nyle Dehydrators

FD-SERIES

Heat Pump Dehydrator

USER MANUAL

www.nyledehydrators.com

NSF

MADE IN USA
WITH U.S. & IMPORTED PARTS

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Introduction

General Information

Nyle Dehydrators offer commercial users an energy-efficient and controllable means of dehydrating from 80° to 160°F. The dehydrators gather energy from moisture-laden air through a refrigeration cycle, depositing the extracted energy back into the circulating air to maintain the desired drying temperature. Through this cycle, water is removed from the product.

Nyle Dehydrators consist of a dehumidification unit and airflow control components positioned within an insulated drying chamber. These units are built specifically for small to large sized commercial batch dehydrating applications where temperature and humidity during the drying process may be closely monitored and controlled.

About The FD24

The FD-Series is rated to remove 24-60 pounds of water per hour at air conditions of approximately 115°F dry bulb temperature and 70% relative humidity. Actual water removal rates will depend largely on the ability of the food product to release moisture at the desired drying temperature. Nyle Dehydrators encourage experimentation within the confines of the dehydrator operating characteristics to achieve the desired drying cycle time.

Safety Information

Installation and servicing of heat pump equipment can be hazardous due to system pressure and electrical components. Please note that only trained and qualified service personnel should perform installation, repairs, or service on Nyle dehydrators. When performing installation, repair, or service on the unit, observe precautions in the manual, tags, and labels attached to the unit. Follow all other safety precautions that may apply.

Improper installation, adjustment, alteration, service, maintenance, or use can cause an explosion, fire, electrical shock, or other hazardous conditions which may cause personal injury or property damage. Always consult a qualified installer, service agency, or distributor for information or assistance.

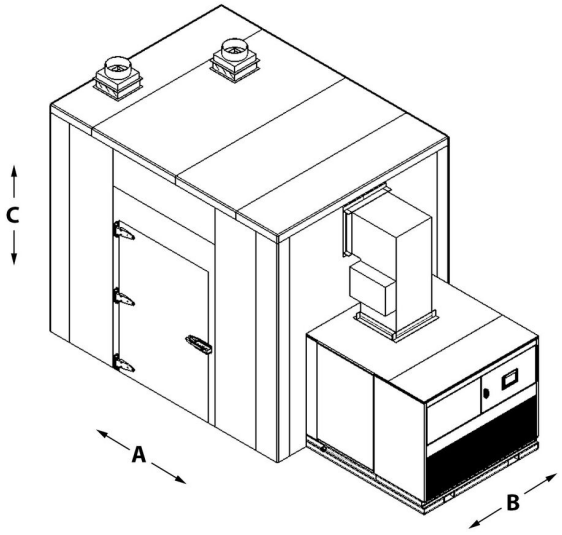
- Do not stand or sit on the unit.
- Disconnect all power before removing the control panel.
- There is no need to remove the control panel unless there is a malfunction internally. Only a licensed technician is to remove the control panel.
- Disconnect all power before installing or servicing the unit.
- Ensure the power supply is rated for the appropriate load.
- Ensure the electrical supply has proper over-load fuse or breaker protection rated for at least the appropriate amperage.
- Moving or lifting the unit components should be done with team lifting or appropriate equipment to prevent back injuries or damage to components. Never lift or move the unit alone.

Follow all safety codes. Wear safety glasses and work gloves. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and the National Electrical Code (NEC) for special installation requirements.

Model Information

Dimensions

	A (ft +in)	B (ft +in)	C (ft +in)
FD24			
Load Space	8′ 2″	5′ 2″	6′ 0″
Total Footprint	15′ 6″	5′ 10″	9′ 5″
FD60			
Load Space	13′ 0″	7′ 7″	6′ 0″
Total Footprint	22′ 4″	8′ 4″	10′ 8″



Nomenclature

Model Number System

FD _ _ _ _ _ _

- Optional Equipment: →

Option	Notes	Designation
Interior Finish	Stainless Steel	SS

- Power: Refer to Table →

Voltage (V)	Phase (Φ)	Frequency (Hz)
480	3	50
480	3	60

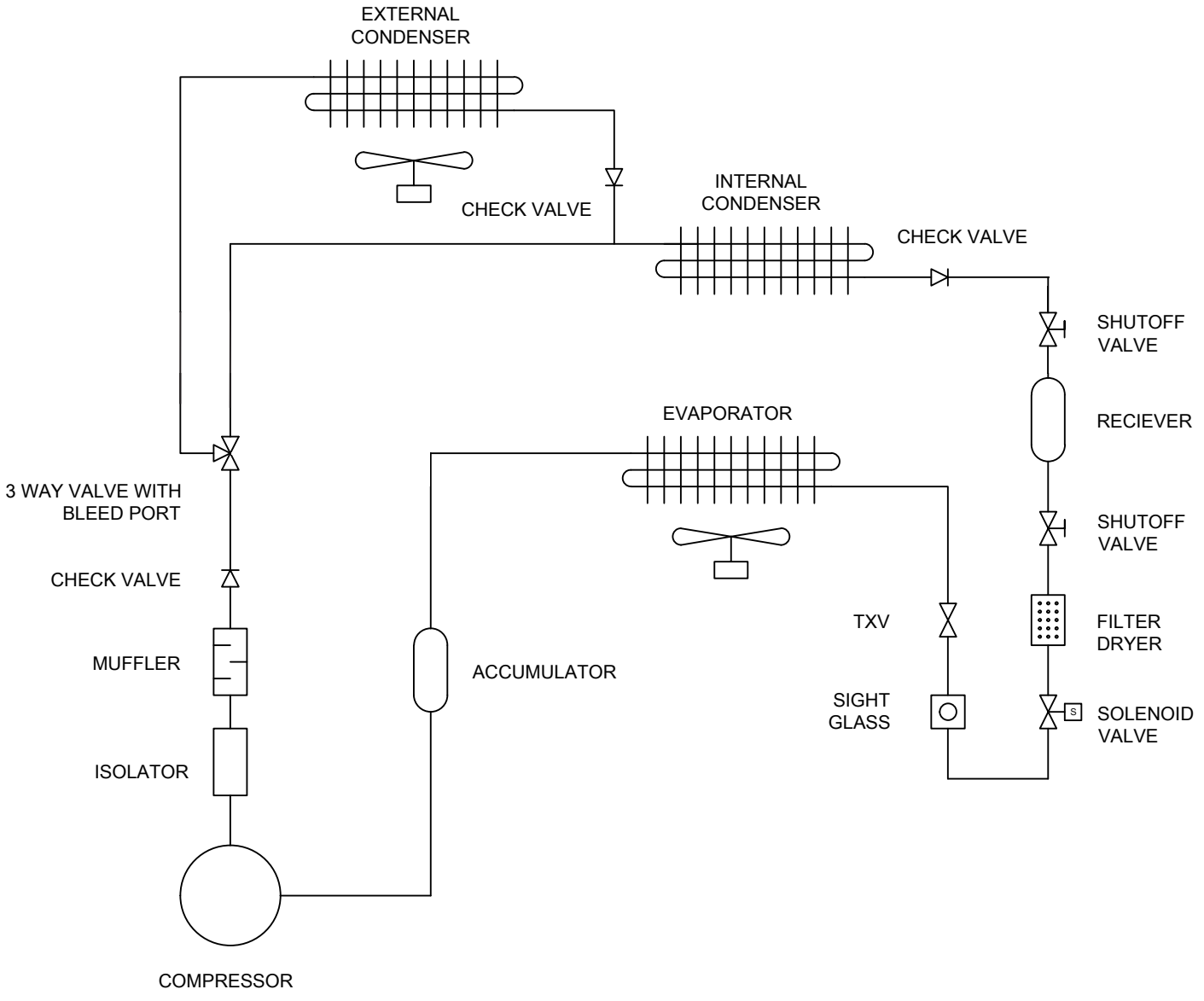
- Water Removal: Nominal (Lbs/hr)
- Series: FD

Technical Specifications

Series	Compressor Type	Refrigerant	Temperature Range
FD	Semi Hermetic	R-513a	80° - 160° F

Model	Water Removal	Rack Capacity	Total Drying Space	Interior Finish	Exterior Finish
FD 24	24 lbs/hr	8 Racks	520 Sq Ft	Stainless Steel	Painted Galvanized
FD60	60 lbs/hr	18 Racks	1,170 Sq Ft		

Refrigeration Diagram



Pre-Installation

IMPORTANT: Please read this entire manual before installation. Be sure to follow all installation steps. Failure to conform to these instructions may decrease dehydrator performance and cause severe injury or death. Only qualified, licensed persons should install the equipment and electrical supply. Installation must conform to all applicable local, state, and federal codes.

Receiving & Storage

When receiving shipment at the job site, carefully inspect the shipment against the bill of lading. Please make sure that all units have been received as ordered. Inspect each unit's shipping crate/packaging and inspect each unit for damage. If there is a problem, notify the shipping company to properly notate any shortages or damage on all copies of the freight bill.

NOTE: It is the responsibility of the purchaser to file all necessary claims with the shipping company.

If the equipment is not needed for immediate installation upon arrival at the job site, it should be left in its shipping carton(s) and stored in a clean, dry area of the building. Heat pump units must be stored in an upright position at all times. Do not remove any equipment from its shipping carton(s) until it is needed for installation.

Unit Location

1. Units are for indoor use only.
2. Provide sufficient space for water and electrical connections.
3. Allow enough space for service personnel to perform maintenance. *(ensure there is atleat 3ft infront of electrical cabinet.)*
4. Allow enough space around the chamber footprint for chamber construction.
5. If shifting partially assembled chamber walls into a building corner or against a building wall, allow a minimum of 2" clearance between the drying chamber and existing building walls to allow air circulation.
6. Allow enough space for free air movement to and from the external condenser fan.

Installation

Chamber Installation

Follow the chamber manufacturer's instructions for installing the pre-fabricated insulated drying chamber. These instructions will be included with the chamber shipment or in this manual.

All seams and gaps should be closed either by NSF-approved gaskets or NSF-approved silicone caulking. The unit must be sealed to the floor using NSF-certified gaskets or NSF-certified silicone caulking.

Particular attention should be given to caulking joints between insulated panels during installation. This will prevent moisture migration into panel joints.

Connecting Wiring

A licensed professional should perform all electrical work and adhere to all local and state codes.

The wiring panel is located behind the door, which sits on the D.H. unit. Follow the nameplate information located on the unit for proper voltage, phase, amps, breaker sizing, and wire sizing. Locate a fused disconnect as close as possible to the heat pump.

NOTE: Check to ensure that fans rotate in the correct direction. If fans run backward on a unit requiring 3-phase power, switch 2 legs of the incoming power at the distribution block.

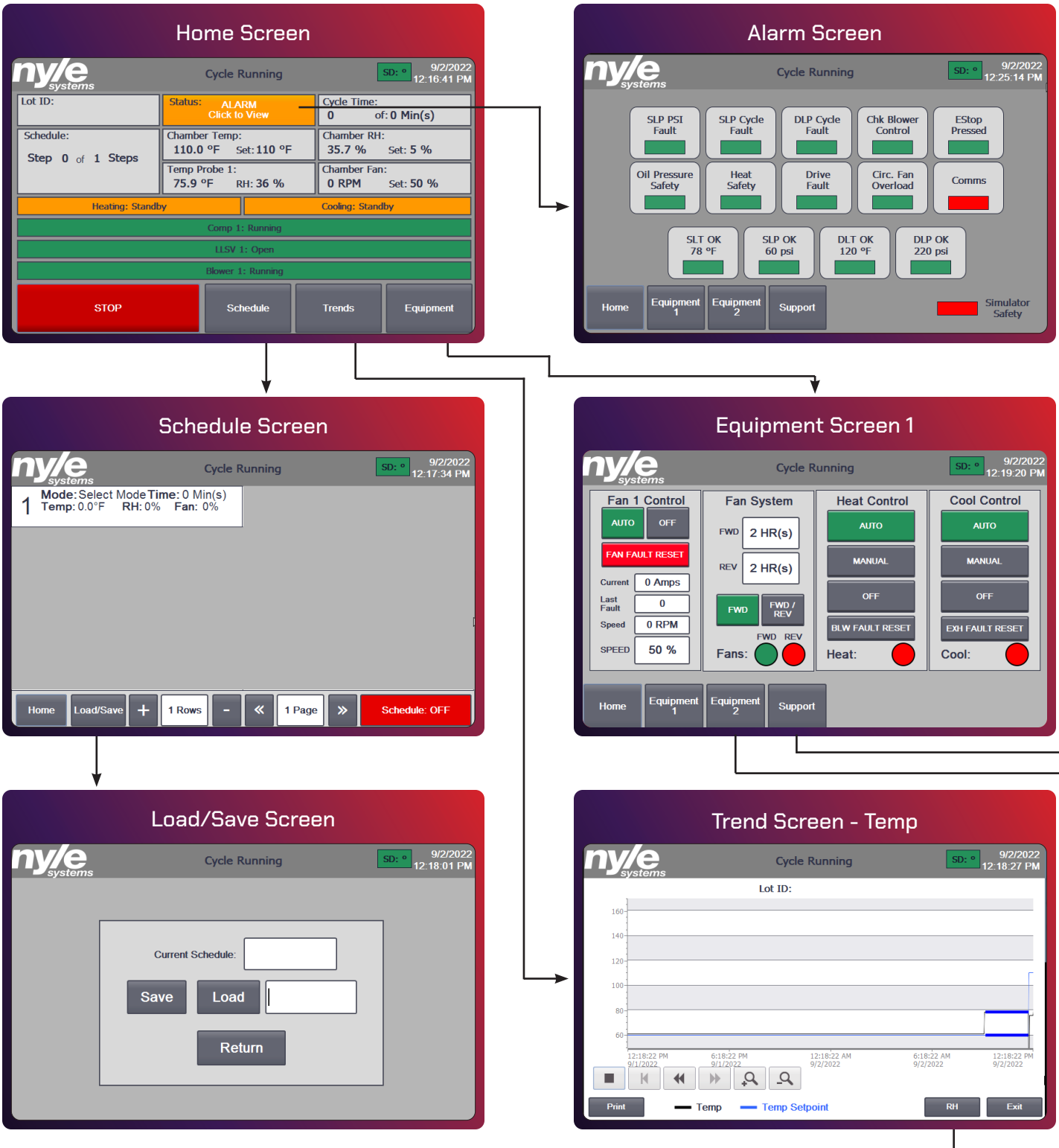
System Usage

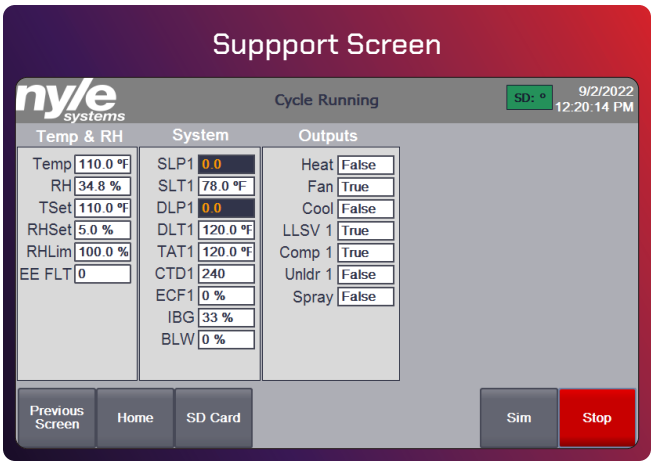
Before Start Up

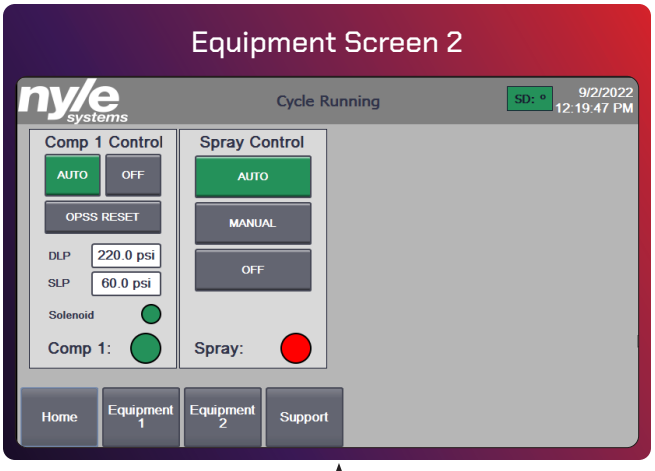
Verify the following:

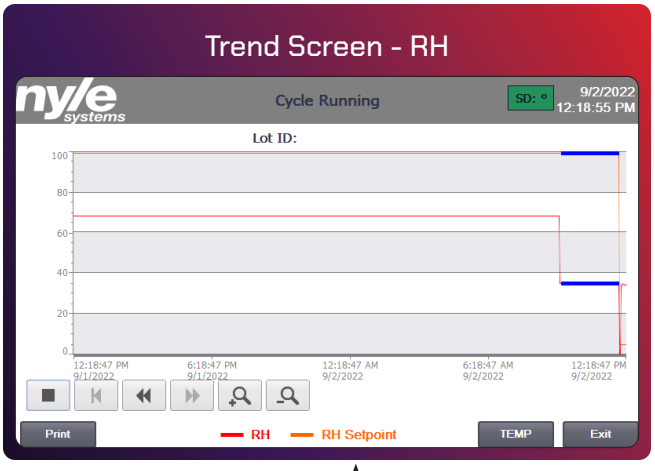
- Voltage is correct and matches the nameplate.
- Temperature/RH sensor is mounted near the air intake of the DH unit.
- Service panels are in place.
- Emergency stop is deactivated (twist counterclockwise until the button pops out)

Control Screen Navigation



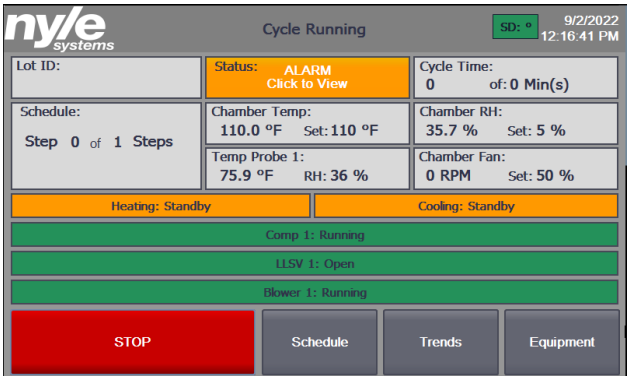






Control Screen Overview

Home Screen:



The home screen provides basic process information, including:

LotID: Indicates the name of the cycle that is running.

Status: Indicates the status of the dehydrator. If an alarm is present it will show here.

Cycle Time: Indicates how much time in the cycle has elapsed as well as the total amount of time the cycle will take.

Schedule: Indicates the current step within the schedule as well as total amount of steps in the schedule.

Chamber Temp: Indicated the current chamber temperature as well as the cycles temperature setpoint.

Chamber RH: Indicated the current chamber RH percentage as well as the cycles RH setpoint.

Temp Probe 1: Displays the current temperature and RH readings of the temperature probe within the chamber.

Chamber Fans: Indicates the fans current RPMs as well was the setpoint for fan speed percentage.

Along the bottom of the home screen is the navigation menu buttons. The buttons can help navigate you to additional screens.

“Schedule” button: Changes the display to the Schedule Screen.

“Trend” button: Changes the display to the Trend Screen.

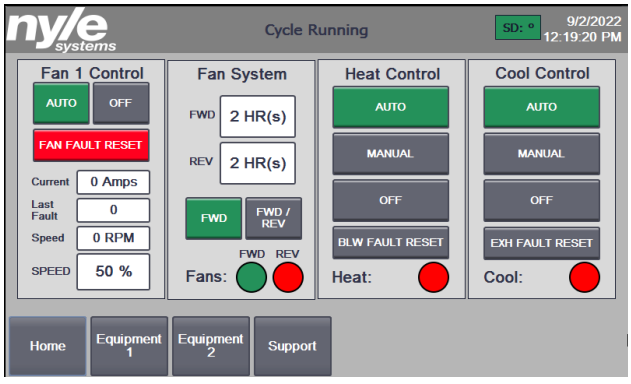
“Equipment” button: Changes the display to the Equipment Screen.

“Information” button: Changes the display to the Information Screen

Equipment Screen

The equipment screen provides control options to the user. There are two screens associated with the equipment.

Equipment 1 Screen:



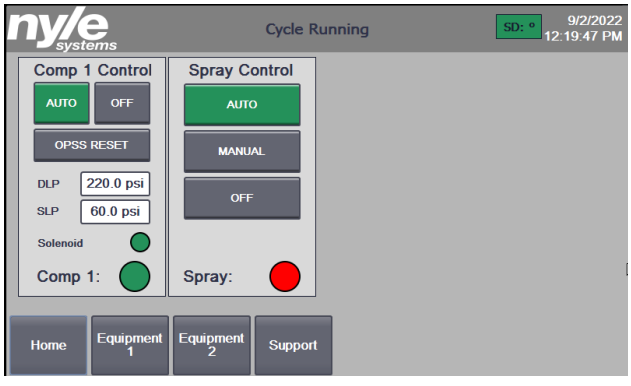
Fan 1 Control: allows you to control the fan settings.

Fan System: allows you to set the fan direction and run time.

Heat Control: allows you to control the heater and the setpoints.

Cool Control: allows you to control the vents.

Equipment 2 Screen:



Comp 1 Control: allows you to control the compressor as well as monitor the line pressures.

Spray Control: *(If Equipped)* allows you to control the spray system.

Along the bottom of the Equipment screen are navigation buttons. These buttons can help you navigate between the two equipement screens as well as to the Support screen or back to the home screen.

Support Screen

The Support screen provides the full status of the system and it’s current metrics. This screen should be used when contacting customer support.

Schedule Screen:

The schedule screen allows the user to manage dryer scheduling. Further details concerning schedule operation are included in the schedule management portion of the manual.

“Step” column: Identifies the step number.

“Step Mode” column: Indicates the type of step mode selected for the particular step number.

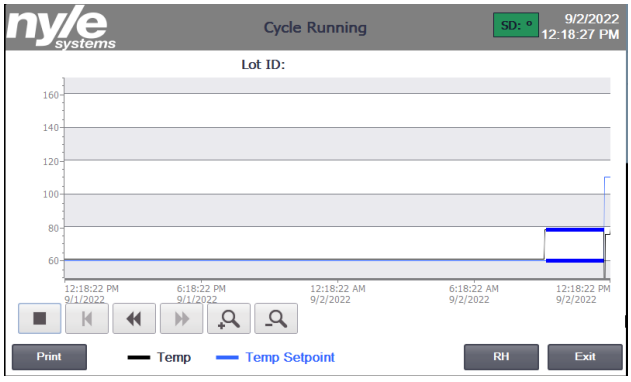
“Time” column: Indicates the run time in minutes selected for a “Time” step mode.

“Temp” column: Indicates the temperature set point selected for each step number.

“RH” column: Indicates the relative humidity set point selected for an “RH” step mode.

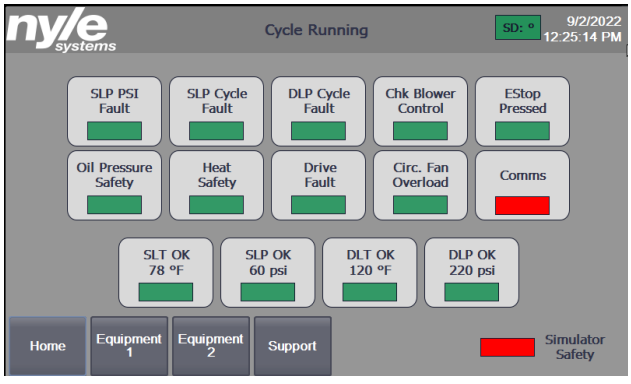
“Fan” column: Indicates the percentage of fan speed (100%) selected for each step number.

Trend Screen:



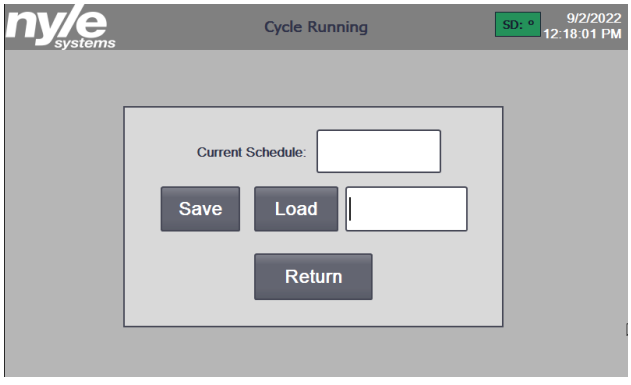
The trend screen lets the user view the previous 24 hours of dryer operation in a graphical display. The system offers two trend screens, one that records system temperature and one that records RH.

Alarm Screen:



The alarm screen allows the user to view currently active alarm conditions and which equipment have faults.

Schedule Load/Save Screen:

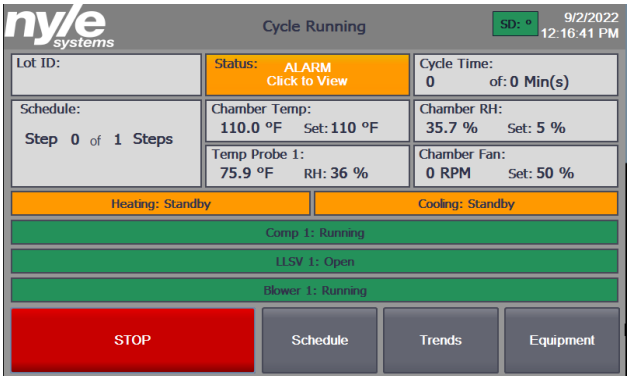


The schedule load/save screen allows the user to save a currently programmed schedule or load a previously saved schedule. Further details concerning this screen are included in the schedule management portion of the manual.

Quick Start Guide

1. When the dehumidification unit is energized, the touch screen will undergo a boot process until the Home screen is displayed.

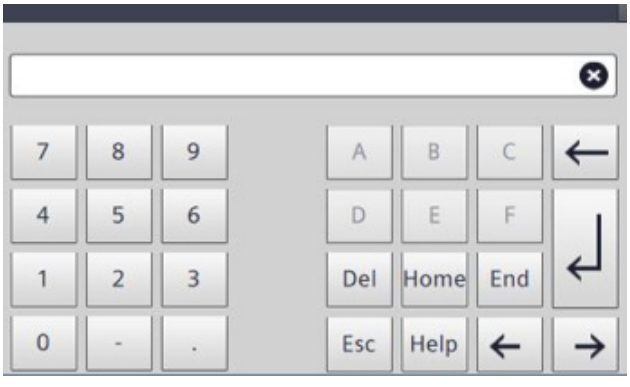
Home Screen:



Chamber temperature and relative humidity will be displayed, along with current user set points for desired chamber temperature and relative humidity.

2. To change set points, touch the box representing the parameter you desire to change. A number pad will appear. Enter the desired set point, and press the return button. The value entered should now be displayed in the appropriate set point box.

Number Pad:

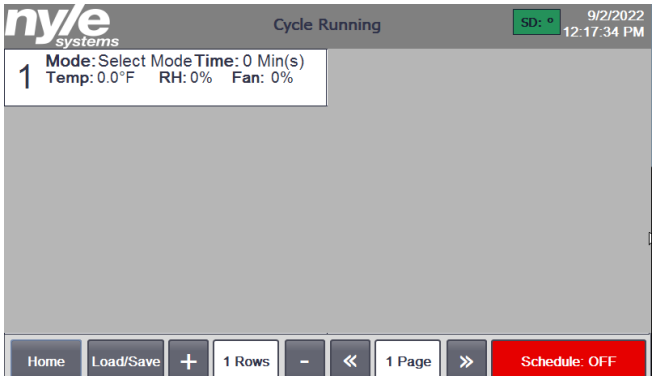


Before starting your cycle, change the cool down set point on the load & save screen to the temperature you desire the chamber to cool down to after reaching the relative humidity setpoint and before shutting down.

3. With your temperature and relative humidity entered, you can start your dehydrator by pressing the “Start” button on the right-hand side of the screen. To stop your cycle at any time, press the “Stop” button on the right-hand side of the screen. In case of emergency, press the E-stop button below the touch screen.

During a drying cycle, the dehumidification unit will run until the relative humidity set point is reached. At this time, the unit will enter a cool-down mode prior to shutting down.

Schedule Screen:



4. The schedule screen allows the user to manage the dehydrator scheduling. Further details concerning schedule operation are included in the schedule management portion of the manual on page 7.

Home Screen - Schedule:

When the schedule is active, current schedule step information is displayed on the Home Screen.

“Step”: Indicates the type of step mode selected for the particular step number.

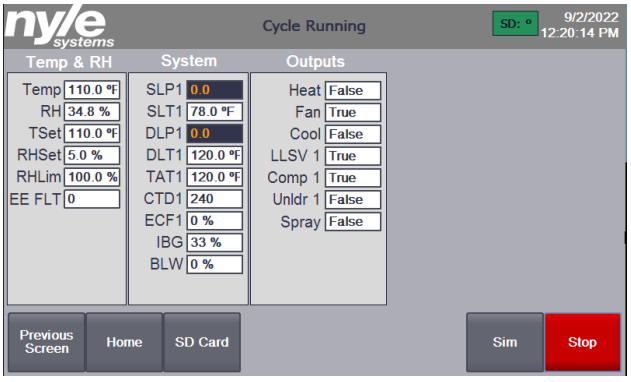
“Time”: Indicates the run time in minutes selected for a “Time” step mode.

“Temp”: Indicates the temperature setpoint selected for each step number.

“RH”: Indicates the relative humidity setpoint selected for an “RH” step mode.

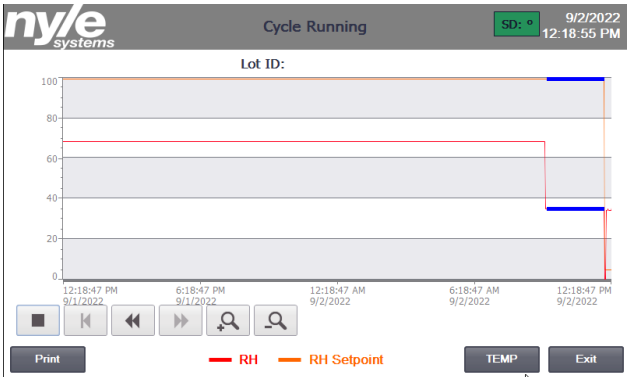
5. The support screen is accessed by pressing the “support” button on the Equipment screen. The support screen provides refrigeration system operation information for troubleshooting purposes by a qualified service technician. You may be asked to access this screen during a troubleshooting call with a Nyle technician.

Support Screen:



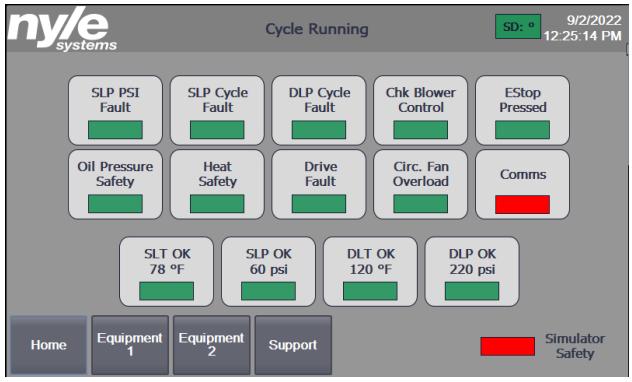
6. The trends screen records data every minute. This unit provedes two trend screens, one records temperature, temperature set point, and another records relative humidity, and relative humidity set point. The toolbar stop button freezes the graph on the screen, but it will still record during this time. The rewind button moves the trend graph backward. The fast-forward button moves the trend graph forward. The zoom buttons increase or decrease the time range shown on the graph.

Trends Screen:



7. If there is an issue with the unit, an alarm indicator will pop up on the top right column of the home screen. You can select this to view the alarm screen.

Alarm Screen:



The chart below will provide information on each alarm and steps to take if one is shown.

0 - OK	N/A
1 - Estop	Estop is pressed in
2 - Blower Fault	Blower motor starter tripped. Reset switch in panel. Upon multiple trips contact Nyle.
3 - Heat Safety	Overheat safety. Check wiring. Ensure the blower is working. Contact Nyle if issue continues.

Schedule Management

Schedule Operation

Before starting your cycle, change the cool-down set point on the schedule load/save screen to the temperature you desire the chamber to cool down to after reaching the relative humidity setpoint and before shutting down.

In order to operate a drying schedule, use the schedule management features included with the controls package. From the home screen, tap the schedule button along the bottom of the screen. Up to 10 schedule steps may be programmed into the schedule using the “+” and “-“buttons at the bottom of the schedule screen.

Schedule flexibility is provided primarily by allowing the user to select from 4 “step modes,” including Time, Temp, RH, and Cool Down. Each step mode uses different criteria to determine when to advance to the following step within the schedule. Each step mode operates as follows:

Time step mode: A time step allows the user to input a set amount of time in minutes that the step should run for before advancing to the following step. Setpoints available for user input during a time step include Temp, Exhaust, Blower, and RH.

NOTE: Do not adjust the time setpoint of a currently active time step. Doing so will cause the current time step to reset or advance to the next step.

Temp step mode: A temperature step allows the user to input a temperature value the dehydrator should warm up to before advancing to the following step. Setpoints available for user input during a temp step include Temp, Exhaust, Blower, and RH.

RH step mode: A relative humidity step allows the user to input a relative humidity value the dehydrator should reach before advancing to the following step. Setpoints available for user input during an RH step include Temp, RH, Exhaust, and Blower.

Validation Step mode: A validation step allows the user to maintain a temp and RH for a specified period of time. This step is used to help achieve specific guidelines for certain food products. During this step, all vents will remain closed, and the compressor will remain off, allowing temperature and RH to climb. When both Temp and RH setpoints are satisfied, the timer will begin. Once the specified time is up, the schedule will advance to the next step.

Cool Down step mode: A cool-down step allows the user to end a cycle by venting heat from the dehydrator with no heater input. A cool-down mode ends the cycle when chamber temperature is measured to equal the setpoint the user specified in the schedule load/save screen.

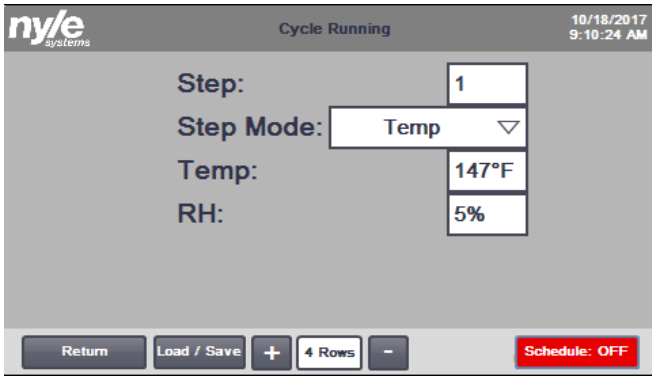
Note: for all step modes except for time, the schedule will advance based on a selected parameter other than time. Therefore, experimentation will be necessary to understand the amount of time a particular schedule will take to run to completion. Factors affecting the run time of a particular schedule include product type, product load size, and ambient air conditions.

To enter and run a new schedule, conduct the following steps:

1. From the home screen, tap the schedule button along the bottom of the screen.
2. Using the “+” and “-“buttons along the bottom of the screen, adjust the number of steps desired for the schedule.

3. For the first step, tap the step to enter the step edit screen. Then select the step mode you desire.

Step Edit Screen:



4. Depending upon the step mode selected, continue down the screen until each selectable parameter has been entered for the step. Hit return to navigate back to the schedule menu or change the step input box to any of the other 10 steps to modify them without leaving that screen.

5. Repeat steps 3 and 4 for each step.

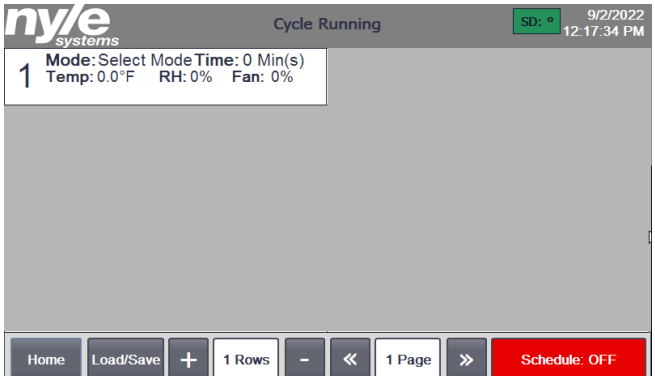
6. Return to the home screen.

7. Tap the start button. The dehydrator will start up based on the values displayed on the home screen.

8. Return to the schedule screen.

9. Tap the “Schedule: OFF” button in the lower right corner of the schedule screen to activate the schedule. It should then read “Schedule: ON.” The dryer should now begin with step 1 of the entered schedule.

Schedule Screen:



Schedule Monitoring

While a schedule is running, the schedule screen will indicate which step is being run and whether or not a transition is being considered. While a particular step is active, the step number will be highlighted in green. When the condition has been met for enough time to filter out sensor flutter, the next step will be highlighted in green, and the equipment will follow the entered conditions for the highlighted step.

As long as an SD card is inserted into the appropriate slot in the back of the control screen (accessed by opening the control panel door), schedules may be saved to or loaded from the SD card from the control schedule load/save screen.

To load or save a schedule, conduct the following steps:

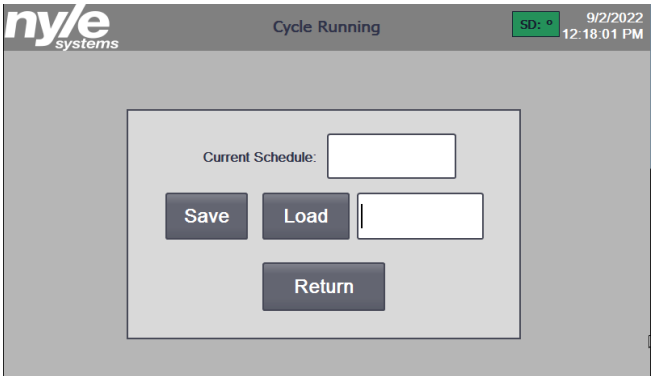
1. From the schedule screen, tap the load/save button to enter the load/save dialog. If a saved schedule is loaded, the “Current Schedule” window will display the name of a previously saved schedule. Otherwise, the “Current Schedule” window will be empty.

2. Tap the load/save value entry window and enter a name in the value entry screen. Tap the return or enter button.

3. Tap the load or save buttons to either load the entered schedule or save the entered schedule to the selected number slot.

4. Tap the “Return” button to return to the schedule screen.

Load Save Screen:



Drying Theory

Dehumidification drying should be understood as a two-step process: moving dry air absorbs water from a moist product, & the refrigeration system removes the water from this air as it passes over a cold surface. This cycle repeats until the moisture in the product reaches equilibrium with the moisture content of the air. Several factors affect each step of this drying process, ultimately affecting the drying time achieved by your Nyle dehydrator.

For moisture to be removed from the air within your chamber, moisture must first be removed from your product. Air temperature, velocity, and product characteristics affect this process. Generally speaking, higher temperature and air velocity will result in shorter drying cycles. Product characteristics vary widely and include characteristics inherent to the raw product itself and those caused by any processing that takes place before the drying process begins. For example, thinner, more porous products usually dry more quickly than thicker, dense products.

Once moisture is removed from your product and absorbed into the air within the chamber, the dehumidification system can remove this moisture and drain it away. The moisture removal capacity of the dehumidification system is most affected by the desired drying temperature. Drying temperatures warmer or cooler than the rated condition (115°F) will tend to change capacity.

To control your drying process, you will choose a drying temperature and relative humidity "target." The relative humidity target represents the air moisture content at which you wish your product to be in equilibrium with when it is finished. This equilibrium occurs at the point of the "Equilibrium Moisture Content" (EMC) and varies by product and drying temperature. Although published data is available for many products, your results may vary based on raw product inconsistencies, ambient atmospheric conditions, and proprietary product processing. Some experimentation will be necessary to achieve your desired results.

Data Logging

As long as an SD card is inserted into the appropriate slot in the back of the control screen (accessed by opening the control panel door), operational data may be logged. Data logging functionality is active when:

1. An SD card is present AND
2. A cycle is active.

No further user action is necessary to activate data logging as long as the above conditions are met. Data is logged at a frequency of 1 measurement per minute.

Data is logged to a folder named "NyleDataLogs" on the inserted SD card. If a new SD card is inserted, the software will automatically create the folder.

Do not remove the SD card from the HMI slot to retrieve or otherwise manage data. Data management may be accomplished from a computer web browser using the following steps:

1. Enter the IP address of your dryer PLC into the web browser address bar. The dehydrator's IP address is: 192.168.1.61
2. Click on the "ENTER" button at the top left of the page.
3. Sign in with the following information:

   a. Name: Administrator

   b. Password: 100
4. Press Enter on your keyboard or click the "Log in" button at the bottom right of the login context box to enter the PLC management screen.
5. On the left side of the page, locate and select the following:

   File Browser > SD Card > Nyle Data Logs.
6. You should see data logs collected during previous cycles and named:

   "Nyle_[schedulename]."

7. Use the file operations to the right of the file name to download, download and clear, or delete data logs from the SD card.

Maintenance

General Maintenance

The FD-Series is designed for continuous duty with little maintenance. However, when a problem does arise, prompt repair will ensure a long life for the machine.

Maintenance Schedule

Weekly

- Check air filters
- Visual inspection of unit & chamber
- Inspect Evaporator & Condensor for debris
- Clean drain pan

Monthly

- Inspect Blower Assembly - No broken fins
- Inspect Blower Belts
- Inspect Electrical Panel Interior
- Inspect Electrical Heater Terminals
- Inspect Interior Damper Assembly

Every Four Months

- Grease Blower Assembly
- Grease Circulating Fan Assembly
- Grease Blower Motor
- Clean Drain Lines and Pan

Yearly

- Lubricate Exhaust Dampers and Linkages*

**Lubricate with NSF-compliant lubricant; details on following pages for maintenance.*

Unit/Chamber Inspection

Inspect the unit and chamber for signs of leaks. Yellow-tinted streaking will appear near leaks on both the chamber and unit. Troublesome areas are typically the seams between chamber panels, near vents, fans, and unit/duct cutouts in the chamber. If streaking is present, use NSF-compliant 100% RTV silicone rated at 160°F+ to seal these areas. Remove old silicone before applying a new bead. Keeping the unit sealed tight will ensure your drying cycle is as efficient as possible.

Air Inlet Filter Maintenance

The air filters are provided to keep the air inside the DH unit as clean as possible. Dirt build-up on the coils will lead to poor heat transfer with a loss of water removal efficiency. In extreme cases, the coil will clog entirely. The supplied filter should be replaced when light can no longer shine through it after cleaning.

Damper assembly inspection

The interior damper assembly consists of metal blades just behind the unit's blue filter media. The damper assembly should consist of 3 sections of blades, two sections on the ends and one in front of the evaporator. The sections on the ends should be approx. 180° apart from the ones in front of the evaporator. This allows us to regulate flow over the evaporator as necessary. Be sure all linkages are tight and work together without binding. The nylon bearings supporting the damper assembly are also a point of wear and should be inspected during this time.

Coil Cleaning

NOTE: These recommendations apply to all Nyle Systems DH-based drying units and may be considered a part of standard maintenance procedures for the trouble-free operation of the system.

Your dehydrator relies on a refrigeration system to efficiently dehydrate your product. As part of each refrigeration system, refrigerant-to-air heat exchangers ("coils") are used to complete the refrigeration cycle. Over time, refrigeration coils may become dirty as air is pulled through them, resulting in lower dehumidification performance and reduced operating efficiency. Your dehydrator includes two to six coils which should be inspected and cleaned periodically to maintain optimum performance and efficiency.

The coil most prone to soiling is the evaporator coil. The Evaporator Coil must operate below the dew point temperature of the chamber conditions to allow process condensate to form

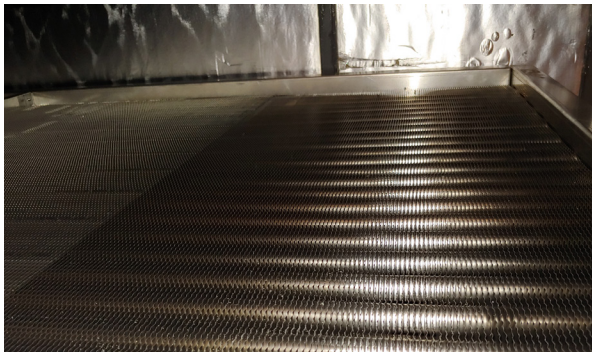
on it. Process Condensate is generated from the moisture removed from your product. In this process, condensate drips down into a stainless steel drain pan, where it is piped away. A trap needs to be added in the condensate line for the condensate to drain properly. Because this coil becomes wet during drying, it tends to gather particulates traveling in the air stream, which build up over time.

Coil cleaning procedure:

1. Ensure that the DH unit is shut down. Follow proper lock-out tag-out procedures.
2. Remove service panels allowing access to the coil to be cleaned.
3. Inspect the coil for damage or debris. Remove dry debris by gently blowing compressed air through the coil fins or vacuuming the coil fans. If using compressed air, blow through the coil from the back towards the front or opposite the direction of airflow.

Danger: Coil fins are sharp and represent a cut hazard to bare hands. Wear proper PPE before conducting coil cleaning.

Warning: Coil fins are fragile and require gentle treatment to prevent bending, which can result in a subsequent reduction in performance.



4. Use an FDA-approved coil cleaning chemical to remove built-up material on the fins. Follow all manufacturer directions included with the cleaner. Depending upon the chemical chosen, gently rinsing the coil after applying the cleaning chemical may or may not be necessary. Repeat cleaning if necessary.
5. Rinse the condensate drain pan and drain line to prevent clogging.
6. Reinstall service panels before using the system again.

Blower System Maintenance

This system should be serviced every 4-6 months.

The system should be checked for the following:

1. Worn blower shaft bearings.
2. Loose, tight, or worn belts.
3. Loose drive and driven sheaves.
4. Loose bearing and motor mount bolts.

The blower shaft bearings require 2 pumps of high-quality NSF-compliant grease.

The belt tension must be correct. If too tight, reduced bearing and belt life will result. If too loose, belt life will be shortened due to slippage. The ideal situation would be for the belts to be as loose as possible without squealing.

Correct tension is ½" deflection at mid-span with a force of 5 to 8 pounds.

Belt tension should be checked after the first few days of high temperature (140° F +) operation due to initial belt stretch.

Always change belts in pairs because a new belt will do more work than a stretch-used belt, ruining the new belt.

Belts should never bottom in the groove of the sheave. This is a sign of over-tightening. Belts get their grip from the sides. If it bottoms, this grip goes away, and no amount of tightening will return the grip.

Never stretch the belt over the pulleys; this will break the inner cords. Always reduce the center distance when replacing belts motor base moves to reduce center distance. Install the belt on the smaller pulley first.

Electrical Panel Inspection

Before opening any electrical panel, be sure the electrical disconnect is in the off position and follow your specific company's lockout procedures. With the disconnect off, the electrical panel can be opened. Visually check all components in here for signs of burns/shorts. If any wire connections inside the panel appear black or brown, don't turn the power back on until a licensed electrician has observed the area of concern. Check the heater's electrical boxes using the same method. The disconnect should also remain off when checking the heater's electrical boxes.

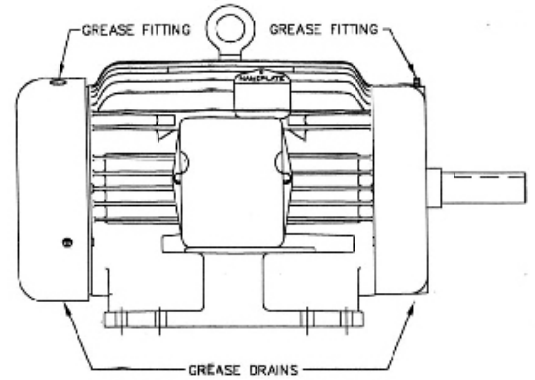
Lubricating Motors

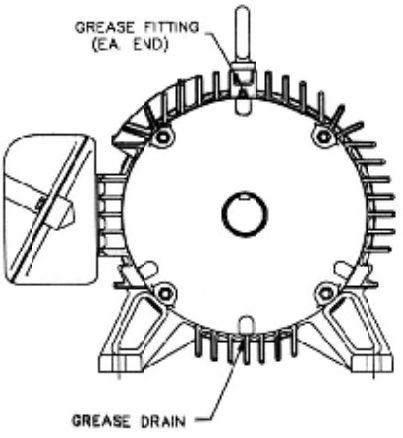
- On motors equipped with a grease fitting, clean the tip of the fitting and apply a grease gun. Remove excess grease from the fitting when done.
  - Use 1 to 2 full strokes on motors.
- On motors equipped with slotted head grease screws, remove the screw and apply the grease tube to hold.
- Insert 2 to 3-inch length of grease string into each hole on motors in NEMA 215 frame and smaller.
- Insert 3 to 5-inch length on larger motors.
- On motors with grease drain plugs, remove the plug and operate the motor for 20 minutes before replacing the drain plug.

CAUTION: Keep grease clean—Lubricate motors at a standstill. Remove and replace drain plugs at a standstill. Do not mix petroleum grease and silicone grease in motor bearings.

Lubrication Schedule		
Service and Conditions	HP Range	Suggested Schedule
Minimal Use 5,000 Hrs or less	1/8 to 7 1/2	5 years
	10 - 40	3 years
	50 - 150	1 year
Seasonal Use 6 months or less	All	At the start of every season
Continuous Use Normal conditions	1/8 to 7 1/2	1 year
	10 - 40	1 year
	50 - 150	9 months
Continuous Use Harsh conditions	1/8 - 40	6 months
	50 - 150	3 months

Fan Motor Lubrication Points





Refrigerant System Information

The refrigeration system is a closed-loop system with its own lubrication oil supply. Nyle uses only the best trade practices when assembling these systems. The system should give years of trouble-free service. However, if

the system is not removing the right amount of water, or if a problem should arise from rough shipping or a refrigeration leak, the system should only be worked on by a qualified refrigeration mechanic.

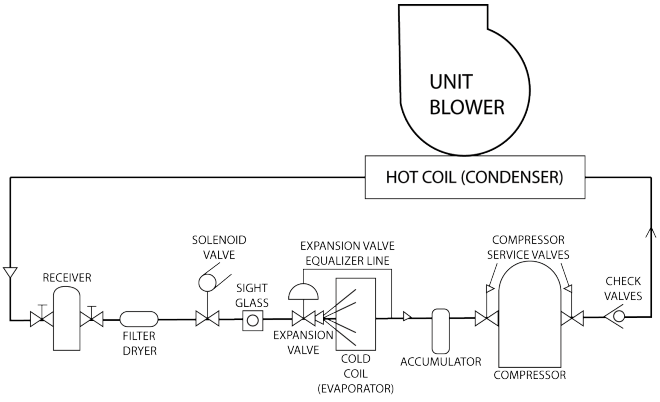
Warning: Refrigeration professionals should use caution; these refrigeration conditions are uncommon.

These systems operate over a very wide temperature and humidity range. The pressures will be relatively high compared to air conditioners and heat pumps. For these reasons, you cannot charge by the sight glass, the sight glass will eventually clear at certain conditions, but it is unlikely that those conditions will exist when servicing.

If the chamber is loaded, running the unit at extreme limits will be very dangerous, as the product will degrade severely. With this danger factor and the factor of time involved in heating the chamber, Nyle insists that these machines have weighed in charge. The amount is as follows:

FD 24 - 12lbs. R-513a
FD 60 - 25lbs. R-513a

Call nyle if your technician lacks the recommended refrigerant. We can recommend alternatives.



Refrigerant Charging

WARNING: This procedure is extremely dangerous and should only be performed by a certified HVAC Technician. Failure to comply could result in significant property damage, serious injury, and even death.

The proper refrigerant charge is essential for the efficient use of the system. The charging procedure outlined below will result in optimum performance.

Because this unit's load and operating conditions vary, normal procedures followed in the refrigeration and air conditioning industry cannot be used for charging the system.

At the extremes of high and low temperatures, the following criteria must be met:

1. At high temperatures (160° F, 32% RH), adequate sub-cooling must be present in the suction gas to cool the motor windings.
2. The discharge gas pressure must not exceed 330-360 PSIG at high temperatures.
3. At High temperatures, the actual discharge gas temperature must not exceed 265° F.
4. At low temperatures, prevent excessive liquid flood back.

Nyle suggests that the refrigerant charge be adjusted **at maximum** operating conditions (160° F, 32% RH). **Do Not** allow the system to exceed the maximum temperature limits. **Do Not** run the compressor when chamber temperatures are below 80° F unless the unit is low temp.

These conditions should be simulated if the chamber is empty by operating the heaters and humidifier. If the chamber is loaded, it may not be possible to accurately adjust the charge until maximum conditions are reached at the end of the cycle. If an approximate charge is put in the system, it is imperative the refrigeration technician return when conditions are at the extreme. If the conditions are simulated in an empty chamber, it will be necessary to closely watch both temperature and relative humidity because the dehumidification system will have a dramatic effect on both readings when the chamber is empty.

Install service gauges on the suction and discharge line valves and thermometers on the suction and discharge lines as close to the compressor as possible. If you have reversing fans, be sure the fans are in the "Forward" mode, the belts are tight on the blower, the blower is turning in the proper rotation, the filters are clean, and check the damper operation (this is essential, and instructions are given elsewhere in this manual). Be sure the air flows are all normal, and note the temperature and relative humidity.

A sight glass is installed in the liquid line. Do not charge to a clear sight glass. The sight glass is provided as a reference and moisture indicator only. There are only limited periods when the sight glass will clear.

Add refrigerant while monitoring suctions and discharge pressure. When the actual suction line temperature drops to 80° F.-90° F, stop charging and observe pressure readings. Also, note the damper position. At 32% RH, they should be nearly closed or modulating from closed to slightly open. If they remain fully closed and the discharge pressure allows, add refrigerant to lower suction line temperature until they begin to modulate slightly.

At the maximum operating temperature (160° F, 32% RH), the following approximate readings will be noted.

Suction Pressure	50-60 PSIG
Discharge Pressure	330-360 PSIG Do not exceed 375° F.
Suction Temperature	75°F - 95°F Do not exceed 100°F
Discharge Temperature	204°-255° Do not exceed 265°F
Evaporator Damper	Modulating from closed to slightly open

The following can affect actual discharge temperature:

1. Excessive suction gas temperature: Check the operation of the damper system. Be sure the relative humidity is below 32%, and check the refrigerant charge.
2. Excessive discharge pressure: Check airflow over the condenser, check blower operation (direction and belt tightness), filter for obstructions, and check the refrigerant charge. Be sure the set temperature is under 160° F.
3. A mechanical failure in the compressor, broken reed valves, bearings, etc.
4. An electrical problem with the compressor motor, such as low voltage, unbalanced voltage, loose electrical connections, motor insulation failure, etc.

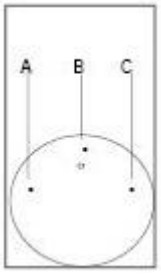
An increase in suction gas temperature is usually related to improper refrigerant charge, improper damper operation, airflow problems, or, occasionally, a compressor or expansion valve malfunction.

Unbalance 3 Phase Supply

A very slight voltage unbalance will cause a significant unbalance in the amperage draw. Operating a motor where these conditions exist will shorten equipment life and waste energy, dramatically increasing winding temperature. The following example will show how to calculate your unbalance.

To assess the % unbalance, you must find your maximum standard deviation. This number represents how much your voltage is deviating from the average voltage.

First, measure the voltage for A-B, B-C & A-C, as shown in the figure to the left.



Example: AB = 200
BC = 205
AC = 216

Then find the average voltage.

Example: 200 + 205 + 215 = 621

621 / 3 = 207

Find the difference between the average voltage and the measured voltages for AB, BC, and AC. This is called the standard deviation. The highest number is your maximum deviation.

Note: Always put the larger number first.

Example: AB = 207 - 200 = 7
BC = 207 - 205 = 2
AC = 216 - 207 = 9

This voltage unbalance is accompanied by a motor temperature rise. A 10% unbalanced is equivalent to a 200% rise in temperature. Phase unbalances (which some might consider to be minimal but are quite serious) greatly shorten motor life and can cause catastrophic failure at any time.

Never operate a motor with a phase unbalanced supply voltage greater than 2%. If this happens, consider it a severe electrical issue and immediately contact your local electric utility company.

Replacement Procedure

When contacting Nyle for service or replacement parts, refer to the model and serial number of the unit as included on the data sticker attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required

Troubleshooting

Compressor Will Not Run

1. The breaker may be open, or the circuit breaker is tripped. Check electrical circuits and motor windings for shorts or grounds. Investigate possible overloading. Replace the fuse or reset the circuit breakers after the fault is corrected.
2. Emergency stop may be depressed. Ensure that E-stop is deactivated.
3. Supply voltage may be too low. Check the voltage with a volt meter.
4. Control system may be faulty. Check control for correct wiring of temperature/relative humidity sensor and check the control transformer for proper voltage.
5. Wires may be loose or broken. Replace or tighten.
6. The low-pressure switch may have tripped due to one or more of the following:
    - Compressor suction line clogged
    - Low refrigerant
7. The high-pressure switch may have tripped due to one or more of the following:
    - Compressor discharge line clogged
    - Airflow in the D.H. unit is reduced due to a blockage
    - Airflow in the D.H. unit is reduced due to a blower malfunction.

Unit Is Noisy

1. Check the compressor for loosened mounting bolts. Make sure the compressor is floating free on its isolator mounts. Check for tubing contact with the compressor or other surfaces.
2. Check the screws on all panels.
3. Check for chattering or humming in the contractor or relays due to low voltage or a defective holding coil. Replace the component.
4. Check for abnormally high discharge pressures. 350 psi + (see page 30)
5. Check for loose panels or parts that may be in contact with each other; vibrations from the compressor may cause them to chatter against one another.
6. Check for vibration related to the blower. Debris in the blower wheel may cause an unbalanced condition.

Insufficient Heating

1. Check for restrictions in airflow.
2. Check for leaks at the intake, exhaust duct, and damper openings.
3. Check the auxiliary electric heater for an appropriate current draw. (displayed on heater cover)
4. Consult with a qualified electrician concerning the heating circuit.

Troubleshooting Matrix

Issue: Cycle is running too long; product is not drying; RH is not dropping as expected

Potential Cause	Secondary Cause	Root Cause	Solution
User RH setpoint is satisfied (in or out of schedule)	N/A	Input error	Lower RH setpoint
Load size is larger	Moisture removal	System sizing	Allow system more time to dry
Poor circulation	Circulating fan	Input error	Raise fan speed setpoint
	Circulating airflow restriction	Overloaded product racks	Reduce product loading on racks
		Perforated baffle plugged	Clean baffles
		Circulating fan intake restricted	Remove restriction
	Circulating fan(s) not running	Fan motor fuse blown	Replace fuse; investigate reason for blown fuse
		Fan motor failure	Replace fan motor
Compressor not running	SLP not achieving cut in	Crank case heater faulty	Replace crank case heater
		Cold mechanical space (at compressor location)	Heat mechanical space
		User temp setpoint too low	Raise user temp setpoint
		LLSV malfunction	Verify control and power wiring integrity for LLSV
			Verify control logic integrity for LLSV (opens with compressor call)
			Verify valve mechanism is not stuck
		Refrigerant Leak	Identify leak; re-charge system
	Oil pressure safety tripped	Liquid floodback to compressor	Verify control and power wiring integrity for LLSV
			Verify control logic integrity for LLSV (opens with compressor call)
			Verify valve mechanism is not stuck closed
Compressor not running	Oil pressure safety tripped	Dampers not modulating properly	Verify control logic integrity for dampers (opening when SLT <77°, closing when SLT >77°)
			Replace damper actuator
Compressor cycling (runs briefly then shuts back down)	DLP exceeding high-pressure safety	Loose blower drive belts (where applicable)	Tighten or replace drive belts
		DH blower motor fuse blown	Replace fuse; investigate reason for blown fuse
		DH blower airflow restriction	Clean intake filters
			Remove blockage
		DH blower motor starter tripped	Reset motor starter
		DH blower motor failure	Replace blower motor
		DH blower not spinning freely	Grease bearings
			Replace bearing
		User temp setpoint exceeds performance envelope	Reduce user temp setpoint
		System overcharge	Reduce refrigerant charge

Potential Cause	Secondary Cause	Root Cause	Solution
Compressor cycling (runs briefly then shuts back down)	DLP exceeding high-pressure safety	External condenser fan not running properly	Verify control and power wiring integrity to external condenser fan motor
			Replace external condenser fan motor
			Check for blockage in Condenser air stream (verify no debris in coil and fins are not bent restricting airflow) address blockage.
			Verify control logic integrity for external condenser fan (Fan runs when Chamber temp is >Temp Setpoint +2)
		External condenser running too hot ambient temp (85°F+)	Reduce ambient temp
	SLT exceeding SLT limit	Dampers not modulating properly	Verify control logic integrity for dampers (opening when SLT <77°, closing when SLT >77°)
			Verify nothing is tangled in dampers jamming them up.
			Replace damper actuator
		Refrigerant leak	Identify leak; re-charge system
	SLP not remaining above cut out	Refrigerant leak	Identify leak; re-charge system
	DLP not remaining below high pressure safety	Loose blower drive belts (where applicable)	Tighten or replace drive belts
		DH blower motor fuse blown	Replace fuse; investigate reason for blown fuse
		DH blower airflow restriction	Clean intake filters
			Remove blockage
		DH blower motor starter tripped	Reset motor starter
		DH blower motor failure	Replace blower motor
		DH blower not spinning freely	Grease bearings
			Replace bearing
		User temp setpoint exceeds performance envelope	Reduce user temp setpoint
		System overcharge	Reduce refrigerant charge
	DLT exceeding high temp safety	Refrigerant leak	Identify leak; re-charge system
		User temp setpoint exceeds performance envelope	Reduce user temp setpoint

Issue: Process is running >5° over temperature setpoint; cool down is taking too long

Potential Cause	Secondary Cause	Root Cause	Solution
Cooling mode is not effective	Vents not opening	Intake or exhaust vent damper actuator not opening	Verify control and power wiring integrity for vent actuators
			Verify control logic integrity for vents (open when temp >2° above user setpoint)
			Replace damper actuator
		Vents blocked	Remove blockage
		Intake or exhaust vent actuator loose on damper shaft	Tighten actuator connection to shaft
		Energy exchange is too low	Increase venting capacity
Cooling mode is not effective	External condenser not operating	3-way valve not operating	Verify control and power wiring integrity for 3-way valve
			Verify control logic integrity for cooling mode (active when temp >2° above user setpoint)
		External condenser fan not running properly	Verify control and power wiring integrity to external condenser fan motor
			Verify control logic integrity for external condenser fan
			Replace external condenser fan motor
			Remove blockage from external condenser fan air stream
		External condenser running in too hot ambient temp	Reduce ambient temp

Issue: Process will not reach setpoint temp; warm up is taking too long

Heater is not running	Heater internal safety is tripped/blown	Heater fuse is blown	Replace fuse; investigate reason for blown fuse
		Loose blower drive belts (where applicable)	Tighten or replace drive belts; replace blown heater safety
		DH blower airflow restriction	Clean intake filter; replace blown heater safety
			Remove blockage; replace blown heater safety
		DH blower motor fuse blown	Replace fuse; investigate reason for blown fuse; replace blown heater safety
		DH blower motor starter tripped	Reset motor starter; replace blown heater safety
		DH blower motor failure	Replace blower motor; replace blown heater safety
		DH blower not spinning freely	Grease bearings; replace blown heater safety
			Replace bearings; replace blown heater safety
Air leakage from process	Vents not operating	Intake or exhaust vent damper actuator not closing	Verify control and power wiring integrity for vent actuators
			Verify control logic integrity for vents (open when temp >2° above user setpoint)
			Replace damper actuator

Potential Cause	Secondary Cause	Root Cause	Solution
Air leakage from process *(Continued)*	Vents not operating	Intake or exhaust vent actuator loose on damper shaft	Tighten actuator connection to shaft
		Energy exchange is too high	Decrease venting capacity
	Chamber leakage	Sealant failure	Replace sealant
		Chamber fasteners not tight	Tighten fasteners
	DH unit leakage	Discharge duct joint gasket/sealant failure	Replace sealant/gasket

Alarm Codes

Color	Cause	Solution	
Alarm Code: SLP PSI			
Green/Orange	SLP< Cut in	Wait for refrigeration call	
Orange	SLP outside expected range while in cycle	Immediate attention not required	Tighten/Replace blower belts
			Clean intake filter
			Check for Debris in evaporator coil
			Check for Refrigerant Leaks
Alarm Code: DLP PSI			
Green/Orange	DLP> Cut in	Wait for refrigeration call	
Orange	DLP outside expected range while in cycle	Immediate attention not required	Tighten/Replace blower belts
			Clean intake filter
			Check for Debris in Condenser coil
Alarm Code: DLT			
Red	Compressor Shut down because DLT climbed above Threshold.	Review DLT troubleshooting section	
Orange	DLT outside expected range while in cycle	Immediate attention not required,	Verify dampers in front of evaporator are functioning correctly. Begin to open when SLT>77F and close once SLT<77F
			Check Refrigeration circuit for leaks
Alarm Code: SLP Cycle Fault			
Red	SLP dropped below cut in while in cycle	Wait for CTD to expire	
Orange	Compressor has dropped below SLP cut in twice within 30 minutes	Monitor system to determine cause of SLP drop	
Alarm Code: DLP Cycle Fault			
Red	DLP dropped below cut in while in cycle	Wait for CTD to expire	
Orange	Compressor has dropped below DLP cut in twice within 30 minutes	Monitor system to determine cause of DLP drop	
Alarm Code: Blower Overload			
Red	Overload for refrigeration blower (blower in DH cabinet) tripped	Reset overload, investigate reason for tripping	Verify integrity of wiring between OL and Motor
			Inspect Bearings for blower shaft, replace if necessary
			Verify Motor is not faulty
			Replace Overload.

Alarm Code: E-Stop			
Red	E-stop is pressed in	release E-stop and hit reset on screen.	
Alarm Code: Oil Pressure			
Red	Oil pressure sensor detected insufficient oil pressure	Check oil pressure at oil pump service port on compressor	
		Verify oil level in compressor sight glass, should be 3/8" up from bottom and not be frothy.	
		Verify sufficient superheat at evaporator, should be 15-20F	
Alarm Code: Heat Safety			
Red	Heater windings have overheated	Tighten/Replace belts on blower motor	
		Replace intake filter on DH unit	
		Check for airflow restriction through DH discharge duct.	
		Check for damage on Blower wheel	
Alarm Code: Drive Fault			
Red	Drive has encountered a Fault	Review VFD Manual for fault listings	
Alarm Code: Circ Fan Overload			
Red	Overload for circulation fan tripped	Reset overload, investigate reason for tripping	Verify integrity of wiring between OL and Motor
			Verify Motor is not faulty
			Replace Overload.
Alarm Code: Comms Fault			
Red	PLC has lost connection to Temp and RH sensor	Clean filter tip on Temp/Humidity sensor	
		Check wiring from PLC to sensor	
		Replace Sensor	
Alarm Code: Compressor			
Red	Sufficient Pressure differential not detected between SLP and DLP	Check Compressor Fuses	
		Verify Compressor isn't tripping out on Thermal overload	

Glossary

CTD - Compressor Time delay

DLP - Discharge Line Pressure

DLT - Discharge Line Temperature

E-Stop - Emergency Stop

OL - Overload

SLP - Suction Line Pressure

SLT - Suction Line Temperature

SP - Set Point

Limited Warranty

The equipment supplied by Nyle is warranted to be free from defects in workmanship and materials for a period of one year from the date of the original installation or 15 months from the date of delivery, whichever comes first. In the event of component failure, a new or remanufactured part will be supplied by Nyle, providing the defective part is first returned to Nyle for inspection. The replacement part assumes the unused portion of the warranty. The warranty does not include the following:

- Labor or other costs incurred for diagnosis.
- Repairing or removing.
- Installing.
- Shipping the defective or replacement parts.

Nyle makes no warranty as to the fitness of the equipment for a particular use and shall not be liable for any direct, indirect, or consequential damages in conjunction with this contract and/or the use of its equipment. Buyer agrees to indemnify and save harmless Nyle from any claims or demands against Nyle for injuries or damages to third parties resulting from buyer’s use or ownership of the equipment.

No other warranties, expressed or implied, will be honored unless in writing by an officer of Nyle Systems.

Service Log

Issue Description	Date	Servicer

Service Log

Issue Description	Date	Servicer

Service Log

Issue Description	Date	Servicer

Service Log

Issue Description	Date	Servicer

FD-Series User Manual Rev 2024.01

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