



User Manual

NDK^R Kiln Controls



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NDK^R Kiln Control Manual
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Table of Contents

Safety Guidelines	1
<i>Precautions</i>	1
<i>Electrical Grounding</i>	1
About The Controller	1
Modes of Operation	2
Conventional Mode	2
DH Mode	2
Hybrid Mode	2
Utilizing Your Controller	2
Kiln Status	2
Kiln Mode	2
Lot ID	3
Kiln Temperature and Set Points	3
Manually Changing Set Points	3
Cycle and Runtime	3
Equipment Status	3
Return Button	3
Configuring Your Controller	3
Heat	4
Fans	4
Vent/HRV	5
Spray	6
Compressor	6
Advanced Settings	7
Moisture Samples Screen	7
Trends Screen	7
Schedule Screen	8
Navigating The Schedule Screen	8
To Create and Save a Schedule	8
To Load a Previous Schedule	9
Other Pertinent Information	9
Alarm Screen	9
Logging Into The Controller	9
Starting Your Kiln	10
Warranty	10



WARNING Read through entire manual before installing, operating, or servicing this unit. Failure to follow any steps or guidelines could result in personal injury, death, destruction of property or may cause the unit to become inoperable. These are the "original Instructions for this unit." **This manual must be kept with the unit at all times.**

Safety Guidelines

Precautions

Do not operate if the unit or any of its parts:

- Have been exposed to fire.
- Have been submerged in or exposed to excessive water.
- Has significant interior or exterior damage.

If any of the above are suspected make sure to have your unit serviced by a qualified professional before continuing operation.

Electrical Grounding

The unit must be grounded.

Failure to ground the unit will result in unreliable performance or an inoperative unit. You can ground the unit by connecting the unit to a grounded metal, permanent wiring system. Make sure the unit is in accordance with national and local electrical codes. If you don't know the building codes in your area or need more information, please contact your municipal office.

About the NDK-R Controls

Nyle Systems developed the NDK-R Controller as a one-stop retrofit controller for any Conventional or a Single compressor Dehumidifier kiln.

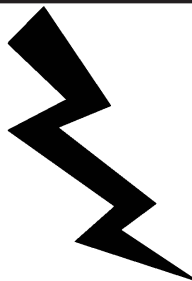
Multiple custom settable options enable it to be configured to nearly all different control configurations, including on/off control, modulating, analog in & output, or Modbus Serial/ TCP.

In terms of control strategies, it was designed to be flexible down to specific schedule steps. Up to 20 steps can be configured individually. This allows the operator complete control over the drying cycle and provides the ability to ramp up in temperature, advance based on time or moisture content, run a heat treat only, or even a "heat-dump-rest" step as part of the schedule.



Electrical Shock!

- Turn off power to unit before service.
- Make sure wires are labeled before disconnecting.
- Test unit after reconnecting wires.
- Failure to do the above could result in death or injury.



Modes of Operation

Conventional Mode

Conventional mode is the basic mode from which all other modes are built. Conventional mode relies solely on venting or vent call to reduce high air humidity and spray or spray call to increase air humidity levels.

To simplify, in conventional mode, the Dry bulb set point drives the heat call, the Wet bulb set point drives the vent, and the spray set point drives the spray.

Conventional drying can be used on any type of lumber as a jack-of-all-trades mode.

DH Mode

DH (Dehumidification) mode is a drying mode pioneered by Nyle. It utilizes a compressor for the moisture removal call, and the vents are only used for a “cool down” call if the Dry Bulb begins to exceed set points. Since the vents don’t open to remove moisture, all the energy used to heat the kiln chamber doesn’t go to waste. A DH kiln can be equipped with a cold water spray for increasing humidity levels.

To simplify, in DH mode, the Dry Bulb set point drives the heat call, the Wet Bulb dry point drives the compressor call, and the spray set point drives the spray.

DH drying can be used on any type of lumber but particularly shines with slower-drying hardwoods.

Hybrid Mode

Hybrid mode is a newly designed control system for specific applications while running a DH kiln. It has a built-in temperature “offset,” which allows a primary and a secondary call for heat. For example, the offset would be lower if a Dry Bulb set point is 100 degrees Fahrenheit. The offset is customizable but is defaulted to 1 degree Fahrenheit below set points. This mode changes the “vent” call back to the vents and utilizes the compressor and a traditional heat source (gas/electric/etc.) as the primary and secondary heat calls.

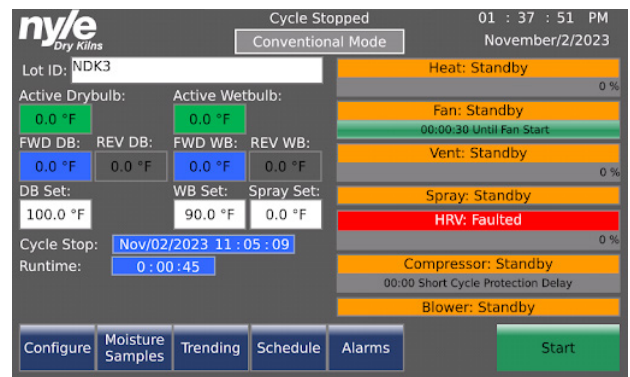
To simplify, in Hybrid mode, the Dry bulb set point drives the compressor, while the Dry bulb “offset” drives the primary heat source. The Wet bulb set

point drives the vents, while the Wet bulb “offset” drives the compressor off. The spray set point drives the spray.

Hybrid drying is designed for use with a DH kiln and situations where DH drying can occasionally struggle. Fast-drying softwoods, particularly in small chambers, could benefit significantly from using hybrid mode.

Utilizing Your NDK² Controller

This section is a walk through of the complete operation of the NDK controller. Starting at the home screen, this is a summarized view of the kiln’s current state.



Kiln Status

At the top of the screen will either show the kiln is running or stopped.

Cycle Stopped

Kiln Mode

Just below this is the Mode indicator and Mode select button.

Conventional Mode

This button becomes inactive when the kiln is running. If the schedule is enabled, the mode becomes controlled by the mode option in the schedule. (see schedule section, page)

You can change modes while the kiln is off by selecting the mode indicator. This will bring up a scroll box with the different modes.



Select the desired mode and hit “okay”.

Lot ID

Lot ID:

The lot ID allows the user to specify the log file name for the current run. This can be entered manually for each kiln charge, or the “auto-increment” feature can be used at kiln start-up. (see start-up section,page)

Kiln Temperature and Set Points

Active Drybulb:		Active Wetbulb:	
0.0 °F		0.0 °F	
FWD DB:	REV DB:	FWD WB:	REV WB:
0.0 °F	0.0 °F	0.0 °F	0.0 °F

This shows current kiln temperatures, including the controlling or active probes. The active Dry bulb/ Wet bulb will have a green highlight, and the Forward or Reverse Dry bulb/Wet bulb will highlight blue if used for the controlling value. An orange or yellow highlight indicated a probe fault. Controlling probes can be assigned manually in Advanced Settings if logged in as an Admin. (See Advanced Setting section, page ? and Login Section, Page ?)

Manually Changing Set Points

DB Set:	WB Set:	Spray Set:
100.0 °F	90.0 °F	0.0 °F

When no schedule is enabled (see schedule section, page), temperature set points can be entered manually from the home screen. When the Set Point background is highlighted white, settings can be manually adjusted by clicking on the box and inputting the desired values.

If the Set Point background is highlighted gray, the kiln operates from a schedule, and these values cannot be manually adjusted.

Cycle and Runtime

Cycle Stop:
 Runtime:

Cycle start and runtime show when the kiln was started and how long it has been running. If the cycle is stopped, the date and time it was stopped is displayed instead.

Equipment Status

The right half of the main screen shows equipment status. The general color schemes used are:

- Green: Enabled and running
- Orange: Enabled, not running
- White: Disabled and/or Off
- Yellow: Running in manual
- Red: Trip or Fault

Heat: Manual	0 %
Fan: Standby	00:00:09 Until Fan Start
Vent: Running	100 %
Spray: Off	
HRV: Faulted	0 %
Compressor: Standby	00:00 Short Cycle Protection Delay
Blower: Running	

Return Button



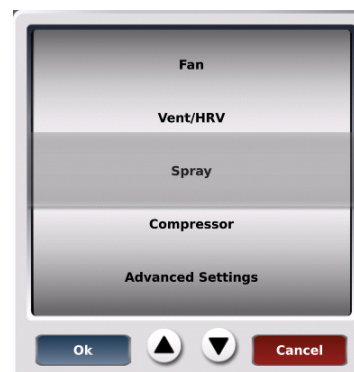
On all screens except the main/home screen, Tapping the Nyle Dry Kilns Logo will function as a back button and return to the previous screen.

Navigation Buttons

Configure	Moisture Samples	Trending	Schedule	Alarms
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These buttons allow the user to navigate through to other settings and screens.

Configuring Your Controller



The configure button opens up a scroll wheel list of equipment in the kiln. This allows the user to access much finer degrees of control with these various pieces of equipment. While running the kiln manually, certain functionalities like fan speed adjustment can only be accessed through these options.

Specific adjustments can only be made while logged in as an Admin. (See login section, Page)

Heat



In the heat control screen, specific settings and adjustments for manual operation can be made. Clicking on the heat control box (highlighted green) will open a scroll wheel for heat Auto, Manual, or Off.



Auto: Heat call adjusts based on kiln set point.

Manual: Heat is always on

Off: The heat is always off.

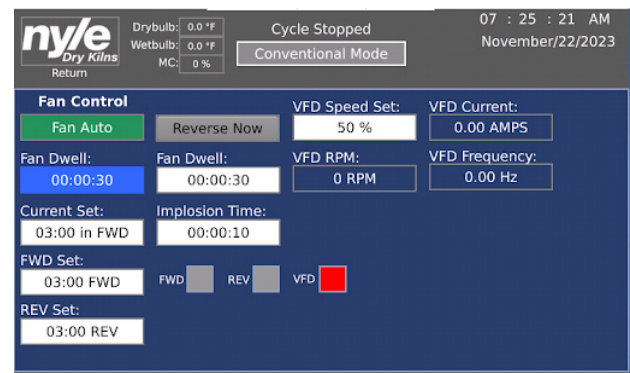
DB deadband is the difference between the Actual Dry bulb and Dry bulb set point; this tells the kiln when to call for heat. For example, with a -2.00 degree deadband on and a 0.00-degree deadband off, a kiln set to 100 degrees dry bulb will get the heat call on at 98 degrees and shut off at 100 degrees.

Ramp Start/End and Ramp time would manually ramp the kiln to temperature over as much time as desired. If the checkbox is directly under "Ramp:" it would enable a manual ramp based on any values plugged into this screen.

Manual position allows a percentage of the heat call, 0-100%, from entirely off to fully on when Heat Manual is selected. This is only available on kilns with modulating heat sources.

The auto position shows the percentage of the heat call used if Heat Auto is selected. On When Below and Off When Above directly correlate to Dry Bulb and Deadband set points.

Fans



Clicking on the fan control box (highlighted in green) will open a scroll wheel for Fan Auto, Fan Off, Fan Forward, and Fan Reverse.



Auto: Fans adjust direction based on kiln settings

Off: Fans are always off

Forward: Fans will always blow forward

Reverse: Fans will always blow reverse

Reverse now is a selectable box that allows the user to swap the direction of the fans immediately.

Fan Dwell is the downtime while the fans change direction to protect equipment. The blue box will show a countdown during the direction swap, while the white box is where the user can input a different fan dwell time.

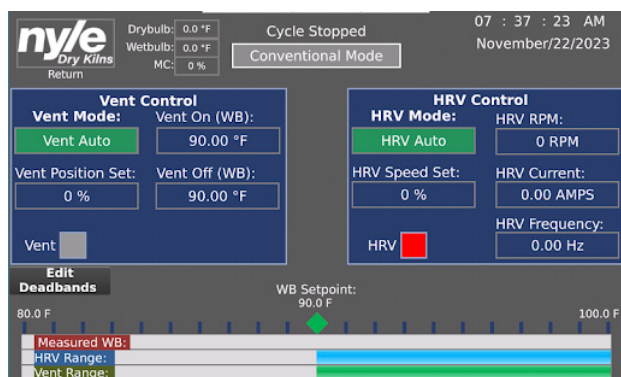
Fan dwell can only be changed when logged in as an Admin. (See login section, Page)

Current Set, FWD Set, and Rev Set determine how long the fans blow a particular direction before swapping.

Implosion time is the amount of time the vents will open for upon fan start-up to prevent extreme pressures with various temperatures and air movement in the kiln. It can only be changed when logged in as an Admin. (See login section, Page)

If the kiln has a VFD enabled, the user can use this screen to set specific fan speeds and view the VFD RPM, current draw, and Hertz. The VFD speed set is plugged in at a 0-100% ratio of 0-60hz. Putting in a value of 50% will equal 30hz on the VFD.

Vent/HRV



Clicking on the vent mode box (highlighted in green) will open a scroll wheel for Vent Auto, Vent Manual, and Vent Off.



Auto: Vents will operate based on kiln set points

Manual: Vents will open all the way

Off: Vents will close all the way

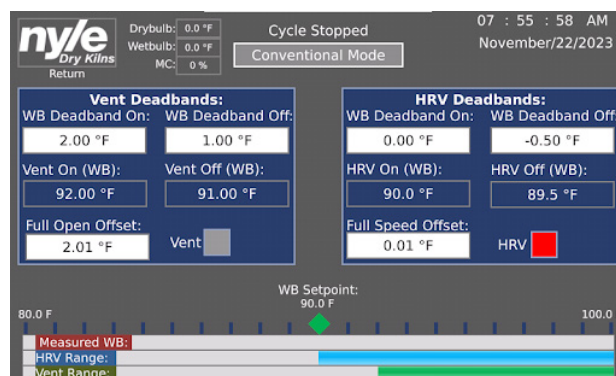
It's important to note that the Fans/HRV screen changes slightly based on the selected drying mode. This is because the vent call is triggered by different settings based on the different drying modes.

Vent Control (Conventional)

Vent on (WB) is your Wet bulb set point. This is the basic setting for when your kiln will vent moisture. If an HRV is enabled, it will function the same as the vents, venting off the WB setting and a similar scroll wheel for Auto, Manual, and Off.

With Vent/HRV controls set to Manual, the user can use either the Vent Position Set or HRV Speed Set to have the vent open to a specific percentage or the HRV run at a particular speed. Note: if the kiln does not have modulating vents, this function will only allow the user to open or close the vents fully.

Using the Edit Deadband button, the user can customize the moment the vents will open/close and when an HRV will turn on/shut off if enabled.



Example: The above screen is set up with some example deadbands. It shows the HRV at a 90-degree WB On set point, a -0.50-degree WB Off set point, and a 0.01-degree Full Speed offset. This means the HRV will turn on precisely at the set point, hit max speed at 0.01 degrees above the set point, and shut off when active WB reaches .5 degrees below the set point. The vents are offset by 2 degrees, which means they will not open until 2 degrees over the set point, if the HRV can't keep up on its own.

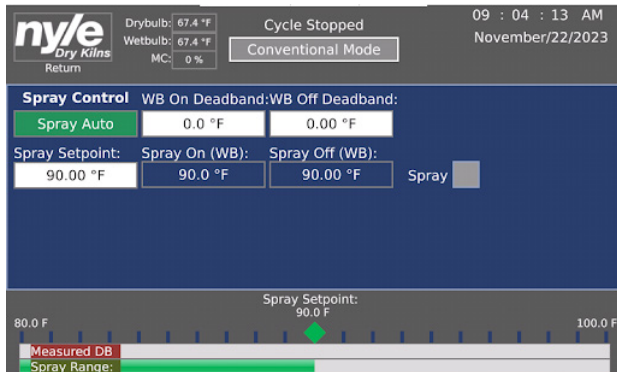
Vent Control (DH Mode)

Vent control settings & deadbands function almost the same as conventional mode, except they would vent off the Dry Bulb instead of the Wet Bulb.

Vent Control (Hybrid Mode)

Vent control settings and deadbands function the same as in conventional mode.

Spray



Clicking on the Spray Control box (highlighted in green) will open a scroll wheel for Spray Auto, Spray Manual, and Spray Off.



Auto: Spray will operate based on kiln set points.

Manual: Spray will always be on.

Off: Spray will always be off.

Note: The spray setting cannot be higher than the current Wet Bulb setting.

The Spray screen is relatively simple; in auto, the kiln will spray until it hits the spray set point. Spray dead bands can be adjusted if the operator wants the spray to turn off or turn on a few degrees above or below the set point.

Compressor



In the compressor control screen, certain manual adjustments can be made. Specific information about the compressor is also only viewable from this screen. Clicking on the Comp Control box (highlighted in green) will open a scroll wheel for Comp Auto and Comp Off (pump down).



Auto: Compressor will run based on kiln set points.

Off (pump down): The compressor will not run based on kiln set points and will be off as much as possible. The compressor will pump refrigerant out to avoid liquid inside on the next startup.

This screen will also show the various temperatures and pressures of all the systems that make up the compressor. Suction Line Temperature (SLT), Suction Line Pressure (SLP), Discharge Line Temperature (DLT), Discharge Line Pressure (DLP), and Solenoid Valve delay (LLSV).

Conventional Mode

In conventional mode, the compressor (if equipped) will remain permanently in the Off (pump down) setting and will not run.

DH Mode

In DH mode, the compressor will run based on the WB setting.

Hybrid Mode

In Hybrid mode, the compressor will run in a zone where certain conditions are met. The compressor will run based on a heat call if the dry bulb is below a certain amount below the set point, but the wet bulb also needs to be above a certain set point.

Deadbands can be adjusted if logged in as an admin. Hybrid offset can be adjusted from the Heat Configure screen if the kiln is in DH Mode.

Advanced Settings

The screenshot shows the 'Advanced Settings' screen for a Nyle Dry Kiln. At the top, it displays 'Drybulb: 67.4 °F', 'Wetbulb: 67.4 °F', and 'MC: 0 %'. The 'Cycle Stopped' button is highlighted. Below this, there's a 'Lot ID Selection' field with 'NDK3' entered. The 'Current User' is 'Admin'. There are buttons for 'Login' and 'Logout'. The 'Probe Setup' section has 'Configure' and 'Open' buttons. The 'Heater Setup' section has 'Configure' and 'Open' buttons. The 'Email Log File' section has 'Email Now' and 'Auto Email When Stopped' options. The 'Email Heat Treat Log' section has 'Email Now' and 'Auto Email when Finished' options. At the bottom, there are 'Probe A' and 'Probe B' settings, both set to 'Default'.

The advanced settings screen allows the user to log in as an operator or admin. It also allows the user to enter a lot number manually, configure which probes the kiln is running off, and set up emails for log files.

Probe setup is only accessible while logged in as an admin and allows a lot of changes & customization to how the kiln functions. The user can select which probe

This screenshot shows the 'Advanced Settings' screen with more detailed probe configurations. It includes fields for 'FWD WB', 'REV WB', 'FWD DB', 'REV DB', and 'SLT', each with a temperature reading and a status indicator. There are also buttons for 'WoodProbe Log Only', 'Log Extra Probe', and 'Use Backup Drybulb Probe On Fault'. The 'Cycle Stopped' button is still highlighted. The 'Current User' is 'Admin'.

The FWD and REV Dry Bulb and Wet Bulb readings are coming from. The user can also change which probe is the "active" probe based on fan direction. These are all under specific defaults, & changing them will fundamentally change how the kiln operates. For example, changing the WB and DB mode to "OPP Fan Direction" will make the active DB and WB read the air on the exiting side of the lumber stack instead of the entering side.

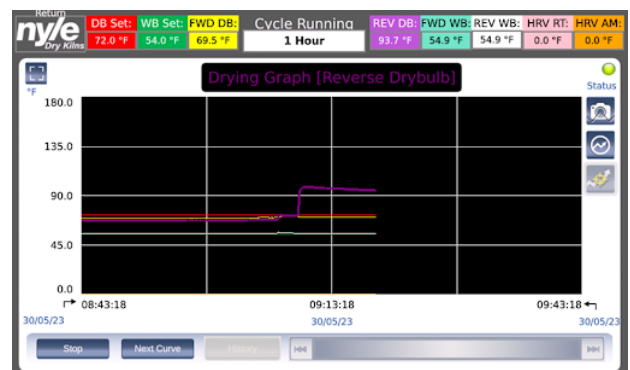
Nyle recommends having a clear understanding of how these changes will affect the operation before making any adjustments away from the default. Please feel free to reach out to our service line with any questions. Service@Nyle.com

Moisture Samples Screen

The screenshot shows the 'Moisture Samples' screen. It features a grid of 12 sample input fields, each with a '99 %' value. To the right of the grid, it shows 'Active Samples: 0' and 'MC Average: 0 %'. The 'Cycle Stopped' button is highlighted. The 'Current User' is 'Admin'.

The moisture samples screen allows the user to manually input the moisture content of various samples in the kiln charge. These will directly correlate to MC% steps set up in the schedule. (See schedule section, Page) If the box next to a particular sample is checked, then that sample will be used as part of the average samples calculation. This is the value used for MC% steps in the schedule.

Trend Screen



The Trending button opens the Trend view screen. This view shows trends of currently measured values and only trends values when the kiln is in run mode.

The user can zoom in and out on the data range by tapping the time span value at the top center.

1 Hour

This opens a scroll selection box to view the data in 1-hour, 6-hour, 24-hour, 48-hour, and 99-hour spans. The user can further zoom in on data by tapping the [Stop] button. This freezes the graph and enables the focus button.



Once this button is tapped, the cursor changes to a crosshair, allowing one to click on a curve to see the specific time & actual value at that point.

The name of the current curve is displayed at the top.

Drying Graph [Reverse Drybulb]

Click on the [Next Curve] button to scroll through the curves.

To scroll through recorded value and time, tap on the forward and back arrows, or tap on a new point on the curve.

When finished viewing data, tap on the [Run] button; this will update the graph to live data.

Note: This trend graph shows data up to 99 hours at 1-minute intervals. Should one wish to see more data, they can download the Log file of the current run to a USB drive (see File Browser section under Advanced settings), import the .csv data into MS Excel, & generate a graph of the whole run.

Schedule Screen

When editing a specific step in the schedule section, there is an option to adjust step functions. This section details the differences between each function.



Timed Step: The schedule will advance to the next step when an entered amount of time has passed.

Heat Ramp: The schedule will advance to the next step when a certain amount of time has passed and gives the option of gradually inputting an amount of time for the kiln to reach a Dry Bulb set point.

Heat Treat: The schedule will advance to the next step when the selected Dry Bulb temperature is held for the amount of time inputted.

MC%: The schedule will advance when a specific Moisture Content is met across an average of samples. This directly correlates to the Moisture Samples tab accessible from the main screen.

Dump Cycle: The schedule will advance to the next step when a certain amount of time has passed. It also gives options for a heat, vent, and rest cycle. Operators may find this helpful in getting the final moisture out of thicker lumber.

Navigating the schedule screen

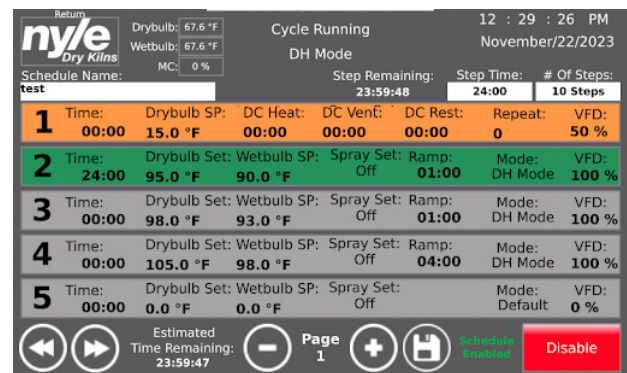
Use the plus (+) and Minus (-) buttons to cycle through multiple pages of steps.

When the kiln is running, use the arrow buttons (>>, <<) in the bottom left to cycle through active steps manually.

An orange step denotes a previous step, a green step is active, and a gray step is upcoming.

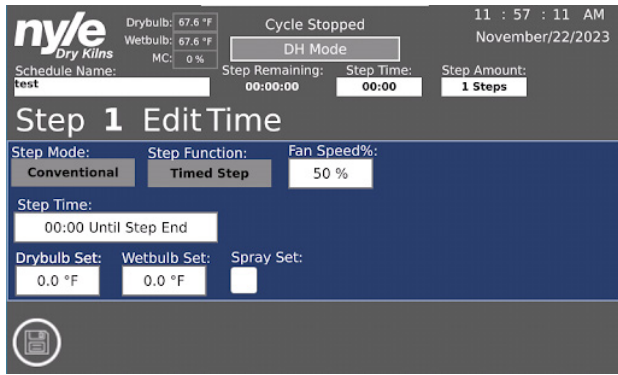
To create and save a schedule:

Once in the schedule tab, begin adding specifics of the desired schedule. Users can add the number of steps at the top right of the screen and the schedule name at the top left.



While there is no hard limit to the number of schedules that can be saved and loaded, we recommend only running those necessary for user operation. This will make frequently used schedules easier to find and load from the file list.

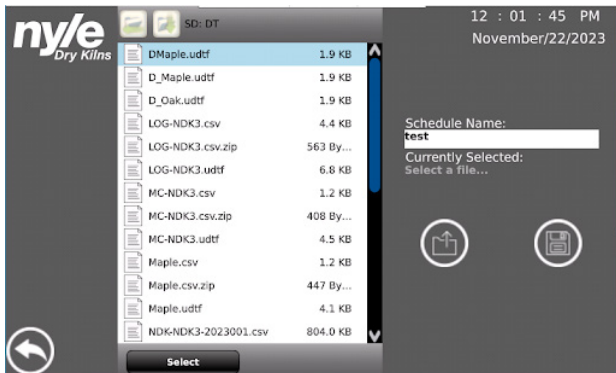
Now, we can begin editing specific steps. Click on step one and determine step mode, step function, values for time, DB/WB, spray (if necessary), and any step-specific functions. Once the step is set up, click the save button in the bottom left, then the Nyle logo in the top right to return to the previous screen.



Once all steps are complete, click the “save/load” icon at the bottom of the screen. This will open up a file list, including all saved schedules.

By default, the selected schedule should be the one just edited and enabled. Click the “save” button on the right side of the screen to save the current schedule.

To load a previous schedule:



Once in the schedule tab, click on the “save/load” icon at the bottom of the screen. This will open up a list of files that includes all saved schedules.

To load a specific schedule, scroll up or down to find and click on the desired schedule. Make sure it is the correct schedule followed by “.udtf”, trying to load any files that do not have “.udtf” should result in an error message.

Once the correct file is selected, click “Select” at the bottom of the screen. This should cause the text bar on the right of the screen to populate with the name of the selected schedule.

Under this text bar, click the load icon. Then, hit “yes” to the text box asking to load the schedule.

Your desired schedule should be loaded once you back out to the normal schedule screen.

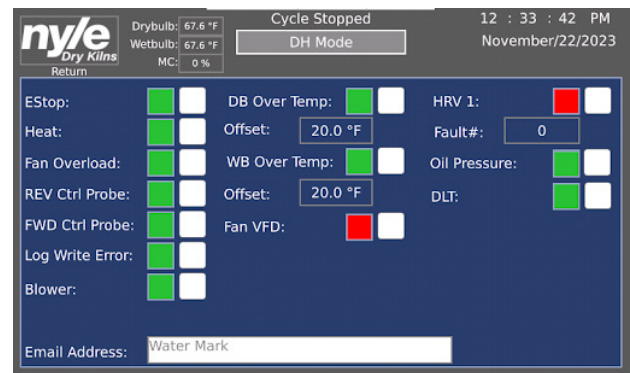
Other pertinent information:

If the “enable” button in the bottom right of the schedule tab is not clicked, the program will

disregard the schedule & run based on manual settings. The schedule can be enabled from the schedule tab or at the kiln start-up with a pop-up box.

If any steps chosen in a selected schedule are MC% steps, they will read off the Moisture Samples tab accessible from the main screen. If these values are not filled in either manually or with moisture probes, then the MC% steps will not function as intended.

Alarm Screen



The alarm screen details more information about different alarms and faults, as well as an option for inputting an email address to send fault reports.

Logging into the Controller

To log in to the controller, the user must first go to Configure > Advanced settings.

There are two logins readily available to the user.

User: Operator

Password: 100000

User: Admin

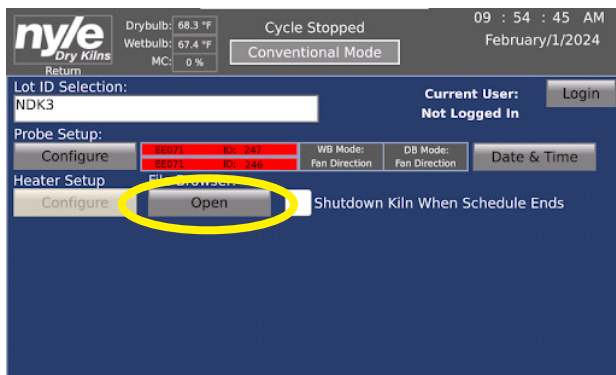
Password: NyleAdmin

Accessing the Data Logs

There are several ways to access data logs from the controller. The easiest way is to remove the micro SD card that can be found on the side of the screen near the ethernet port. This should only be done while the unit is not in cycle to prevent data loss. The log files can be found in the DT folder.

To access log files while the unit is running you can use the built in file browser to copy the logs to an external flash drive.

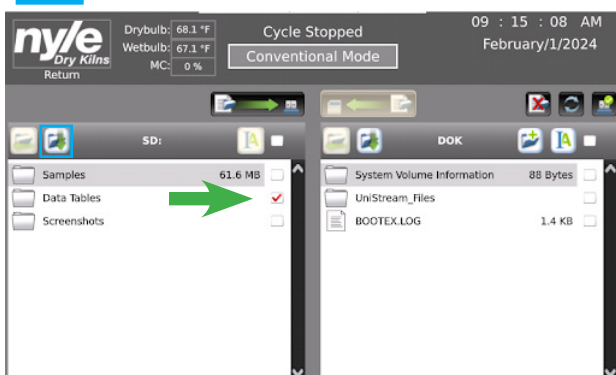
To do this insert a flash drive into the USB port on the side of the screen and follow these steps to navigate to and copy the desired files to the flash drive. Open the file browser on the advanced settings screen.



➡ Select the "Data Tables" folder by checking the box next to it.



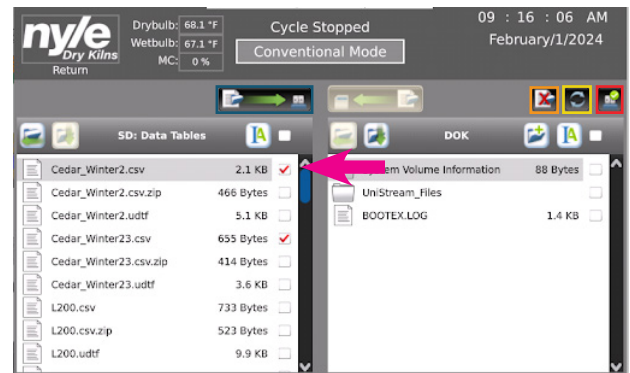
Open this folder.



➡ Select the log files you would like to copy by checking the boxes next to their name.



Once you have selected all the files you would like to transfer press the copy button.



This button deletes all selected files.

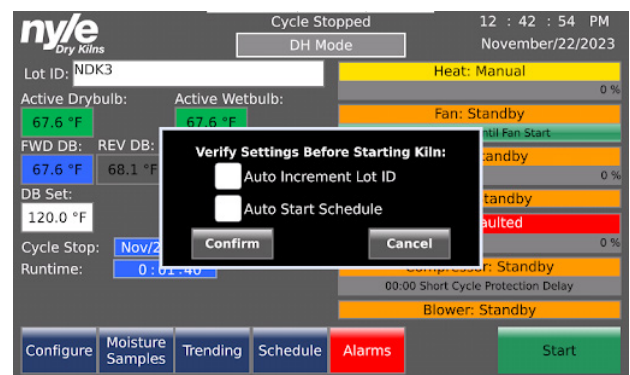


Use this button to refresh any changed files.



This button ejects the flash drive so it can be safely removed.

Starting Your Kiln



To start a kiln with an NDK controller, click the green Start button in the bottom right of the main screen. This will open a pop-up box with two options.

Auto Increment Lot ID: If this box is checked, every time a new kiln charge starts, the Lot ID will be updated with the Year and a number. This number will increase by 1 each time a new cycle starts.

Auto Start Schedule: If this box is checked when the kiln starts, the controller will automatically enable any schedule actively plugged into the schedule screen. If this box is unchecked, the kiln will be running manually, and all set points and functions will need to be inputted and operated manually.

Warranty

LIMITED WARRANTY: The equipment supplied by Nyle Systems is warranted to be free from defects in workmanship and materials for a period of one year from the date of the original installation under normal use and maintenance, or 15 months from the date of delivery, whichever comes first. A new or re-manufactured part will be supplied by Nyle Systems if the defective part is first returned to Nyle Systems for inspection. The replacement part assumes the unused portion of the warranty.

The warranty does not include labor or other costs incurred for diagnosis, repairing or removing, installing or shipping the defective or replacement part(s). Nyle Systems 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 Systems from any claims or demands against Nyle Systems for injuries or damages to the 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 authorized officer of Nyle Systems.

Model _____

Serial Number _____

Date Purchased _____

[illegible]

[illegible]



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