



**MAXIMIZE**

Your Lab Freezer Life,

**MINIMIZE**

Odds of Disaster

Lab refrigerators and freezers may operate at different temperatures with different uses, but there is a common thread that ties the two together: **they are mechanical devices, which means they will eventually fail.** While it's inevitable these mechanical systems will eventually need to be replaced or repaired, the timeline to this point of failure can vary considerably between systems.

In some cases, lab refrigerators and freezers can last for 10 to 20 years, possibly even longer. However, there is also the unfortunate possibility that some freezers will fail considerably earlier — in as little as two years, as we've seen.

Considering the valuable specimens stored inside freezers, it's critical that laboratories invest in a real-time temperature monitoring system so they instantly know if a freezer is on the verge of failure and take the necessary steps to protect their assets. **But that's the last line of defense.**

From the setup of lab freezers to the daily and routine procedures followed, we'll showcase the initial layers of defense that are vital to extending the life span of your freezer and keeping its contents safe.



  
A single -80°C freezer typically costs anywhere from \$8,000 to \$14,000. On average, the contents inside such a freezer are valued at over \$150,000.

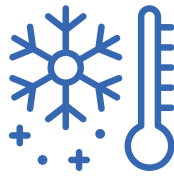
## PHASE 1:

# The Proper Setup of Your Lab Freezer



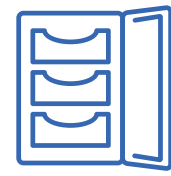
### Make Sure You Have the Right Type of Power Outlet Available

Lab refrigerators and freezers usually come with a 6-foot power cord. With this in mind, you'll want to make sure you have the correct outlet within reach of where you want to install a new device. Refrigerators and -20°C freezers can typically just plug into a standard 110V power outlet; however, most -80°C freezer vendors recommend a dedicated 220V outlet rated at 20 amps. The latter will most likely require a licensed electrician to handle the installation. Preferably, the electrical outlet used will be hooked up to an automated emergency generator.



### Check to Confirm There Is Adequate Air Conditioning

Freezers emit a lot of heat to keep the contents inside cool. So in a room with closed doors and no A/C, these devices will rapidly heat the space — and as the room becomes warmer, freezers have to work even harder to keep contents cool, causing them to wear out or fail faster. To this end, it's important that freezers are in the same room as the thermostat that controls that room's A/C. Multiple freezers in the same room tend to require additional A/C capacity to keep the room at a reasonable temperature. A good rule of thumb is 5 tons of A/C per every 10 to 15 - 80°C freezers.



### Maintain Stability Throughout the Installation Process

Lab freezers should always be installed on a level, stable surface. If the floor is not level, make sure to adjust the casters to keep the freezer level; otherwise, the door may not close properly, creating very small gaps in the door gasket. These small gaps let in room temperature air that causes the compressor to work harder to maintain the right temperature, and also causes frost to quickly build up inside the freezer. If the freezer door swings closed rather than open, it's a sign the device has been correctly installed.

## PHASE 2:

# The Proper Storage and Retrieval Processes



### Make Sure Not to Overload Your Freezer

Air circulation is a critical component to ensuring all parts of your freezer stay cold. But when every nook and cranny of the device is filled with samples, and frost has built up over time, airflow is naturally limited – and in the areas that lack sufficient airflow, warm pockets have the potential to form. With these factors in mind, it's best to adhere to a manufacturer's guidelines and start shopping for a new lab freezer before your existing one is already full.

### Load Your Freezer In an Even Manner

Freezers typically regulate their temperature based on a single sensor, which is oftentimes located in the bottom of the freezer cavity. This sensor controls when the freezer switches its cooling cycles on and off. By distributing samples evenly throughout the freezer, you'll ensure the thermal mass of the freezer is also balanced and those cold temperatures will reach samples at approximately the same rate. All the while, as new samples are added to the lab freezer, they'll be uniformly cooled and come down to their intended temperature faster.

### Actively Monitor Frost Build-Up

Freezers operate well below the freezing point of water, and room air includes humidity, which is water. Pair the two together – freezers will freeze the water right out of the air – and you get frost. While small amounts of frost are completely normal and expected, excess frost poses a big problem. When frost builds up between lab samples and prevents airflow from reaching those samples, these specimens can become much warmer than their counterparts inside the freezer. Likewise, frost build-up along the freezer walls, shelves and racks will hinder cold air from reaching all of the contents inside.

As we've discussed to some extent, a freezer will work to combat these warm spots and keep its temperature sensor cold. But if the temperature sensor is buried under a thick layer of frost, the rest of the freezer will experience erratic warming and cooling cycles, since the frost acts like a dampener on temperature variation. And if the frost prevents the sensor from detecting warm spots in the first place, areas of the freezer with poor insulation (e.g., near door gaskets, probe portals) are bound to heat up even further and cause disruption.



### Minimize the Time Your Freezer Is Open

Freezers are designed to keep samples far below room temperature (very far in some cases). Since they're already working hard to achieve this end result, you don't want to make these devices work even harder by continually introducing 70°F room air into carefully confined conditions.

Each time the freezer door opens, more frost is created and samples closer to the door are briefly exposed to warmer temperatures, and then need to be cooled back down by the freezer. The longer the freezer door remains open, the more cold air escapes and the more warm air from the room sneaks inside.

Considering this impact, it's important to have a plan of what to do before you open the freezer. That way, there's no time added to the clock as you decide what you need to retrieve. In some cases, labs will keep records of the last time a freezer was open for an extended period, so they can ensure the freezer has adequate time to reach its intended temperature equilibrium once again before more warm air is introduced.

### Defrost Your Freezer on a Regular Basis

While it may be a hassle to find a temporary home for all the samples in your lab freezer, defrosting your freezer on an annual basis means you can plan ahead. Instead of scrambling to figure out where to put samples when frost build-up causes some sort of failure, you'll have time to line up an alternate freezer where you can store lab samples during the defrost process. If you cannot use another freezer for temporary storage, many labs use dry ice (-79.5°C) or LN<sub>2</sub> to temporarily keep samples in well-insulated ice chests.

### Keep Records of Where Samples Are Stored

Having to search for a lab sample inside a freezer is never an ideal scenario and one you shouldn't have to go through. Samples should be situated in a known location, so you can quickly access what you need and close the freezer door. While labeling is an important piece of the puzzle, having a map of the inside of the freezer that shows where everything is stored is also vital to saving time and electricity, as well as preventing frost build-up.

## PHASE 3:

# The Proper Maintenance Activities



### Check for and Clean Up Debris on Compressor Coils

When dust and dirt builds up around a freezer's compressor coils, the barrier of grime can strain the coils' ability to efficiently release heat. This in turn forces compressor coils to work harder than they normally would and use more energy to regulate temperatures inside the freezer. Cleaning/vacuuming away this debris on a monthly or quarterly basis improves the performance of your freezer and avoids potential damage. If your freezer has an air filter, be sure to clean it at least every three months as well, so that airflow to cool the compressor is not restricted.

### Perform a Bi-Monthly Inspection of the Entire System

Making a bi-monthly inspection part of your routine maintenance plan for freezers can point out small issues before they turn into big, costly problems. Consider the case where a door gasket has become loose over time. If this goes unnoticed for months, cold air will continuously leak out of the device, prompting the freezer to work harder to keep contents cool and creating room for temperature irregularities. (You should not be able to slide a thin piece of paper past the door gasket.) With scheduled inspections, personnel will take notice of the issue faster and be on the road to resolution in less time.

### Take Special Care When Moving Appliances

Whether it's a matter of moving to a new space or reconfiguring the layout of an existing area, it's possible that freezers will need to be relocated at some point in their lifetime. When this time comes, careful handling of the device is critical to maintaining its integrity, from the prevention of door damage to preserving the proper mechanical operation of the compressor. Be sure not to hold onto the door when moving a -80°C freezer, or the door can be slightly bent, creating small gaps in the gasket seal.

# The Importance of a Real-Time Temperature Monitoring System

While there's a lot that labs can do to thwart failure and extend the life span of freezers, labs are familiar with the stories of devastating freezer malfunctions, or perhaps have experienced one themselves. With these concerns comes the need for a safety net to catch any issues that may go unnoticed. That's where a real-time temperature monitoring system comes into the picture.

By logging and analyzing freezer temperature readings as they occur, a real-time temperature monitoring system puts labs ahead of potential problems. When freezer temperatures move outside of acceptable boundaries, lab personnel instantly receive alerts to notify them of the issue. These early warnings give staff enough notice to safely move freezer samples to another storage location, while the freezer receives the care it needs to get safely back up and running.



To learn more about the CORIS temperature monitoring system, [contact our team today.](#)



**In most labs, there is a 4- to 6-hour window of time after a freezer failure for lab personnel to find spare freezer space and move samples before they're jeopardized.**

The real-time temperature monitoring system from CORIS combines these innate benefits with other advantageous features:

- Alerts can be customized to your unique needs, with a tiered escalation scale in place
- Temperature data is stored on the cloud-based platform for an infinite period of time
- Intuitive nature of the system means only an hour of training is needed for personnel
- Patented security network does not require a hole in the firewall (for the monitoring hardware)
- Self-contained sensors streamline installation and lend themselves to the DIY route
- Hardware, software and support are bundled in an all-inclusive monthly subscription fee