



Overview

The air inside any freezer is frigid and virtually incapable of holding any moisture, while the ambient store air outside the freezer will always hold more moisture compared to the frigid, dry air inside. Therefore, some frost forms every time a freezer door is opened. Although, the frigid, dry air inside the freezer is capable of slowly shedding frost every time it passes through the coil and it circulates around the case.

Seeing frost form on the product, shelves, and wall surfaces is not unusual. However, excessive accumulation occurs when a large amount of moist ambient air enters the case. Moisture from the air then condenses on cold surfaces as fluffy patches of frost. Frost can also be formed from moisture contained in the air during the defrost cycle.

Solving Product Frost Problems

To eliminate a product frost problem, you must eliminate the product's excessive exposure to moisture. That is why it is important to identify the path of the moisture.

Many possible paths exist, but your diagnosis should begin with a close look at where the frost is accumulating and where the frost is heaviest. This provides clues regarding the source of the moisture from which the frost originates and how the moisture reaches the product.

Sometimes, product frost is caused by a combination of factors. If so, you may wish to address the most easily-corrected sources of frost first. By doing so, you may be able to quickly make a noticeable improvement. On the other hand, it is advantageous to (at least) identify all the contributing factors. Then your diagnosis can be most accurate.

The table on the following pages of this document describes each possible cause of product frost, plus the resulting frost observed and the needed correction.

General Info & Advice

- Identify case model #, serial #, store name & location, date of visit, store temperature & humidity readings, & condition of case (any frost in case, stocking/shopping habits, etc.)
- Clean the ceiling & honeycomb holder of any ice
- Level drain traps
- Fix/replace drifting/stuck thermostats
- Replace any stuck/failed fan motors



- Replace any bent/damaged fan blades
- Adjust door closers
- Check door gaskets & seal to case
- Take velometer readings at the honeycomb
 - o This helps to identify blocked evap coils & failed fan motors
- Adjust superheat (if required)

Other Technical Assistance Available

If you have addressed all of the items from the table and you still have product frost accumulating, consider installing a temperature chart recorder at the back of a top shelf. This allows you to evaluate case temperature, defrost performance and stocking habits over a whole week of operation. This is usually worthwhile for tough frost problems. Disposable, self-contained chart recorders are available for about \$25 (Example: Cole-Parmer Single-Use Temperature Recorder).

It is Zero Zone's top priority to help you operate profitably. We have a commitment to participating in the solution of your technical challenges. If you require further technical assistance, check with your Zero Zone installer or local Zero Zone dealer. Further assistance is also available from Zero Zone at 800/247-4496. Thank you.

Conclusion

What treatments were taken & what were the results?



Table of causes, resulting frost patterns and corrections on the following page.

Notes: This table has most – but not all. “Reading” the frost pattern is important.

Cause of product frost	Resulting frost pattern	Correction
Excessively cold product temperatures (lower than -10°F for frozen food or -15°F for ice cream).	May be heaviest at the front center of shelf and at honeycomb holder. Diagnose by measuring temperature at or near product.	Raise temperature control to maintain product temperatures listed at left, <u>if end user wants</u> less frost.
Excessively humid store (higher than 55% relative humidity <u>or</u> higher than 58°F dewpoint in store). <u>Is possible in A/C'd store.</u>	Worst frost during humid (possibly cool) weather. Frost heaviest at front center of shelf. Possible sweating on case exterior.	Control store humidity independently of store temperature, to maintain humidity levels listed at left, <u>if end user wants</u> less frost.
Door ajar (when not in use) or store stockers leaving doors open too long.	Frost heaviest at front center of shelf, possibly heavier on underside of top shelves.	Adjust door closers to close door from 2” ajar. Advise end user regarding leaving door open during stocking. Verify that the door closers function and are not broken. If broken, replace.
Poorly sealed case joints, refrigeration exits or wiring exits.	Varies. Inspect joints or exits for local frost, ice or water. Attempt to shine a light through joint or exits. Air leaks such as around wires can cause leaks to happen elsewhere to “make up” for the air falling out. This can contribute to frost elsewhere.	Recaulk or foam-in joints or exits as needed to form an airtight seal. Do not rely on adhesion of permagum.
Poor sealing door frames or	Frost (or ice) just inside door	Carefully “read” frost.



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Cause of product frost	Resulting frost pattern	Correction
<p>air infiltration between door frame and case opening. (Evolution models)</p>	<p>frame or mullions, possibly at the perimeter of the doorset.</p>	<p>Smoke test frame or disassemble and inspect. Seal with caulk or putty.</p>
<p>Poor sealing door gaskets (visually inspect: try “dollar bill” test or “flashlight test” or “smoke pen test” to check gasket contact).</p> <p>Note: anti-sweat controllers can make gaskets cold, stiff, and possibly not sealing well.</p>	<p>Frost (or ice) just inside door opening or door frame (Evolution models), possibly at the corners of the gaskets. Water forms on inside glass, which can “point” back to the air leak.</p> <p>Humid air can also travel a short distance (15”) before depositing the water it carries, making the diagnosis difficult. A smoke pen helps here.</p>	<p>‘Fluff up” gasket by hand, or carefully heat gasket to soften and form.</p> <p>You may also try to flip the gasket.</p> <p>Peel back the gasket corner & look for excessive flash round the dart. This prevents the gasket from seating properly. Remove excessive flash with a razor blade. Be careful not to damage the gasket.</p> <p>An offset in the gasket greater than .03” could cause frost pattern. Replace gasket if torn or deformed.</p> <p>Inspect gaskets along the hinge side. If gasket is rolled over, replace it or rotate the gasket.</p> <p>If the gap between the horizontal & vertical gasket magnets is greater than .25”, replacement of the gasket is recommended.</p> <p>Check back plastic on door miter joints. If there is a gap,</p>



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		pull the plastic away, caulk, & then reassemble.
Poorly trapped drain.	Varies. Inspect drain system for coolness on surface of trap and drain.	Install or modify trap so that air is not allowed to flow out through drain system. Be sure that the trap is primed.
Delayed defrost termination (defrost cycle too long) causing warm, moist air to settle as product frost.	Heaviest toward back wall and back of top shelf. May see icing at ceiling, back wall or back of drain pan.	<u>Set defrost termination to 50°F</u> using a thermocouple to measure temperature at sensing bulb of thermostat.
Defrost termination thermostat stuck open (or drifting away from proper calibration).	Heaviest toward back wall and back of top shelf. May see icing at ceiling, back wall or back of drain pan.	Test by measuring termination temperature. Replace thermostat if not closing at proper time.
Defrost termination thermostat improperly set (or drifting to close).		
Time-only defrost cycle (an installation choice <u>strongly not recommended</u>).	Heaviest toward back wall and back of top shelf. May see icing at ceiling or back.	Install defrost temperature terminating thermostat <u>if end user wants</u> less frost.
Too many defrost cycles.	Heaviest toward back wall.	Use <u>one defrost per day</u> .
Residual ice on evaporator coil, causing delayed defrost termination.	Heaviest toward back wall and back of top shelf. May see icing at ceiling, back wall or back of drain pan.	Correct source of excessive coil frosting to prevent residual ice. Set defrost clock to <u>60 minute fail-safe</u> .
Poor airflow due to failed fans, blocked return grilles, excessive coil frost, or bent fan blades	Ice and frost on ceiling, top product, top shelves and brackets.	Restore airflow by fixing fans, unblocking grilles, and/or adding a defrost.
Mullion strikeplate to ceiling or	Frost forming in the corner	Unscrew mullion strikeplate



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floor connection not flush	where the mullion meets the ceiling or floor. (If you see this frost pattern, but no misalignment in strikeplate, this could be from a door gasket issue.)	from ceiling or floor. Properly align strike plate in opening in ceiling or floor & rescrew into place. Make sure that strikeplate is now flush with ceiling or floor.
24" shelves vs 22" shelves		
Air blowing in or around cases. This disturbs air curtains.		
Leaks through the doors originating at the top pin or side electrical access.	Typically results in water drops forming on glass. Note: there needs to be a leak somewhere else to drive the air into the case this way. If the air enters these leak points, it will exit at "the path of least resistance" opening somewhere along the IG/breaker interface. This tends to not cause frost, but water droplets on the door.	