



FDC-2010-K5C

Dry Kiln and Pallet Heat-Treat Configuration Manual

Dry Kiln Main View



Pallet Heat-Treat
Main View



FDC-2010-K5C Configuration Manual

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What is the FDC-2010-K5C?

The FDC-2010-K5C is a Dry Kiln and/or Pallet Heat-Treat controller combined with an operator interface color touch screen. The color touch screen is a 5.7", 28-oz, industrial PC (Windows CE) with embedded Supervisory Control and Data Acquisition (SCADA) software. No external PC software is required for configuration or operation. All Kiln/Pallet Heat Treat data variables are saved to FDC-2010-K5C's internal memory (1GB CF Card).

The base FDC-2010-K5C has 4-temperature inputs (RTD or Type J T/C) with up to 6 additional temperature inputs available (10 temperature inputs total).

The FDC-2010-K5C controls all Dry Kiln and Pallet Heat-Treat functions and can be configured in one of three ways:

- Dry Kiln control: 4 sensor inputs for DB1, DB2, Wet Bulb +1 temperature input for monitor and/or core logic control. Optional hardware allows up to 6 additional temperature sensors for use as monitor only and/or for use in Core logic control to advance a stage within a schedule and whose values can also be data logged.
- Pallet Heat-Treat control: 4 sensor inputs, 1 main chamber and 3 pallet probes. Optional hardware allows up to 6 additional temperature sensors for use as monitor only (the optional monitor only sensors are view only, their values are not data logged).
- Combination Dry Kiln and Pallet Heat-Treat Control: Provides temperature inputs and control functions for traditional Dry Kiln, Pallet Heat-Treat and ability to automatically begin a traditional Dry Kiln Schedule at the end of a Heat-Treat cycle. The combination unit requires optional temperature inputs (quantity four – 2 input modules); during the Heat-Treat cycle the Kiln's Dry Bulb #1 is the Heat-Treat chamber temperature sensor with specific temperature sensors assigned as the Heat-Treat Core sensors. During Dry Kiln the Core sensors used in Heat-Treat may be used as Monitor and/or as components in Core logic control.

The FDC-2010-K5C Configuration: The FDC-2010-K5C is typically configured by the Kiln or Pallet Heat Treat chamber manufacturer specific to their system design & control needs. A separate configuration manual is provided to these manufactures; FDC-2010-K5C_Kiln_Config_Manual_Rev_x.x_m-d-y.pdf (Rev level & date stamp may change).

Operator Interface Screen Views: The FDC-2010-K5C provides a rich set of tools for control interaction and data analysis. Views include Kiln/Pallet Heat-Treat overview, trends, alarms, schedules as well as historical data, alarm history and audit trail views. The menu driven Interface eliminates screen "clutter" by providing an easy to use "Windows" interface for interaction between the operator and FDC-2010-K5C system.

Control Outputs: The FDC-2010-K5C comes equipped with 24 relay outputs for the control of heat, vents, spray and fans as well as alarm and customer programmable relay outputs. Two analog outputs are standard on the device and can be configured by the OEM to control output(s) for Heat, Spray, Vents, Fans or Dry Bulb and Wet Bulb retransmitted temperature or setpoint values when used as kiln or as a combo unit only. When temperature input cards are added, additional OEM configurable analog outputs are included with a maximum of 5 configurable analog outputs.

Digital Inputs: Sixteen 24VDC digital inputs come standard on the FDC-2010-K5C controller. Digital inputs are used for fan "sync" input, schedule hold, schedule end (abort) stage advance/previous and digital input alarm functions. Five of the digital alarm inputs are configurable to defeat a combination of event/control outputs if the alarm input is energized. All digital inputs have programmable time delays before the input is activated at the system level.

Dry Kiln Operation: The FDC-2010-K5C when configured for a kiln can be run in manual or automatic schedule control mode. Schedule entry is made easy by the use of copy, paste and delete menu selections; hundreds of Schedules with up to 99 Stages/Schedule. Schedules can be copied to the external "USB" memory stick and then imported to any FDC-2010-K5C controller eliminating the need to enter duplicate schedules into multiple kiln controllers.

When running in automatic schedule mode, the operator can put the unit into hold and change any control parameters without modifying the saved schedule. This gives the operator maximum flexibility over all kiln control parameters.

Data logging can be enabled manually or automatically during automatic schedule run.

Pallet Heat-Treat Operation: When run as a Pallet heat-treat, the simple start/stop selection by the operator allows for ease of use in running the system. The system allows for inputting a file name, batch and lot number of pallets if needed. Once run is selected the system automatically begins datalogging the heat-treat cycle. If connected to a printer (HP model 6540 or equivalent) the FDC-2010-K5C may be configured at the end of the Heat-Treat cycle to automatically print out the beginning of the cycle and the sterilization temperatures of the cycle in one-minute increments. No additional operator interface is required.

Combination Kiln & Pallet Heat-Treat: When configured as a combination unit, the Kiln & Pallet Heat-Treat functions act as described above but also allows a schedule to be selected and automatically run at the end of the heat-treat cycle to better dry the load if needed; in this case the system is configurable to automatically start a separate historical file specific to the Schedule running.

Data Logging (Historical Files), Alarm and Audit Trail Files

Kiln & Pallet Heat-Treat operations offer the following:

- Historical Data Files (data logging):
 - Kiln: Data logging can be enabled manually or automatically at the start of a Schedule.
 - Data log manually (on-demand): system will name the file based upon time & date the log is started: "mm-dd-yyyy-hr-mn-ss"
 - Data Log on Schedule Start: system allows inputting a batch & lot number with the saved file auto assigned: "ScheduleName_LotDate_date-time.csv"
 - Pallet Heat-Treat: Once run is selected the system automatically begins datalogging the heat-treat cycle. The system allows for inputting a file name, batch and lot number of pallets if needed and appends the file with a time date stamp as part of the file name.
- Alarm Files: The System creates an alarm file every day that an alarm occurs. The file name is the date of the first alarm and is saved in a .csv format.
- Audit Trail Files: If Security is enabled the system will create an audit trail file of every operator action every day there is an operator action. The file name is the date the file is created.

Historical Data Files & Analysis Tools:

The FDC-2010-K5C can store multiple years of data on its 1GB internal compact flash card. Data backup is provided with the 1GB USB memory card for "plug and play" transfer of files to any PC running Microsoft Windows XP® or by utilizing the embedded FTP Client historical files may be transferred automatically or on-demand to an FTP Server.

Data Analysis (auto-trend) makes looking at historical data a simple task. Any control variable saved to the FDC-2010-K5C flash card can be plotted on the embedded historical data trend, for any time frame within the data files' total time range. Full "USB" print capabilities from the FDC-2010-K5C interface to a standard HP Model 6540 inkjet printer eliminates the need for a PC, strip or circular chart-recording device. Graphics trends, historical and report print functions are standard. The historical data, whether printed locally or not, is saved to the 1GB CF Card.

Local Area Network (LAN) Features:

The LAN features described utilize an Ethernet connection to the color touch screen from a network router.

The features described can be made available on a LAN (intranet) and if so configured (network & router) access via the Internet.

- Web Page Server: An embedded "Web Server" provides access to all Kiln/Pallet Heat-Treat data (view only) using Microsoft's Internet Explorer or equivalent from a PC, PDA, etc.
- Email / SMS: Email and/or SMS configuration to allow automatic notification of alarm conditions to up to 30 email addresses. Historical Data, Alarm & Audit Trail files may be emailed on-demand.
- Remote Access: An embedded Remote Access Server is included allowing full access to the color touch screen as though standing in front of it from a remote PC or PDA utilizing VNC View software.
- File Transfer Protocol (FTP): Embedded FTP Client software is included allowing automatic or on-demand transfer of Historical Data files to an FTP Server PC. This feature allows an easy manner to view, archive, etc. historical data files from a remote location without the need to physically copy the files via USB flash drive and move to a remote PC.

The FDC-2010-K5C control system includes the following interface features:

- Overview screen; displays all kiln/pallet "runtime" information.
- Schedule run and schedule monitor views.
- Pallet View screen
- Current alarm view and alarm history view (alarm history for multiple years).
- Real time trends (with adjustable X & Y limits) for all inputs.
- Monitor probes view for additional (optional) temperature sensors connected to system.
- Schedule entry, open, save and download interface screens.
- System setup that includes kiln setup (fans direction/timing, control tuning etc.)
- Data logging interface screens to include log point's selection and historical viewing.
- "Plug and Play" memory stick functionality for data transfer/backup.
- Full USB print capabilities and on-line help screens
- Web server for intranet/internet access (view only)
- E-mail settings for e-mail on alarm or text message on alarms
- FTP/WAN setup screen (FTP embedded Client)
- IP Address/VNC active screen (Web Server and Remote Access)
- Help Text & Audio Views & Audio Files per Screen

FDC-2010-K5C Configuration Overview:

The FDC-2010-K5C Configuration is an embedded program that allows the OEM or user to setup all options for the FDC-2010-K5C controller runtime software. The Configuration program will not run at the same time as the main runtime software, therefore, no Kiln/Pallet Heat-Treat control functions are active while the OEM or operator is running or editing the Configuration program.

The Configuration program is a powerful tool that allows full customization of the FDC-2010-K5C controller. Text editing for all inputs, outputs and event names can be customized via the Configuration program. The FDC-2010-K5C control functionality may also be edited via the Configuration program.

The Configuration program will run the first time power is applied to the FDC-2010-K5C controller. The Configuration program can also be run when the runtime software is exited and the "Run Configuration On Next Power Up" option is selected; the next time the unit is re-powered the Configuration will run.

As the Configuration program effects the controls' functions we strongly recommend a detailed review of the system security and at minimum enable security and assign a password to minimize unauthorized access to the Configuration program.

The FDC-2010-K5C Configuration provides the following functionality:

1. Configuration of kiln, pallet heat-treat or combination system
2. Selection of inputs RTD or Type J t/c (Global setting) F or C
3. Text editing for all input, output and event names
4. Probes enables for core and additional sensors
5. Scaling for all retransmitted analog outputs
6. Programmable output types for dynamic runtime viewing.
7. Programmable delays for all alarm inputs
8. Program output disable during digital input alarms
9. Enable/disable options for runtime view.
10. "Splash Screen" name editing for custom OEM or user requirements.
11. Stage Advance delay when input from Core Temperature event
12. Configurable 4-20mA output(s) for control of Heat, Spray, Vent, Fan or retransmission of dry and/or wet bulb temperature or setpoint values.
13. Stage burner setup
14. EMC operation for EMC logic control

KilnView PC based supervisory software

What is KilnView?

KilnView is a SCADA and configuration package for FDC 300 series digital backup controllers and up to a quantity of 16 FDC-2010-K5C Kiln control systems

(Note: KilnView v1.1 is only compatible with FDC-2010-K5C when configured as a Kiln only control system with the limitations shown at bottom of this page.)

KilnView v1.1 is not compatible with the FDC-2010-K5C v2.x when configured as a Pallet Heat-Treat or Combination Kiln Pallet Heat-Treat control system.)

Data from each device (FDC 300 Series digital backup controls and/or FDC-2010-K5C Kiln control) can be viewed and changed from the Windows® base KilnView package. Connection to controllers is accomplished via an RS485 (one to many) connection.

KilnView provides a rich set of tools for control interaction and data analysis. View Control data in Kiln Faceplate, digital, trend or bargraph format. Change setpoint, tuning parameters, alarm setpoints or units for any controller on the link.

The KilnView software can monitor up to 64 devices [maximum of 16 FDC-2010-K5C Kiln Controls]. Any of these 64 devices can have their data saved to the hard disk at user-defined rates. Data file analysis tools (digital and auto-trend) make looking at schedule run data a simple task.

The project based approach to the software make setup for different product runs a “snap” and easy for operators to work with.

What does KilnView have to do with Configuring FDC-2010-K5C?

The FDC-2010-K5C allows configuration flexibility for outputs, inputs, control logic as well as custom naming alarms, outputs and additional (optional) temperature inputs.

If KilnView will be used with one or more of the FDC-2010-K5C Kiln Controls you are about to configure, document the following parameters for use to configure KilnView.

1. Alarm Names [1-11 alarm names]
2. Option; Names and Enable/Disable [1-26 options]
3. Relay/Analog Output Setup for Vent, Fans, Heat and Spray
4. Output/Event Names [1-22 output names]
5. Probes enables for additional (optional) temperature sensors.

For further information review ***KilnView Configuration Manual*** available on our site or through your supplier.

Important:

KilnView Limitations when used with FDC-2010-K5C version 2.x or greater

KilnView version v1.1 is current as of April 2008.

The FDC-2010-K5C v2.x was released April 2008 that includes features that are not compatible with KilnView v1.1

KilnView and FDC-2010-K5C configured in Pallet Heat-Treat Mode

KilnView v1.1 should NOT be used in applications where the FDC-2010-K5C is configured as a Pallet Heat-Treat only or as a Combination Kiln and Pallet Heat-Treat control system.

KilnView v1.1 will NOT accurately communicate with the FDC-2010-K5C v2.x while running in the Pallet Heat-Treat Mode. KilnView will NOT generate communication error logs AND the operator may not be aware that the temperature values shown on KilnView's display DO NOT reflect the Kiln's temperature values & control action depicted while the FDC-2010-K5C is running in the Pallet Heat-Treat mode.

KilnView and FDC-2010-K5C configured in Dry Kiln Mode

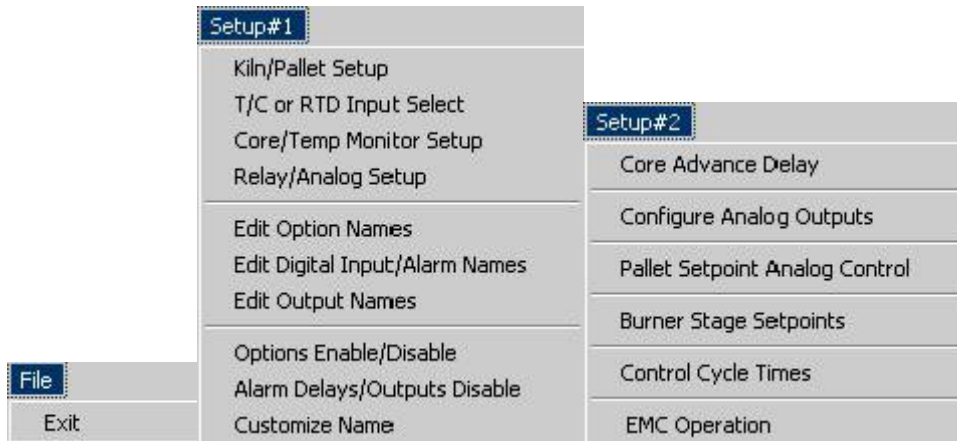
KilnView v1.1 will communicate with the FDC-2010-K5C v2.x while in the Kiln Mode.

KilnView may only be used with the FDC-2010-K5C v2.x when configured in the Kiln only mode with end user understanding the limitations below.

KilnView Limitations when communicating with FDC-2010-K5C v2.x:

- KilnView must not have optional temperature inputs configured as MC sensors – all optional sensors must be configured within KilnView to be temperature.
- EMC: KilnView does not display nor can it configure Schedules logic based on EMC value shown on the FDC-2010-K5C color touch screen display.

Configuration Menus:



The FDC-2010-K5C controller Configuration menu system provides a familiar, easy to use interface while reducing screen “clutter” by eliminating extra buttons required for navigation. Each series of interface screens will have their own series of menus specifically focused on the tasks for the specific screen.

File Menu:

The “File” menu provides the exit function for the Configuration. After selecting this menu item, the system will advise the operator to re-power the unit so all new setting will take affect.

Setup#1 menu:

The Setup#1 menu provides the main group of setup items for the kiln/pallet controller.

Setup#2 Menu:

The Setup#2 menu provides the delay time setting for Core advance, configure 4-20mA analog outputs, pallet setpoint option, stage burner setpoints, control cycle time and EMC functions.

Configuration Views: SETUP #1

Kiln / Pallet Setup:

The Kiln / Pallet Sensor Setup screen allows for the setup of the system as either a Kiln only, Pallet Heat-Treat only, Kiln / Pallet Heat-Treat combination or "Pallet Control Off Lowest Probe"; the latter being a derivative of the Pallet Heat-Treat only configuration.

The standard FDC-2010-K5C system consists of 4 discreet inputs, 24 outputs and 16 digital inputs. Additional monitor/"core" probe inputs are allowed if optional input cards are ordered. Additional inputs can perform as monitor only for use with kiln, pallet or combination. These inputs can also be used as additional "core" probes when system used in kiln mode.

Initial Configuration: When the Configuration program is run for the first time the screen provides four system operation selection buttons: "Kiln Control", "Pallet Control", "Kiln and Pallet Control" and "Pallet Control Off Lowest Probe". Initially all the buttons are gray in color indicating none have been selected. Once a selection has been made the button background turns green indicating the selection is active. The "Pallet Control Off Lowest Probe" selection button is removed if either "Kiln Control" or "Kiln and Pallet Control" option is selected. "Pallet Control Off Lowest Probe" is ONLY available when system is to be used as a Pallet Heat-Treat control system (see description below).

Kiln Control: When the "Kiln Control" button is selected, the system will perform as a kiln only. The standard kiln operation consists of 4 temperature probe inputs; Dry bulb 1, dry bulb 2, wet bulb and an optional 4th temperature input that can be selected or deselected (not functional) for use as an extra monitor probe or as "core" probe. The system will internally switch dry bulb control between dry bulb 1 and dry bulb 2 based on fan direction as programmed. When the 4th temperature probe is used as a "core" - when selecting kiln options the operator can input a core value that will allow for a stage advance based on the selected "core(s)" going above or below (cool down) set value.

The main Kiln screen and associated screens will change dynamically to properly display associated programming associated with kiln only operation.

Pallet Heat-Treat Control: When the "Pallet Control" button is selected the system will perform as a Pallet Heat-Treat control. The standard Pallet Heat-Treat operation consists of 4-temperature probe inputs; a main chamber probe and 3 pallet probes. The heat is controlled with reference to the Chamber temperature sensor and setpoint. The main screen dynamically changes to properly display on pallet only operation screens.

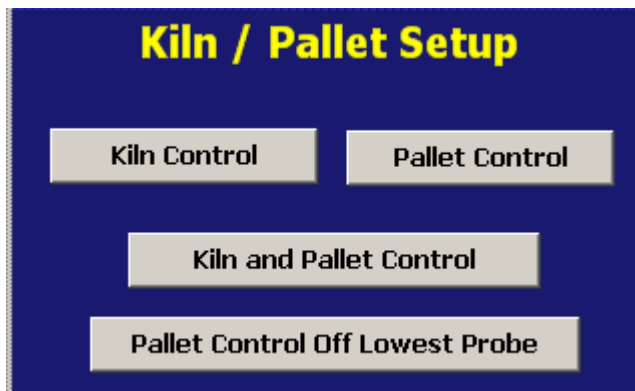
The "Pallet Control Off Lowest Probe" control logic requires the selection of both the "Pallet Control" and "Pallet Control Off Lowest Probe" with both buttons selected and backgrounds must be green. "Pallet Control Off Lowest Probe" cannot be selected individually or in combination with "Kiln and Pallet Control" configuration. The resultant control logic compares the Chamber Setpoint to the lowest of all active sensor inputs (Chamber & Pallet sensors 1-3; optional monitor sensors are not considered "active sensor inputs"). The temperature input currently used for the control logic has a small arrow pointing to its' value.

Combination Kiln and Pallet Heat-Treat: When the "Kiln and Pallet Control" button is selected the system will allow the FDC-2010-K5C to operate as a Kiln OR Pallet Heat-Treat control depending on the selection from the main runtime screen. The combination system consists of 8 temperature inputs, these are:

- | | | | |
|---------------------------|--|--------------------|--------------------|
| 1) Dry bulb 1 | 3) Wet bulb (Kiln only) | 5) Pallet Probe #1 | 7) Pallet Probe #3 |
| 2) Dry bulb 2 (Kiln only) | 4) 4 th probe input (Kiln only) | 6) Pallet Probe #2 | 8) Monitor Probe |

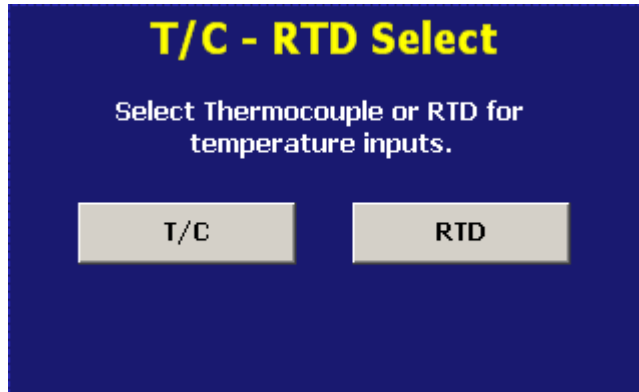
Input #1: Dry Bulb #1 is also used as the Chamber sensor when system is operating in the Pallet Heat-Treat mode.

Inputs #5 - 7: When operating as in the Kiln mode Pallet Probes 1-3 can be monitor points and/or Core with control logic.



TC – RTD Selection:

This screen allows selection of type of probes/sensors wired to the analog input cards. This is a GLOBAL setting. All probes wired to inputs, must be of the same selected type for use as kiln, pallet heat-treat or combination system. The button appearing with GREEN background is the active global probe selection.



Core/Temp Monitor Setup:

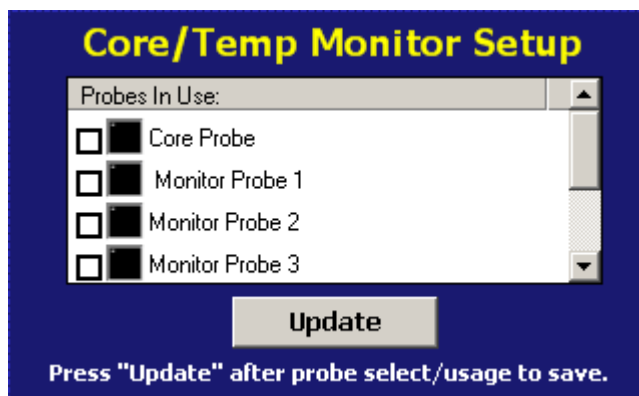
The probe names will dynamically change depending on type of Kiln/Pallet Heat Treat operation selected.

If system is selected to be Kiln only, selections seen will be Core and Monitor 1-6. When configuration will not use Core or additional Monitor probes leave boxes "unchecked". If core and/or additional monitor probes are to be used "check" the appropriate box to activate.

When using as a Pallet Heat-Treat only you MUST "check" Pallet Probe 3 to activate the 3rd pallet probe.

After checking appropriate box you MUST press Update to activate selected probes. Active probes will then indicate a green light in the box to the left of probe selection.

(Note: When configured as Pallet Heat-Treat ONLY any optional Monitor Probes (Probes 4-6) will not be data logged; their values may be viewed only.



Relay/Analog Setup:

The Relay/Analog Setup screen applies to Kiln control functions; it does NOT apply to Pallet Heat-Treat configuration. If configuring a Pallet Heat-Treat only control no changes are required or suggested to this section.

The Relay/Analog Setup allows the user to set the type of Kiln control output for fans, vents, heat and spray outputs; configurable for either relay or analog with all analog outputs 4-20mA. These settings dynamically affect specific display views/screens and options applicable to specific outputs.

If configuring for Analog output, confirm sufficient analog outputs are included in the specific model. The FDC-2010-K5C control as standard offers two analog outputs configurable for Heat, Vent, Spray, Fan, or Retransmission of Dry Bulb and/or Wet Bulb Temperature or Setpoints; one additional analog output is provided with each dual channel analog input module with a maximum of 5 analog outputs.

Note: Even when a control output is configured for Analog output there are permanently assigned relay outputs that will activate in conjunction with the analog outputs.

Analog Output Setup and Configurations

Analog output function selections apply ONLY if the system has been configured for Kiln only or the Combination Kiln/Pallet Heat-Treat operation.

The Pallet Heat-Treat only control system: regardless of the number of Analog input cards, the system only recognizes Analog output #1 as Heat control; any selection made for Fan, Vent, Spray have no effect but recommend selection of the Relay output box.

The “Configure Analog Outputs” menu selection is described in Setup #2 on page 16; this is where the actual analog output hardware is assigned a specific output. When a system is configured as Pallet Heat-Treat only, this Configure Analog Outputs menu is grayed out.

Vent Output

When configured as a Kiln only the vent output will operate off of the wet bulb only.

When configured as a Pallet Heat-Treat only the vent relay (no analog output regardless if so selected) will operate off of the main chamber setpoint for venting (cooling).

When configured as a Combination Kiln and Pallet Heat-Treat system outputs controlling the vents will automatically switch operation to work off of wet bulb when system is running as a kiln and dry bulb #1 when running as a pallet heat-treat control system.

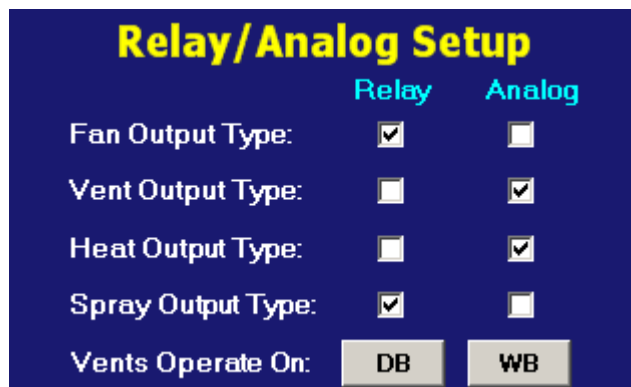
Note specific to Kiln operations:

If the Vent and/or Fans outputs are set for relay operation, the fields in the main runtime will display the vent that is active (up to 3 vent positions dependent upon configuration – refer to page 13 “Options Enable/Disable”) as well as the fan direction (forward or reverse).

If these outputs are set for analog, the vents and fans will show actual output for each within a range of 0 to 100%.

When the system is setup for analog type operation the user can enter actual values for vents and fans within the range of 0 to 100%

Note: When vents are set for “auto” in runtime (Kiln system active) user cannot enter a % output value since the vents will operate off of the wet bulb or dry bulb setpoint.



	Relay	Analog
Fan Output Type:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vent Output Type:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Heat Output Type:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Spray Output Type:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vents Operate On:	DB	WB

Edit Option Names:

The Edit Option Names screen allows the user to edit the names for each of the Kiln options; it does NOT apply to Pallet Heat-Treat configuration. If configuring a Pallet Heat-Treat only control no changes are required or suggested to this section.

Kiln options can be set in manual or automatic mode in the runtime software. Kiln options are settable functions that equate to kiln operations such as heat enable, spray control, vents, etc. Up to 6 custom events correspond to relay outputs (for each event) and can be used for any special operation that requires a relay output in manual operation or during automated schedule operation (different options can be set per stage).

Be careful when renaming events since some of the events correspond to specific kiln functions. Events like Kiln On, Heat Enable, Spray and Vents operate specific kiln functions so renaming these events could be confusing to the end user during kiln operation.

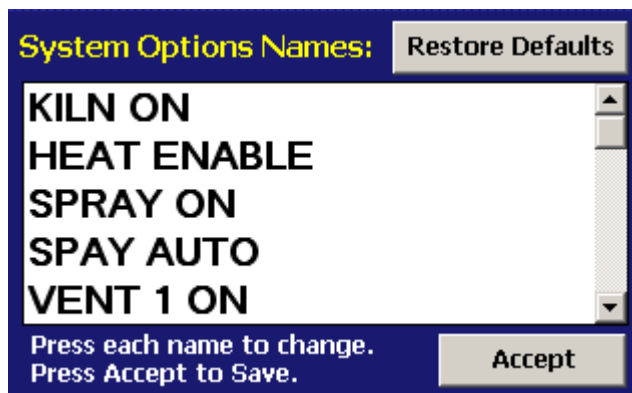
The "Options Enable/Disable" described later in this document allows selection of those Option names that will be accessible to the Operator. Those options "disabled" will be grayed out in the selection screen seen by the Operator.

The "Restore Defaults" button will always reset the name to factory default values if required.

Note: Names are limited to 14 characters with exception of the 6 fields with default descriptions of Mon1 through Mon6, which are limited to 4 characters.

Following is a brief description of each of the kiln events:

Default Name	Description
Kiln On:	Main kiln switch. No kiln operations are active unless this event is turned on.
Heat Enable:	Heat control is enabled when this event is on.
Spray On:	Activates spray output(s) continuously when this event is on
Vent 1 On:	Activates Vent #1 relay output continuously when this event is on
Vent 2 On:	Activates Vent #2 relay output continuously when this event is on
Vent 3 On:	Activates Vent #3 relay output continuously when this event is on
Vent Auto:	Vents operate off of wet bulb when used as kiln, dry bulb when used as pallet heat-treat
Fans Fwd:	Activates fan forward relay output.
Fans Rev:	Activates fan reverse relay output.
Fans Auto:	Fans operate (fwd, rev) based on timing settings in runtime setup mode.
Mon1:	Monitor probe when used as pallet, monitor/core probe when used as kiln
Mon2:	Monitor probe when used as pallet, monitor/core probe when used as kiln
Mon3:	Monitor probe when used as pallet, monitor/core probe when used as kiln
Mon4:	Monitor probe when used as pallet, monitor/core probe when used as kiln
Mon5:	Monitor probe when used as pallet, monitor/core probe when used as kiln
Mon6:	Monitor probe when used as pallet, monitor/core probe when used as kiln
EMC Active:	Indicates when EMC is active in a running kiln schedule during runtime
Stage Alarm:	Activates stage alarm relay output. Used to alert operator to check load during stage.
Cool Down:	Activated during stage when "cool down" event is selected in runtime as a kiln system
Cust Event 1:	Activates customer 1 relay output. Can be used for any relay output requirement
Cust Event 2:	Activates customer 2 relay output. Can be used for any relay output requirement
Cust Event 3:	Activates customer 3 relay output. Can be used for any relay output requirement
Cust Event 4:	Activates customer 4 relay output. Can be used for any relay output requirement
Cust Event 5:	Activates customer 5 relay output. Can be used for any relay output requirement
Cust Event 6:	Activates customer 6 relay output. Can be used for any relay output requirement

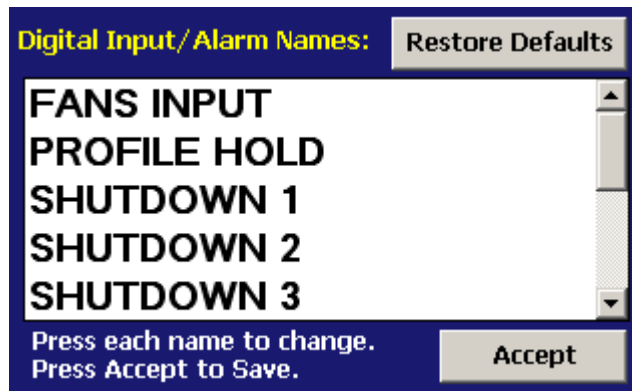


Edit Digital Inputs/Alarm Names:

The FDC-2010-K5C control provides up to 15 digital inputs mapped to specific Kiln and/or Pallet Heat-Treat functions and programmable alarms. The first two digital inputs are used for the synchronization of fans for heat/spray operation (I0) and remote profile hold (I1). Digital inputs 2 to 7, found on the Main PLC can be used for indication alarms in addition digital inputs 2 to 6 are able to shut down specific kiln operations while the alarm is active. Digital inputs 0 to 2, found on the Digital Input card are indication alarms only with no “disable” functionality. The main FDC-2010-K5C alarm output, Q2, will be energized during any digital alarm condition.

The below screen allows the user to edit the names for all alarm inputs as well as restore the names to factory defaults if required. Press the desired text name to edit the text. Press the “Accept” key when all names have been edited.

Note: The “Fans Input” and “Profile Hold” names cannot be changed. All other inputs/alarms may have names up to 22 characters. Digital inputs for remote profile run, stop, advance next/previous stage cannot be edited and are not displayed here.

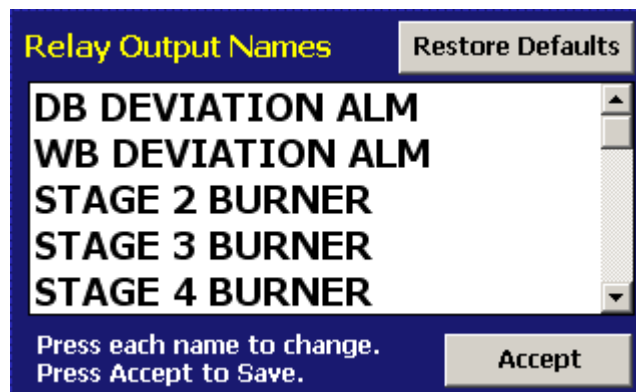


Edit Digital Output Names:

The relay output screen allows the user to rename the system outputs to meet specific Kiln and/or Pallet Heat-Treat requirements. The “Restore Defaults” button will restore all names to factory defaults if required. Press the desired text name to edit the text. Press the “Accept” key when all names have been edited.

Be careful when renaming Digital Outputs since some of the Digital Outputs correspond to specific Kiln and/or Pallet Heat-Treat functions. Digital Outputs like Stage 2-3 burner, Heat Output, Spray, Fans, Vents, etc. operate specific control functions; so renaming these events could be confusing to the end user during system operation. Reference to the preceding section “Edit Option Names” on page xx to match option & digital output names is appropriate along with other detailed review of editing/assigning Digital Output Names.

Note: Output names may have up to 25 characters.

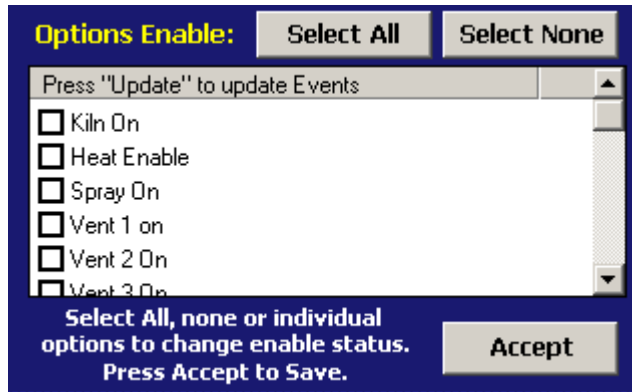


Options Enable/Disable:

The Options Enable/Disable screen is applicable to Kiln functions only; it does NOT apply to Pallet Heat-Treat ONLY configuration. If configuring a Pallet Heat-Treat only control no changes are required or suggested to this section.

The Options Enable/Disable screen allows the user to enable or disable any kiln event in the runtime software. This is used to customize the system to meet specific kiln requirements. If a specific event function is not required for the kiln, it can be disabled from this screen. When kiln events are disabled at the Configuration level, the event will be disabled in the runtime software so the operator cannot select the event in the manual or automated schedule mode. Clicking the checkbox inserting a "check" in the box will enable the event while clicking the checkbox removing the "check" will disable the event.

When used as a Pallet Heat-treat only leave all selections unchecked.



Alarm Delays/Outputs Disable:

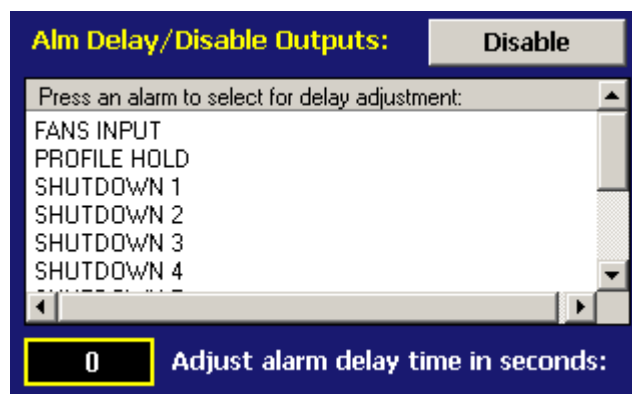
The FDC-2010-K5C control provides up to 15 digital inputs mapped to specific Kiln and Pallet Heat-Treat functions and programmable alarms.

The first two digital inputs located on the Main PLC are used for the syncing of fans for heat/spray operation (I0) and specific to Kiln operations remote profile hold (I1).

Digital inputs 2 to 7, found on the Main PLC, can be used for indication alarms; in addition digital inputs 2 to 6 are able to shut down specific kiln operations while the alarm is active (refer to next page for details "If shutdown 1 - 5 is selected").

Digital inputs 0 to 2, found on the Digital Input card, are indication alarms only with no "disable" functionality. The main FDC-2010-K5C alarm output (Q2) will be energized during any digital alarm condition.

By clicking the text for each alarm type, the user can enter a delay [0 to 9,999 seconds (166.6hours)] for the input before the alarm will be activated (delay starts after the input is energized). This gives the user/OEM the ability to customize the system to specific kiln needs. Digital inputs for remote profile run, stop and advance to next or previous stage do not have alarm delays associated and are not displayed here.



If **shutdown 1 to 5** is selected, pressing the “Disable” button will display following screen. This screen allows the user to select which events are disabled during the selected alarm input condition. A check next to the event will disable the function when the digital input is energized. The event will be enabled after the digital input is de-energized.

<input type="checkbox"/> Kiln On	<input type="checkbox"/> Vents Auto	
<input type="checkbox"/> Heat On	<input type="checkbox"/> Fans fwd	
<input type="checkbox"/> Spray On	<input type="checkbox"/> Fans Rev	
<input type="checkbox"/> Spray Auto	<input type="checkbox"/> Fans Auto	
<input type="checkbox"/> Vent 1 On	<input type="checkbox"/> Temp Probe 1	
<input type="checkbox"/> Vent 2 On	<input type="checkbox"/> Temp Probe 2	
<input type="checkbox"/> Vent 3 On	<input type="checkbox"/> Temp Probe 3	
More Options	Done	Cancel

Customize Name:

The Customize Name screen allows the user to customize the main splash screen when the FDC-2010-K5C runtime starts. This is used so the OEM name and contact information is shown each time the FDC-2010-K5C controller is powered up. Press the desired field to enter text with a maximum of 20 characters per field.

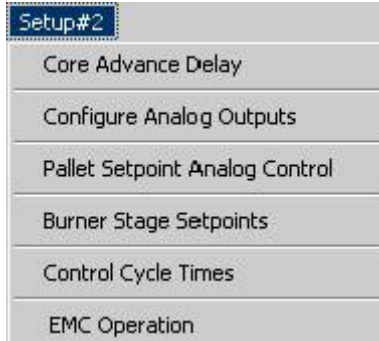
Enter Company Name, City, State, zip and phone number to customize Orion to your company. The Orion splash screen will show your company information each time the system is started.

Company:	Future Design Controls
Address:	BridgeView, IL, 60455
Phone:	888-751-5444

Configuration Views: SETUP #2

Setup # 2 allows for setting additional features as described below.

Configure Analog Outputs is NOT allowed (grayed out) when system has been selected to operate as a Pallet Heat-treat only.

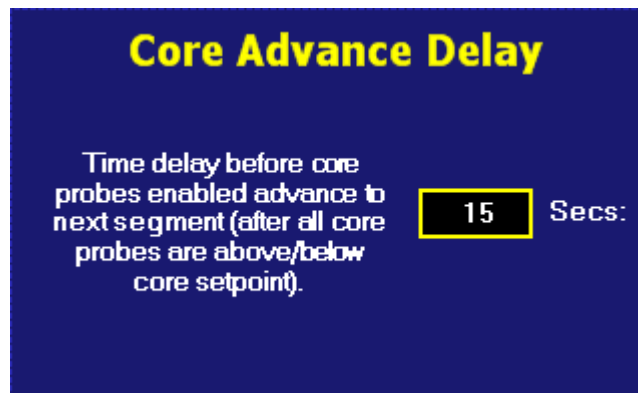


Core Advance Delay:

The Core Advance Delay is applicable to Kiln functions only; it does NOT apply to Pallet Heat-Treat configuration. If configuring a Pallet Heat-Treat only control no changes are required or suggested to this section.

The Core advance delay screen allows the user to enter a time delay before the system indicates a "core temp met" condition during automated schedule operations. This core setting ONLY effects system operation when using as a kiln and the core feature is active. This delay is used eliminate "false" conditions due to noise or probes that "bounce" during system operation. Press the number field to enter a value.

Delay may be set between 0 and 999 seconds.



Configure Analog Outputs

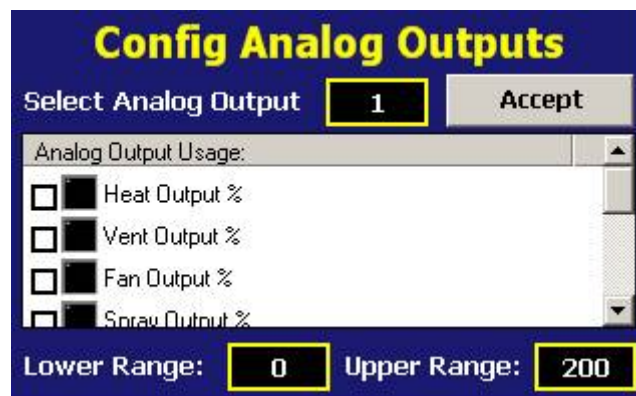
This screen is active only when system is configured as a Kiln or Combination Kiln Pallet Heat-Treat system; when configured as a Pallet Heat-Treat only system this screen is “grayed” out. Note: when configured as a Pallet Heat-Treat ONLY, Analog output card #1 defaults to Heat output with no remaining analog outputs active.

When configured as a Kiln or Combination Kiln Pallet Heat-Treat system the analog outputs are configurable as shown below:

The Configure Analog Outputs screen allows configuration of the two standard and up to three optional 4-20mA outputs as control outputs for Heat, Spray, Vent, Fan and Retransmission of Dry and Wet Bulb temperatures or setpoints. The 8 Analog Output configurations (five maximum analog outputs) are listed as:

Heat Output %: PID Control Output for Heat
Vent Output %: PID Control Output for Vent
Fan Output %: Operator Set Output for Fan
Spray Output%: PID Control Output for Spray
DB PV Retransmission: Dry Bulb Process Variable [temperature] Retransmission
DB SP Retransmission: Dry Bulb Setpoint Value Retransmission
WB PV Retransmission: Wet Bulb Process Variable [temperature] Retransmission
WB SP Retransmission: Wet Bulb Setpoint Value Retransmission

The “Select Analog Output” field is used to select the appropriate hardware analog output to be configured. Refer to the FDC-2010-K5C Operational Manual, Wiring section to identify the appropriate input card number to be configured.



The Configure Analog Outputs screen displays 4 of the 8 Analog Output types at one time. The scroll bar on the right allows viewing of the remaining 4 output selections [DB/WB PV/SP Retransmission].

To configure an output type select the appropriate check box to the left of the output description, depress the Accept button and confirm “Yes” that the output will be configured. The Black box shown to the left of the selected output description will turn Green to indicate the configured output type; after configuration the check in the box will no longer be displayed.

Whenever one of the four Retransmission outputs is selected the Lower & Upper Range fields will appear as shown in the above graphic. If one of the control outputs, Heat, Vent, Fan or Spray is selected, the Lower & Upper Range fields will not be visible.

When configuring an Analog output for Retransmission, Dry or Wet bulb temperature or setpoint retransmission, the Lower & Upper Range points may be configured to a different range than the factory default setting of 0 to 100F. The range displayed is the span over which the 4-20mA will be transmitted.

The above graphic shows the Upper & Lower Range fields meaning one of the four Retransmission options has been selected but is not visible as the scroll bar position is at the top of the output option list showing the first four Analog Output Options. The first four Analog Output Options are the Control Outputs; the four Retransmission Outputs are shown below the Control Output Options.

Retransmission Lower & Upper Range may be set between –148.0 to 932.0 degrees F or C.

Factory default values are 0 to 100 degrees F or if unit is configured for Celsius –17.8 to 37.8 C.

Note: The factory default configuration is degrees Fahrenheit.

Refer to the FDC-2010-K5C manual [Setup/Offline] to change from Fahrenheit to Celsius.

Once an output has been configured for Retransmission changing from C/F or F/C the system automatically converts temperature values to the appropriate F/C

Analog Control Type:

The Analog Control Type screen is only applicable to Pallet Heat-Treat configuration. For Kiln only and Combination Kiln Pallet Heat-Treat configurations this selection does NOT affect Kiln control functions.

Stop Analog Control button will force the proportional heat analog output (4-20mA) output to 0% (4ma) once all 3 pallet probes reach sterilization setpoint. This feature is advantageous systems where large burners are used which require no control after the sterilizer setpoint is reached.

Continue Analog Control button selection will allow the proportional heat analog output to continue controlling the burner to maintain the chamber setpoint, regardless if sterilization setpoint is reached.



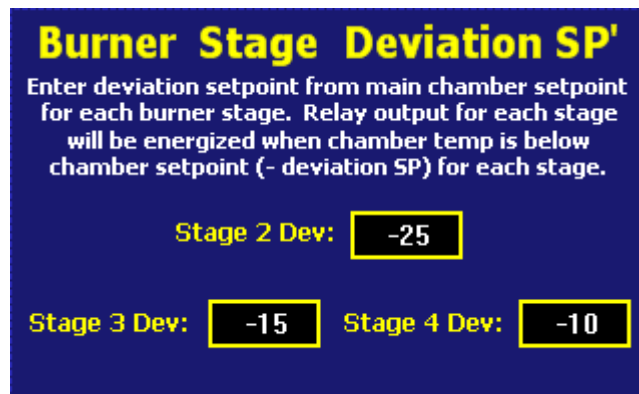
Burner Stage Setpoints:

The Burner Stage Setpoint screen is only applicable to Pallet Heat-Treat configuration. For Kiln only and Combination Kiln Pallet Heat-Treat configurations this selection does NOT affect Kiln control functions.

Stage burner outputs are active for Pallet Heat-Treat only and Combination Kiln Pallet Heat-Treat configurations, and only apply to Pallet Heat-Treat operations;

Burner outputs are located on the main PLC at outputs Q2, Q3 and Q4. These outputs are configurable as deviation settings that are active BELOW the deviation from main chamber setpoint. Press on number field and enter in deviation value from setpoint output is to energize/de-energize the output.

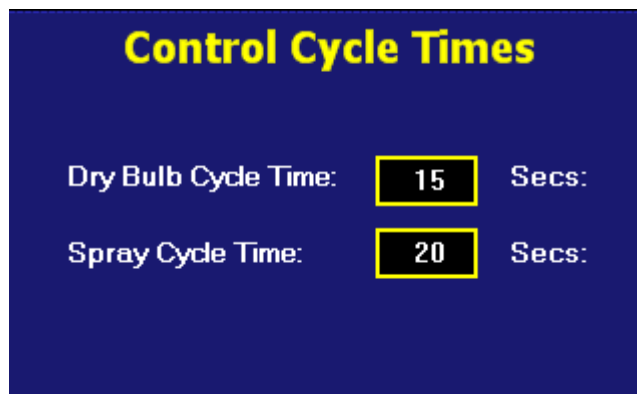
Deviation values range is: -100 to +100.



Control Cycle Times:

Control cycle times are used when heat (Kiln and/or Pallet Heat-Treat) and spray (Kiln only) proportional relay outputs are required for system operation. The FDC-2010-K5C controller supports on/off, on/off time proportioning and analog output control (4-20mA) for heat and spray control. If time proportioning outputs are required (relay cycles on and off based on proportional band settings), enter the desired cycle times for both control outputs. Relay and analog output work concurrently so if "PID" analog outputs are used, enter a cycle time of at least 20 seconds for both heat and spray cycle times.

Cycle times may be set between 0 and 300 seconds.



Control Cycle Times

Dry Bulb Cycle Time: **15** Secs:

Spray Cycle Time: **20** Secs:

EMC Equilibrium Moisture Content (EMC) Operation:

The EMC Operations screen is applicable to Kiln functions only; it does NOT apply to Pallet Heat-Treat configuration. If configuring a Pallet Heat-Treat only control no changes are required or suggested to this section.

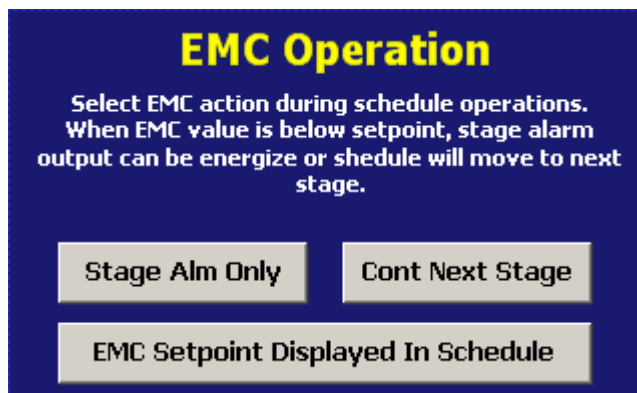
A green button background indicates feature selected.

"EMC Setpoint Displayed in Schedule" dynamically shows or removes the EMC setpoint selection box from the schedule option screen. If not using EMC function it is best to leave as "not selected"; a green button background indicates the feature is selected and will be dynamically shown in the option screen.

The following two selections are mutually exclusive.

"Stage Alm Only" will allow the stage alarm output to energize when the EMC value for a stage goes below the EMC value set in a running schedule.

"Cont Next Stage" will cause a stage advance when the set EMC value in a stage goes below the EMC value set in a running schedule.



EMC Operation

Select EMC action during schedule operations.
When EMC value is below setpoint, stage alarm
output can be energize or shedule will move to next
stage.

Stage Alm Only Cont Next Stage

EMC Setpoint Displayed In Schedule

FDC-2010-K5C Order Matrix (page 1 of 2)

FDC - 2010- K5C - □

1

1 Optional Analog Input and Output

0: None

- 1: One Analog Input module with 2 analog inputs and one configurable linear 4-20mA output.
- 2: Two Analog input modules: each have 2 analog inputs and one linear 4/20ma output
- 3: Three Analog input modules: each have 2 analog inputs and one linear 4/20ma output

Part Number and Price Examples below- see p.2 for notes

Kiln Only Systems: FDC-2010-K5C-0
4 temperature inputs: 1 wet bulb, 2 dry bulbs and 1 core temperature sensor.

Sterilizer Only System: FDC-2010-K5C-0
4 temperature inputs: 1 main chamber and 3 pallet probes

Note: Kiln & Sterilizer only control systems (additional sensors)
Three additional temperature input modules (6 inputs) may be specified: Kiln-only configurable as core sensors: Sterilizer only as "monitor only". Part number with 2 additional modules (4 additional inputs: FDC-2010-K5C-2

Combination Kiln-Sterilizer FDC-2010-K5C-2
Contains a total of 8 temperature inputs: (5 are monitor/core sensors.)

- Kiln Function: 1 wet bulb, 2 dry bulbs and 5 core/monitor probes for use when running as kiln.
 - Kiln action may use Core sensors (5 total) as monitor and/or with Core control logic during kiln drying schedules.
- Sterilize Function: 3-Pallet sensors for Sterilizer logic control and 1 of the 2 remaining core sensors may be used as monitor only, allowing system a total of 4-core temperature sensors.
 - Sterilize action uses Dry bulb #1 & 2 as chamber temperature sensor based upon fan direction.

System with Maximum of 10 Temperature sensors

The last digit in the matrix can provide 2-additional temperature inputs for a total of 10 temperature sensors.

- Part number with 10 temperature inputs:
 - FDC-2010-K5C-3
- Kiln Only (not configured as a combination unit)
 - Inputs 1, 2 & 3 are DB1, DB2 and Wet bulb respectively.
 - The inputs 4 thru 10 can be used as monitor or core sensors via control logic functions.
- Sterilizer Only (not configured as combination unit)
 - Inputs 1, 2, 3, and 4 are main chamber sensor and pallet 1 –3 input sensors.
 - Inputs 5 thru 10 are monitor only points.
- Combination Kiln-Sterilizer;
 - When selected to run as kiln inputs 4-10 can be used as monitor or core type sensors depending on control logic.
 - When selected to run as sterilizer inputs 5, 6 & 7 are for pallet sensing. Input uses DB1 & DB2 for main chamber control. The remaining inputs are monitor only.

Base System Includes:

FDC-2010 5.7" TFT CE Color Touch Screen with a combined Kiln-Sterilizer (KS-K5C) Application software on a 1 GB CF card and one 1GB I-Stick memory Card

- Power Supply 24VDC 60 watt: [PS5R-SD24 24VDC/60Watt]
 - CPU Control Module with 6 digital outputs, 8 digital inputs and components below.
 - CPU Control Module [FC5A-D16RS1]
 - 8 digital 24VDC Input Module [FC4A-N08B1]
 - RS485 Modbus 2 wire connector [FC4A-HPC3]
 - 64KB Memory Cartridge [FC4A-PM64]
 - Real Time Clock Module [FC4A-PT1]
 - Time Delay Relay & Socket [GE1A-C10MA110 / SR2P-06]
 - Connecting Cable - Display to CPU Control Module 8-foot length [CA-2011-8]
 - Low Frequency Ferrite Beads for each Analog Input: [LFBead-240-2282-ND]
 - Base System Temperature Inputs: [FC4A-L03AP1]
Two input modules each with 2 RTD or J t/c inputs and one OEM configurable linear 4-20mA output (total 4 –inputs & 2 – outputs). The input type is a global setting for RTD or Type J thermocouple. (F or C)
 - Base System Analog Outputs: Two analog [4-20mA] outputs OEM configurable for Heat, Spray, Vent PID control, Fan control and/or retransmission of Dry & Wet bulb setpoints or temperature values.
 - One linear analog output with each analog RTD input card [2 RTD inputs]. [FC4A-L03AP1]
 - Relay Outputs: Control, Alarm & Event Relays total 22 relays. Refer to Manual for control outputs, alarms, etc.
 - 6 Relays on CPU Control Module
 - 16 Relays on Relay Module [FC4A-R161]
 - When linear PID outputs are not used; Heat and Spray control have 1 relay each, Vent has 3 relays for single to three-stage vent control and Fan has two relay outputs [Forward & Reverse].
 - Digital Inputs: Quantity 15 - 24VDC normally open digital inputs. [8 on CPU and 7 on FC4A-N08B1 Digital Input Module.]
 - Digital Inputs can be named and a time delay may be configured before input is recognized as closed.
 - Up to 5 Digital Inputs may be configured to turn on or off any of the up to 25 Events configured for each Stage or in the manual Control Mode.
 - An Alarm is logged and Relay Q10 is energized anytime a configured digital alarm input is closed or temperature sensor failure occurs.
- Optional Temperature Inputs/Analog Outputs (FC4A-LO3AP1)
- Total of 6 optional analog inputs maximum [3 modules with two inputs and one output each per module] with 5 analog outputs maximum. (Base system includes 2-modules: allowing 4 inputs and 2 analog outputs as standard.
- OEM Configuration:
- Analog Outputs configurable for PID control or retransmission of Kiln only Dry/Wet bulb setpoint and/or temperature values.

FDC-2010-K5C Order Matrix (page 2 of 2)

Order Matrix Notes

Note – Order Codes 0 through 3:

Configurable Analog Outputs [4-20mA]:

The two analog outputs provided as standard when configured as a Kiln Control or Combination Kiln Pallet Heat-Treat control, and up to three optional analog outputs [5 maximum] are each configurable as one of the following: (note: Pallet Heat-Treat only configuration has no analog outlook configuration – refer to manual)

- PID Control Output for Heat, Spray and/or Vent
- Fan Control output set as a percent output.
- Retransmission of active Kiln Dry Bulb, Wet Bulb or Sterilizer chamber setpoint and/or temperature values. If the control system is a combination Kiln-Sterilizer while in Sterilize function the Sterilizer's Chamber and Kiln Dry Bulb #1 are the same sensor.

Options:

ISTICK-PANEL: USB Panel Mount Adapter for Memory I-Stick or Printer Connection

ISTICK-4X-CVR: Nema 4X USB Panel Mount Adapter

KilnView Software: PC communication to Orion Control System (**CONSULT FACTORY FOR DELIVERY**)

SNA-10A: RS232 to RS485 Converter connects PC RS232 Serial connection to Orion RS485

DB9M-DB9F-6ft: Cable [6 ft] to connect SNA10A to PC serial port

Printer: HP 6540 inkjet printer

Low Frequency Ferrite beads (qty 2): [LFBead-240-2282-ND]

High Frequency Ferrite Beads (qty 2): [HFBead-240-4279-ND]

Low Frequency beads are included for each analog input to provide additional protection for electrical "Noise" typically created by Variable Speed Drives.

High Frequency Ferrite beads are optionally available.

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Future Design Controls, Inc.
P.O. Box 1196 / 7524 West 98th Place
Bridgeview, IL 60455
<http://www.futuredesigncontrols.com>
csr@futuredesigncontrols.com

Office: 888.751.5444
Fax: 888.307.8014
Technical Support: 866.342.5332