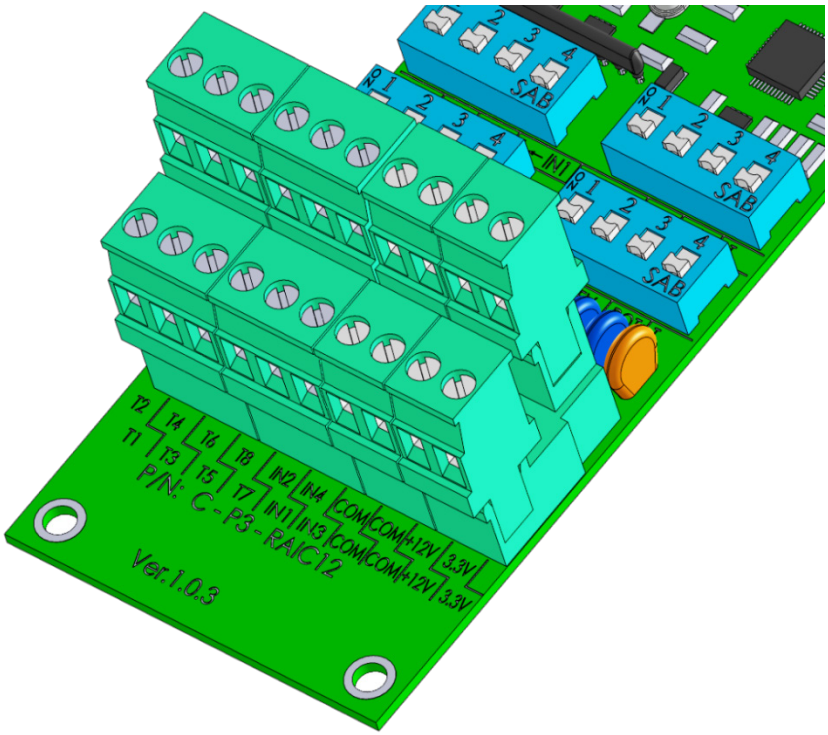


Figure 48: Analog Input Card Ports

To configure the IN1 – IN4 ports move **one** dip switch to **ON** in each set of ports.

CAUTION *Leaving all switches in the Off position or placing more than one switch in the On position in a set nullifies those functions!!*

- **DIP Switch 1**: 4 – 20 mA (CO2 and light sensors)
- **DIP Switch 2**: 0 – 5V (humidity)
- **DIP Switch 3**: Potentiometer and wind direction sensors
- **DIP Switch 4**: Temperature sensor

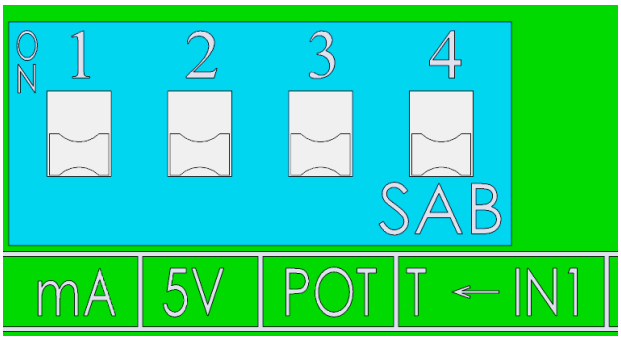


Figure 49: Dipswitches Expanded

3.5.5.3.2 CO2 Sensor Wiring

Refer to the CO2 Sensor Manual for details on installing this unit.

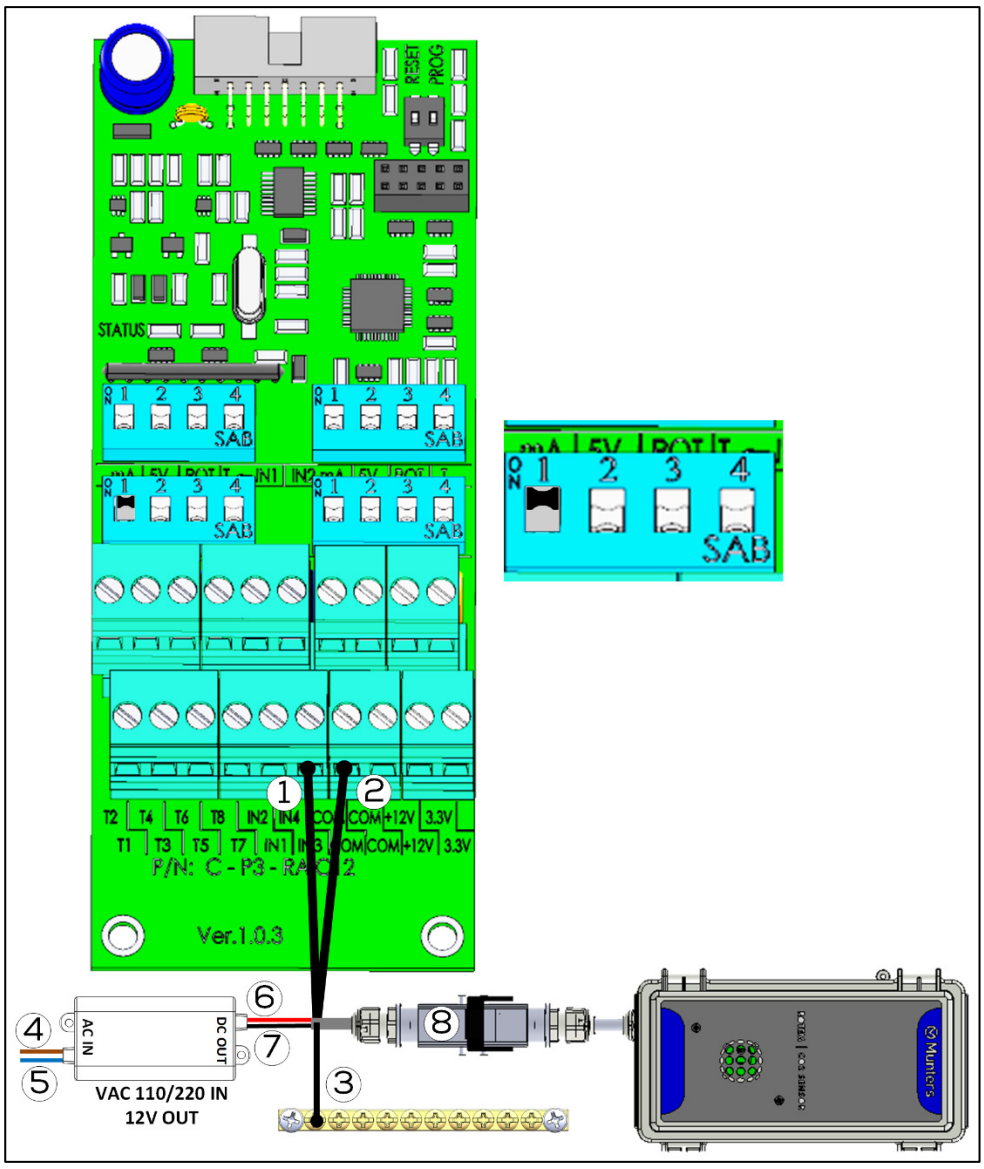


Figure 50: CO2 Sensor Wiring

1. Connect each sensor to an input and COM port.
2. **IN1 – IN4:** Turn DIP Switch 1 on each set as required.

Number	Function	Number	Function
1	IN port	5	Blue wire: neutral
2	COM port	6	Red wire: +12VDC
3	Shield wire	7	Black wire: -12VDC
4	Brown wire: phase	8	Connector

3.5.5.3.3 Temperature Sensor Wiring

An RTS Sensor can be connected to the analog input card via a dedicated temperature sensor port (Figure 50) or a data input port (Figure 51).

- Connect each RTS sensor to a T port and a COM port.

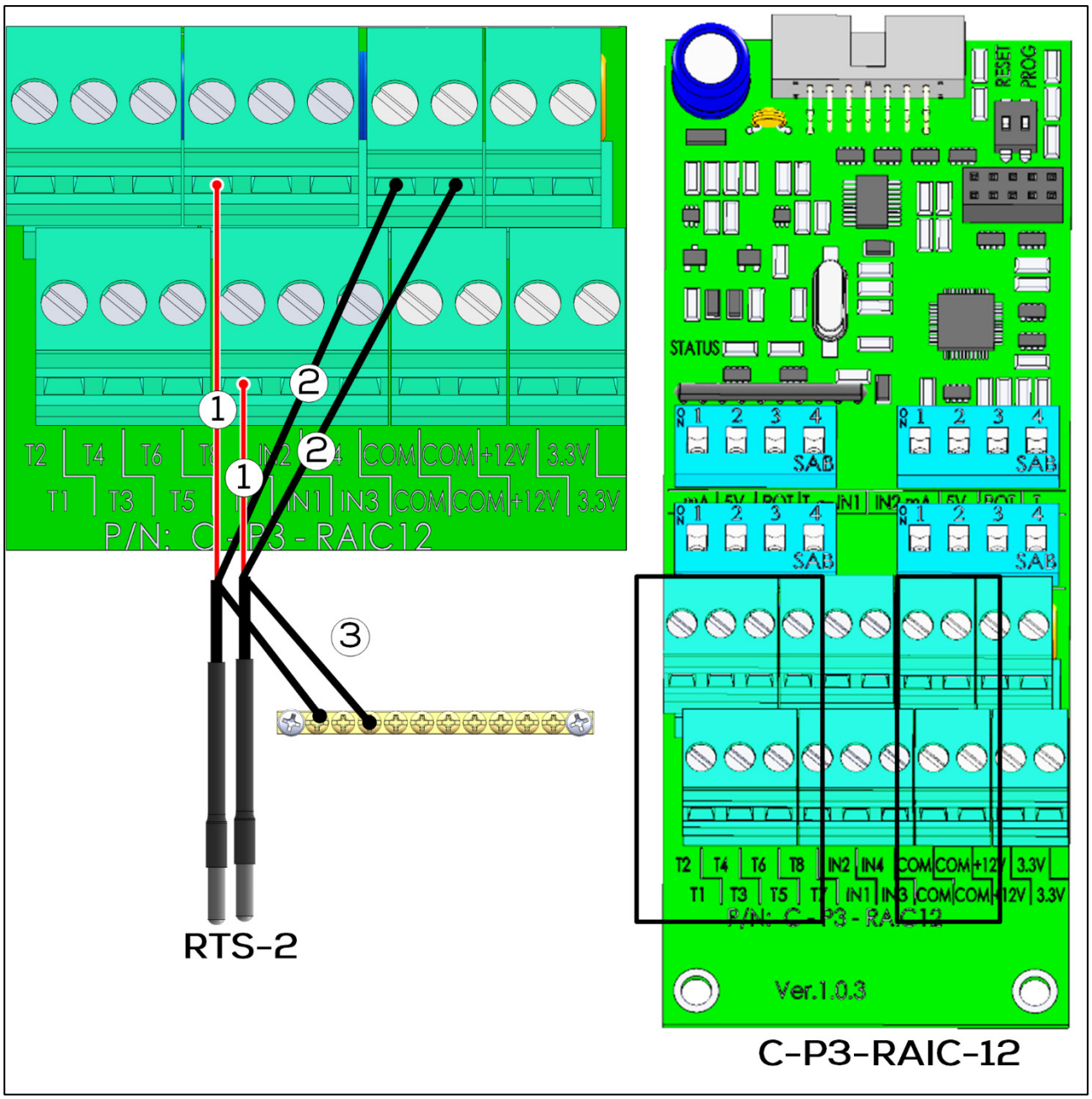


Figure 51: Card Wiring: RTS Wiring

Number	Function
1	COM port (black wire)
2	T port (red wire)
3	Ground wire

1. Connect each RTS sensor to a N port and a COM port.
2. **IN1 – IN4:** Turn DIP Switch 4 on each set as required.

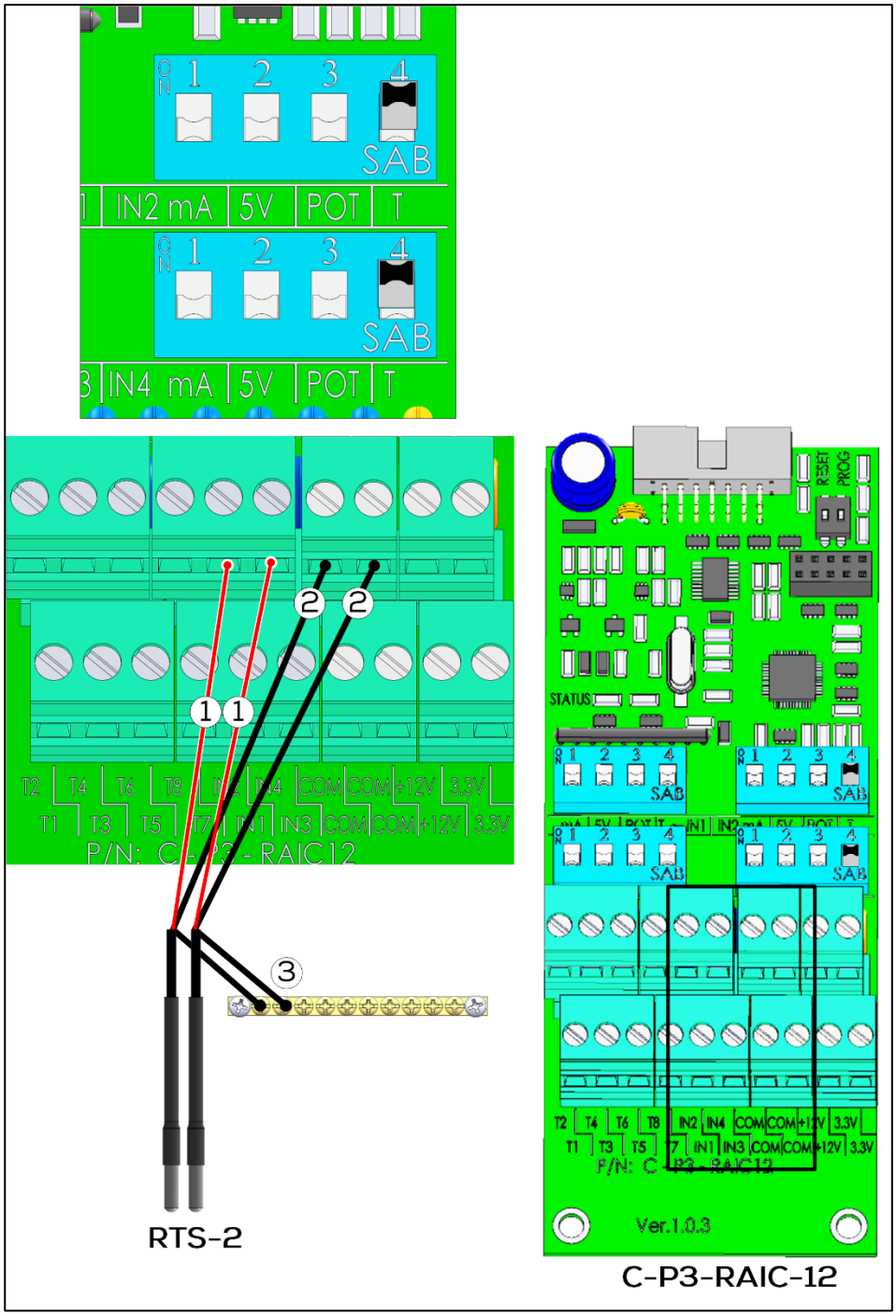


Figure 52: Card Wiring: RTS IN Port Wiring

Number	Function
1	IN port (red wire)
2	COM port (black wire)
3	Shield wire

3.5.5.3.4 Humidity Sensor Wiring

1. Connect each humidity sensor to input, a COM, and +12V port.
2. **IN1 – IN4:** Turn DIP Switch 2 on each set as required.

Figure 52 shows an example of a humidity sensor wiring setup.

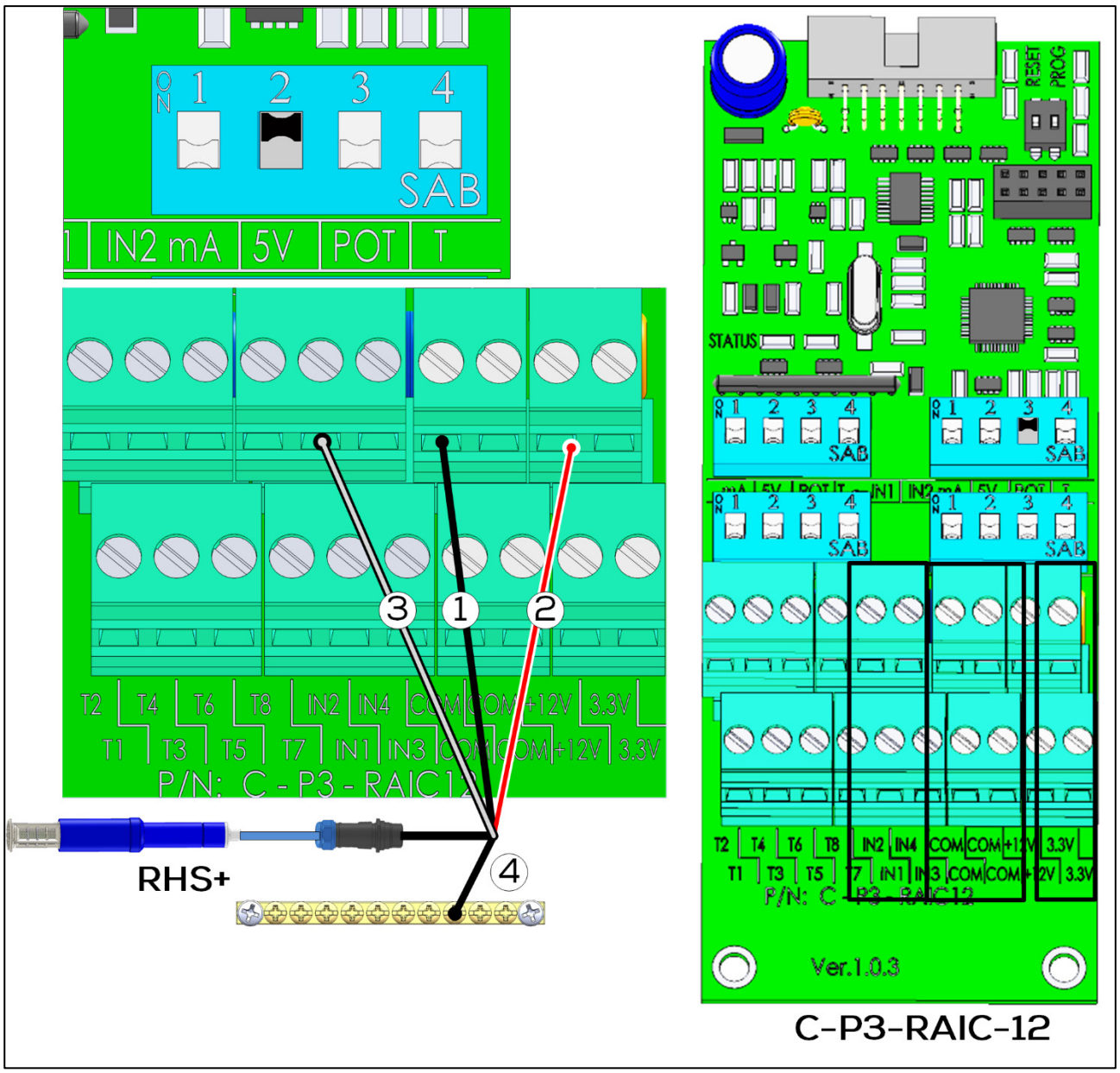


Figure 53: Humidity Sensor Wiring

Number	Function
1	COM port (black wire)
2	12V (red wire)
3	IN port (white wire)
4	Shield wire

3.5.5.3.5 Potentiometer Device Wiring

1. Connect each potentiometer (10 - 20 KOhm) to an input, a COM, and 3.3V port.
2. **IN1 – IN4:** Turn DIP Switch 3 (**POT**) on each set as required.

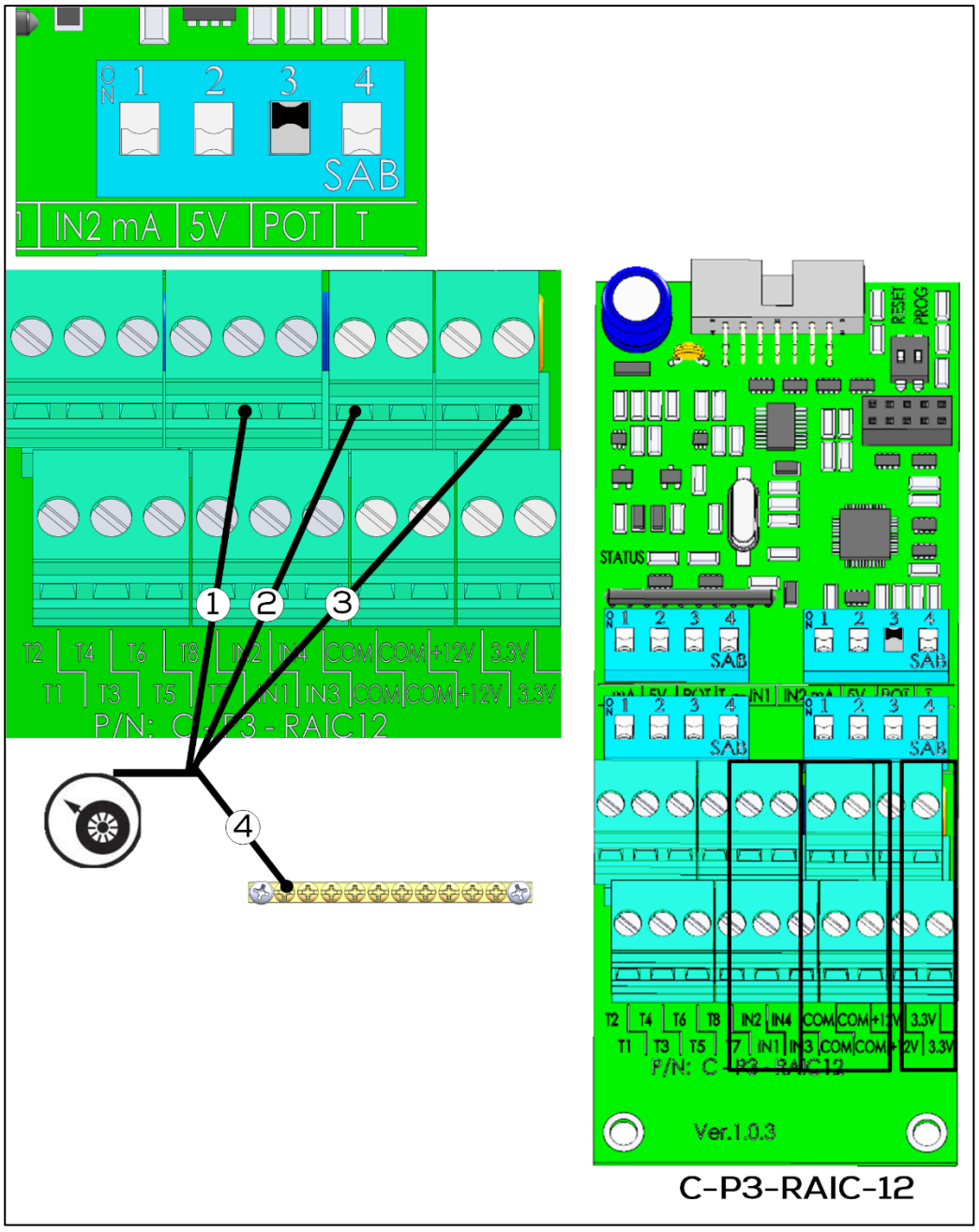


Figure 54: Potentiometer Wiring

Number	Function
1	In port
2	COM port
3	3.3 port
4	Shield wire

3.5.5.3.6 Ammonia Sensor Wiring

Refer to the Ammonia Sensor manual for further information.

- On the Analog Input Card, set the corresponding dipswitch to the 5V position (dipswitch 2).

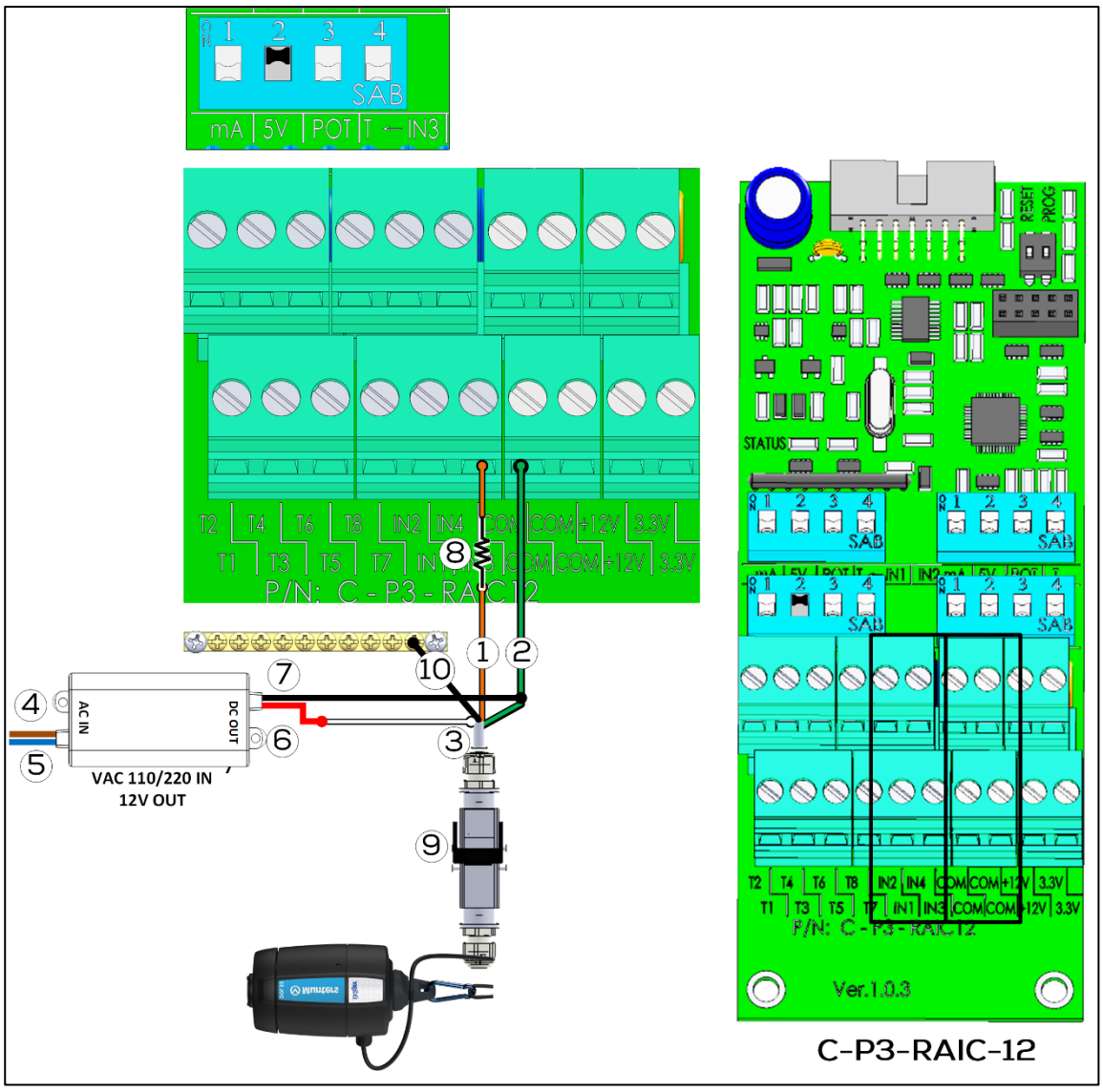


Figure 55: Card Wiring: Ammonia Sensor Wiring

Number	Function	Number	Function
1	IN port (Brown wire)	6	18-30VDC (Red wire)
2	COM port (Green wire)	7	COM (Black wire)
3	White wire	8	20.3 kohm resistor (Note: The resistor comes supplied with the sensor but must be installed on-site)
4	Phase (Brown wire)	9	Connector
5	Neutral (Blue wire)		

3.5.5.3.7 Light Sensor Wiring

Refer to the RLS Manual for more information.

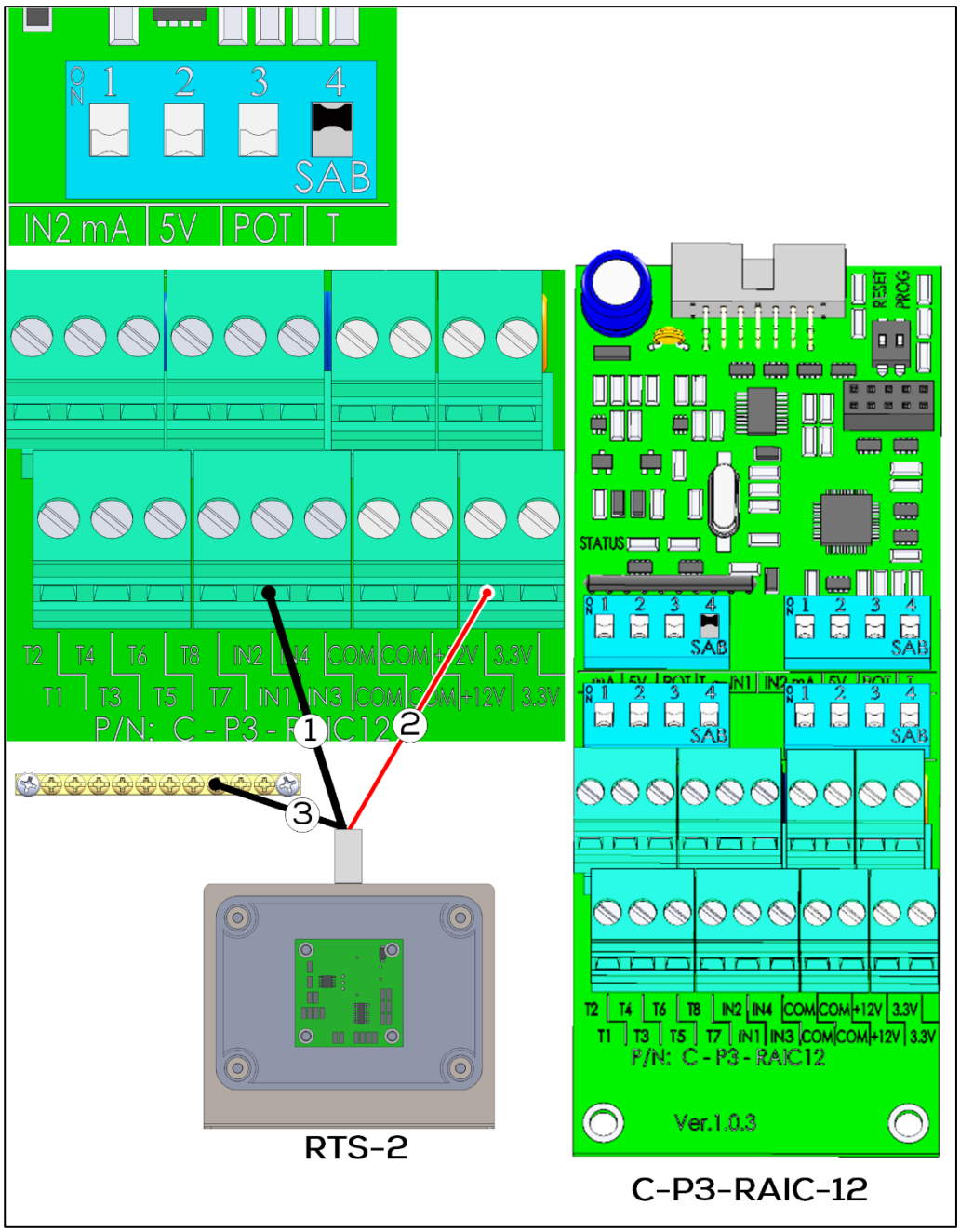


Figure 56: Card Wiring: Light Sensor Wiring

Number	Function
1	IN port (black wire)
2	12V (red wire)
3	Shield wire

3.5.5.4 Scale Card Devices

- Bird Scale Wiring
- Silo Wiring

3.5.5.4.1 Bird Scale Wiring

If you install a scale card, perform a cold start. Refer to the user manual.

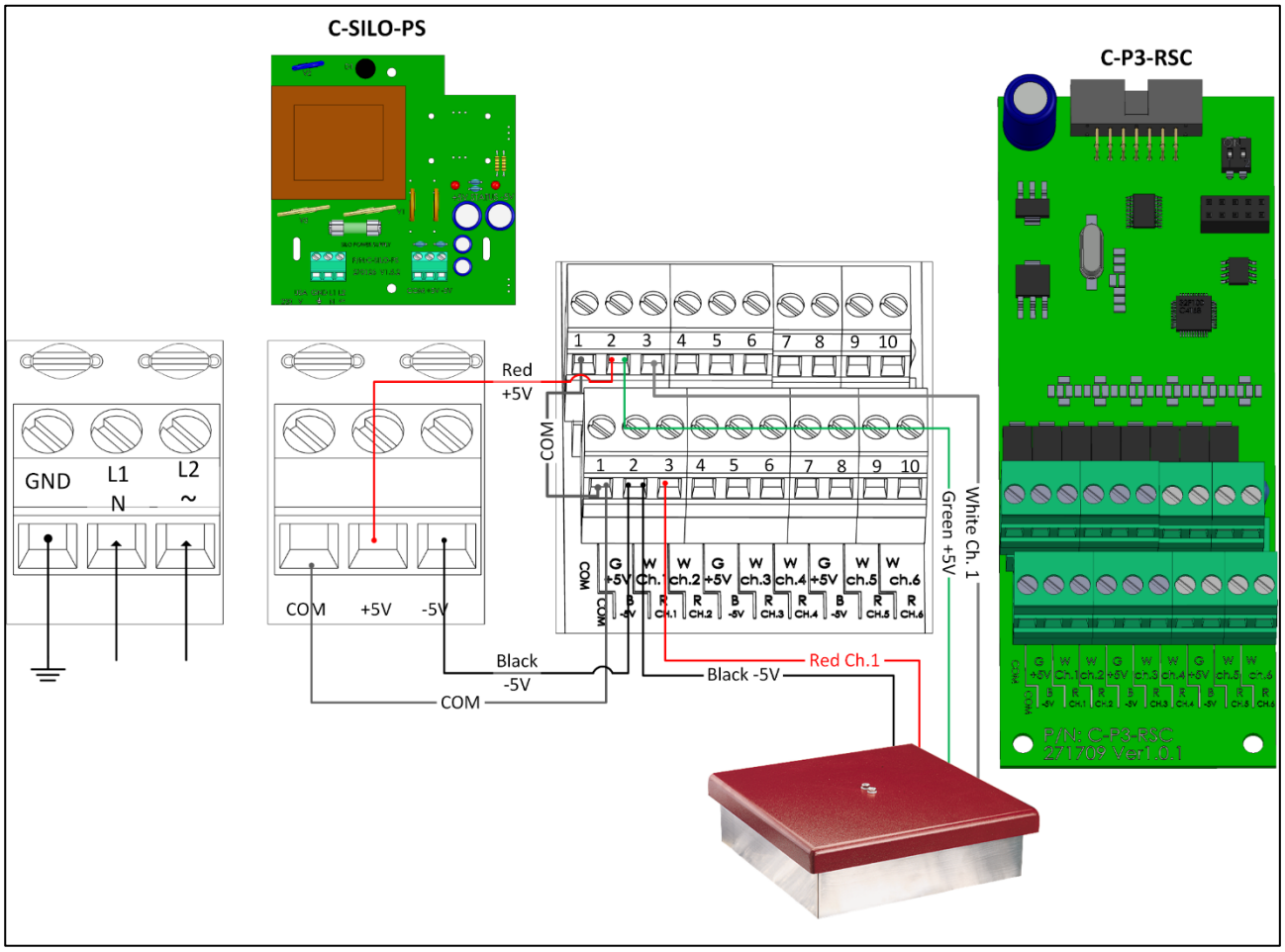


Figure 57: Scale Card wiring to Power Supply and Bird Scale

3.5.5.4.2 Silo Wiring

Wire the TRIO to an RJB-6 Junction Box and power supply. For details on how to wire the Junction Box to the load cells, refer to the RJB manual.

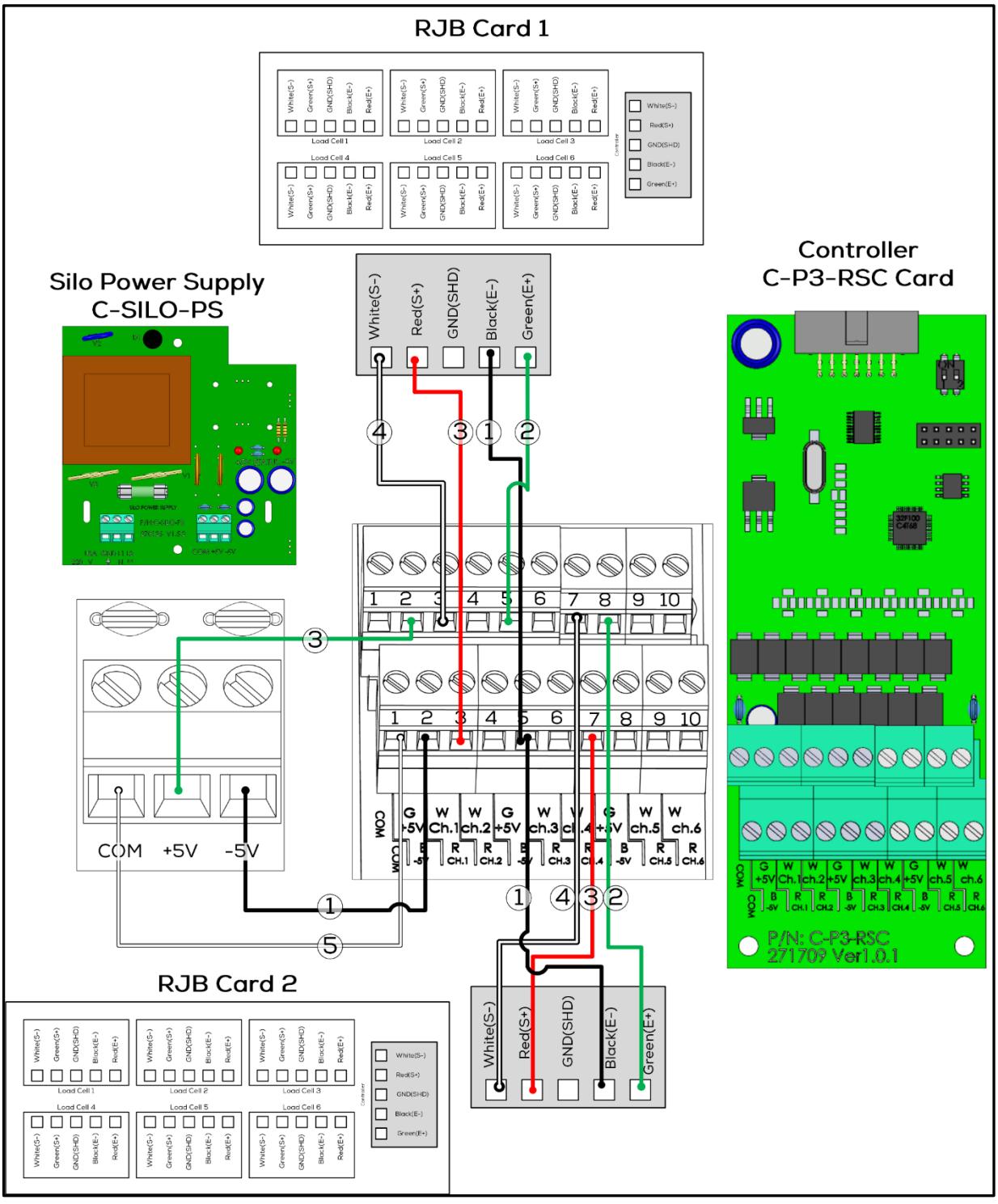


Figure 58: Scale Card wiring to Power Supply and RJB

RJB Wire	RSC Ports	RJB Wire	RSC Ports
Green	2, 5, 8 (Upper)	White	3, 4, 6, 7, 9, 10 (Upper)
Black	2, 5, 8 (Lower)	Red	3, 4, 6, 7, 9, 10 (Lower)
Note: Connect each RJB white and red wire to matching ports. For example White Ch.1 and Red Ch.1			

3.5.6 TRIO RPS

Trio RPS serves as a second static pressure sensor for the Rotem Trio Controller. The following section details the installation. Trio supports up to two static pressure sensors, one built in and one external. Install the RPS in the second room.

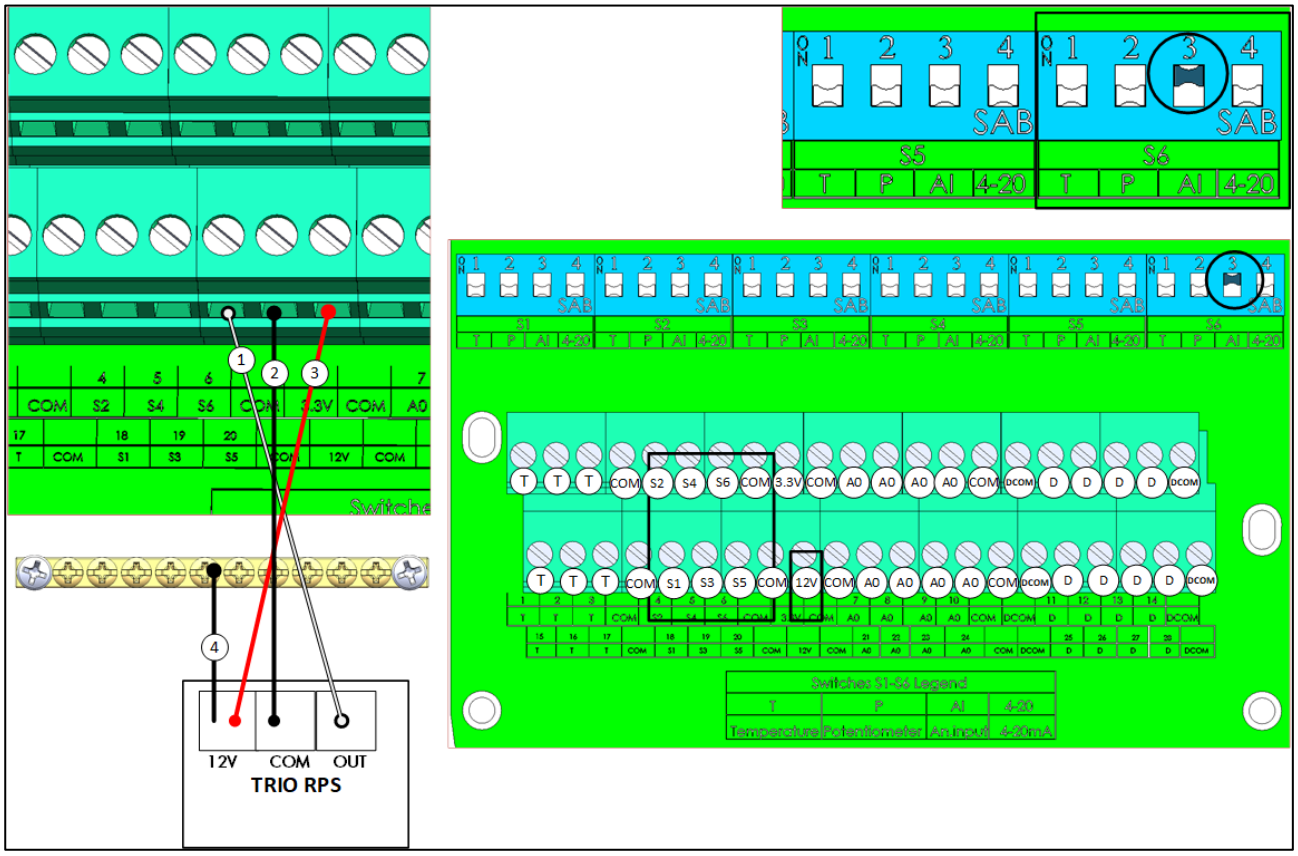


Figure 59: RPS Wiring

Number	Function
1	S port. Raise the corresponding S3 dipswitch.
2	COM port
3	12V
4	Shield wire

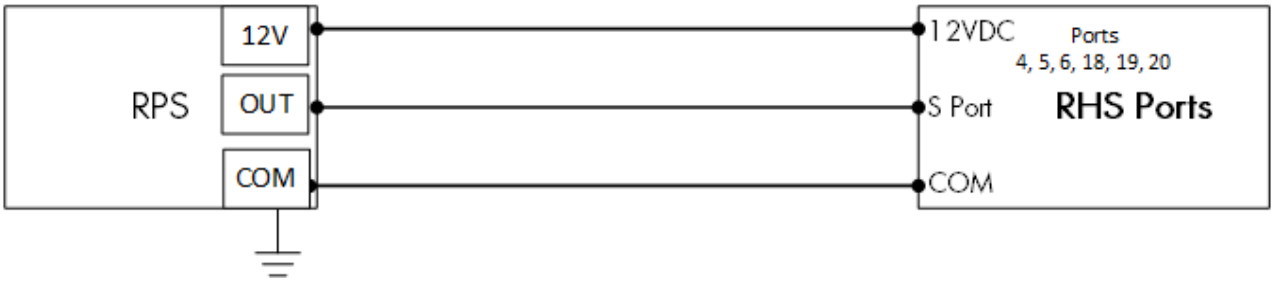


Figure 60: RPS Wiring Schematic

NOTE After installing the RPS, no Cold Start is required.

3.5.7 RSU WIRING

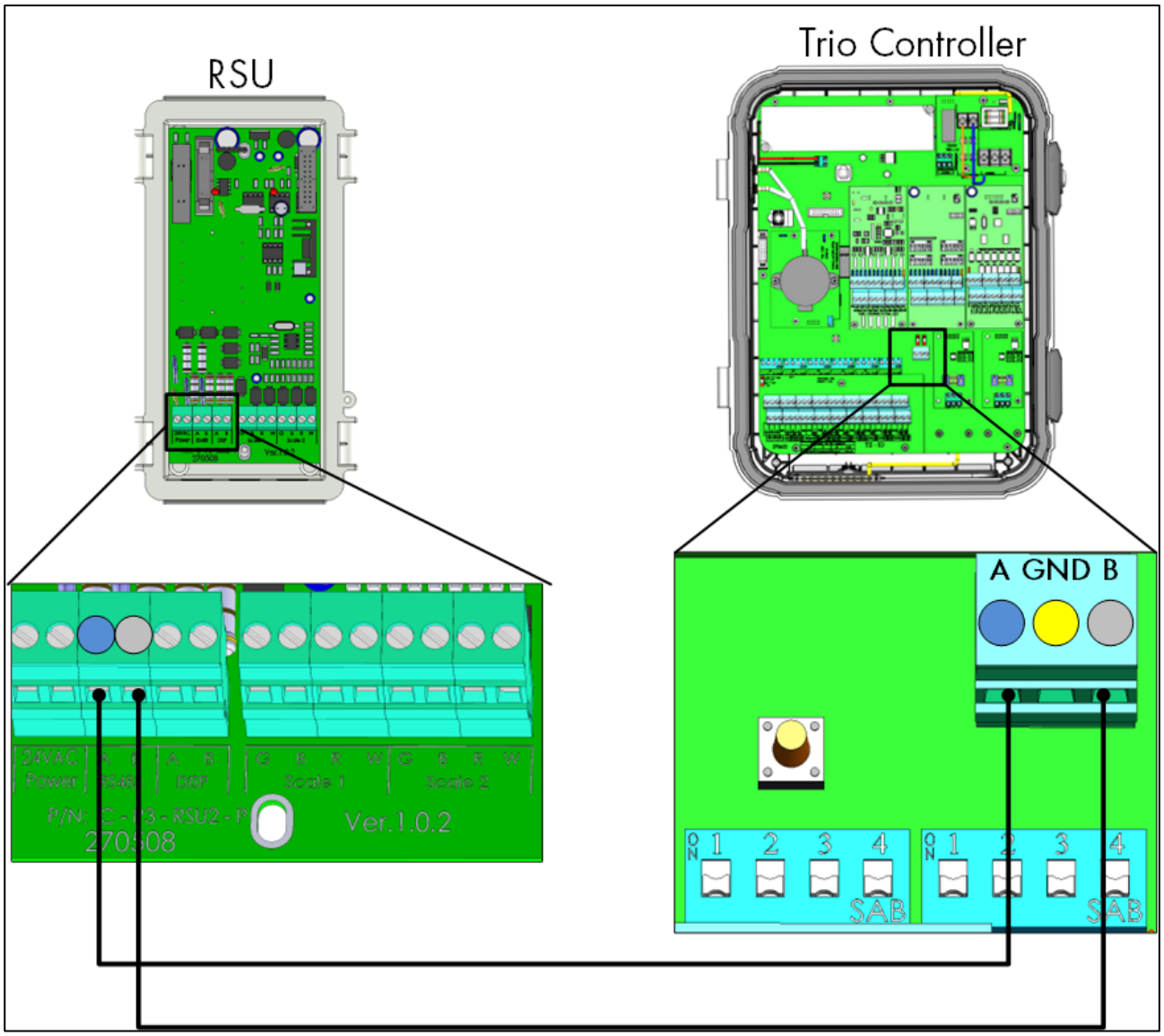


Figure 61: Trio – RSU Wiring

3.6 Termination

Termination, installing or enabling 120-ohm termination resistors at the beginning and end units of a chain, ensures reliable communication in RS-485 infrastructures.

Termination is recommended when the distance between Trio and the final device in the chain is more than 50 meters/165 feet. Trio and Trio Expansion come with a switch to enable termination; an external resistor must be installed on the RSU communication card. Termination may not be required in shorter installations.

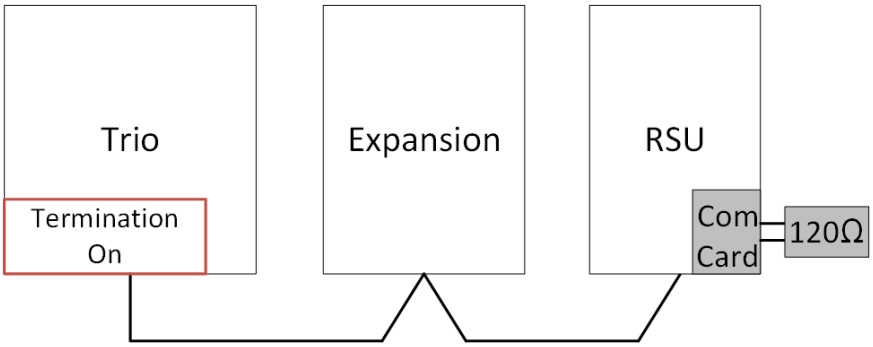


Figure 62: Termination Sample Topology

3.7 Pressure Sensor Hoses

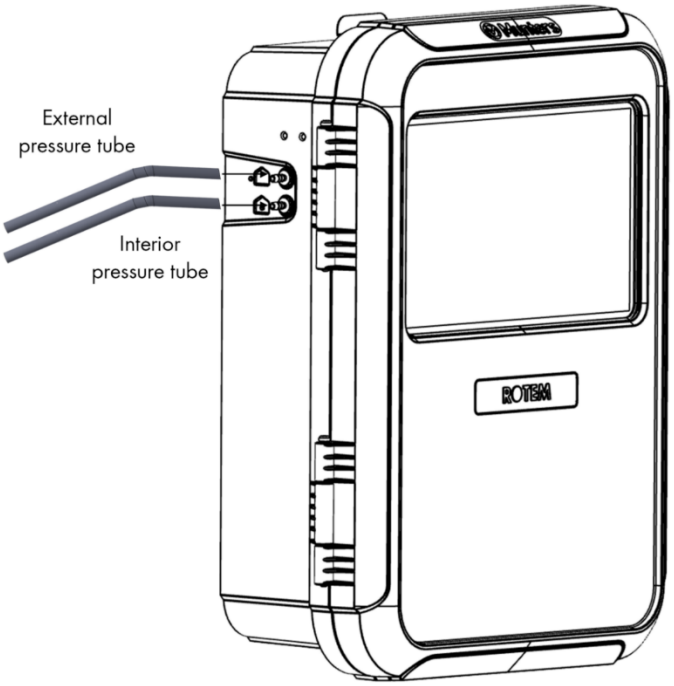
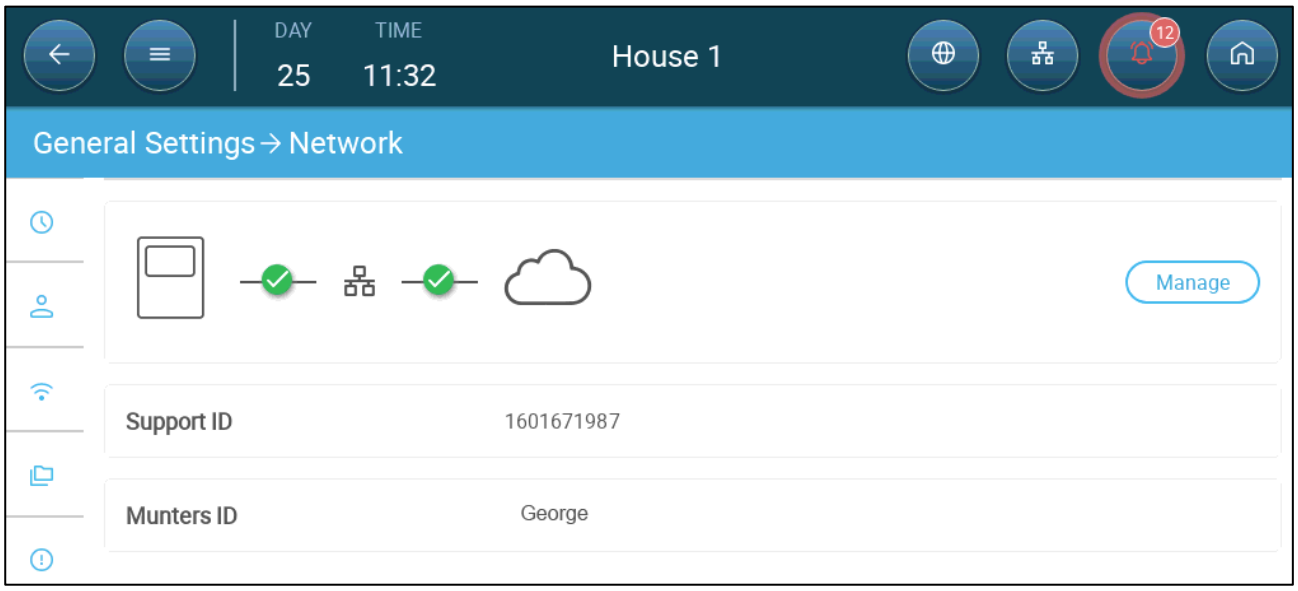


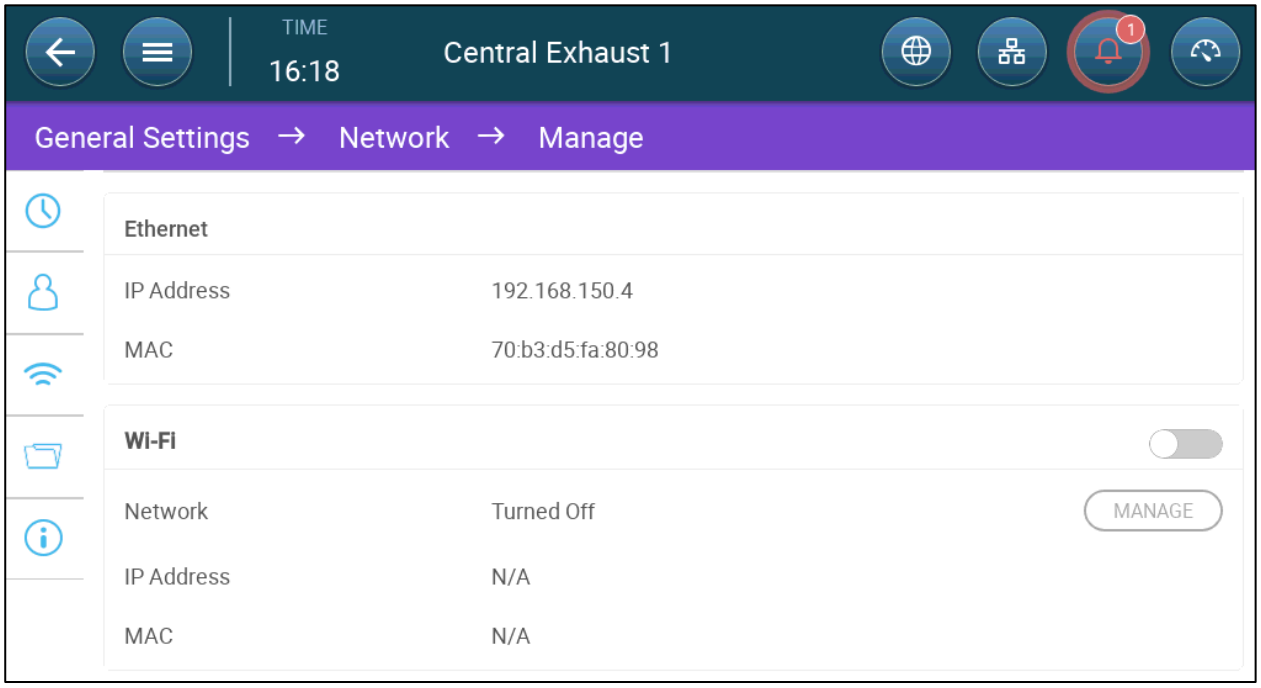
Figure 63: Static Pressure Hoses

3.8 Tech Support/Wi-Fi

To view your unit's network information go to System › General Settings › Network . You will need this information when speaking with technical support.



- Click Manage.



  - Ethernet fields are read-only information.
  - Enable Wi-Fi if required.

4 Specifications

4.1 Rotem Trio Expansion 70 Specifications

Description	Specification
Input Power Voltage	• 100 - 240 VAC • 1.0 A, 50/60 Hz
Relay Rating	15A
Normally Open Relays	• Non Fused • 70% of relays can operate simultaneously (maximum) • 200 - 240 VAC max load: 2HP (6.25A during continual operation, up to 30A at startup) • 100 -130 VAC max load: 1HP (5.8A during continual operation, up to 30A at startup)
Normally Close Relays	• Non Fused • 70% of relays can operate simultaneously (maximum) • 200 - 240 VAC max load: 1HP (3A during continual operation, up to 20 Amp at startup) • 100 -130 VAC max load: 0.SHP (2.9A during continual operation, up to 20A at startup)
CAUTION *Switching loads over 10A reduces a relay's life span (from 100,000 operations to ~10,000 operations).*	
Operating Temperature Range	32° to 125° F (0° to +50° C)
Dimensions (H x W x D)	26 x 19 x 9.7 in (665 x 484 x 247 mm)
Environmental Specifications	• Altitude: -400 m to 2000 m • Relative Humidity: 20% - 90% • Main supply voltage fluctuation up to +10 - 20% • Overvoltage category II • PD: 2

Description	Specification
Enclosure	• IP: 52 • Indoor use only
Fuses	Fuse F1 and F4 on PS card: 5A, 250V

4.2 Rotem Trio Controller Specifications

Description	Specification
Input Power Voltage	• 100 – 240 VAC • 50/60 Hz
Input AC Power	0.75A
Analog Inputs	0 – 3.3 Volts
Analog Output	0 - 10 Volts; maximum load: 20 mA
Digital Inputs	3.3 Volts, 1.5 mA, dry contact
Communication	LAN – Standard 10/100 BaseT
Operating and Storage Temperature Range	-10° to +50° C (+14° to +125° F)
Environmental Specifications	• Altitude: -400 m to 2000 m • Relative Humidity: 20% - 70% • Main supply voltage fluctuation up to 5% • Overvoltage category II • PD: 2
Enclosure	• IP: 52 • Indoor use only
Dimensions (H/W/D)	16 x 13 x 5.6 inches (403 x 324 x 141 mm)
Fuses	Fuse F2 on PS card: 3.15A, 250V
Certification	

4.3 Electrical Notes

- **Disconnection device/overcurrent protection**: In the building installation, use a certified 2-pole circuit breaker rated 10A, certified in accordance with the IEC standard 60947-2 (in the US and Canada use a Listed Brach Circuit protective circuit breaker). This step is required to provide overcurrent protection and mains disconnection. The circuit breaker must be easily accessible and marked as the controller disconnect device.

- **Main supply voltage**: Permanently connect the controller to the mains in accordance with the relevant national code. Relays must be suitably protected against overcurrent, using a circuit breaker rated at 10A.
- **Keep the units closed and locked. Only authorized personnel should open and close the units.**

4.4 Devices Specifications

Table 8: Summary

I/O type	Qty
Analogue Output	16
Analugue Input	16
Digital Input	8
Temperature Sensors	16
Relays	70

Table 9: Output Devices

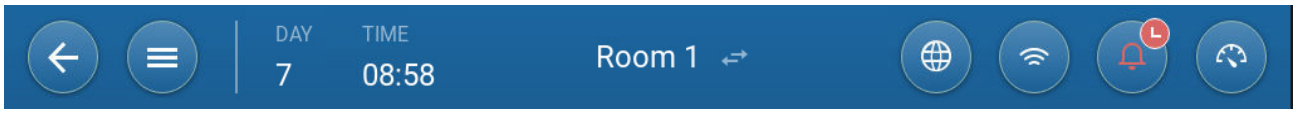
Device type	Maximum Number of Devices	Number of Relay Devices	Number of Analog Devices
Cooling	4	4	N/A
Foggers	4	4	N/A
Heaters	16	16	16
High Heaters	16	16	16
Inlets	4	4	4
Outlets	1	N/A	1
Tunnel Doors/Curtains	4	4	4
Fans Exhaust/Tunnel	30	30	30
Stir Fan	2	2	2
Timer	5	5	N/A
Auger	2	2	N/A
Feeder	4	4	N/A
Lighting	4	4	4
As Relay	70	70	N/A

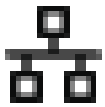
As Analog Output	16	N/A	16
Alarm	1	1	N/A

Table 10: Sensors

Device type	Analog Sensors	Digital Sensors
Temperature Sensors	16	N/A
Humidity Sensors Inside	2	N/A
Humidity Sensor Outside	1	N/A
CO2 Sensors	1	N/A
Ammonia Sensors	1	N/A
Pressure Sensors	1	N/A
Lux Meter (Non-USA)	1	N/A
Bird Scale	4	N/A
Silo Scale	4	N/A
Potentiometers	4	N/A
Water Meters	N/A	4
Gas Meters	N/A	3
Augur Sensor	N/A	2
Feeder Line Sensor	N/A	4
Feed Weighing by Pulse	N/A	2
RSU	N/A	2
RLED-2	2	N/A

5 Using the Trio Touch Screen



	Go back to the previous screen
	View the Main menus
	Choose language
 	Network settings
	View alarms
	Go back to the main screen
	Settings icon
	Edit parameters
	Replace the dashboard battery with a **RENATA-CR2450N** battery.
	Click this icon to delete data stored on that page.

Phone App	
	Click the circle containing the user name to edit personal preferences such as the language, units, name, and more.
	When a Trio controls two or more rooms or there are two or more houses on a farm, Send to All enables editing certain select functions in more than one room or house. Edit the setting, click Send to All, and select the required Trios. The select rooms' or houses' settings are updated. Note: Send to All does not appear on every screen.

6 Output Devices

NOTE *Munters recommends that a trained technician perform the following operations.*

➲ **Perform a cold start (System › General Settings › About › Reset Factory Settings) after:**

- connecting all devices to the Rotem Trio Expansion 70 and Rotem Trio Controller
- connecting the Rotem Trio Expansion 70 to the Rotem Trio Controller

- Understanding the Devices and Sensors Screen
- Using the Mapping Screen
- Editing Relays and Sensors
- Defining Sensors
- Defining Devices
- Mapping the Weighing Devices
- Defining the Trio RPS
- Testing Devices

6.1 Understanding the Devices and Sensors Screen

The Device and Sensors screens shows:

- Trio screen: This screen displays the digital/analog input/analog output ports. What appears on this screen depends on each unit's particular setup.
- Relay screen: This screen displays the Rotem Trio Expansion 70's relays.

Figure 63 and Figure 64 display a setup but each particular setup can be different.

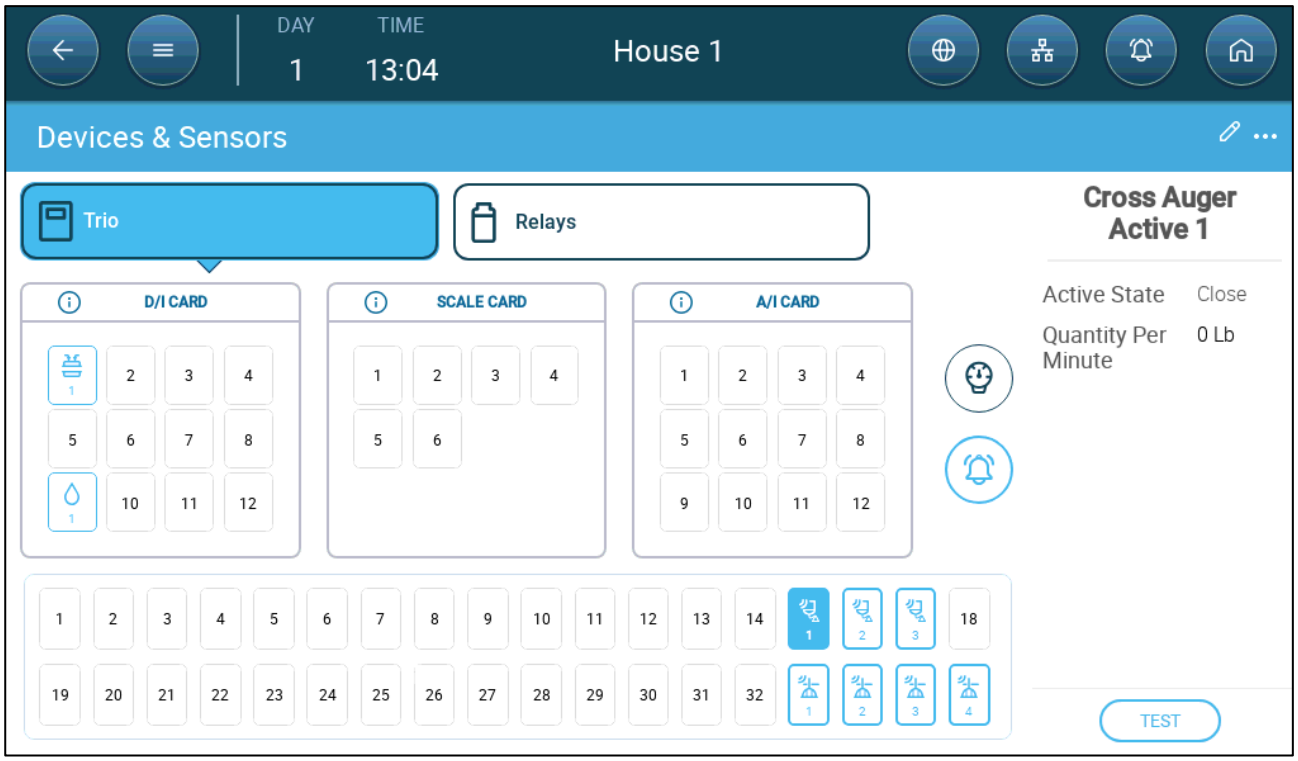


Figure 64: Low voltage input/output ports (example)

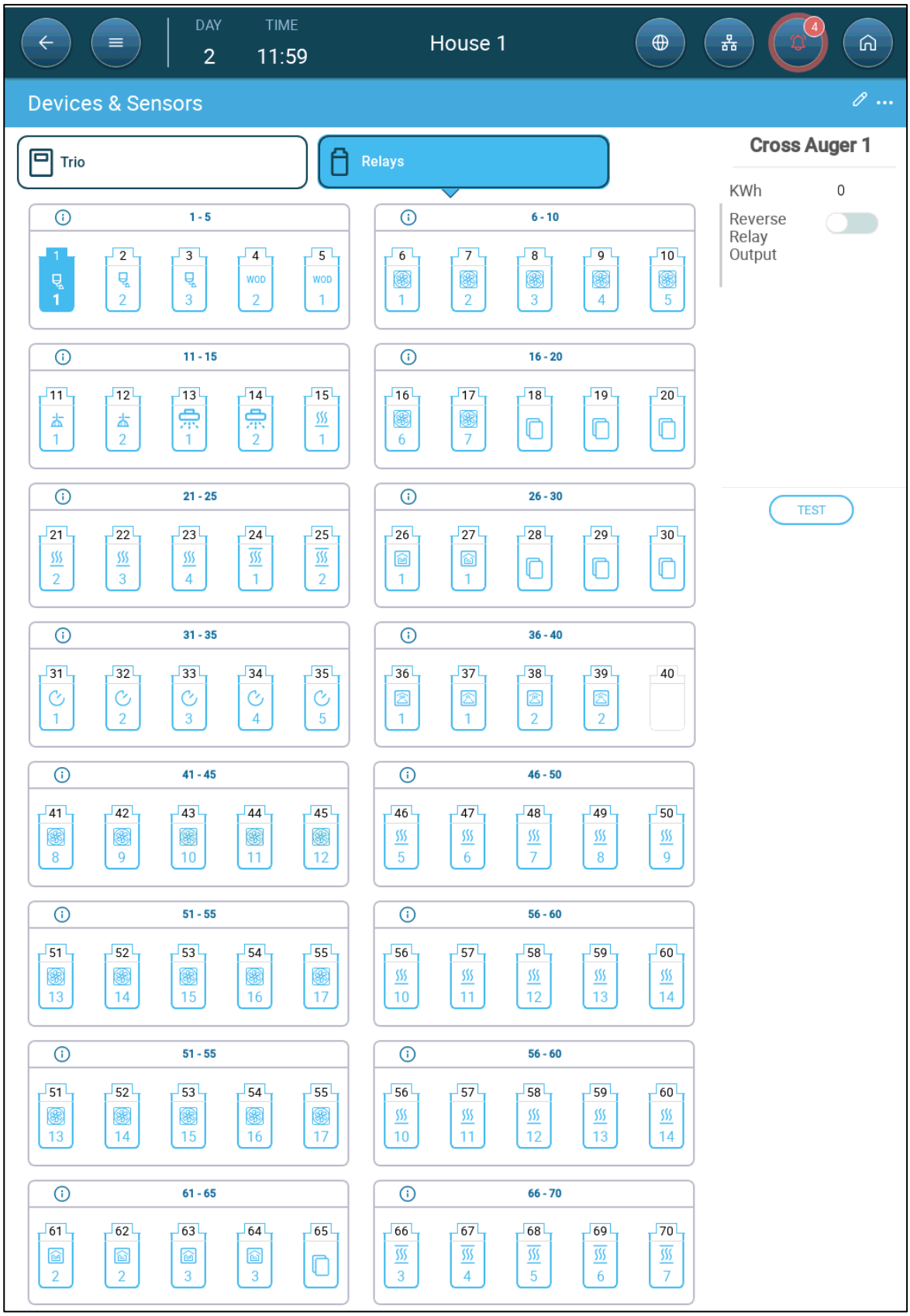


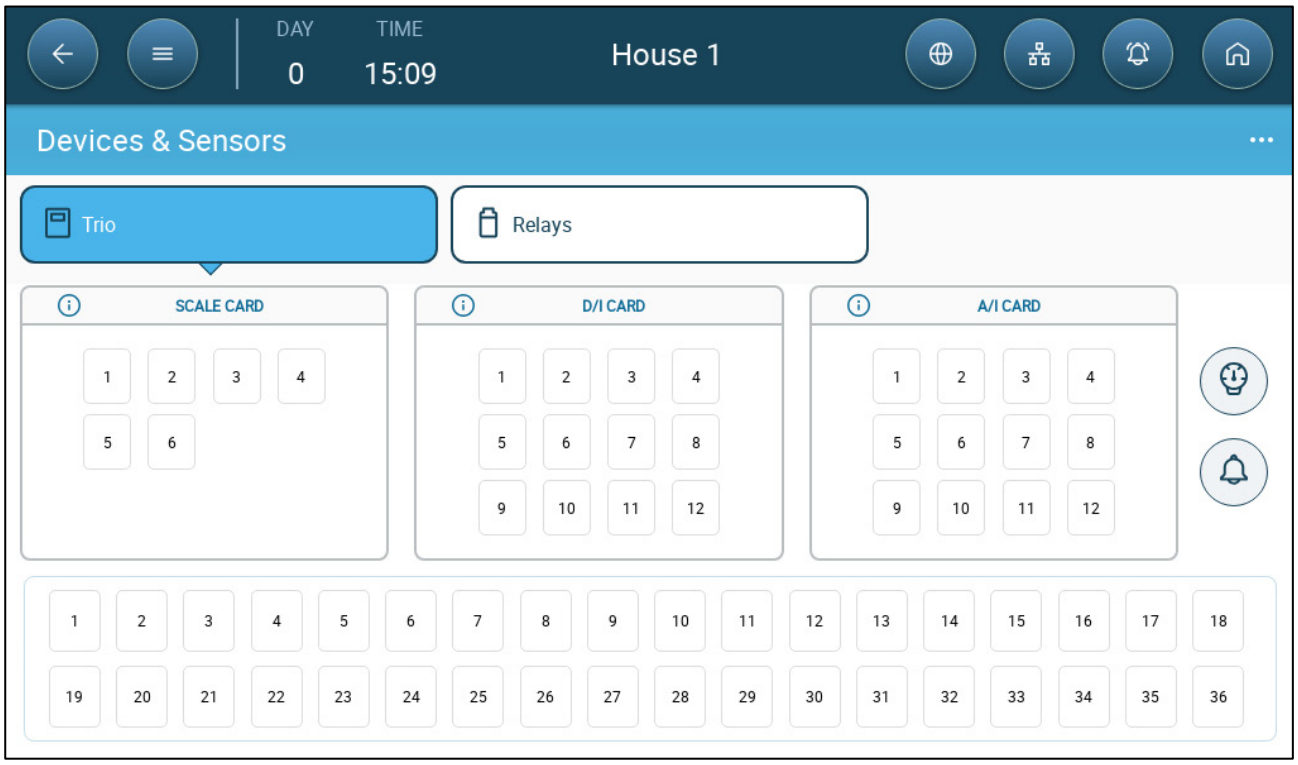
Figure 65: High voltage ports (example)

6.2 Using the Mapping Screen

After wiring devices to the Trio, each device and sensor must be mapped and then defined. Mapping and defining devices enable the system software to control each device's functionality.

CAUTION *Mapping MUST match the physical wiring! An error message appears if the physical device is not wired to the relay or port as defined on the mapping screen.*

1. Go to System › Device & Sensors.



This screen displays the relays and analog/digital ports. At this point all, icons are undefined.

2. Click the Installation icon 

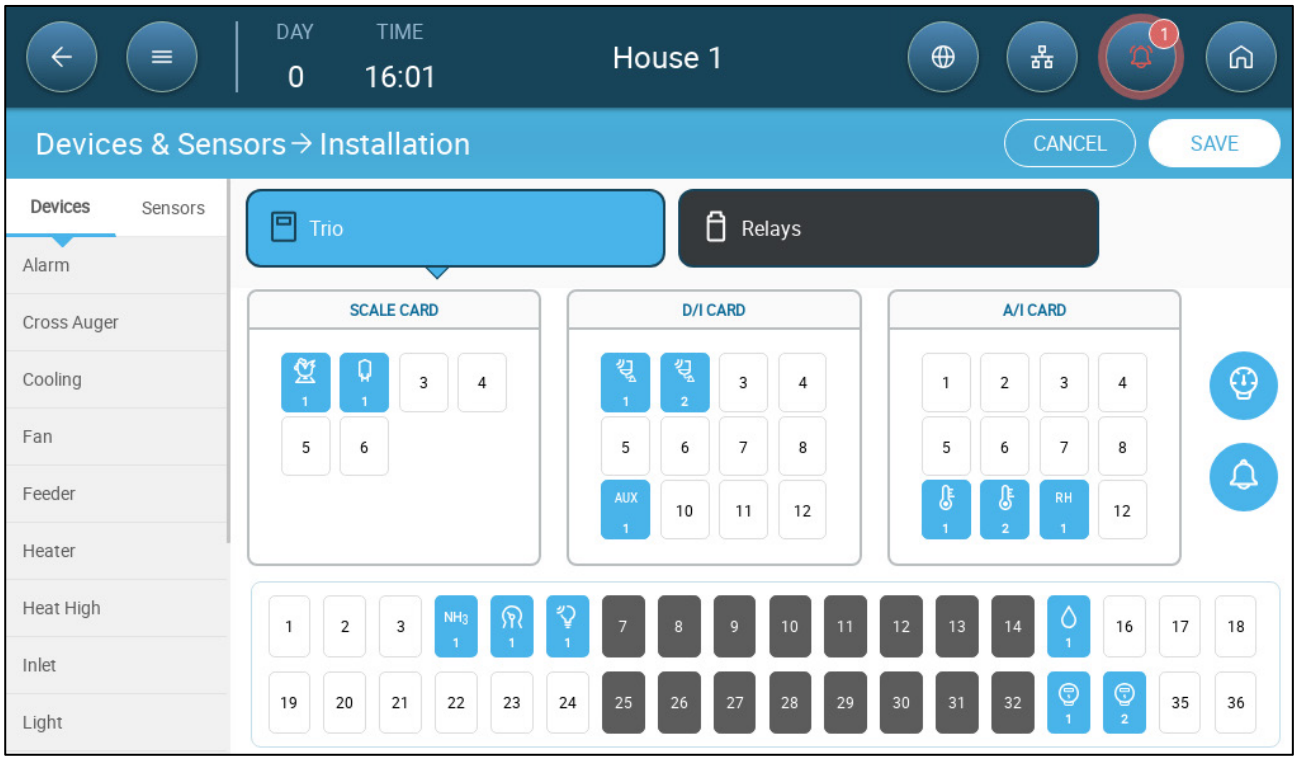
.

- Click Sensors to map auxiliary inputs, sensors, meters, and potentiometers.
- Click Devices to map cooling devices, heaters, inlets, fans, stir fans, timers, tunnel doors, outlets, or the alarm relay.

NOTE *Map the sensors first and then map the devices.*

3. Under Trio/Sensors, click the type of sensor that you want to map. In the following example, Temperature Sensor is selected. The screen displays the ports (and the number of ports selected) that can be defined as temperature sensors.

4. Repeat steps 3 for all the connected sensors.



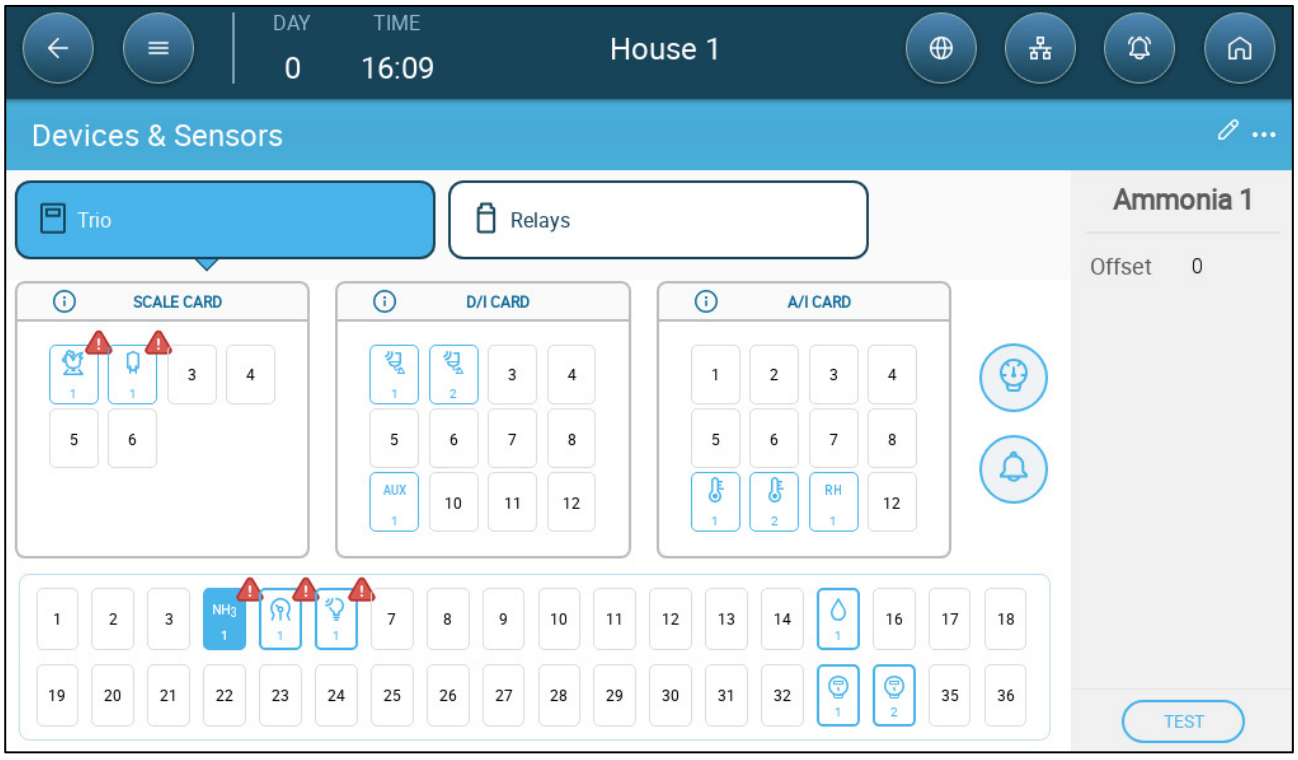
5. Under Relays, repeat the process for the high voltage devices.

NOTE : Relays control on/off devices. Any device controlled by 0 – 10 voltage is mapped to an analog input/output port.

- Trio automatically numbers the devices and sensors.
- Trio enables selecting up to the maximum number of each device.
- Devices having opening and closing relays require mapping of both relays.

6. After mapping all installed devices, SAVE.

NOTE : If you map an analog sensor that is not physically connected to the Trio, an error symbol appears on the designated analog port.



6.3 Editing Relays and Sensors

1. On the Device and Sensors screen, click a relay or sensor.
2. Click  .
3. Edit the parameter(s).
4. Click Save.

6.4 Defining Sensors

- Defining Analog Sensors
- Defining Digital Sensors

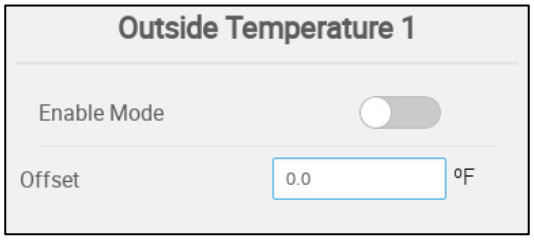
6.4.1 DEFINING ANALOG SENSORS

- Enabling/Disabling Analog Input Sensors
- Defining the Ammonia Sensor
- Defining the CO2 Sensor
- Defining the Humidity Sensors
- Defining the Light Sensor

6.4.1.1 Enabling/Disabling Analog Input Sensors

By default, when the user maps an analog input sensor, the sensor is enabled. To disable a sensor:

1. Go to the device and click edit  .
2. Move the enable mode icon to off and click Save.



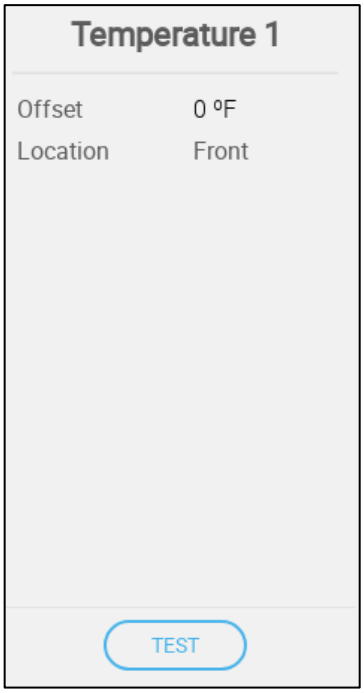
3. On the dashboard, the disabled sensor is marked.

6.4.1.2 Temperature Sensors

- Defining the Temperature Sensors
- Mapping the Temperature Sensors
- Enabling a Weather Station

6.4.1.2.1 Defining the Temperature Sensors

➲ **Define up to 16 analog input ports as temperature sensors (and one port as an outside temperature sensor).**



- Define:
  - Offset: This is an optional correction for the temperature sensor. Range: -10° C to +10° C
  - Enabled: enable/disable the sensor.
  - Location: Designate the area in the room where the sensor is located (front/back/center).
- The temperature reading shows the measured temperature, including the offset.

6.4.1.2.2 Mapping the Temperature Sensors to Devices

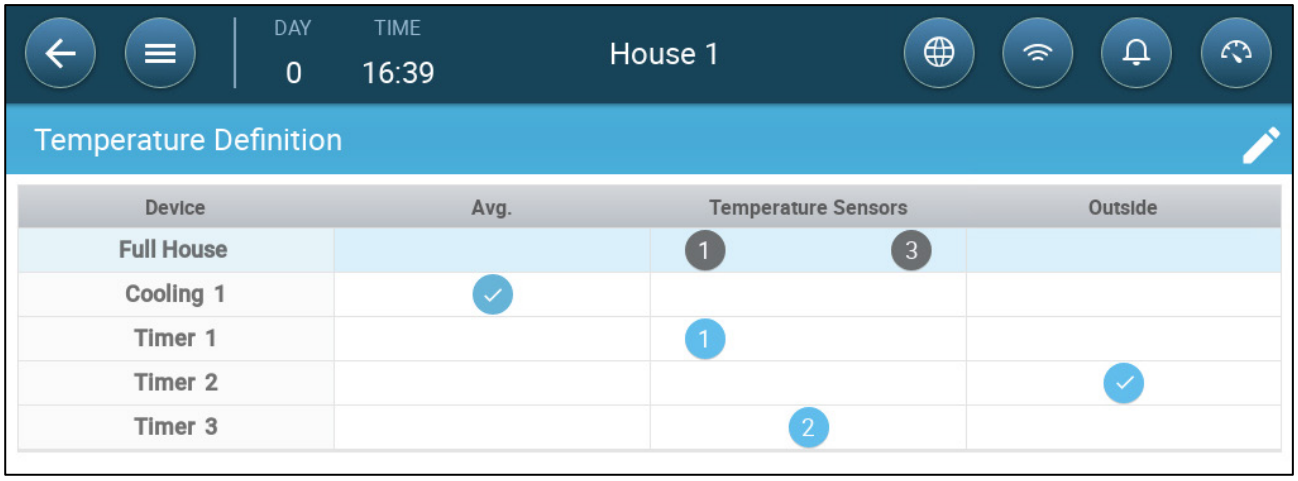
Calculating the temperature data, Trio takes the following into consideration:

- Tunnel temperature: Select a sensor or a group of sensors to determine the tunnel temperature readings or select if the tunnel runs according to the average temperature reading.
- Average temperature: Data from multiple sensors can be averaged. If a sensor fails, the sensor's data is removed from any calculations.
- Device temperature: A sensor (or sensors) can be mapped to a specific device.

- Outside temperature: The temperature sensor defined as an outside temperature is not included in any average calculation.

Map specific temperature sensors to specific devices.

1. Go to System › Temperature Definition.



2. Map the sensors to devices.
   - Define which sensors are used to calculate the average temperature.
   - If an outside temperature sensor is enabled, map timers to it (if required).

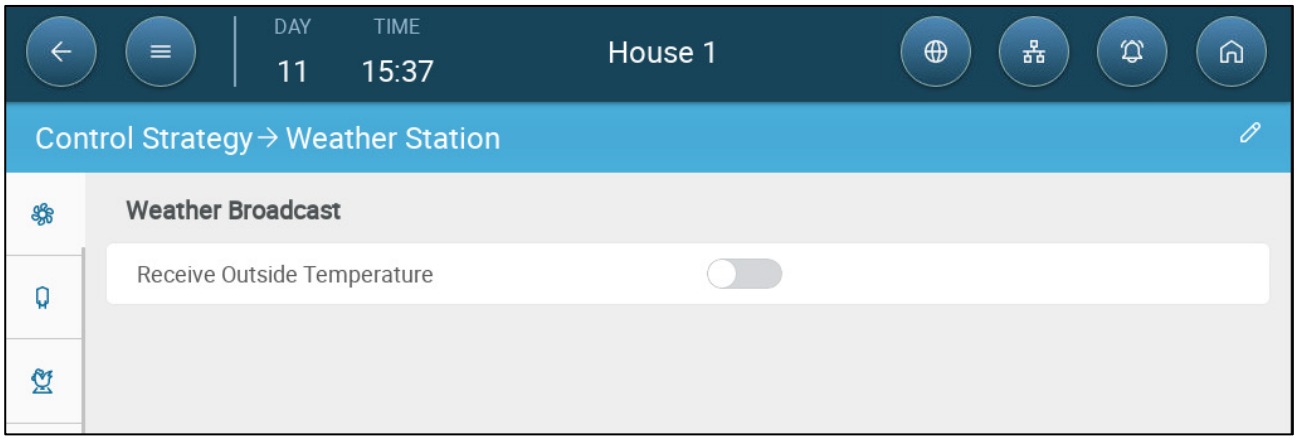
NOTE *Uninstalling a device in the Relay Layout, Analog Output or TRIAC tables removes the device from this screen.*

6.4.1.2.3 Enabling a Weather Station

To say costs on temperature sensors, one outdoor temperature sensor can provide data to the entire Trio network.

NOTE *Install and map one outdoor sensor only.*

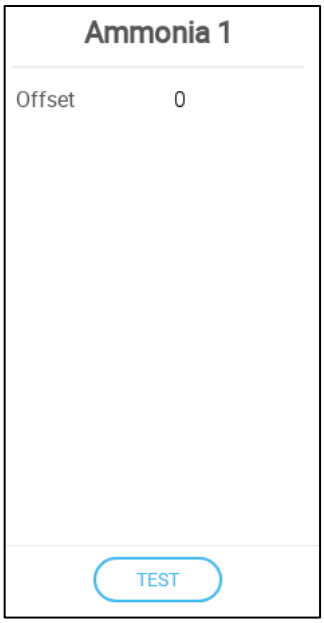
1. In System › Device and Sensors, define one sensor as Outside Temperature.
2. Go to System › Control Strategy › Weather Station  .



3. Enable **Receive Outside Temperature**.

6.4.1.3 Defining the Ammonia Sensor

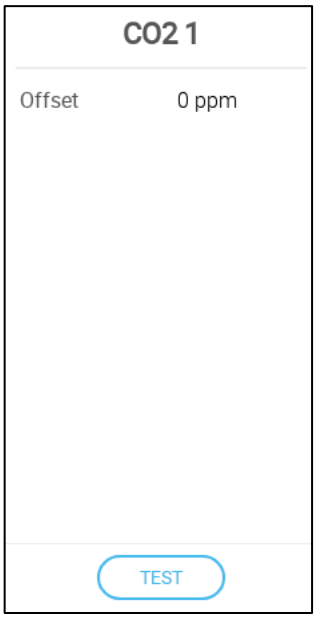
➲ **Define one analog input port as an ammonia sensor.**



- Define:
  - Offset: This is an optional correction for the ammonia sensor. Range: -10 to +10 ppm

6.4.1.4 Defining the CO2 Sensor

➲ **Define one analog input port as a CO2 port.**

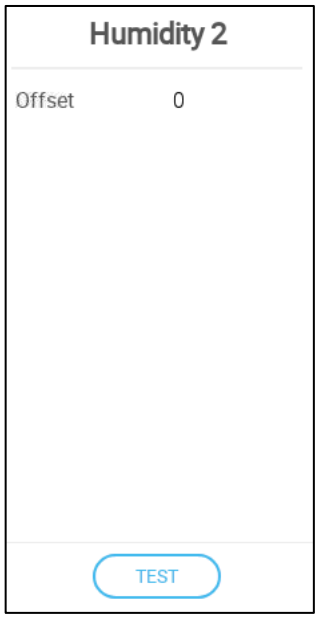


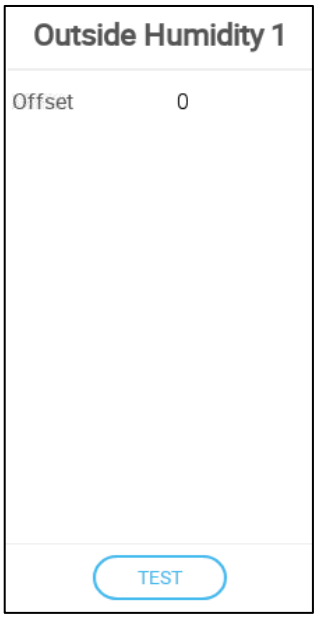
- Define:
  - Offset: This is an optional correction for the CO2 sensor. Range: -500 to +500 ppm
  - Enable Mode: Enables/disables the sensor.

6.4.1.5 Defining the Humidity Sensors

➲ **Define:**

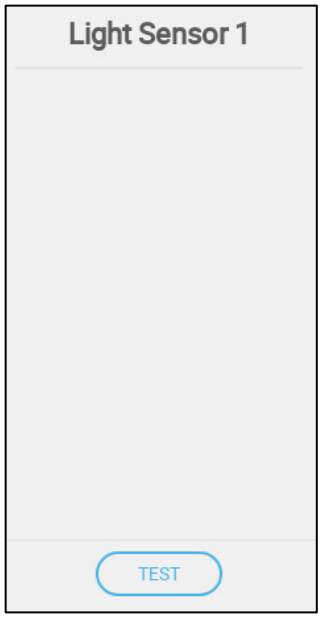
- One or two analog input ports as a humidity sensor
- One analog input port as an outside humidity sensor
- The outside humidity is used to collect data, not to adjust climate control.





- Define:
  - Offset: This is an optional correction for the humidity sensor. Range: -10 to +10%
  - Enable Mode: Enables/disables the sensor.
- The humidity reading shows the measured level, including the offset.

6.4.1.6 Defining the Light Sensor



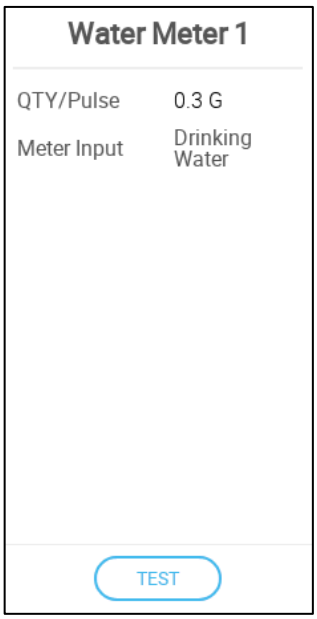
- Define:
  - Enable Mode: Enable/disable the sensor.

6.4.2 DEFINING DIGITAL SENSORS

- Defining the Water Meter Sensors
- Defining the Gas Meter Sensors
- Defining the Power Meter Sensors
- Defining the Auger Active Sensors
- Defining the Feeder Active Sensors
- Defining the Auxiliary Input

6.4.2.1 Defining the Water Meter Sensors

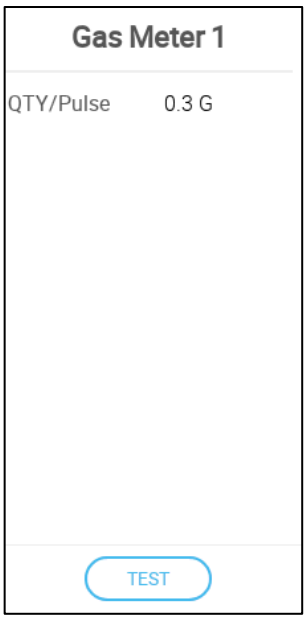
➲ **Define up to four (4) digital input ports as a water meter.**



- Define:
  - Quan/Pulse: Set the water meter's water flow per pulse. Range: 0.0 to 99.9 (unit depends on the General Settings › User.)
  - Meter input: Chose drinking water or cooling.

6.4.2.2 Defining the Gas Meter Sensors

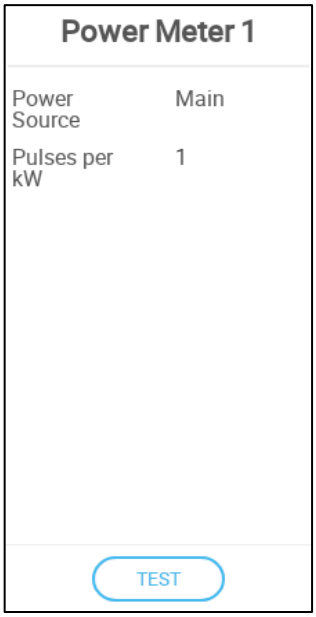
➲ **Define up to three digital input ports as a gas meter.**



- Define:
  - Quan/Pulse: Set the gas meter's flow per pulse. Range: 0.0 to 999 (unit depends on the General Settings › User).

6.4.2.3 Defining the Power Meter Sensors

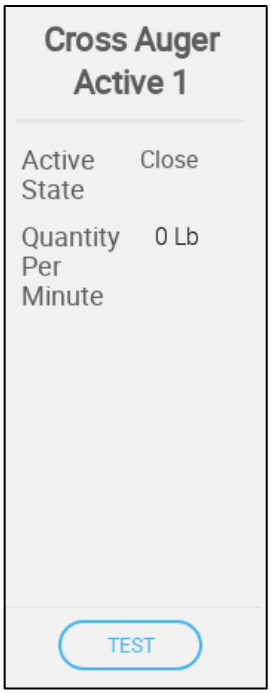
➲ **Define up to two digital input ports as a power meter.**



- Define:
  - Power Source:
    - Main: Power meter measures the amount of electricity used by the system.
    - Heat: Power meter measure the amount of electricity used by the heaters.
  - Pulses per KW: Define the number of pulses to be counted when a kilowatt of electricity is used.

6.4.2.4 Defining the Auger Active Sensors

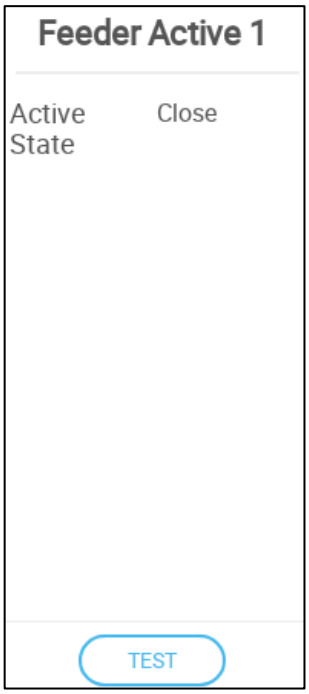
➲ **Define up to two digital ports as auger active.**



- Define:
  - Active state:
    - Open: The circuit is open when the sensor is activated.
    - Closed: The circuit is closed when the sensor is activated .
  - Quantity Per Minute: Define the amount (weight per minute) of feed to be distributed.

6.4.2.5 Defining the Feeder Active Sensors

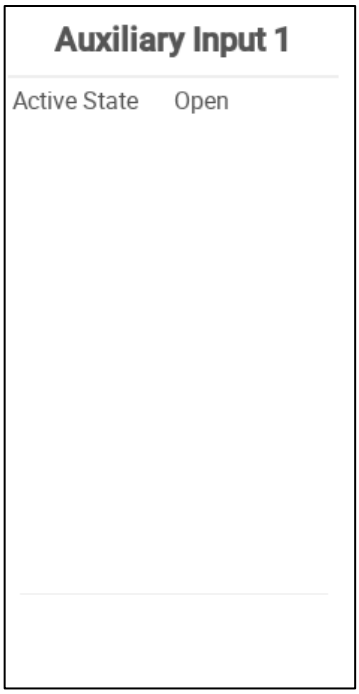
➲ **Define up to four digital input ports as feeder active.**



- Define the active state.
  - Open: The circuit is open when the sensor is activated.
  - Closed: The circuit is closed when the sensor is activated.

6.4.2.6 Defining the Auxiliary Input

➲ **Define up to four digital inputs as auxiliary inputs.**



- Define:
  - Active State: Define the relay mode (open or closed).

6.5 Defining Devices

- Introduction to Device Definition
- Defining the Fans
- Defining the Stir Fan
- Defining Heating Devices
- Defining the Cooling Devices
- Defining the Foggers
- Inlets, Tunnel Doors, Outlets
- Defining the Same As Relays
- Defining the Same As Analog Ports
- Defining the Timers
- Lighting Devices
- Feeding Devices
- Water Pressure Devices

6.5.1 INTRODUCTION TO DEVICE DEFINITION

Devices can be controlled by high voltage relays, 0 – 10V analog output ports, or both.

- Current Sense Relays
- Defining O – 10V Analog Output Ports

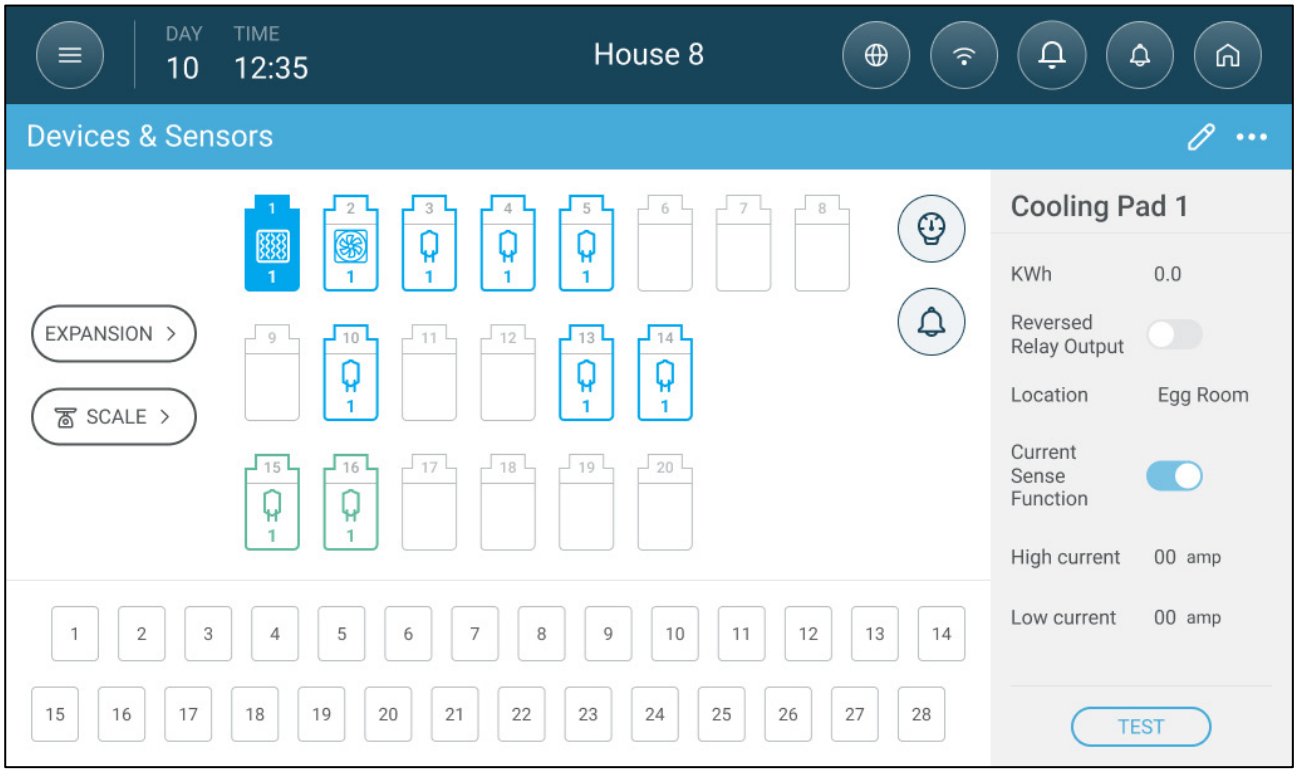
6.5.1.1 Current Sense Relays

Version 9.0: As an option, relay cards can be equipped with current sensors. This sensors monitors the electrical current of connected equipment to ensure the devices' optimal operation. In the event that the current is too high or too low, an alarm is generated. Inlets, tunnel doors, and alarms do not support current senors.

6.5.1.1.1 Set Up

➲ **A current sense switch card mut be installed.**

To enable monitoring the current sense:



In System › Devices & Sensors, define a relay as a required device.

On the relay screen, enable the current sense function.

Define the low and high currents. Default: 0. Range 0: - 6.0 volts

Once the current sense is enabled, the current is displayed on the relay screen.

6.5.1.1.2 Monitoring and Alarms

- The current sensor waits 15 seconds before beginning to monitor the current.
- If the measured current exceeds the high threshold or falls below the low threshold for 30 seconds, an alarm is generated.

WARNING! *After an alarm is generated, the device shuts down to prevent damage to the equipment.*

6.5.1.2 Defining O – 10V Analog Output Ports

When defining the analog output ports, the user has to define the minimum and maximum voltage. These minimum and maximum levels determine the minimum and maximum outputs. For example, if in a variable speed fan the minimum voltage is set to 2V and the maximum to 8V, the controller applies the calculated 0-100% output over a 2V-8V signal.

6.5.2 DEFINING THE FANS

The following sections detail how to configure fans.

NOTE *These settings should be configured by a technician familiar with the fan and inlet/curtain specifications.*

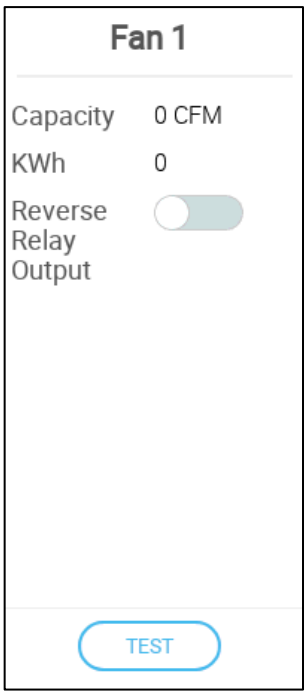
Fan air capacity defines how much air is provided when the fans run at full speed. These numbers are used to calculate minimum air requirements.

➲ **In General Settings › User define the measurement unit.**

➲ **Define up to 20 relays or analog output ports as On/Off or 0 – 10 V fans, respectively.**

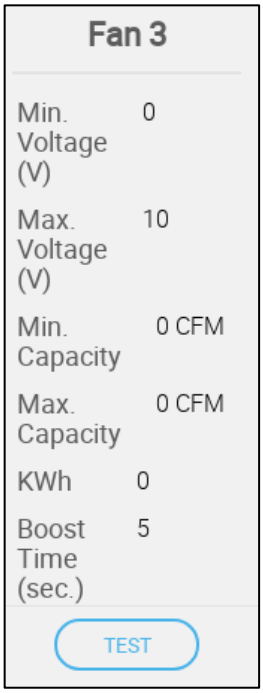
- On-Off Fans
- 0 – 10 Volt Fans

6.5.2.1 On-Off Fans



- Define:
  - Capacity: Enter the fan capacity.
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.2.2 0 – 10 Volt Fans



- Define:
  - Minimum/Maximum Voltage: Enter the minimal and maximal voltage used to calibrate the fan speed.
  - Minimum/Maximum Capacity: Enter the fan's minimum and maximum capacity.

NOTE *The fan delivers the minimum capacity when running at minimum speed.*

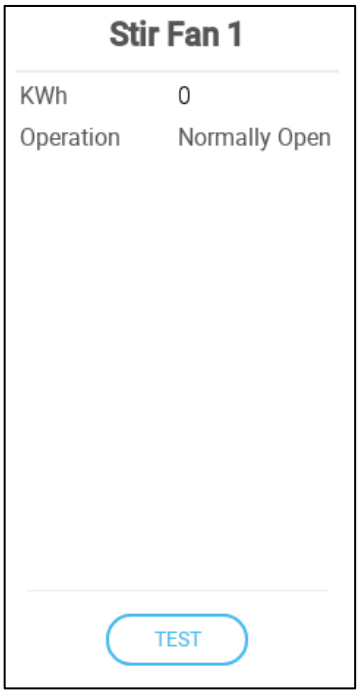
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Boost Time: During this amount of time, the controller applies full power to the fan motor (100%) and then drops to minimum speed.

6.5.3 DEFINING THE STIR FAN

➲ **Define one relay or port as a stir fan.**

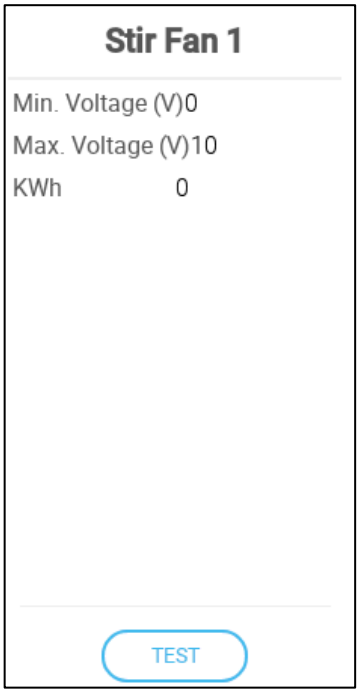
- On Off Stir Fan
- 0 – 10 Volt Stir Fan

6.5.3.1 On Off Stir Fan



- Define:
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Operation: Define the relay mode.

6.5.3.2 0 – 10 Volt Stir Fan



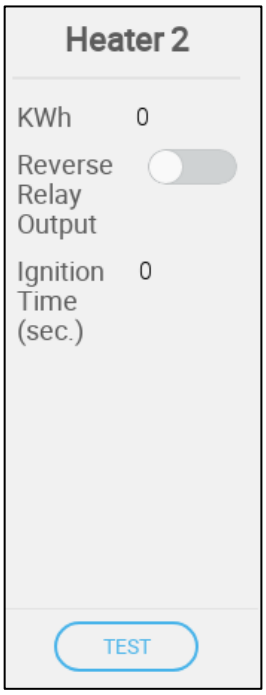
- Define:
  - Minimum/Maximum Voltage: Enter the minimal and maximal voltage used to calibrate the fan speed.
  - KWh: This field displays the amount of kilowatts used. Read-only.

6.5.4 DEFINING HEATING DEVICES

➲ **Define up to sixteen relays and/or analogue output ports as heaters.**

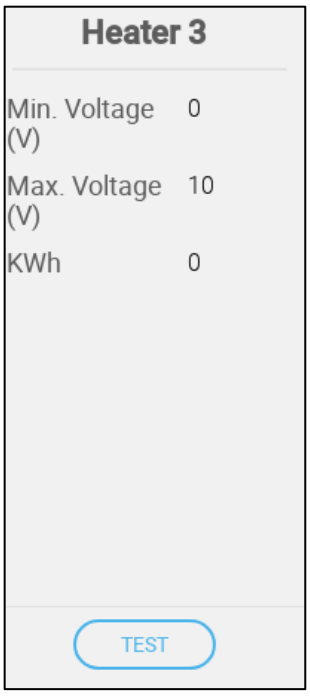
- Defining the On/Off
- Defining the Variable Heaters
- Defining the High Heaters

6.5.4.1 Defining the On/Off Heaters



- Define:
  - KWh: This field displays the amount of kilowatts used. Read-only
  - Reverse Relay Output: Enable this function for Normally Closed Relays.
  - Ignition Time (sec.): Define the delay time between when the heater is turned on and when the gas is ignited.

6.5.4.2 Defining the Variable Heaters

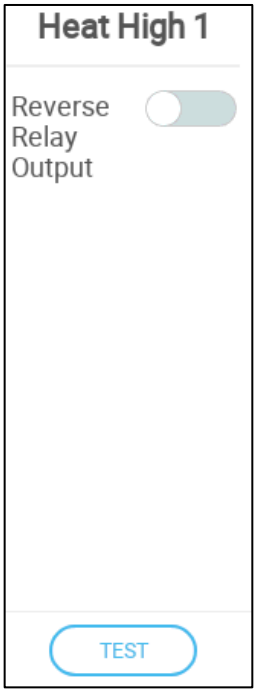


- Define:
  - Minimum/Maximum Voltage: Define the voltage in the analogue output port that corresponds to the 0% and 100% output, respectively.
  - KWh: This field displays the amount of kilowatts used. Read-only.

6.5.4.3 Defining the High Heaters

High heaters work in conjunction with relay heaters. High heater 1 works with heater 1, high heater 3 works with heater 3, and so on. If there is no corresponding heater to a high heater, the latter does not function. For example, if there are three heaters and four high heaters, high heater 4 does not function.

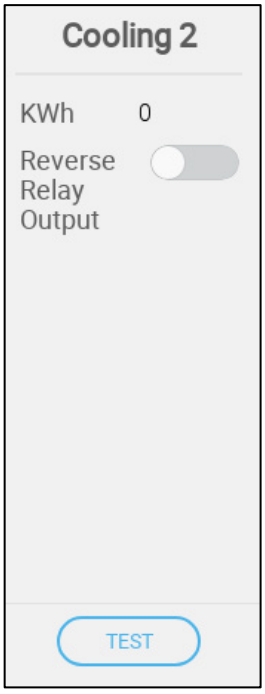
➲ **Define up to 16 relays as high heaters.**



- Define:
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.5 DEFINING THE COOLING DEVICES

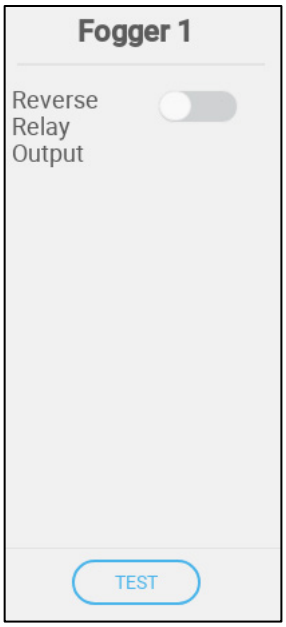
➲ **Define up to four relays as cooling devices.**



- Define:
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.6 DEFINING THE FOGGERS

➲ **Define up to 16 relays as foggers.**



- Define:
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.7 INLETS, TUNNEL DOORS, OUTLETS

- Mapping the Potentiometers
- Defining the Inlets/Tunnel Doors
- Defining the Outlet

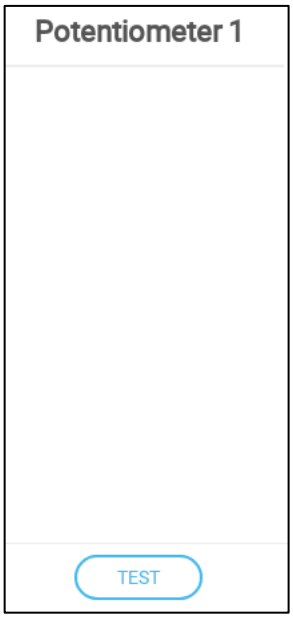
6.5.7.1 Mapping the Potentiometers

➲ **Define up to four analogue ports as potentiometers.**

As an option, potentiometers enable exact positioning of **relay-controlled** inlets\tunnel doors when calibrating. If:

- potentiometers are not employed or
- there is a potentiometer failure

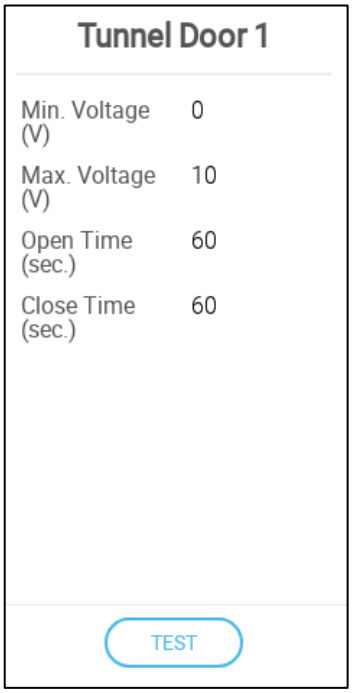
Trio uses the opening and closing times to calibrate the inlets/tunnel doors.



- Enable/disable the potentiometer.

6.5.7.2 Defining the Inlets/Tunnel Doors

➲ **Define up to four relays or analog output ports as inlets or tunnel doors (each device requires two relays or one analogue port).**



- Define:
  - ~~Normal State~~
  - Position: Define how the inlet opening is controlled:
    - By time
    - Potentiometer (relay-controlled inlets or tunnel doors only). Map each inlet/tunnel door to a potentiometer. This option appears only if potentiometers are mapped.
  - Open/Close Time: Measure and enter the amount of time required to fully open or fully close the inlet. These parameters are only enabled when Position/By Time is selected.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.
  - Calibrate: Manually calibrate inlets/tunnel doors positioned by a potentiometer. Potentiometer-controlled calibration only.

6.5.7.2.1 Potentiometer Calibration

If used, a potentiometer can control the opening and closing with a high degree of precision. When there is no potentiometer, positioning accuracy tends to degrade after the inlets go through several opening and closing cycles.

In order to calibrate an inlet/vent/tunnel door using a potentiometer:

- Install and map a potentiometer.

- Define the relay-controlled inlet/vent/tunnel door that the potentiometer controls. (Analog controlled devices don't require a potentiometer.)
- Calibrate the potentiometer. Calibration must be successful.

In for any reason potentiometer calibration does not function:

- Calibration is by time (auto and/or at power up). Time calibration does not fail.
- A potentiometer alarm is generated (if alarms are enabled) . The alarm must be reset to enable potentiometer calibration to function.

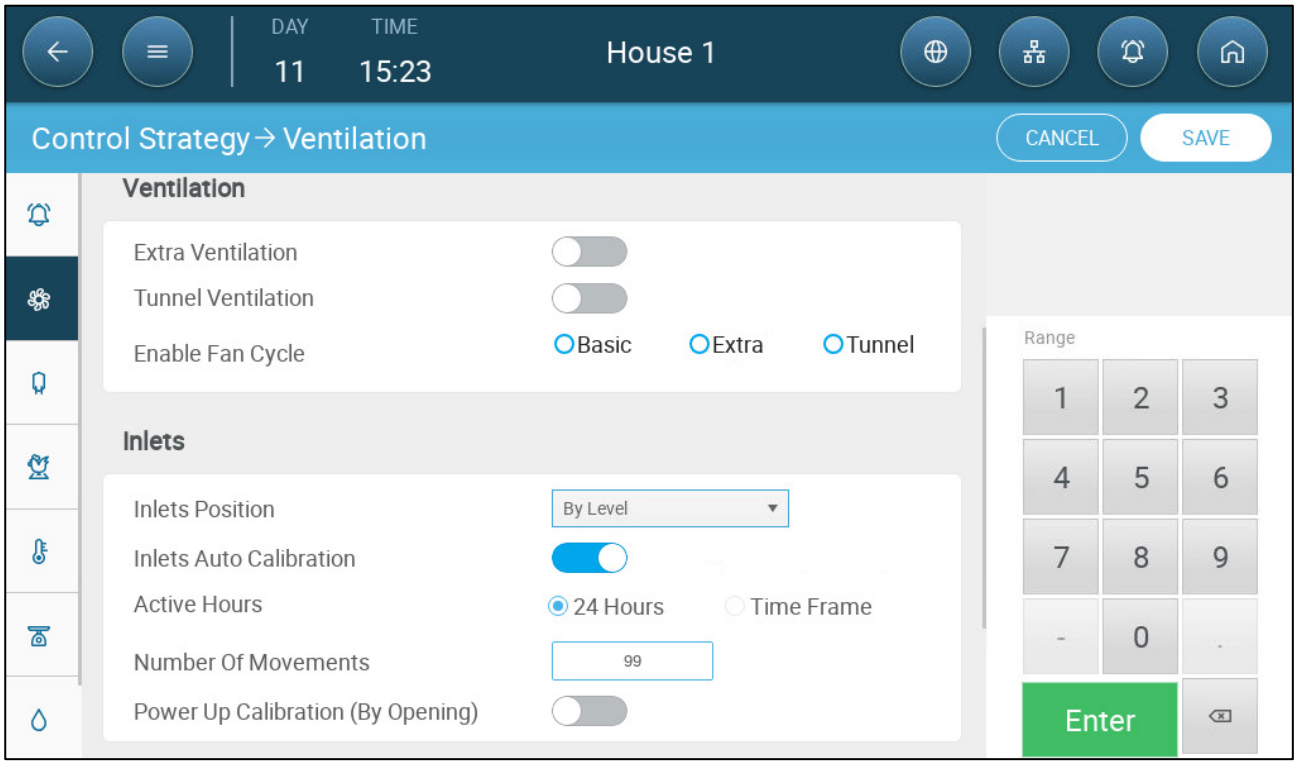
6.5.7.2.2 Calibrating the Inlets/Tunnel Door

During installation, the user enables auto-calibration or power up calibration in digital output (relay) inlets. Calibration automatically takes place after the number of inlet movements equals the number of movements required to start calibration or at Trio power up.

Only one inlet or tunnel curtain can be calibrated at a time.

- Relay open occurs when the target position is 100%.
- Relay close occurs when the target position is 0%.

1. Go to System › Control Strategy › Ventilation  .



2. Click  .
3. Define:
    - Inlets Position Choose By Level or By Pressure. Refer to the User Manual for more details.

- Inlets Auto Calibration: Enable if required.
- Active Hours: Select 24 hours a day or define a specific time frame.
- Number of Movements: Set up the number of movements after which the inlet/tunnel door automatically calibrates. Range 5 – 99.

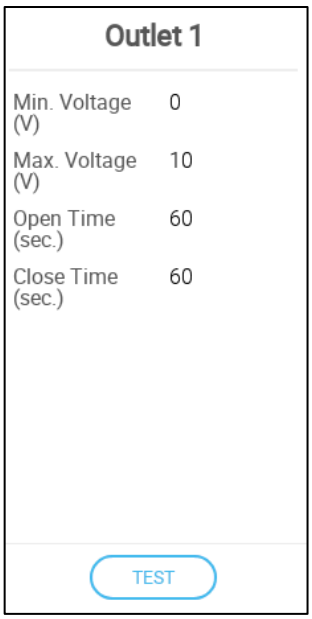
- **Potentiometer-controlled calibration failure**: If calibration fails (during auto or power up calibration) in a potentiometer-controlled calibration, an error symbol appears in the Devices and Sensor screen.

In this situation, click **Calibrate** to run the Calibration Wizard. If the calibration fails again, check:

- Potentiometer wiring
- Potentiometer
- Inlets' and curtains' opening and closing position. There must be a minumum distance between the two, equivalent to 300 A2D points.

6.5.7.3 Defining the Outlet

➲ **Define one analog output port as an outlet.**

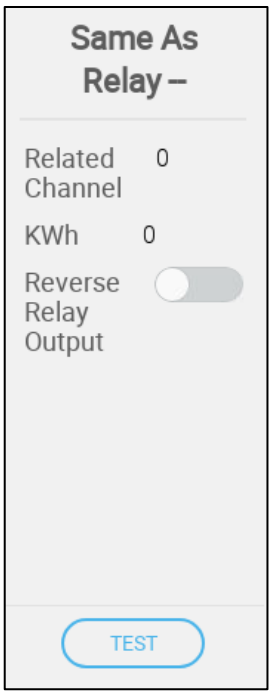


- Define:
  - Min./Max Voltage: Define the voltage in the analogue output port that corresponds to the 0% and 100% output, respectively.
  - Open/Close Time: Enter the amount of time required to fully open or fully close the inlet.

6.5.8 DEFINING THE SAME AS RELAYS

➲ **Define up to 20 relays as Same as Relay.**

This function enables defining a relay to operate using the parameters defined for another relay. A relay can be tied to any other relay.

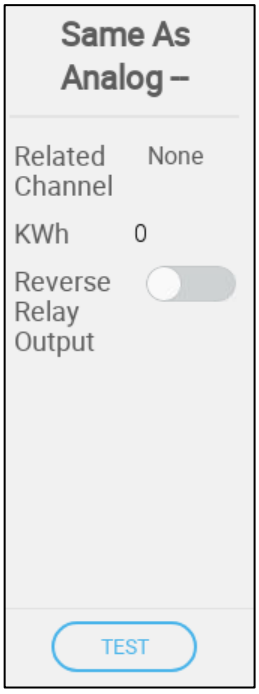


- Define:
  - Related Channel: Define which relay number to follow. Range: 1 – 20
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.9 DEFINING THE SAME AS ANALOG PORTS

➲ **Define up to eight relays as Same as Analog Ports.**

This function enables defining a relay to operate using the parameters defined for a corresponding analog port. Relays can be mapped to eight specific ports only.

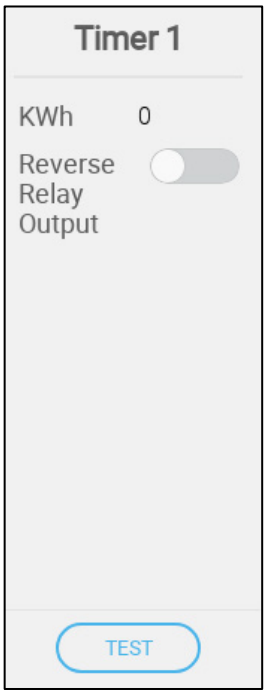


- Define:
  - Related Chanel: Define which port number to follow.
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

Port Number	Related Channel
7	1
8	2
9	3
10	4
21	5
22	6
23	7
24	8

6.5.10 DEFINING THE TIMERS

➲ **Define up to five relays as timers.**



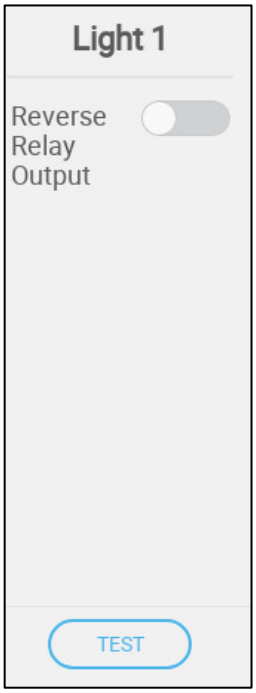
- Define:
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.11 LIGHTING DEVICES

➲ **Define up to four relays or analog ports as light relays and one sensor as a light sensor.**

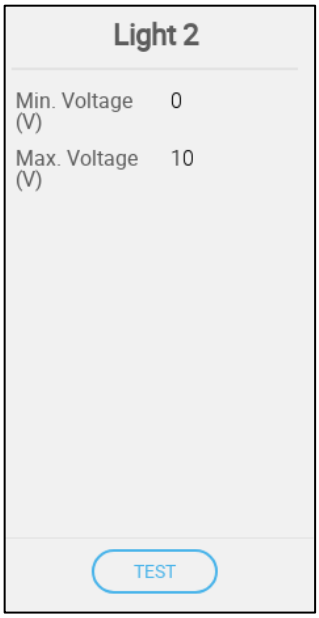
- Defining the On/Off Lights
- Defining the Variable Lights

6.5.11.1 Defining the On/Off LIGHTS



- Define:
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.11.2 Defining the Variable Lights



- Define:
  - Minimum/Maximum Voltage: Enter the minimal and maximal voltage used to calibrate the light strength.

6.5.12 FEEDING DEVICES

Setting up a feed system requires auger relays and sensors, and feeder relays and sensors. Define:

- Auger and feed relays to control the auger/feeder lines.
- Auger digital sensors to detect auger overtime issues: silo is empty, feed lines are stuck, or other mechanical issue.
    - Auger 1 is automatically associated with Augur Active Sensor 1. Auger 2 is automatically associated with Augur Active Sensor 2.
    - Feeder 1 active is associated to feeder 1 relay, feeder 2 active to feeder 2 relay, etc.
- Defining the Auger Relays
- Defining the Feeder Relays
- Mapping the Weighing Devices

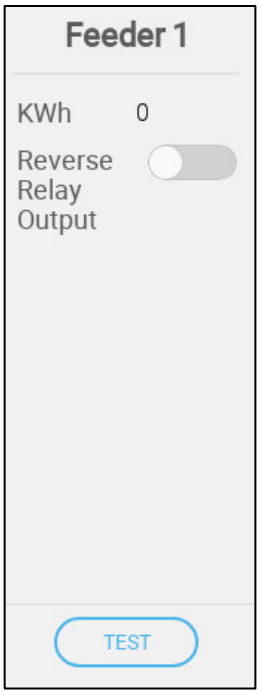
6.5.12.1 Defining the Auger Relays

➲ **Define up to two relays as augers.**

- Define:
    - KWh: This field displays the amount of kilowatts used. Read-only.
    - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.12.2 Defining the Feeder Relays

➲ **Define up to four relays as feeders.**



- Define:
  - KWh: This field displays the amount of kilowatts used. Read-only.
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

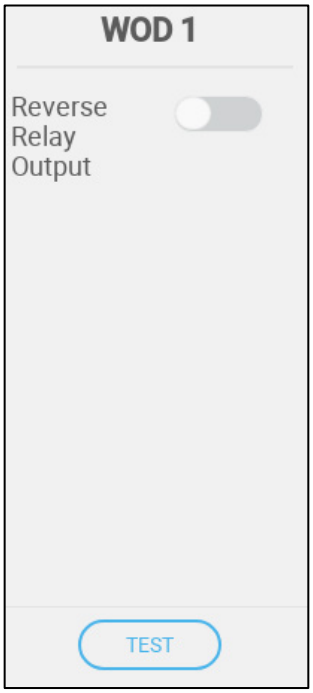
6.5.13 Water Pressure Devices

- Defining the WOD
- Defining the WOD Pro
- WOD Pro Calibration

6.5.13.1 Defining the WOD

WOD relays control two pre-set pressure regulators.

➲ **Define up to three relays as WOD relays.**

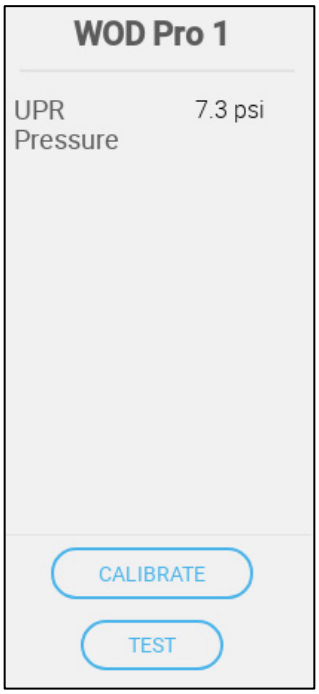


- Define:
  - Reverse Relay Output: Enable this function for Normally Closed Relays.

6.5.13.2 Defining the WOD Pro

The WOD Pro sensor controlls the water pressure and flow in all drink lines.

➲ **Define one analog output port as a WOD Pro sensor.**



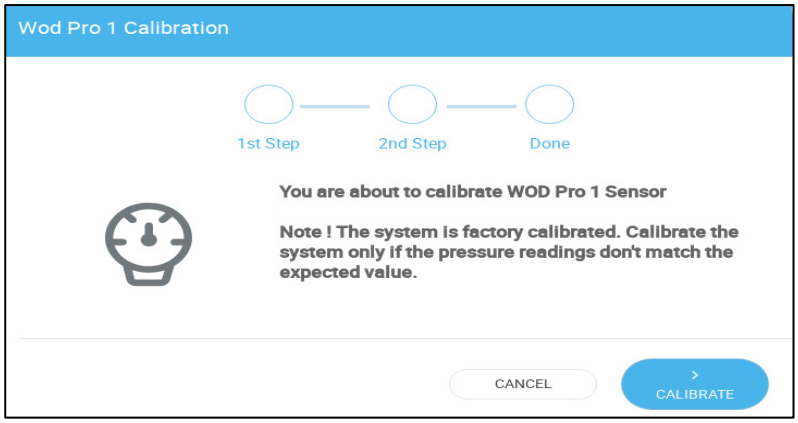
- Define:
  - UPR Pressure: The UPR is a pressure regulator which has an adjustable range between 0 – 58 PSI.

6.5.13.3 WOD Pro Calibration

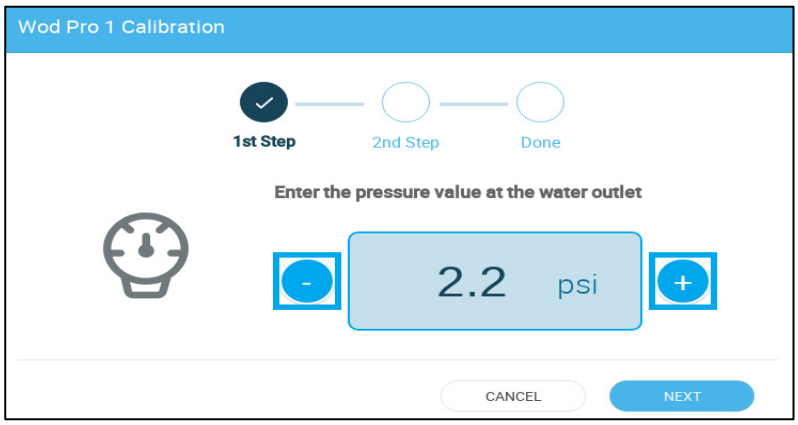
The system is factory calibrated. Calibrate the WOD Pro only if the pressure readings do not match expected values.

To calibrate the sensor:

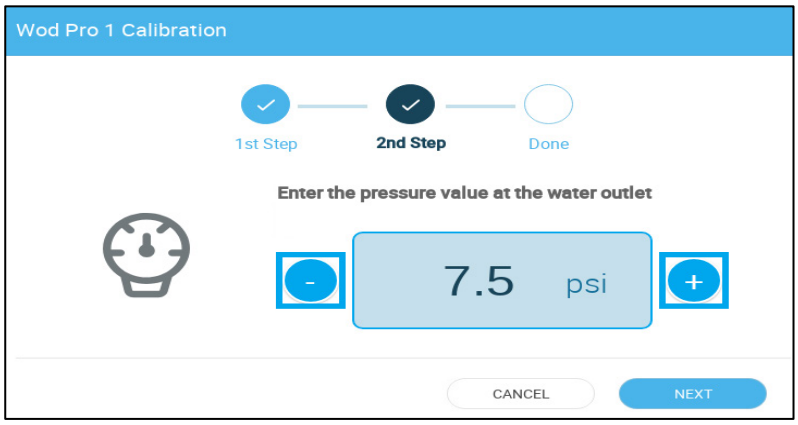
1. Click Calibrate.



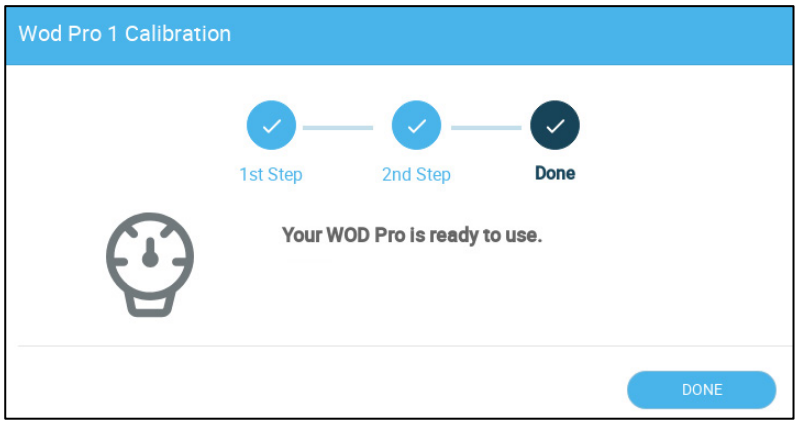
2. Click Calibrate.
3. WOD Pro supplies 2.5 volts. Enter the value of the pressure shown on the water outlet.



4. Click Next.
5. WOD Pro supplies 7.5 volts. Enter the value of the pressure shown on the water outlet.



6. Click Next.



Calibration is complete.

6.6 Mapping the Weighing Devices

- Defining the Silos
- Defining BinTrac Silos
- Defining the Bird Scales
- Defining the RSU

6.6.1 DEFINING THE SILOS

- Mapping the Silo Scales
- Configuring the Silo Scale
- Testing the Silo

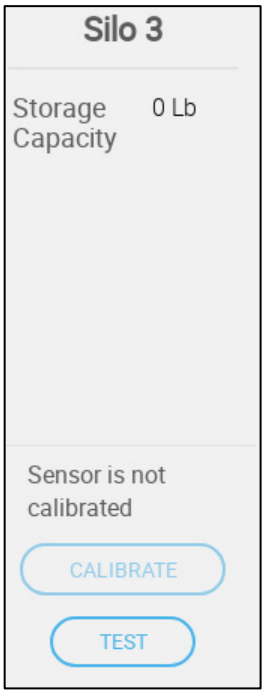
6.6.1.1 Mapping the Silo Scales

Trio can support up to four silo scales.

NOTE *Feed mixing supports up to three silo scales. The fourth silo can only provide feed inventory data only.*

➲ **This function requires a scale card.**

➲ **Define up to four channels as Silo.**

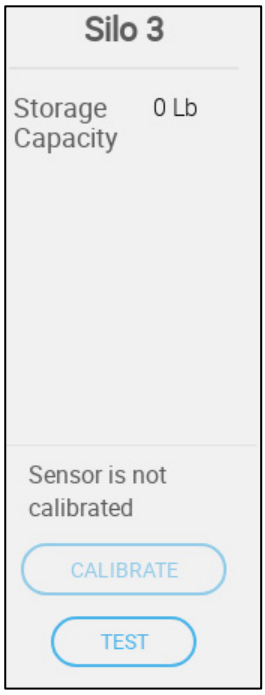


- Define:
  - Storage Capacity: Define the quantity of feed that each silo can contain.
  - Calibrate: Refer to the next section.

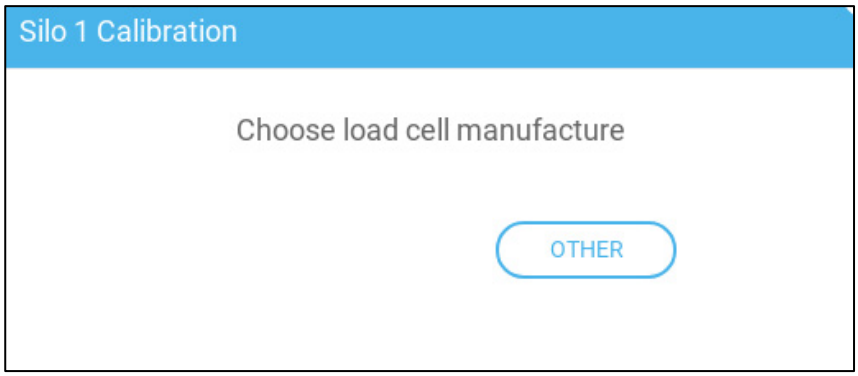
6.6.1.2 Configuring the Silo Scale

The following procedure details how to "zero out" the Trio silo scales. Zeroing out is way to ensure that the unit's A2D number is accurate (shown in the Silo Icon; 430 in the picture below). To summarize the procedure:

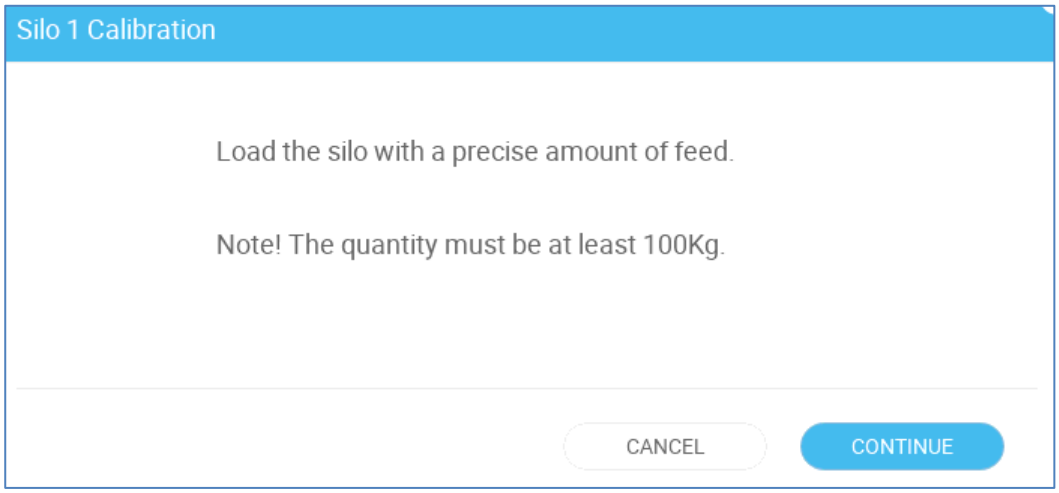
- The user enters the correct amount of feed in the silo while calibrating the silo scale. In the Silo management screen, the user enters "0" (zero). Trio then defines the current A2D signal to be the A2D signal for an empty bin.



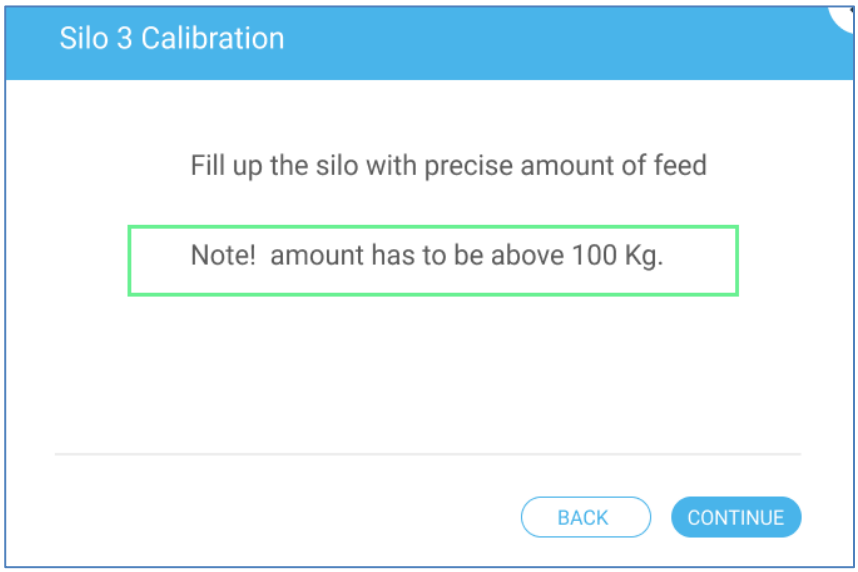
1. Define each silo's storage capacity.
2. Click on the silo icon and click **Calibrate**. The following screen appears:



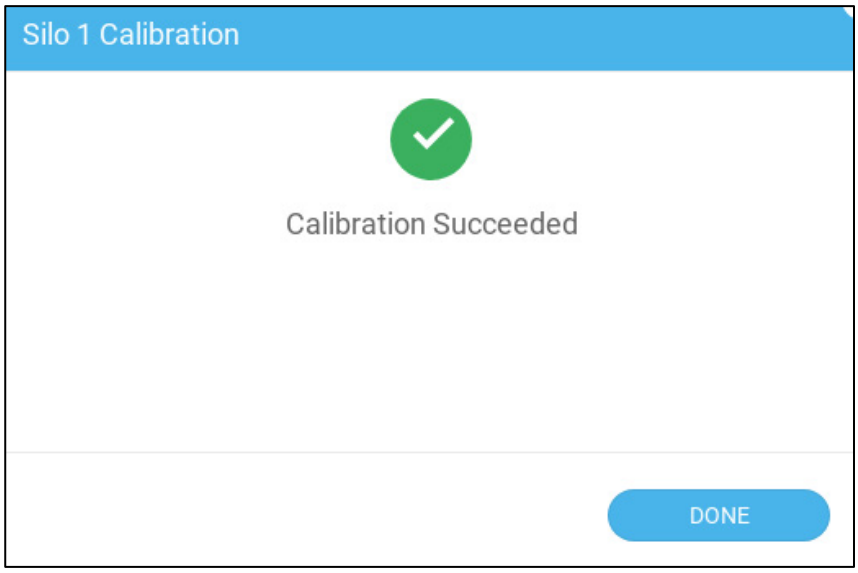
3. Click **Other**. The following screen appears:



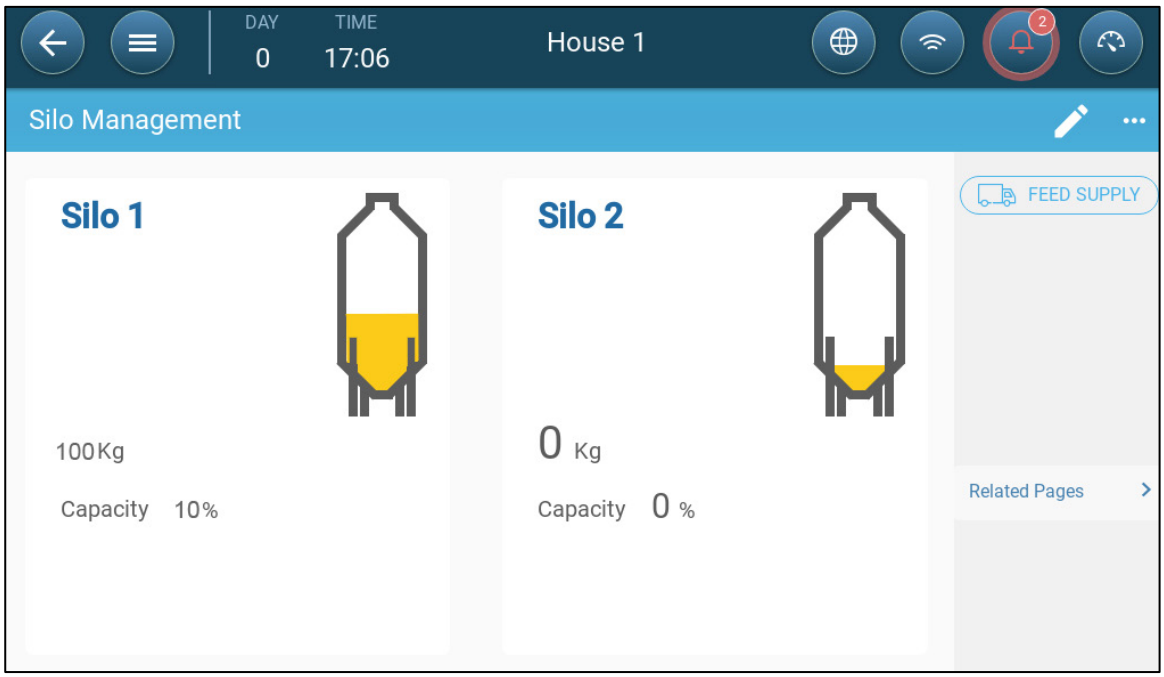
4. Fill up the silo with a known amount of feed. **Munters recommends either a truck filling or a minimum of 500 kilograms.**
5. Enter the amount of feed in the silo and press **Continue**.



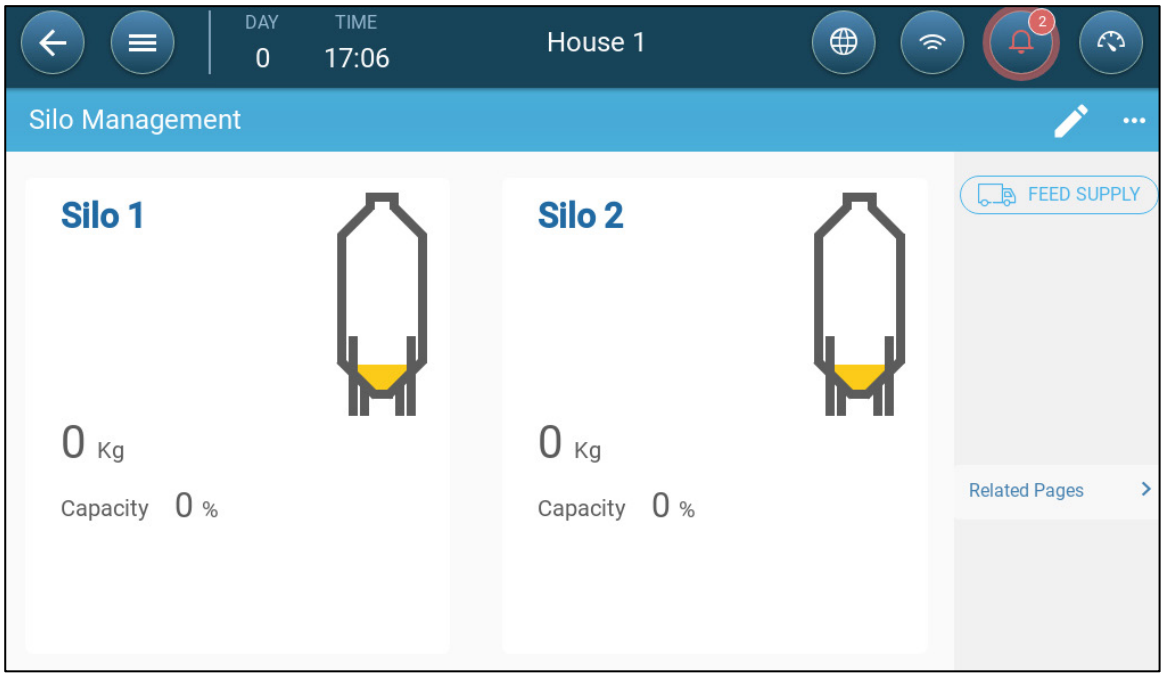
The following screen should appear.



6. Go to Flock › Silo Management.

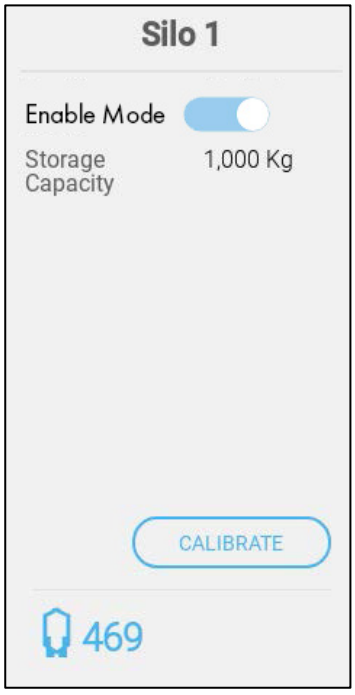


7. Click  and change the feed weight to **0**.



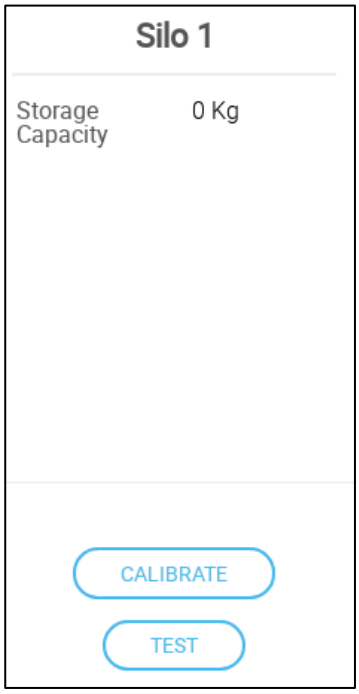
8. Click **Save**.

The Trio now displays an accurate A2D number on the silo icon screen.

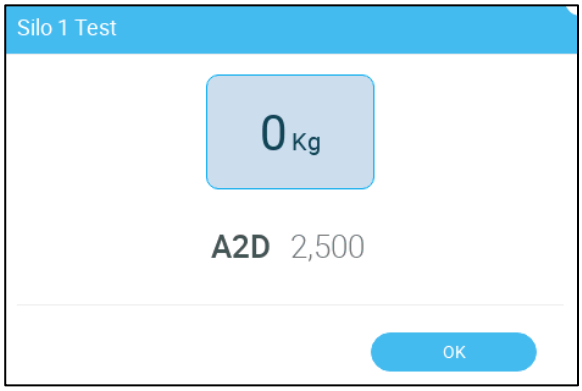


6.6.1.3 Testing the Silo

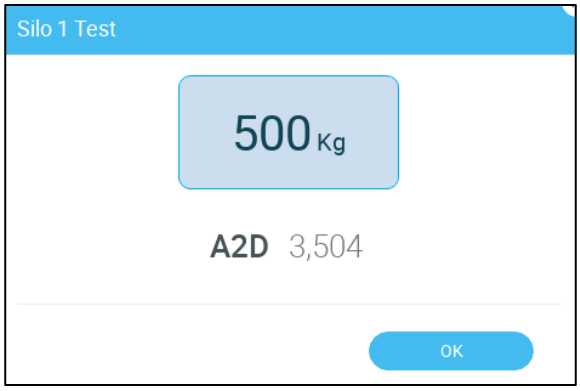
1. After calibrating the silo, go to the Silo relay.



2. Click **Test**.



3. Place a known weight in the silo.



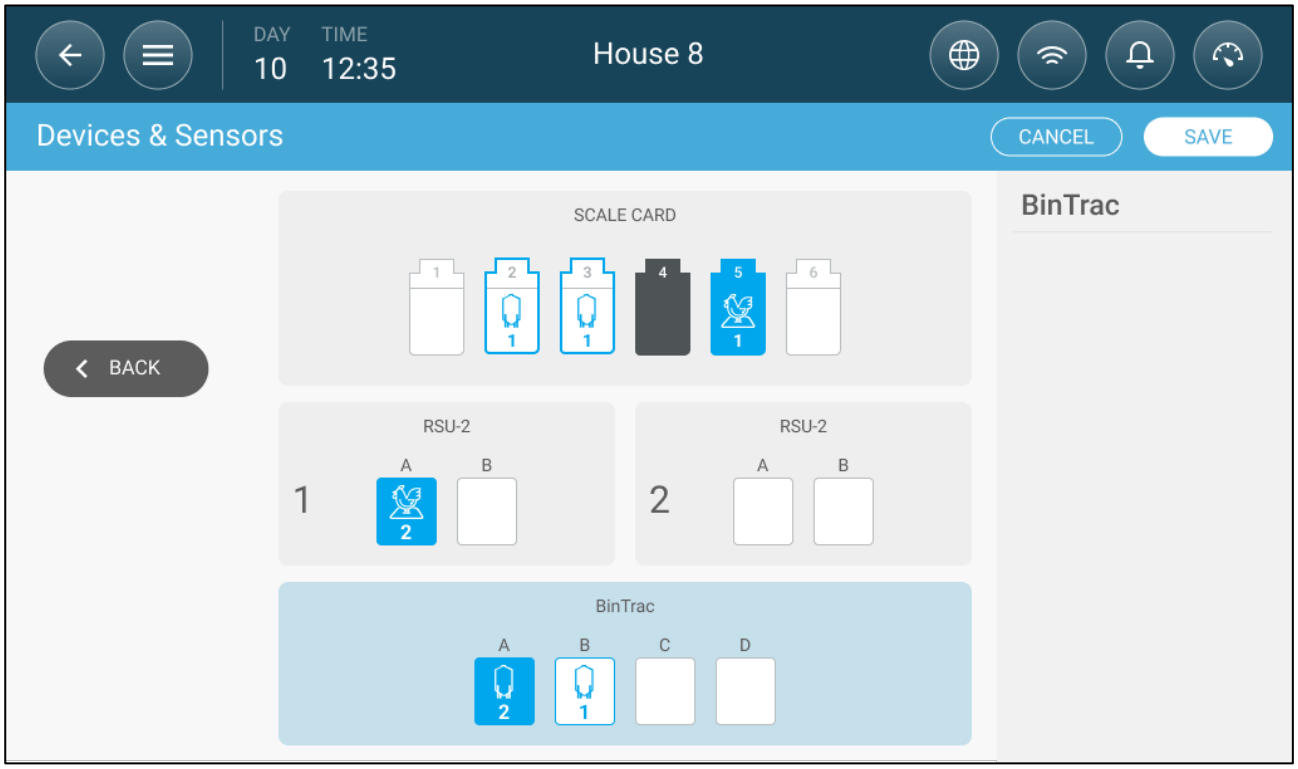
The weight should appear on the screen and the A2D level should rise.

6.6.2 DEFINING BINTRAC SILOS

TRIO can support up to three BinTrac silo scales.

➲ **This function requires a scale card.**

1. On the Devices & Sensors screen, click **Silo**. The Scale icon turns brown. Click the icon.



2. Define the ports as BinTrac; no parameter definitions are required.

6.6.3 DEFINING THE BIRD SCALES

- Mapping the Bird Scales
- Calibrating the Bird Scales
- Testing the Bird Scale

Rotem Trio Controller supports up to four bird scales.

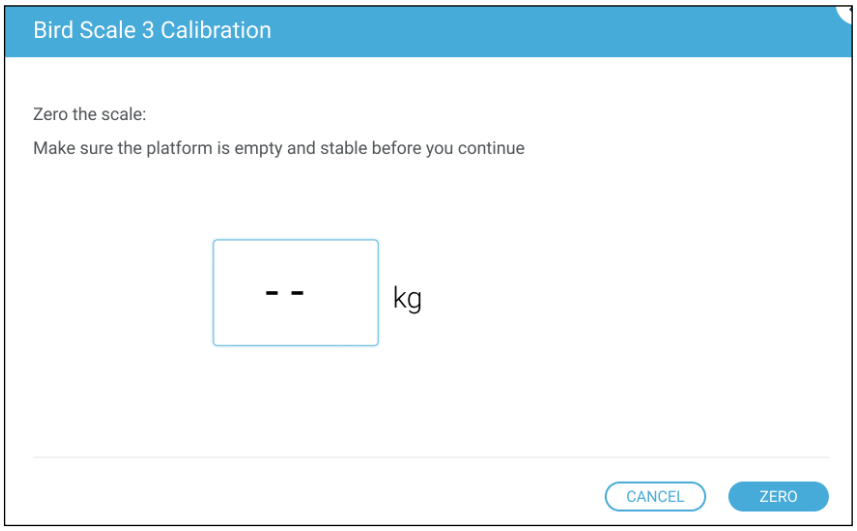
6.6.3.1 Mapping the Bird Scales

➲ **This function requires a scale card.**

- Define up to four channels as scales.

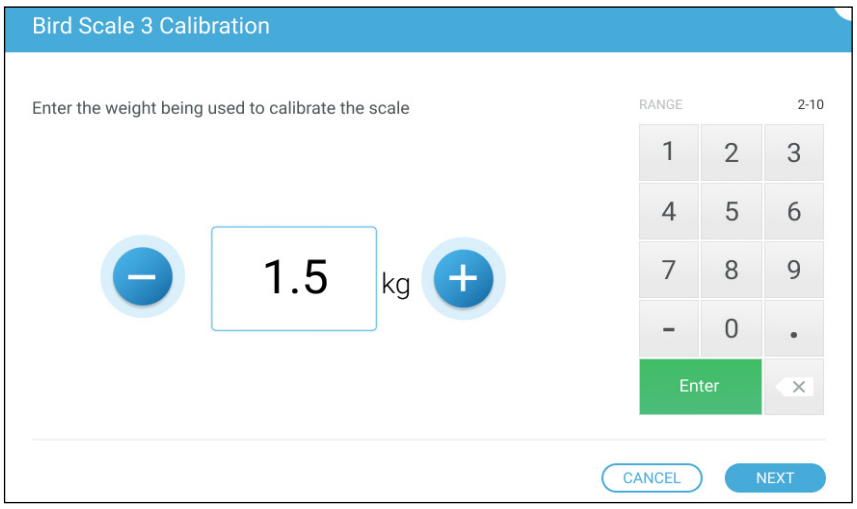
6.6.3.2 Calibrating the Bird Scales

1. Click on a bird scale icon and click **Calibrate**. The following screen appears:

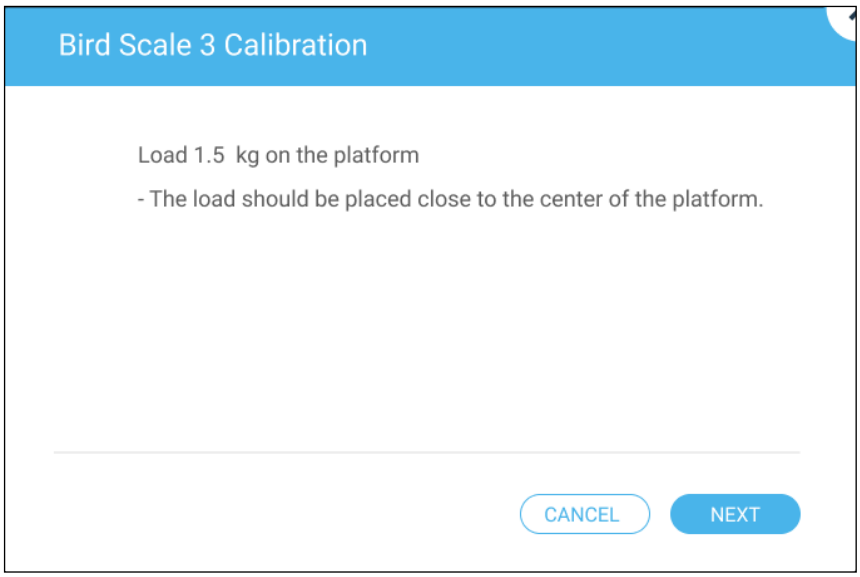


2. Remove everything from the scale and press **Zero**. In the following screen enter the weight being used to calibrate the scale; minimum is 1.0 kilogram. Click **Next**.

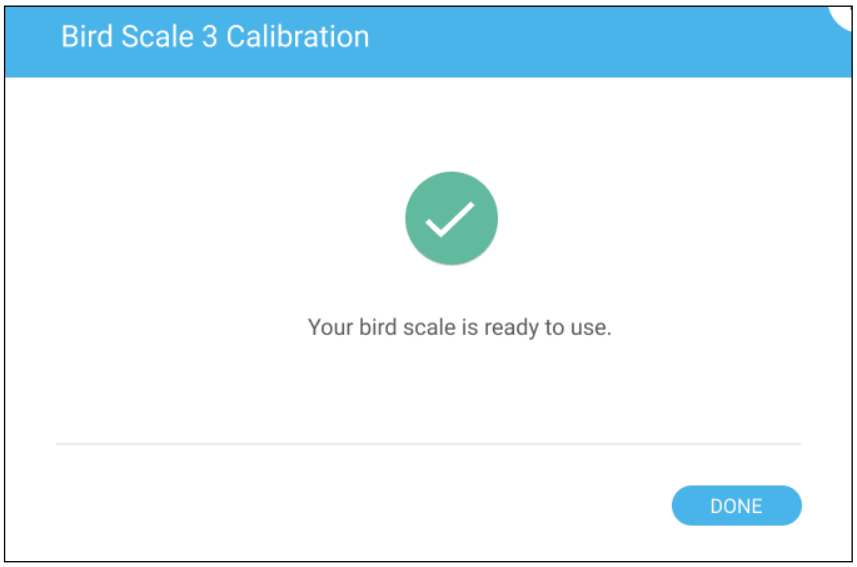
CAUTION *The scale must be free of any objects before pressing Next!*



3. Place a known weight on the scale (1.5 kilograms in the below example) and press **Next**.

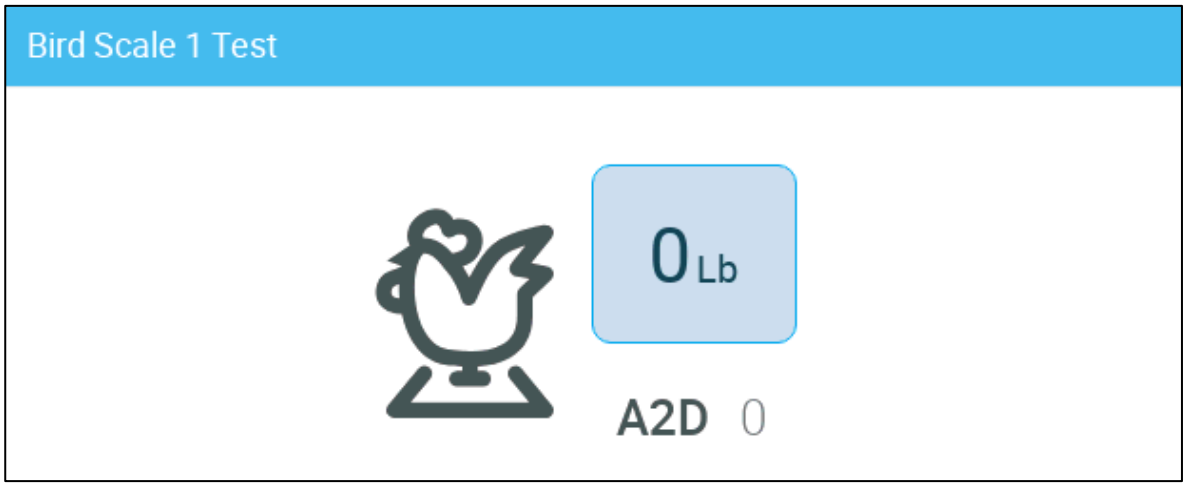


The following screen should appear:

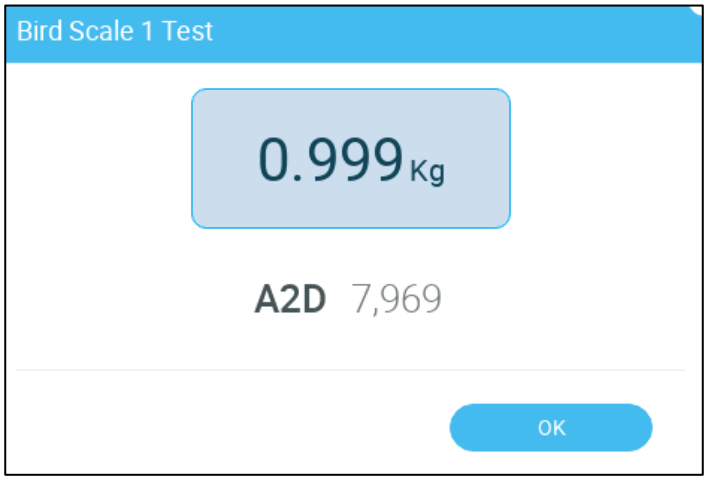


6.6.3.3 Testing the Bird Scale

1. Click **Test**.



2. Place a known weight on the bird scale and click **Done**.



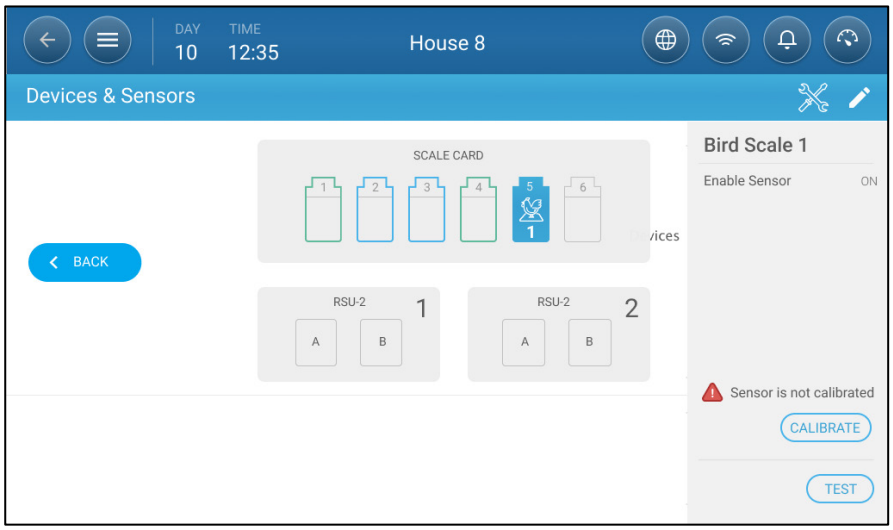
The result should be fairly close to the true weight.

6.6.4 DEFINING THE RSU

The following section details how to define up to two RSU units connected to the Trio (optional). For detailed information on using the RSU, refer to the product manual.

➲ **Wire the RSU to the Trio as shown in Figure 60, page 60.**

1. Reset the Trio, as shown in General Settings › About.
2. Go to Device & Sensors › Installation › Scale.



3. Click the RSU icon.
4. Click Calibrate.

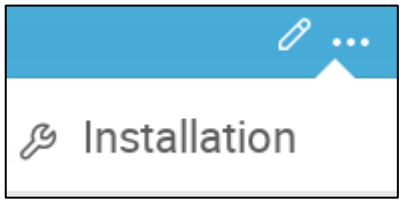
Follow the instructions given in Configuring the Silo Scale, page 105.

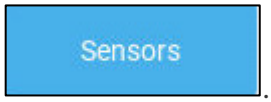
6.7 Defining the Trio RPS

The following section details how to configure the RPS device.

- Define the Sensor
- Static Pressure Calibration

6.7.1 DEFINE THE SENSOR

1. Go to System › Devices & Sensors.
2. Click 

. The Devices & Sensor screen appears.
3. Click 

.
4. Click **Pressure**.
5. Define an analog input port as the pressure sensor. In the following screen, ports 5 is defined as the pressure sensor.

6. Go to Climate › Static Pressure and define the parameters.

6.7.2 Static Pressure Calibration

CAUTION The Static Pressure sensor is factory calibrated. Only calibrate the sensor if you have reason to believe that they are producing inaccurate results.

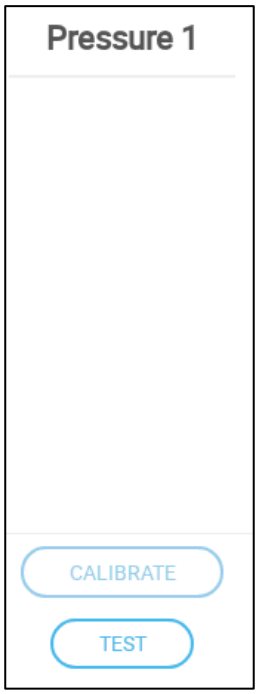
The Static Pressure should be 0 when there is no ventilation and the house is closed. When the controller A/D counts is 100, this means that there is zero (0) static pressure.

NOTE: *Run the controller for a few hours so that the temperature in the box becomes stable and only then calibrate.*

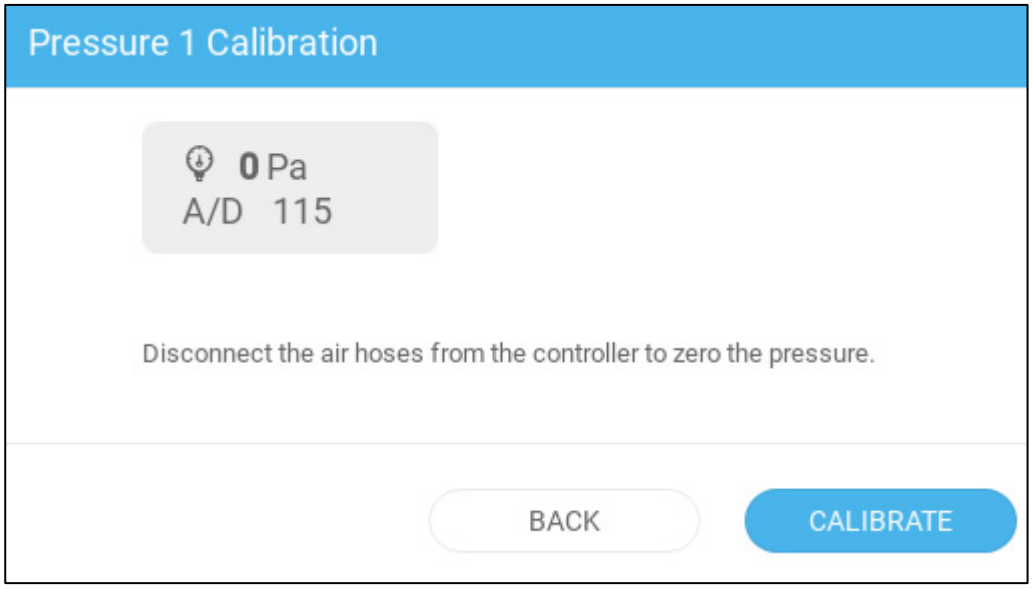
CAUTION DO NOT blow the air into the hose to see if the pressure changes! The sensor is sensitive and blowing air can cause irreparable damage.

To calibrate the Static Pressure Sensor:

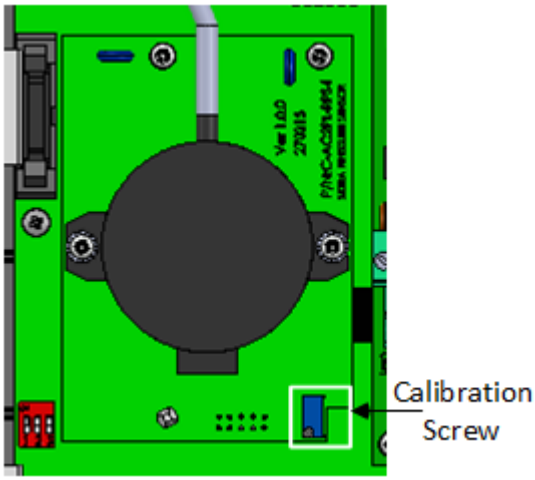
1. Disconnect the air hoses.
2. Go to *System › Device & Sensors › Pressure*.



3. Click **Calibrate**.



4. If the A/D count is 100 +/- 30 (70 to 130), click **Calibrate**.
5. If the A/D count is less than 70 or greater than 130:
    a. Check for blocked air hoses or wind interference.
    b. Open the Trio. On the Main Board, find the Static Pressure Sensor.



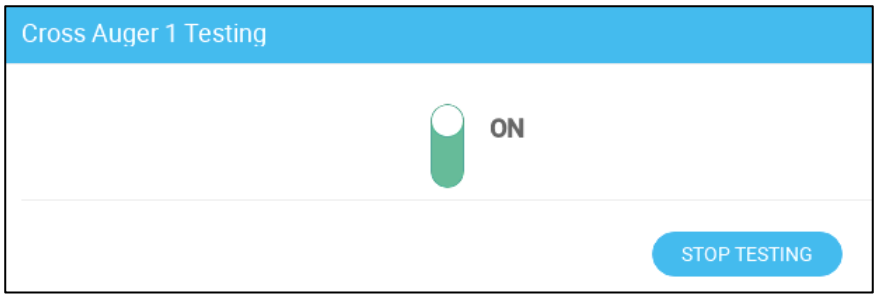
c. Adjust the zero pressure reading to approximately 100 by turning the calibration screw.

d. When the A/D count is within the permitted range, press **Calibrate**.

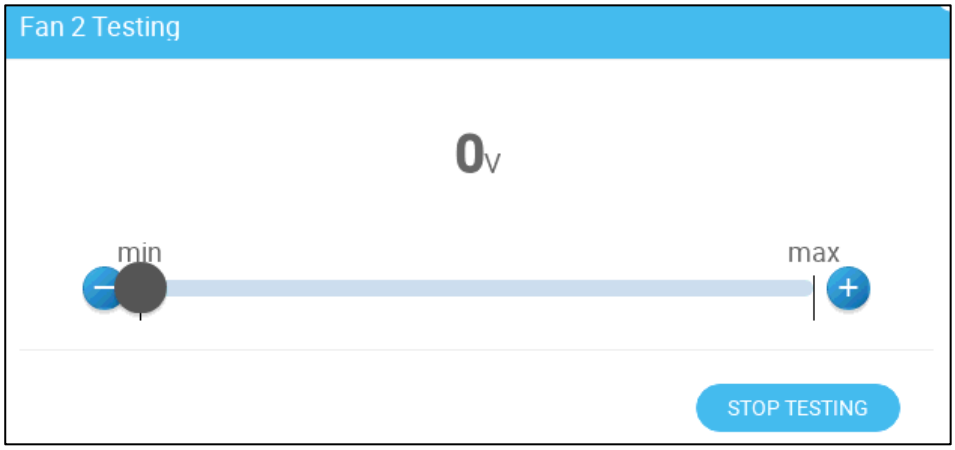
6.8 Testing Devices

After mapping a device, Trio provides a testing function that enables checking the device's performance.

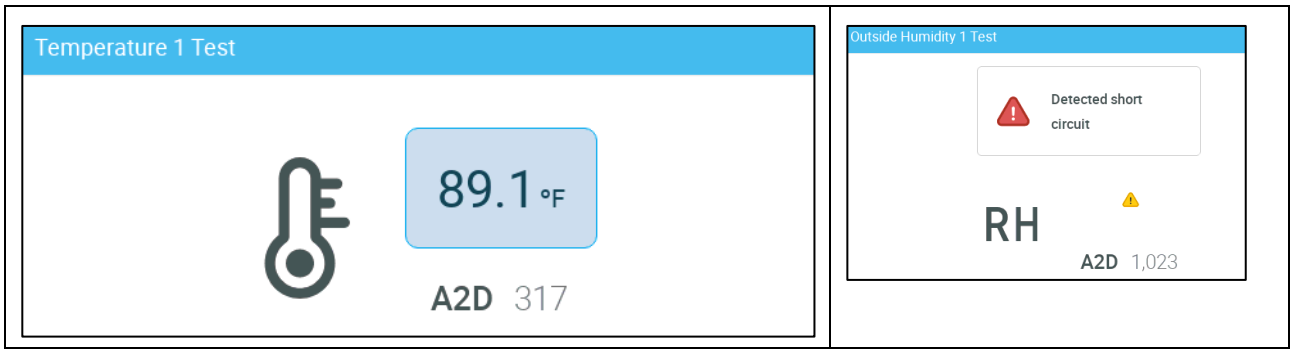
- Relay devices: Click Test > Start Testing to view the relay's status.



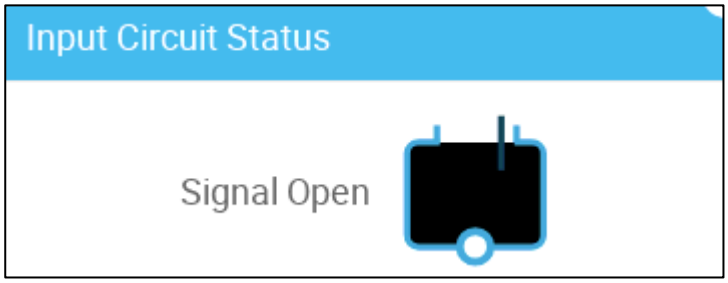
- Analog output devices: Click Test and move the voltage scale to ensure that the device operates at the proper minimum and maximum voltage levels.



- Analog input devices: Click Test to view the current input results and A2D value. The test function also displays an error message when the input signal is weak or non-existent.



    - Acceptable ranges:
        - RTS-2: 200 – 600.
- Digital input devices: Click Test to view the current circuit status (signal close or signal open).



7 Switches

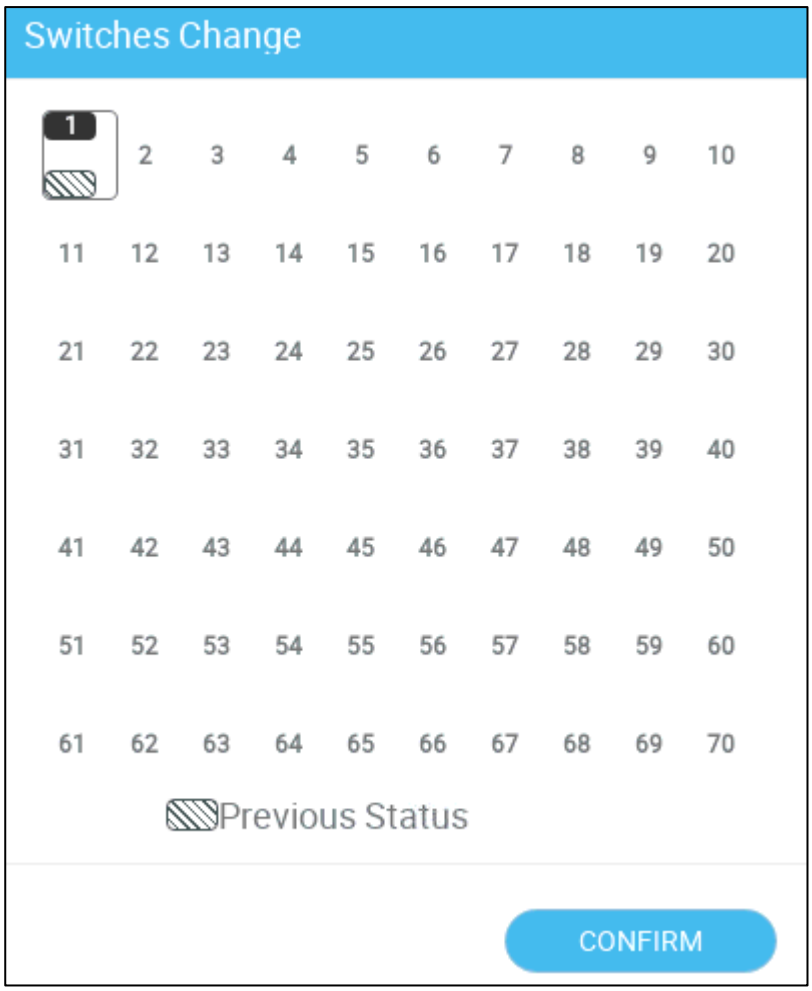
7.1 Relay Types

In the Expansion 70, there are three types of relays:

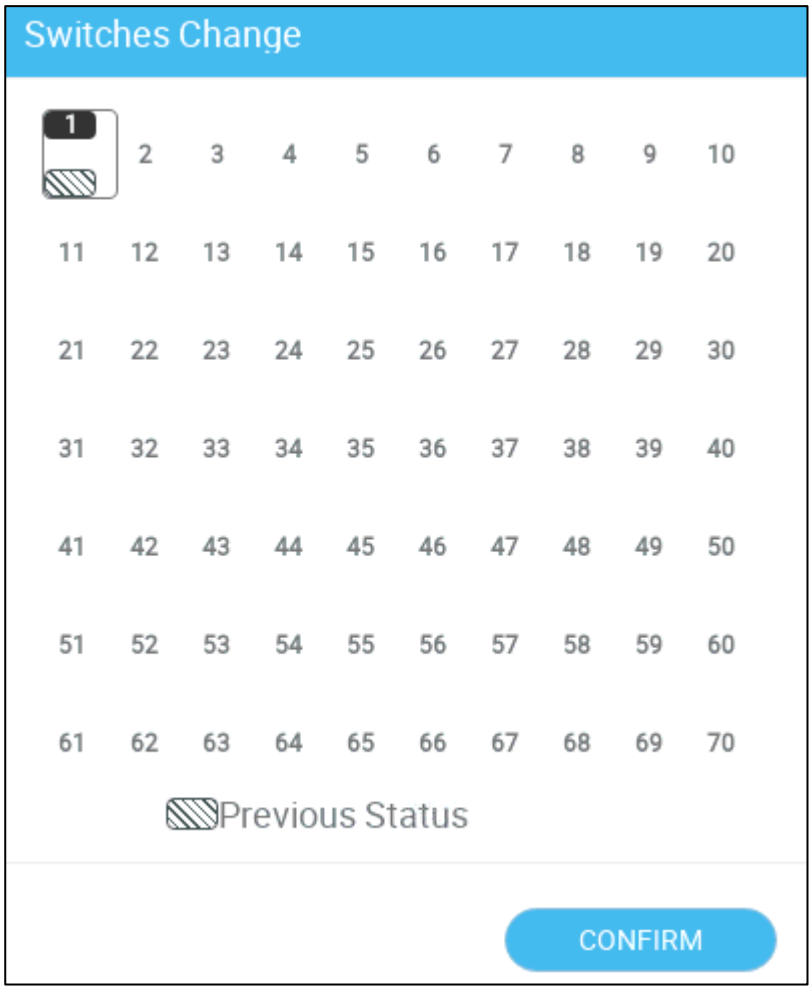
- Normally Open Relay Cards. In these cards the toggle switches have three statuses:
  - On: The relay remains on, regardless of the software.
  - Off: The relay remains off in any situation.
  - Auto: Trio software controls the relay.
- Normally Close Relay Cards. In these cards the toggle switches have three statuses:
  - On: The relay remains OFF, regardless of the software.
  - Off: The relay remains ON in any situation.
  - Auto: Trio software controls the relay
- Winch Cards. Winch cards drive vents (tunnel doors, inlets, outlets). Two relays are used to control each vent (open and close).

7.2 Moving the Toggle Switch

In the event that a user moves a toggle switch, a confirmation screen immediately appears:



- Click Confirm or move the toggle switch to its previous position.
- If you do not confirm or move the switch within 60 seconds, an alarm is generated.



The user needs to confirm the change.

8 Appendix A: Alarm Backup Battery

As an option, the Trio Rotem can be equipped with a backup alarm battery. In the event of a power loss, all controller functionality ceases. The backup battery enables Trio to send out SMS messages to the recipients informing them of the power loss. As soon as power is restored, controller functionality restarts. In addition, the battery prevents automatic resets in the event of a very short power outage.

NOTE *During a power outage, communication is via the cell modem only.*

- A fully powered battery can remain active for five minutes.
- Installation:
  - If the Trio is ordered with the alarm battery, no installation or programming is required.
  - If the battery is ordered as an upgrade, install the unit as shown in Figure 66.

CAUTION *Turn off the alarm battery before restarting the Trio. Switch the toggle switch to off. See Figure 66.*

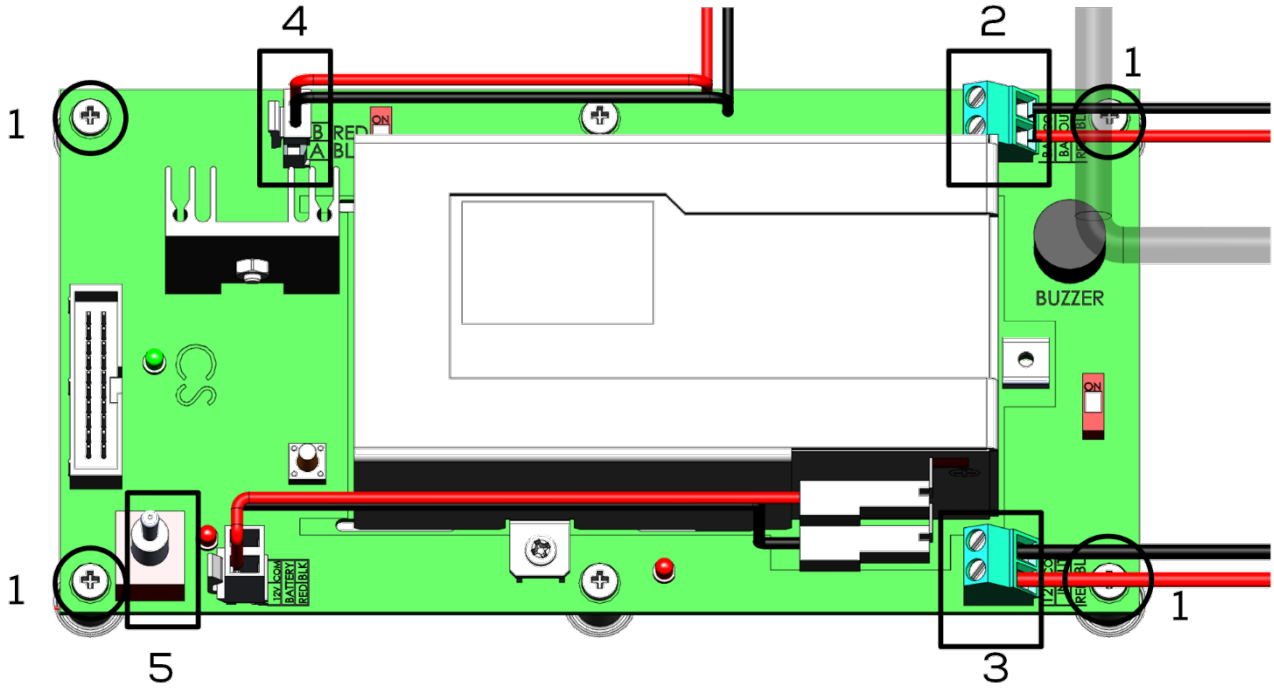


Figure 66: Trio Alarm Battery Installation, Expanded

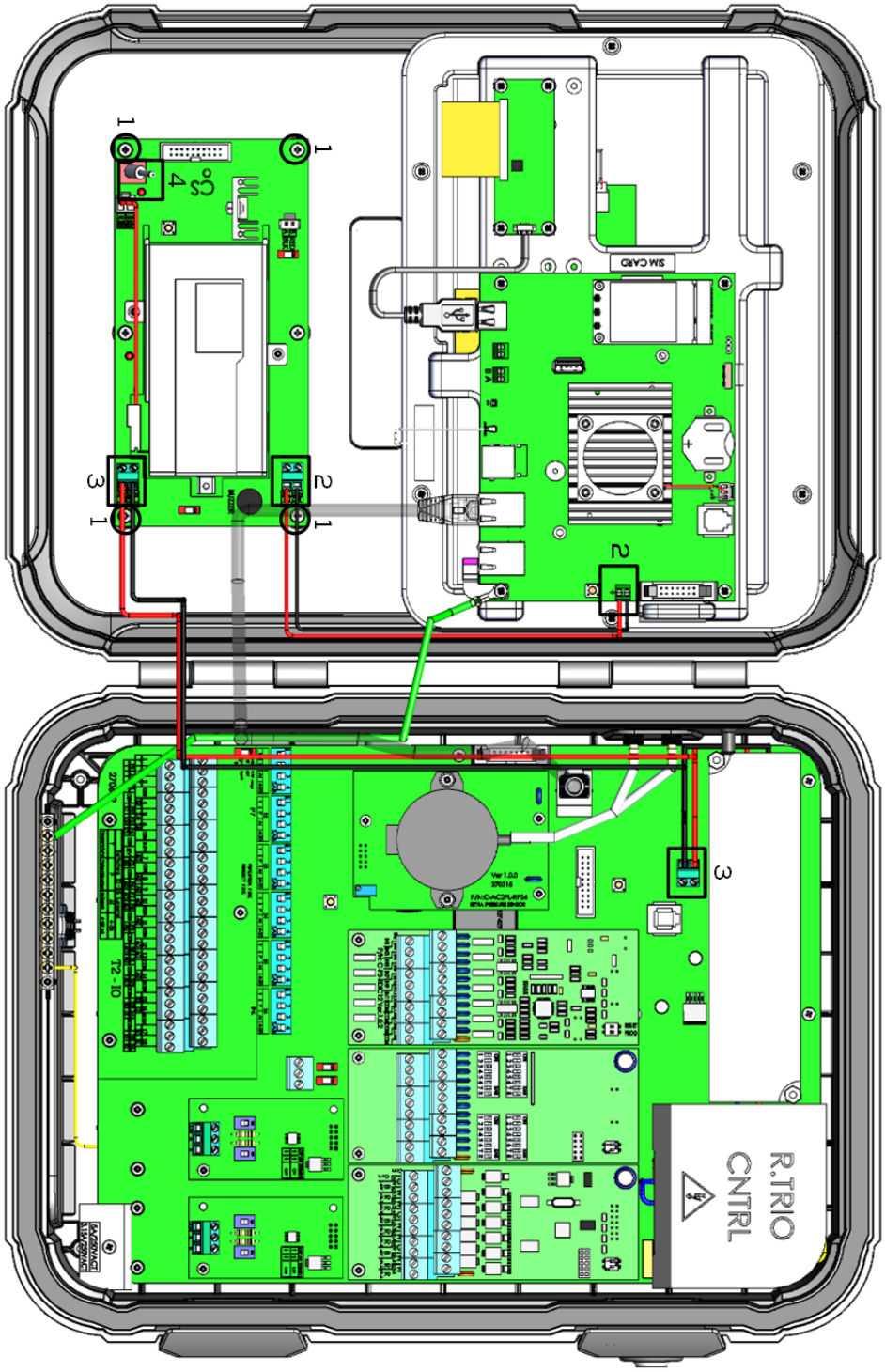


Figure 67: Trio Alarm Battery Installation

1	Attach the card with four screws
2	Attach the wires between the Trio battery and the alarm battery.
3	Attach the wires between the alarm battery and the CPU card.
4	On/off toggle switch

9 Warranty

Warranty and technical assistance

Munters products are designed and built to provide reliable and satisfactory performance but cannot be guaranteed free of faults; although they are reliable products they can develop unforeseenable defects and the user must take this into account and arrange adequate emergency or alarm systems if failure to operate could cause damage to the articles for which the Munters plant was required: if this is not done, the user is fully responsible for the damage which they could suffer.

Munters extends this limited warranty to the first purchaser and guarantees its products to be free from defects originating in manufacture or materials for one year from the date of delivery, provided that suitable transport, storage, installation and maintenance terms are complied with. The warranty does not apply if the products have been repaired without express authorisation from Munters, or repaired in such a way that, in Munters' judgement, their performance and reliability have been impaired, or incorrectly installed, or subjected to improper use. The user accepts total responsibility for incorrect use of the products.

The warranty on products from outside suppliers fitted to Trio Rotem, (for example antennas, power supplies, cables, etc.) is limited to the conditions stated by the supplier: all claims must be made in writing within eight days of the discovery of the defect and within 12 months of the delivery of the defective product. Munters has thirty days from the date of receipt in which to take action, and has the right to examine the product at the customer's premises or at its own plant (carriage cost to be borne by the customer).

Munters at its sole discretion has the option of replacing or repairing, free of charge, products which it considers defective, and will arrange for their despatch back to the customer carriage paid. In the case of faulty parts of small commercial value which are widely available (such as bolts, etc.) for urgent despatch, where the cost of carriage would exceed the value of the parts, Munters may authorise the customer exclusively to purchase the replacement parts locally; Munters will reimburse the value of the product at its cost price.

Munters will not be liable for costs incurred in demounting the defective part, or the time required to travel to site and the associated travel costs. No agent, employee or dealer is authorised to give any further guarantees or to accept any other liability on Munters' behalf in connection with other Munters products, except in writing with the signature of one of the Company's Managers.

WARNING: In the interests of improving the quality of its products and services, Munters reserves the right at any time and without prior notice to alter the specifications in this manual.

The liability of the manufacturer Munters ceases in the event of:

- dismantling the safety devices;
- use of unauthorised materials;
- inadequate maintenance;
- use of non-original spare parts and accessories.

Barring specific contractual terms, the following are directly at the user's expense:

- preparing installation sites;
- providing an electricity supply (including the protective equipotential bonding (PE) conductor, in accordance with CEI EN 60204-1, paragraph 8.2), for correctly connecting the equipment to the mains electricity supply;
- providing ancillary services appropriate to the requirements of the plant on the basis of the information supplied with regard to installation;
- tools and consumables required for fitting and installation;
- lubricants necessary for commissioning and maintenance.

It is mandatory to purchase and use only original spare parts or those recommended by the manufacturer.

Dismantling and assembly must be performed by qualified technicians and according to the manufacturer's instructions.

The use of non-original spare parts or incorrect assembly exonerates the manufacturer from all liability.

Requests for technical assistance and spare parts can be made directly to the nearest Munters office.