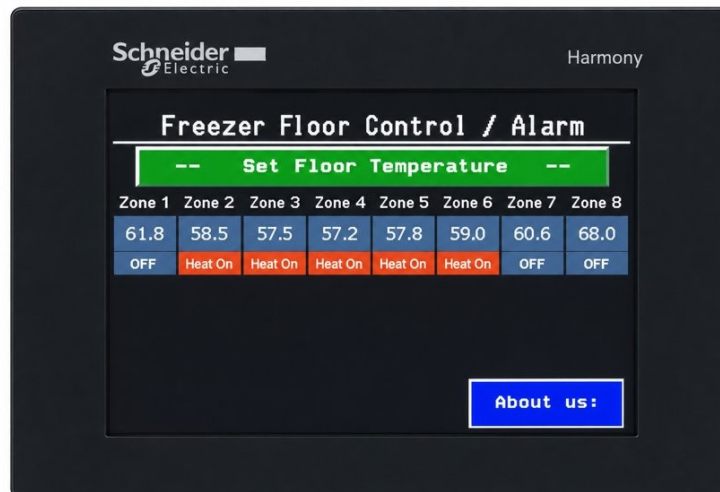


Freezer Floor Systems

A Division of Thermal Equipment Sales Co., Inc.

Freezer Floor Heating System Installation, Startup & Operation Guide

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About This Guide

This guide covers installation of the heating cable and sensors, system startup, and day-to-day operation of the Freezer Floor Systems control panel and touch screen. Keep it with the control panel.

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1. Installation
2. Startup Procedure
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 - Main Screen • Alarm Conditions • Temperature Setpoint
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NOTE: The number of zones, circuits, GFIs and breakers shown on the screens depends on your job. Screens in this guide show a typical system; yours may show more or fewer.

IMPORTANT: Freezer Floor Systems is not an engineering firm and does not provide engineered or sealed drawings. Consult a licensed professional engineer before construction. All electrical work must be performed by a qualified electrician in accordance with the National Electrical Code and local codes.

1. Installation

Heating Cable

- Install the heating cable in **3/4" rigid conduit** (minimum) in the floor, as shown on the layout drawing.
- Pull each cable to a **weatherproof junction box** for both the power connection and the end-of-run connection.
- Terminate each cable end with the termination kit provided, following **Terminating the Heating Cable** below.
- Seal conduit ends with silicone caulk to keep moisture and warm air out of the junction boxes.

WARNING: Do not megger (insulation-resistance test) or energize the cable until the termination silicone has fully cured – about **24 hours**.



Detail 1 – Heating cable in 3/4" rigid conduit

Terminating the Heating Cable

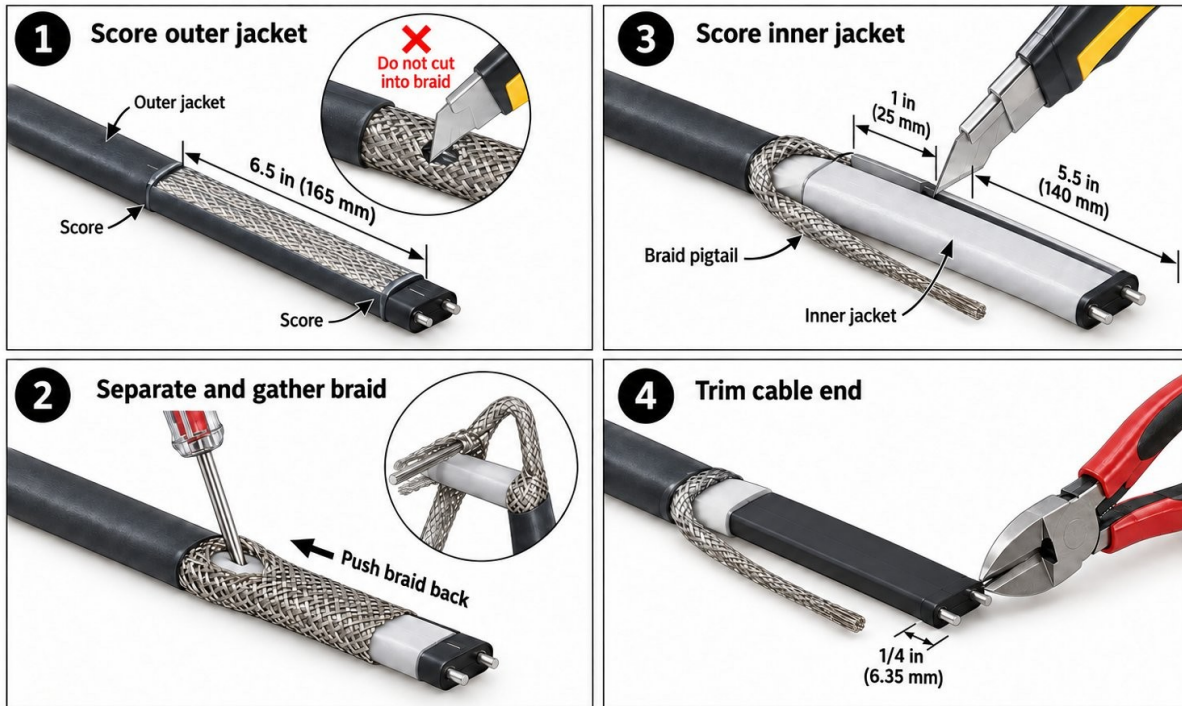
Each power end and end-of-run end of the heating cable is prepared the same way. Work in a clean, dry location and follow the steps exactly.

WARNING: The black core between the bus wires is **conductive**. If the braid (ground shield) touches the black core or either bus wire, the circuit **will trip – either the GFI or the circuit breaker**. Remove **all** core material from the bus wires, keep the braid pigtail clear of the core and bus wires, and fully seal the end before installing the boot.

Steps 1–4: Remove the jackets and form the braid pigtail

Heating Cable – Cable Preparation

Steps 1–4



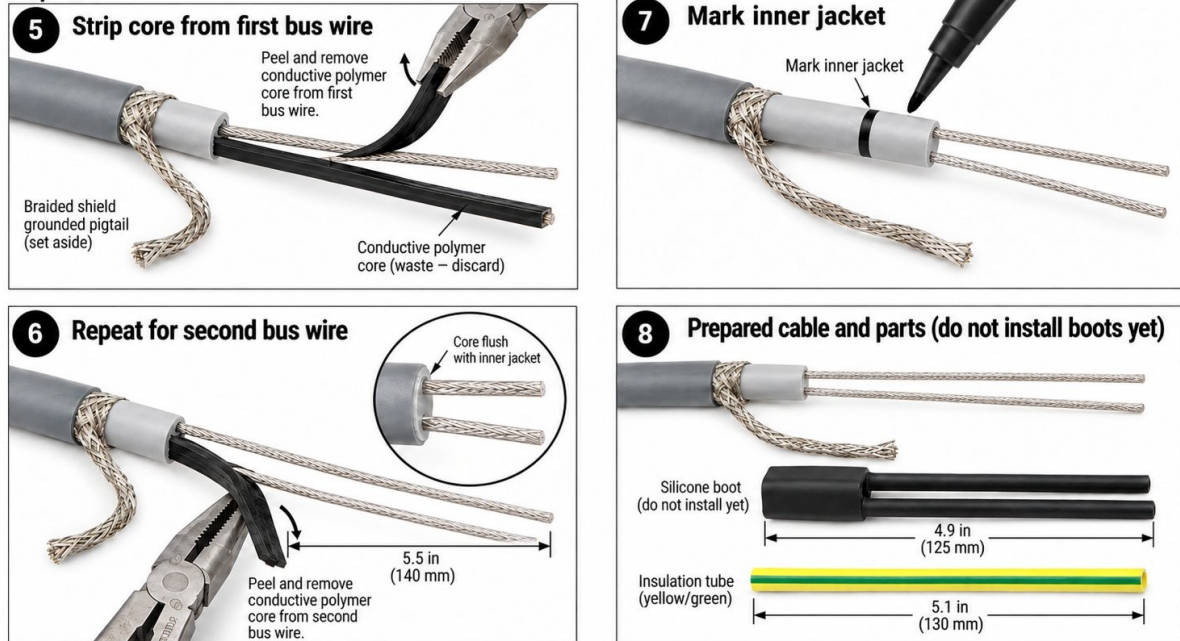
Cable preparation – Steps 1–4

1. **Score the outer jacket** 6.5 in (165 mm) from the end, then score lengthwise and remove it. **Do not cut into the braid.**
2. **Separate and gather the braid.** Push the braid back, open it with a small screwdriver, work the cable out through the opening, and twist the braid into a pigtail.
3. **Score the inner jacket**, leaving 1 in (25 mm) of inner jacket past the braid, and remove the remaining 5.5 in (140 mm). **Do not nick the bus wires.**
4. **Trim the cable end** square, removing 1/4 in (6 mm).

Steps 5–8: Strip the core and lay out the parts

Heating Cable – Cable Preparation

Steps 5–8



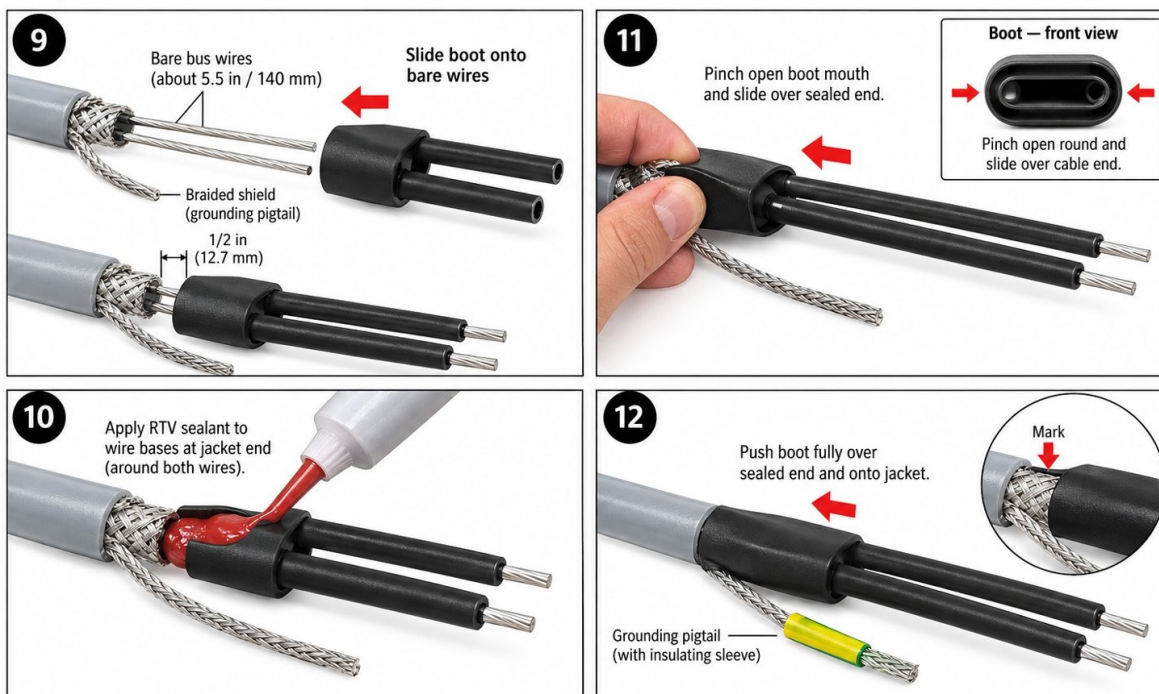
Cable preparation – Steps 5–8

5. **Strip the core from the first bus wire.** Peel the black conductive polymer away with pliers and discard it. Set the braid pigtail aside.
6. **Repeat for the second bus wire.** The core must be removed flush with the inner jacket and the bare bus wires should be about 5.5 in (140 mm) long. **No black core material may remain on the wires.**
7. **Mark the inner jacket** as a reference for positioning the boot.
8. **Lay out the parts:** silicone boot (4.9 in / 125 mm) and yellow/green insulation tube (5.1 in / 130 mm). **Do not install the boot yet.**

Steps 9–12: Seal the end and install the boot

Heating Cable – Cable Preparation

Steps 9 – 12



Cable preparation – Steps 9–12

9. **Slide the boot onto the bare bus wires**, stopping about 1/2 in (12.7 mm) from the jacket. Bus wires must not touch or cross.
10. **Apply RTV silicone sealant** around the base of both wires at the jacket end.
11. **Pinch open the boot mouth** and slide it over the sealed end.
12. **Push the boot fully over the sealed end and onto the jacket**, up to the mark. Slide the **yellow/green insulation tube** over the braid pigtail – it is the ground connection.

NOTE: Connect the bus wires to the power or end-of-run monitor wiring, and the braid pigtail to ground, in the junction box. Allow the silicone to cure about **24 hours** before meggering or energizing.

Power Connections

Size power wiring for the circuit load and terminate each heating circuit directly at its **GFI (ground fault) breaker** in the control panel, per the wiring diagram.

End-of-Run Monitor Connections

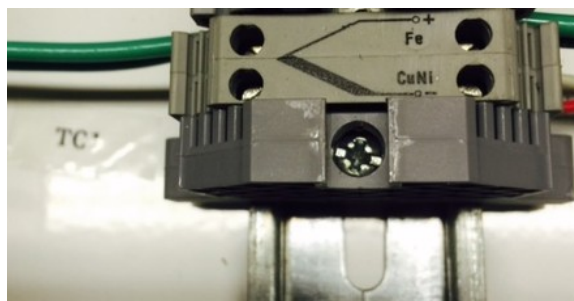
Each cable run has an end-of-run monitor. Wire the far end of each run back to its monitor relay (**R1, R2 ...**) at terminals **A1 and A2**. This wiring carries less than 1 amp; size it accordingly.



Detail 2 – Monitor relays, terminals A1 & A2

Thermocouples

- Install each floor sensor in its own sensor conduit in the slab. **Seal the conduit end before the slab is poured.**
- Use **Type J thermocouple extension-grade wire** run directly to the control panel with **no splices**. For long runs, use shielded Type J extension wire.
- Land the leads on the thermocouple terminals marked **TC+ (Fe)** and **TC– (CuNi)**. On Type J wire the **white lead is positive (+)** and the **red lead is negative (–)**. Reversed leads read incorrectly.
- If a zone has more than one sensor, the controller displays and controls from the **lowest** reading.



Detail 3 – Thermocouple terminal

Remote Alarm Signal

The panel provides a **24 VDC** alarm signal for a building or DCS system. Terminal numbers are shown on the wiring diagram for your panel. A relay for a dry contact can be supplied on request.

Peak Demand Setback (Optional)

For peak-demand or utility load-shed programs, connect a **normally open (N.O.) dry contact** from the building management or utility demand system to **terminals 3 and 5**.

Contact	Panel operation
Open (normal)	Each zone runs at its normal settings – Setpoint 55.0 °F, Deviation Alarm 10.0 °F.
Closed (peak setback)	All zones change to Setpoint 35.0 °F and Deviation Alarm 2.0 °F . Heating is held to the minimum needed to keep the slab above freezing.

- During setback the low-temperature alarm stays active at **33 °F** (35.0 – 2.0). If the floor falls toward freezing (32 °F) for any reason, the alarm sounds.
- When the contact opens, the zones return to their normal settings.
- Use a **dry (unpowered) contact only**. Do not apply voltage to terminals 3 and 5. Leave them open if peak setback is not used.

2. Startup Procedure

Record all readings on the **Freezer Floor Startup Checklist**.

Before power is applied

1. Confirm cable terminations, junction box covers and conduit seals are complete, and the silicone has cured (24 hours).
2. Confirm thermocouple leads are landed on the correct zone inputs with correct polarity.
3. Check panel terminations for tightness and confirm the supply voltage at the main.
4. **Megger each heating circuit** and record the reading. Use the test voltage and minimum value from the cable manufacturer's instructions.

With power on

1. Turn on the main and each GFI breaker. The Main screen should show every zone's floor temperature.
2. On the **Temperature Setpoint** screen, set **every zone's setpoint below the current floor temperature** so no zone is calling for heat.

Check out one zone at a time

Test the zones **one at a time**. With only one zone heating, you can confirm that each end-of-run monitor relay is wired to the correct zone. Repeat these steps for each zone:

1. Raise **this zone's** setpoint above the current floor temperature. Confirm **only this zone** shows **Heat On**.
2. At the monitor relays, confirm that **only the relays for this zone** are energized, and record the voltage at A1/A2 of each. **If a relay for another zone energizes, or one of this zone's relays does not, the end-of-run wiring is crossed or open – correct it before continuing.**
3. Open one end-of-run connection in this zone and confirm a **continuity alarm** on the correct relay (r#) on the Circuit Monitor Fault screen. Reconnect it.
4. Press the **test button** on this zone's GFI breaker and confirm the GFI alarm shows the correct GFI. Reset it.
5. Turn off this zone's circuit breaker and confirm the CB alarm shows the correct breaker. Turn it back on.
6. Force a **temperature alarm**: raise this zone's setpoint **more than 10 °F above the current floor temperature** (more than the 10.0 °F deviation). After the 5-second delay, confirm the zone turns red and the TEMP ALARM button appears.
7. On the first zone, press **Silence** during an alarm and confirm the horn stops, the stack light comes on, and the remote alarm signal stays on while the fault exists. Clear the fault and confirm the system returns to normal by itself.
8. **Set this zone's setpoint back below the actual floor temperature** so it stops heating, then move to the next zone.

All zones – 30-minute run test

After every zone has been checked out individually:

1. Raise **all** zone setpoints above the current floor temperature so every zone is calling for heat. Confirm every zone shows **Heat On**.
2. Record the **start-up amps** and **heater voltage** for each circuit.

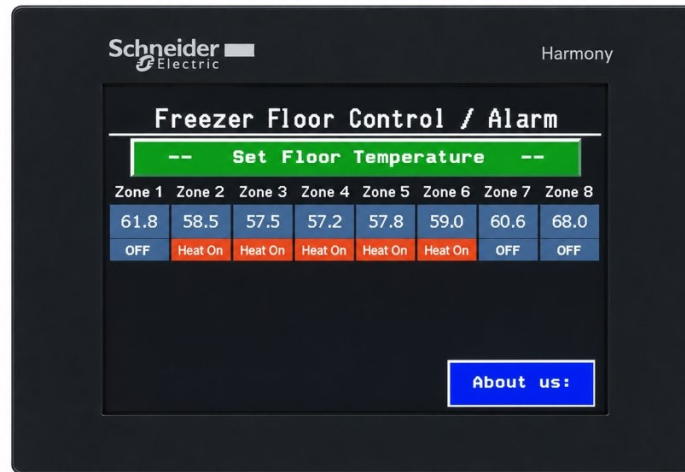
3. Let the system run **30 minutes**, then record the **amps for each circuit**. Confirm the readings are within the design range on the startup checklist. Investigate any circuit that is high, low, or did not settle.
4. If peak setback is used, close the contact at terminals 3 and 5 and confirm every zone changes to **35.0 °F setpoint / 2.0 °F deviation**. Open the contact and confirm every zone returns to its previous settings.

Close-out

1. **Confirm every zone is at its normal settings: Setpoint 55.0 °F and Deviation Alarm 10.0 °F.** Leaving a zone at a test setpoint will overheat the floor and waste energy.
2. Go to **About Us** → **Troubleshoot** → **Fault History** and hold **Reset Count** for 3 seconds to clear the counts created during testing.
3. Show the owner how to read the Main screen and respond to alarms. Leave this guide and a copy of the checklist with the owner.

3. Operation – Touch Screen

Main Screen



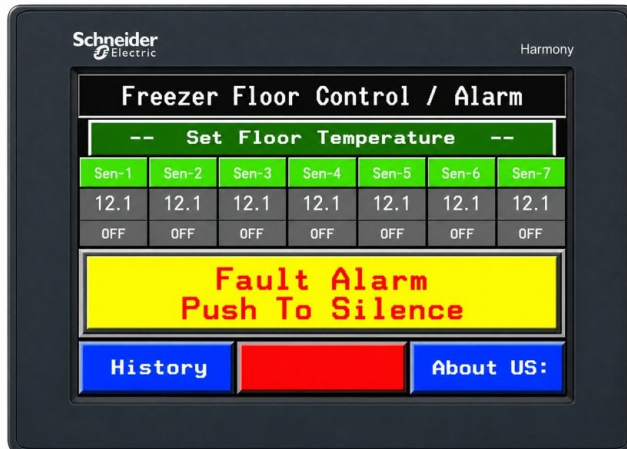
Main screen – normal operation

The Main screen appears at power-up and shows every zone at a glance.

Item	Meaning
Zone temperature	Current floor temperature (°F). With multiple sensors in a zone, the lowest reading is shown.
OFF	The floor is at or above setpoint; heat is off.
Heat On	The zone is below setpoint; the heating cable is energized.
ALARM	The floor is below the zone's low-temperature alarm point.
Set Floor Temperature	Press and hold for 3 seconds to open the Temperature Setpoint screen.
About us	Contact information, panel number, and access to troubleshooting and Fault History.

Each zone controls to its own setpoint with a **2 °F differential** to prevent short cycling.

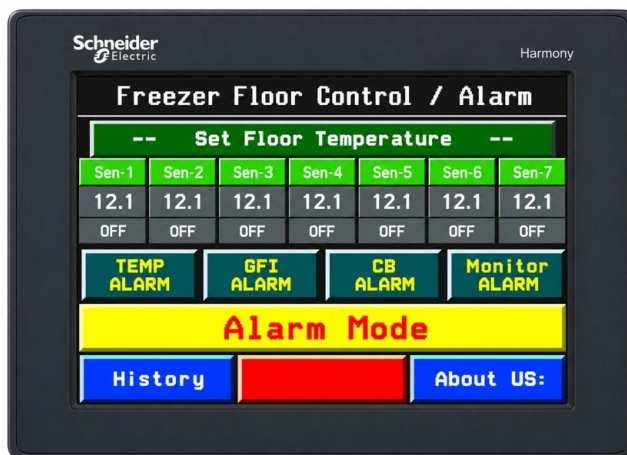
Alarm Conditions



Alarm sounding – Fault Alarm / Push To Silence

When a fault occurs (after a **5-second delay** for temperature and monitor alarms):

- The horn sounds and the **Fault Alarm – Push To Silence** banner appears.
- The remote alarm signal (24 VDC) turns on.
- An alarm button appears in **yellow** for each type of fault present: **TEMP ALARM**, **GFI ALARM**, **CB ALARM** or **MONITOR ALARM**. Press a button to open its detail screen. The buttons are hidden when there is no alarm.



Alarm silenced – alarm buttons and Alarm Mode

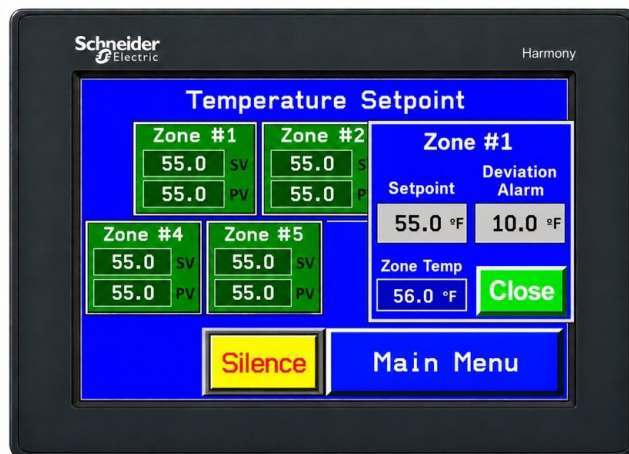
Silencing: press the banner (or any **Silence** button). The horn stops, the stack light turns on, and the **Circuits in Alarm** indicator turns yellow. This indicator does not open a screen.

- If the fault is still present after **24 hours**, the horn sounds again as a reminder.
- The remote alarm signal **stays on** as long as any fault exists, even when silenced.
- When all faults clear, the horn, stack light and alarm indicators **reset automatically**.

Sensor failure: if a thermocouple fails, a sensor alarm appears and that zone switches to timed operation, cycling heat **on and off every 60 seconds** until the sensor is repaired.

Power outage: active alarms reset when power is lost. If a fault still exists when power returns, it will alarm again.

Temperature Setpoint



Temperature Setpoint screen with the Zone setup window open

Open by pressing and holding **Set Floor Temperature** on the Main screen for **3 seconds**. Each zone box shows:

- **SV (Set Value)** – the floor temperature the zone holds.
- **PV (Process Variable)** – the current floor temperature.

Zone color	Meaning
Light green	Normal – heat off
Green	Heat on
Red	Zone in temperature alarm

Changing a setpoint or alarm

1. Touch the zone box. The **Zone setup window** opens.
2. Touch **Setpoint** or **Deviation Alarm** and enter the new value.
3. Press **Close**.

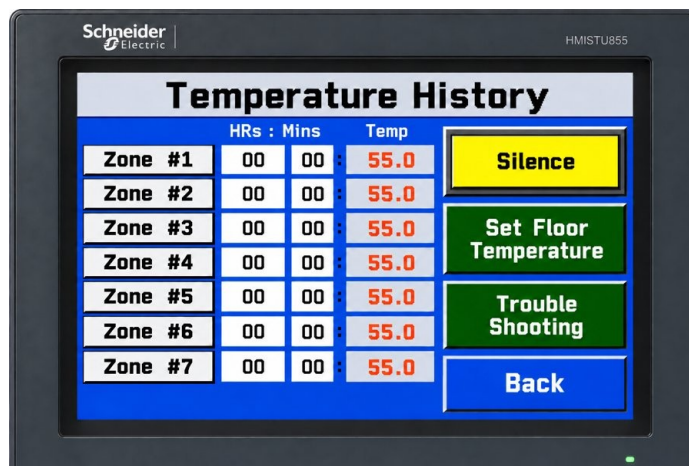
Setting	Description
Setpoint	Floor temperature to hold. Range 32.0 – 100.0 °F . Factory setting 55.0 °F .
Deviation Alarm	How far below setpoint the floor may fall before a temperature alarm. Factory setting 10.0 °F (55.0 °F setpoint = 45.0 °F alarm point).
Zone Temp	Current floor temperature (display only).

If a setpoint entry would put the floor below its alarm point (setpoint minus deviation), the controller resets that setpoint to **50.0 °F**.

NOTE: During startup, setpoints are raised above floor temperature for testing. **Return each**

zone to its normal settings – Setpoint 55.0 °F, Deviation Alarm 10.0 °F – when checkout is complete.

Temperature History (Temperature Alarm)



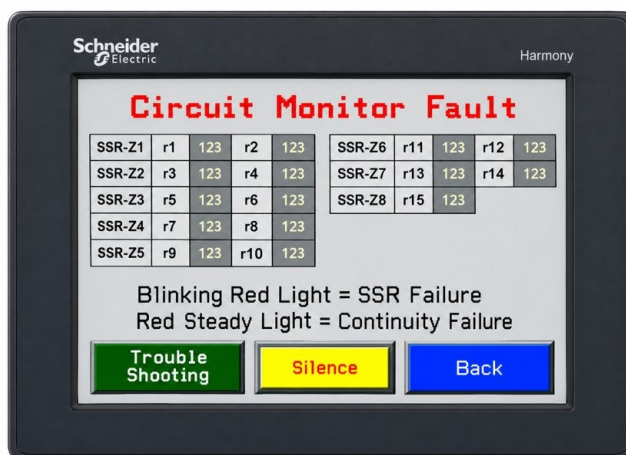
Temperature History screen

Open by pressing the yellow **TEMP ALARM** button on the Main screen.

- **HRs : Mins** – total time each zone has spent below its alarm point. Time accumulates over every alarm until reset.
- **Temp** – the zone's current floor temperature.

A zone with long or repeated time in alarm should be checked. Buttons: **Silence**, **Set Floor Temperature** (opens the setpoint screen), **Trouble Shooting**, and **Back**.

Circuit Monitor Fault



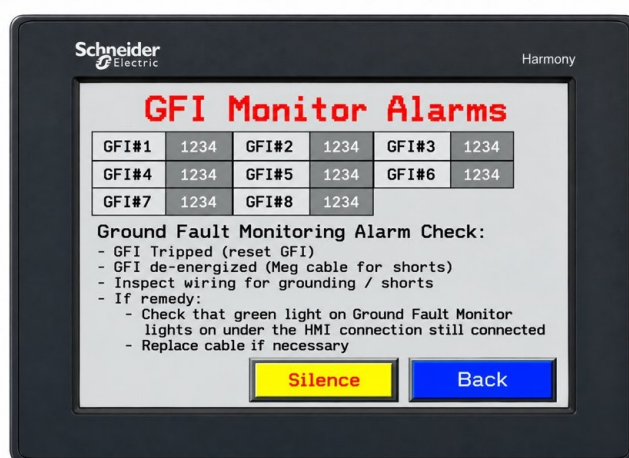
Circuit Monitor Fault screen

Open by pressing the yellow **MONITOR ALARM** button. Each zone's solid-state relay (**SSR-Z1**, **SSR-Z2** ...) is listed with its end-of-run monitor relays (**r1**, **r2** ...). The number beside each item is its fault count.

Indicator	Meaning	Likely cause
SSR solid white	Normal	–
SSR blinking yellow	SSR failure – voltage present on the circuit when the controller is not calling for heat	Shorted solid-state relay; replace the SSR
Relay (r#) steady yellow	Continuity failure – calling for heat but no voltage at the end of that run	Open heating cable, loose power or end connection, or failed monitor relay

Buttons: **Trouble Shooting, Silence, Back.**

GFI Monitor Alarms



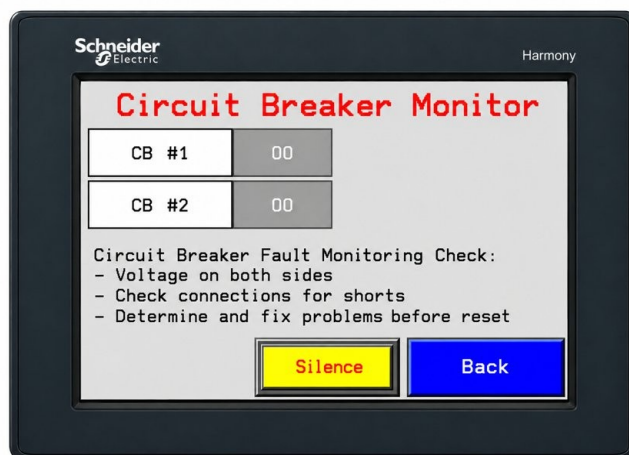
GFI Monitor Alarms screen

Open by pressing the yellow **GFI ALARM** button. Each ground fault breaker (**GFI #1, #2 ...**) is listed with its fault count; a GFI in alarm turns **yellow**. The GFI alarm is generated by an auxiliary contact on the breaker that signals when it is off or tripped.

Ground fault alarm check:

1. GFI tripped – reset the GFI.
2. If the GFI will not stay on – de-energize and **megger the cable** for shorts.
3. Inspect wiring and connections for grounding or shorts (moisture in junction boxes is a common cause).
4. If the alarm continues, check that the green light on the ground fault monitor is lit and the HMI connection is still connected. Replace the cable if necessary.

Circuit Breaker Monitor



Circuit Breaker Monitor screen

Open by pressing the yellow **CB ALARM** button. Each breaker (**CB #1, #2 ...**) is listed with its fault count; a breaker in alarm turns **yellow**. The alarm comes from an auxiliary contact on the breaker that signals when it is off or tripped.

Circuit breaker fault check:

- Check for voltage on both sides of the breaker.
- Check connections for shorts.
- **Determine and fix the problem before resetting the breaker.**

About Us



About Us screen

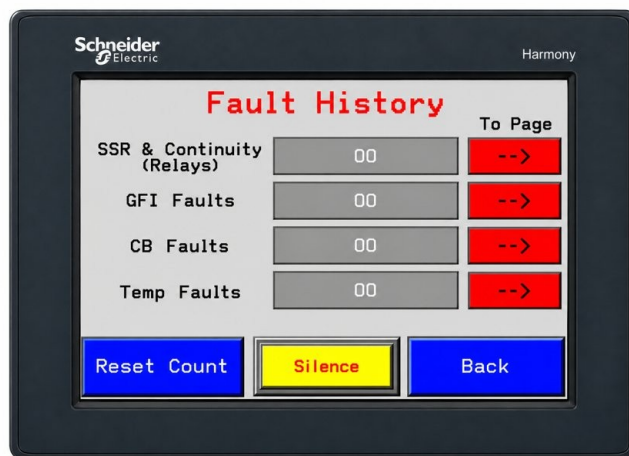
Press **About us** on the Main screen to see the manufacturer's contact information and the information to have ready when you call for help:

- **Company name** – the customer or contractor the panel was built for.
- **Panel part number** – for example #FFCH-24B220-...
- **Serial number (S/N)** – for example FF1225PLC0802.

Panels supplied under a distributor's or contractor's name show their contact information instead.

- **Troubleshoot** – opens the Fault History screen.
- **Silence** – silences the horn.
- **Back** – returns to the Main screen.

Fault History



Fault History screen

Open from **About Us** → **Troubleshoot**. Shows the number of faults recorded since the last reset:

Fault type	Counts
SSR & Continuity (Relays)	SSR failures and end-of-run continuity failures
GFI Faults	Ground fault trips
CB Faults	Breaker trips or breakers turned off
Temp Faults	Low-temperature alarms

Press the red → button beside a fault type to open its detail screen.

- **Reset Count** – press and hold for **3 seconds** to clear all fault counts and Temperature History times.
- **Silence** – silences the horn. **Back** – returns to the previous screen.

NOTE: Record the fault counts before resetting – for example on the yearly inspection report. They help identify a circuit that alarms repeatedly.

4. Alarm Summary

Alarm	Cause	Screen indication	Action
Temperature	Floor below setpoint minus deviation (5-sec delay)	Zone shows ALARM / red; TEMP ALARM button	Check breaker, GFI, cable continuity and sensor. See Temperature History.
GFI	Ground fault breaker tripped or off	GFI ALARM button; GFI turns yellow	Reset GFI; if it trips again, megger cable and inspect connections.
Circuit breaker	Breaker tripped or off	CB ALARM button; CB turns yellow	Find and fix the cause before resetting.
Continuity	Calling for heat, no voltage at end of run (5-sec delay)	MONITOR ALARM; relay r# steady yellow	Check cable, power and end connections, monitor relay.
SSR failure	Voltage on circuit when not calling for heat	MONITOR ALARM; SSR blinking yellow	Replace the solid-state relay.
Sensor failure	Thermocouple open or disconnected	Sensor alarm	Zone cycles 60 s on / 60 s off. Check TC wiring; replace sensor.

All alarms sound the horn and turn on the remote alarm signal. Silence stops the horn for 24 hours and turns on the stack light; the remote signal stays on until the fault clears.

5. Maintenance

- Have a qualified electrician inspect the system **yearly**: megger each circuit, check amps and voltages, test each GFI, and test all alarms. Compare with the original startup checklist.
- Review and record the **Fault History** counts at each inspection.
- Keep junction boxes closed and conduit seals intact to keep out moisture.
- Never turn the system off while the freezer is in operation. The floor heat protects the slab from frost heave.

For service or troubleshooting help call (901) 452-4516 and have your company name, panel part number and serial number from the About Us screen ready.