Kleen Flo Wash System

Installation, Operation & Maintenance Manual

E-Zee-NuPulse

Kleen Flo Wash System

Installation, Operation & Maintenance Manual

CONTENTS

Introduction

The Kleen Flo Wash Controller is a Master Controller for both the Wash and Milking System. The Controller will clean any size pipeline milking system. Every segment of every cycle of the pipeline washing can be adjusted to the needs of your dairy.

This Controller, with its color touch-screen display, is very easy to operate and is the latest in PLC technology with room for future expansion and operation changes to meet your dairy system cleaning demands.

Kleen Flo Wash Controller Overview

The Kleen Flo Wash Controller is easy to navigate with four general areas that are easy to access.

» *Menu* Screen for general operation settings and quick access to *Function Testing* Screen.

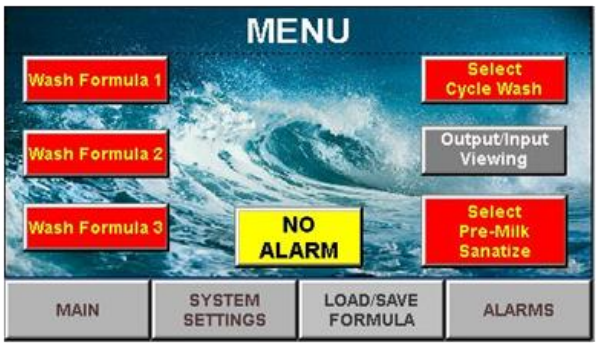
The *Menu* Screen also gives you quick access to the other three:

» *Main System Settings* Screens

» *Wash Formulas* Screens

» *Alarm Info* Screens

Most areas have a **MAIN** button to quickly return you to the *Main Operation Display* Screen. Also, a screen saver will activate in 10 minutes. When screen is touched again, it will revert back to the *Main Operation Display* Screen.



***Menu* Screen**

***Main* Screen**

Kleen Flo Pipeline Wash System Features

The Kleen Flo Wash System will clean any size pipeline milking system. Every segment of every cycle of the Pipeline Washing can be adjusted to the needs of your dairy. The Kleen Flo lowers the cleaning costs of many systems by reducing waste water, eliminating excess vacuum pump run time, consistently dispensing the right amount of chemicals for every wash and catching water heater failures before they create high bacteria counts. You will save on water and you can add an additional Diverter to use the wash water for cleaning the dairy.

3 Formulas - Up to 7 Cycle Wash Programs For Each

1. Pre-Rinse
2. Wash 1
3. Wash 2
4. Rinse 2
5. Acid
6. Rinse 3
7. Sanitize

Easy Programming

The Kleen Flo Wash Controller has an easy-to-navigate layout with touch-screen display and reduces confusion for the operator. The pre-programmed defaults save time and changes are simple to make to effectively and efficiently clean your milking system.

Temperature Controlled Fill, Monitoring Temps for both Milk & Wash

Wash: Actual cycle solution temperatures are displayed on the front of the Kleen Flo Wash Controller. It gives a low temp warning if temperature drops below settable threshold during the fill. It also monitors the temperature during main Wash circulation and will sound alarm and divert to the drain when temperature drops below your selected temperature range.

Milk: System monitors the milk temperature on plate cooler during milking to show proper cooling is taking place using a selectable Alarm Temp Setting for milk that is too warm.

Alarm Feature: Up to 12 different Alarm Codes are displayed and recorded to Alarm History with up to 100 stored in history with time and date stamped. Also, system can trip an external alarm to be seen or heard near the operator.

Add more Water Feature: Ability to add extra water after start of circulation on all cycles. This accommodates systems with small wash vats that need extra water.

Programmable Pre-Sanitizer Start Times: Automatically sanitizes your milking system at the times you want so your milking system will be ready to milk at milking time.

Divert Rinse Water: Divert initial rinse water at programmable time. Does not re-circulate dirty rinse water. Diverted first rinse preheats the pipeline for more effective cleaning in detergent cycle.

Automatic Chemical Dispensing: No chemical handling reduces risk of damage to skin or clothing from caustic chemicals. Precisely operates peristaltic pumps without additional pump timer controls. Pumps are set in 1-second increments. Three pumps are included in one package at 30oz per minute. Three-pump peristaltic pump units are also available for 50 oz per minute.

Supports 2-Part Wash Chemicals: The 2-Part Wash Chemicals can be custom blended on the farm in the wash vat. Lower cost detergents can have stronger, more effective components and the separate chlorine can be kept fresh and used at the level that is right for the dairy.

Automatic Wash Cycling or Manual Wash Selection: Can be programmed to cycle on one wash formula for the amount of washes you prefer, then switch to any of the other two formulas where you can run them for the amount of time you indicate. User can manually select one of three wash formulas, then have it revert back on the next wash to cycle between different formulas you have established.

Skip a Cycle: The Skip Feature allows operator to advance to the next cycle if time is an issue. It is also a great feature for troubleshooting and checking the system operation.

Programmable Hot Acid Rinse: Choose how often to run based on your water quality. Hot acid rinse will help reduce buildup of milk stone and hard water minerals.

Low Chemical Alarm Feature: With the Optional Chemical Probe, user can monitor up to four chemical drums to make sure you don't run out of chemicals.

Wash Control Specifications

The Controller System has the latest PLC touch-screen technology with a 4.3” screen that is easy to see and navigate the functions.

- There are 10 Inputs and 15 Outputs to control many Devices.
- All Outputs are relay isolated from the PLC and are independently fuse protected.
- The 120 VAC Input is surge protected with insurance.
- A Support and Test Package is available which will make testing and demonstrating the unit as easy as plugging into a 120 VAC outlet.
- There is a Test Function Feature to make sure all your Inputs and Outputs are functioning properly.
- The entire main component system has LEDs to indicate what functions are in operation.
- The entire component package has easy to remove quick releases to make replacement of components a snap.
- The Controller System can easily be modified to work with your Output Devices at 12 V, 24 V, 220 V.
- Four Screen Display Levels with a total of 43 screens.
- You can build up to 4 Formulas and there are 7 different Cycles, 93 Timers and 21 Settings for each formula.
- Four Formulas = 456 Timer Settings and another 32 Main System Settings for a total of 488 settings for unsurpassed adjustability.
- Pre-programmed defaults for Formula 1 and a pre-loaded default formula to save you time setting up additional formulas.

In the Wash Mode you can use the **SKIP** button to advance to the next Wash cycle or pre-select to skip that cycle before starting.

Identifying Kleen Flo Components

Inside View of Kleen Flo Wash Controller

Section 1 Input and Output Terminals

Section 2 Power and Relays

Section 3 Delta CPU and Output Module

Section 4 Back of the Delta HMI Display

Connections of the Main Milk / Wash Switch

Pre-Testing & Demo Operation

With pre-set default programming in place when shipped to you, this enables user to plug into normal 120AC outlet to perform pre-testing, programming and demonstration of the Kleen Flo unit before installation. We recommend a Test Kit be purchased for each dealer or installer / repair / service person.

Connecting Test Kit Devices

Open the Kleen Flo Wash Controller Cover.

Connect the Test Kit Switches to the proper location on the Kleen Flo Wash Controller's Input terminals.


Optional Test Kit

Wash Test POT - Connect the blue wire to terminal #1 (+) and the black wire to Terminal #2 (-). This will allow you to simulate the temperature, water valves for temp fill and test the alarm settings.

Milk Test POT - Connect the blue wire to blue terminal #3 (+) and the black wire to blue terminal #4 (-). This will allow you to simulate the temperature, water valves for temp fill and test the alarm settings.

Pressure SW - Connect orange wire to orange terminal #5 and the red wire to red terminal #6. This will allow you to advance into the Wash Cycle to simulate the Fill SW.

Pipe Position SW - If an orange jumper is on the orange terminals #6 and #7, remove it. Install this Pipe SW in its place. This will allow you to test and see how the Pipe Position SW works.

Yellow Jumper Wire - Connect one end to the red common terminal by the Inputs. If you want to test and simulate the Low Chemical alarm Feature, connect or touch any of the yellow terminals to the other end of this yellow wire and after 10 seconds an Alarm for Low on Chemical will activate on the screen.

To install the Test Kit Devices, use the Non-Fluted Flat Blade Screw Driver provided in the Test Kit, or one similar, to insert the wires into Quick Connect Terminal Blocks.

To make connections on the terminal blocks, into the adjoining square hole, insert a 2.5 -3MM or 5/64 to 3/32 Non-Fluted Flat Blade Screw Driver to open the round hole to insert up to a 14-gauge wire.

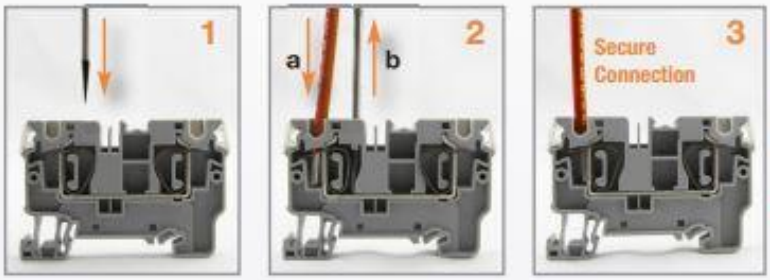
Push in terminal connection.

CX2.5/4P **SPRING CLAMP TECHNOLOGY**

- Easy Installation
- Versatile and Vibration Proof
- Reliable Gas-tight connection
- Fail proof, safe connection
- NO torque requirements
- Maintenance free
- Terminals accept wires with/ without ferrules

E220514 60947-7-1

INSTALLATION GUIDELINES



1 Insert Flat-Head Screw Driver into insertion space to open pre-loaded spring

2 (a) Insert Wire into opening in spring leg.
(b) Remove screwdriver.

3 The spring force presses conductor against the current bar for a reliable/safe connection

Function Testing

The Test Switch Devices should appear as shown.

Plug in AC cord with surge protector into 120VAC outlet and turn on external circuit breaker.

With the Rotary Switch to the Middle in “Off”, it should appear as shown.

With the Rotary Switch to the Left in “Milk”, it should appear as shown.

With the Rotary Switch to the Right in “Wash”, it should appear as shown.

Next, go to *Main Wash Mode* window and start the *Wash*. Skip to advance through each cycle to check the following water valve relays are active for the *Fill* portion of the cycle.

Pre-Rinse – Hot & Cold
Wash 1 – Hot
Rinse 2 – Cold
Acid – Hot & Cold
Rinse 3 – Cold
Sanitize – Cold

Note: The above water valves will function with the rheostat trim POTs installed. Turning the Temp up or down will determine what valve will come on for that cycle depending on the Dead Band Setting and the Temperature Fill Time Setting for that cycle.

Go to the *Output / InputTest* Screen in the *System Settings* to check the Outputs.

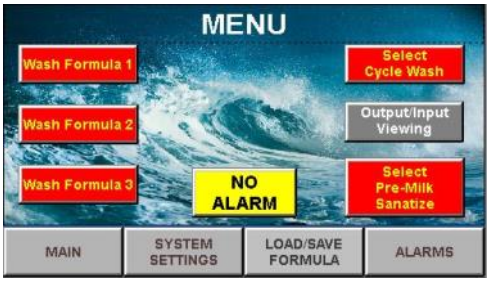
Hold the **OUTPUT** button down and verify the button pressed matches the relay you are activating.

For the Inputs, test that they are wired correctly by activating them with the Test Kit Switches and Jumpers you hooked up earlier.

Touching the yellow jumper as shown to the appropriate yellow terminal will activate the Low Chemical Alarm for that terminal as labeled.

Test / Demo Operation

If you want to test or demo the Kleen Flo Wash Controller and watch the device activations during an actual Wash, you can press the **MAIN** button to enter that menu and press the **OUTPUT / INPUT VIEWING** button.



This will bring up the *System Test* Screen where you can view the status of both the Inputs and the Outputs during each cycle of the wash. The next two screens show red and yellow buttons as **OFF** (not active) and green as **ON** (active) and also shows what cycle you're in. The real-time clock will aid in determining the timing of the devices is consistent with what was programmed.

You can also open the Kleen Flo Wash Controller's lid to view the output relay's LEDs and see what output is active.

You can also look at the CPU / Output Module to view the LEDs and see what functions are active.

Test Running a Wash

You can go to the *Wash* Screen and start a wash by pressing the **START** button. This will start the first cycle in formula that it's running and will display the cycle you're in. You can use the **SKIP** button to advance to the next cycle or pre-skip the cycles you do not want to do in advance of starting the wash. After starting a wash, you can either open the wash controller to view the activations of the relays for the outputs that are active when their green LEDs are lit.

Or, after you start a wash, you can go to the *Main Menu* and press the **OUTPUT / INPUT VIEWING** button to view the activations of the cycle. Next, by pressing the connected **TEST KIT PRESSURE SWITCH** button to advance the cycle into washing to simulate a full sink / tank.

In the *Viewing* Screen, now watch the activations taking place to the devices you will be installing. A glance at the clock there will help determine how far the activations are into the cycle. You can switch back and forth to the *Main* Screen to advance the cycle you are currently at to the next cycle.

Refer to the Page 21 for details on how to build and save formulas for the customer you will be installing for. Formula Forms are available on the Test Kit USB Memory Stick and can also be found online at ***www.ezmilking.com.*** These are useful for outlining the operation of the cycles and device timers that will be needed before building the formulas and setting the device timers.

The Default Formula Settings will help you preload and fill most common formula device timer entries. (Wash 1 & Wash 2 are 10-minute long cycles and all others are 5 minutes long in the *Default Formula*.)

Start another Wash and use the **OK PRESSURE SWITCH** to see if the Wash cycles are performing as desired.

The test temperature POTs will simulate the Wash and Milk Temperature for testing the operation and alarms.

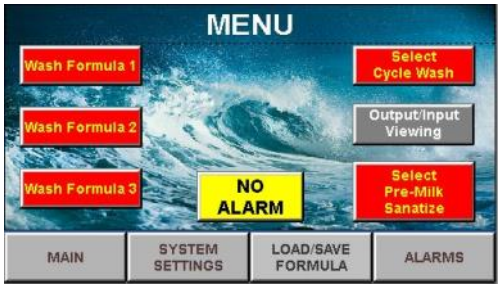
System Settings and Programming

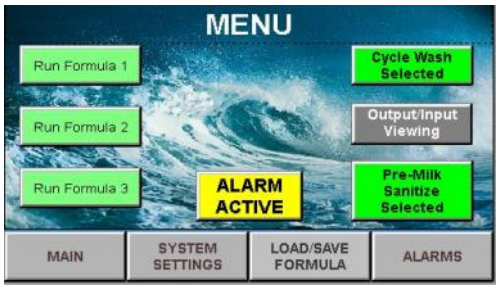
HMI Touch Screen Navigation

Main Operating Screen Displays

MAIN SCREENS
Level 1

MENU SCREEN
Level 2





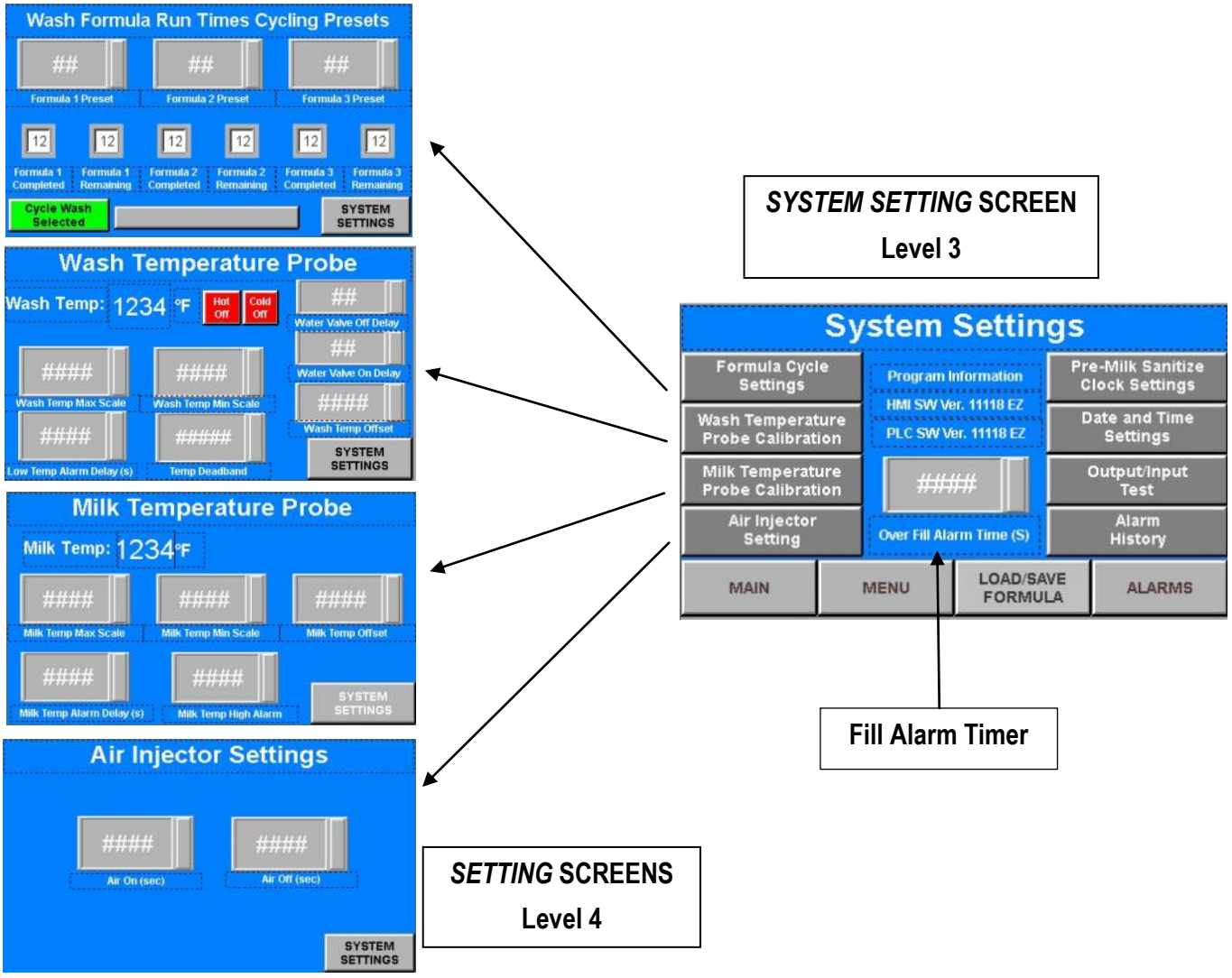
In the *Menu Screen (Level 2*), you can select what formula you wish to run on the left.

On the right side, you can select to have Wash Formulas cycle between each other and a Pre-Milk Sanitize.

The **OUTPUT / INPUT VIEWING** button gives you quick access to view what Outputs and Inputs are active in the Wash cycle. This is nice feature for demonstrating and testing the wash system.

System Settings - Left Side Buttons

Everything can be viewed by the operator, but all changes are password protected. See Page 21 and 24.



Fill Alarm Timer

Set this timer for an Alarm to shut off the water valves if a device like a Pressure Switch fails during the fill. This will stop the waste of water which would result if a failure of a device on the sink / vat occurs. You should figure out how long it normally takes to fill and add 5 or 10 minutes for it to take effect.

Formula Cycle Settings

The settings here will allow you to cycle up to three different wash formulas you may want to use at certain intervals for the Wash Formula Run Times.

Formula Presets Most will cycle only two different formulas and leave the other formula set at "0" Cycling.

Select Cycle Wash If not using this, leave the **SELECT CYCLE WASH** button switched to red to show it deactivated. If you want to cycle formulas, press same button to make green and **CYCLE WASH SELECTED** button will appear which will enable this feature.

Wash Formula Counters Indicates for each formula how many have been done and how many are left to do.

Wash Temp Probe Calibration

The upper temperature reading is what the real time temperature input for Wash is seeing. If set up for no Temperature Probe, it will read 25° all the time.

Water Valve Off Delay This delay smooths out the Off Activation to stop Water Valve Pulsing. This is factory set at 6 seconds.

Water Valve On Delay This delay smooths out the On Activation to stop Water Valve Pulsing. This is factory set at 6 seconds.

Wash Temp Scales The Wash Temp Max Scale Setting is factory set to 0°F while Wash Temp Min Scale Setting is factory set to 20°F. If the Wash Temperature Probe is installed on this system, the Temp Max needs to be set at 220° and Temp Min needs to be set at 0.

Wash Temp Offset This setting is for calibrating the temperature wash probe. Changes here will bring up a keypad on display for you to enter in the correct number it is off by on the Temperature display. Enter in the number and if it must be set lower, press the **MINUS –** button, then enter to save the new calibration setting. The factory setting with no probe will be set at 0° F.

Low Temp Alarm Delay This is for setting at what time the Alarm is active for "too low of a water temperature". This is factory set at 120 seconds and will stop nuisance alarms at the start of filling the sink / vat and give them time to warm up. If activating too soon, increase the Time Setting.

Temp Dead Band This setting is the + / - temperature span that both the hot and cold water valves are on together. It is factory set for a 10° span.

Milk Temp Probe Calibration

The upper temperature reading is what the real time temperature input for Milk is seeing. If set up for no Temperature Probe, it will read 25° all the time.

Milk Temp Scales The *Milk TEMP Max Scale* is factory set to 0° F and the *Wash TEMP Min Scale* is factory set to 20° F. If a Milk Temperature Probe is installed on this system, the *Milk TEMP Max Scale* is set to 220° F and the *Wash TEMP Min Scale* is factory set to 0° F.

Milk Temp Offset This setting is for calibrating the temperature wash probe. Changes here will bring up a keypad on the display for you to enter in the correct number it is off by on the Temperature. Enter in the number, and if it must be set lower, press the **MINUS –** button, then enter to save the new calibration setting. The factory setting will be set at 0° F.

Milk Temp Alarm Delay This is for setting at what time the Alarm is active for "too low of a water temperature". This is factory set at 1200 seconds and will keep the High Milk Temperature Alarm from activating until there is milk flowing to cool down the empty pipes. This timer begins when you switch the main **MILK / WASH** button to the Milk position. If you switch on **VACUUM PUMP TO MILK** mode and it takes milkers 30 minutes to get milk flowing through the plate cooler, then increase this timer. The *Milk Temp High Alarm* setting is factory set at 80 °F. Once you learn what the system's normal maximum cooling temp is, you can set this accordingly in order to best alert you of an issue such as a problem where no cooling water is running through the plate cooler, etc.

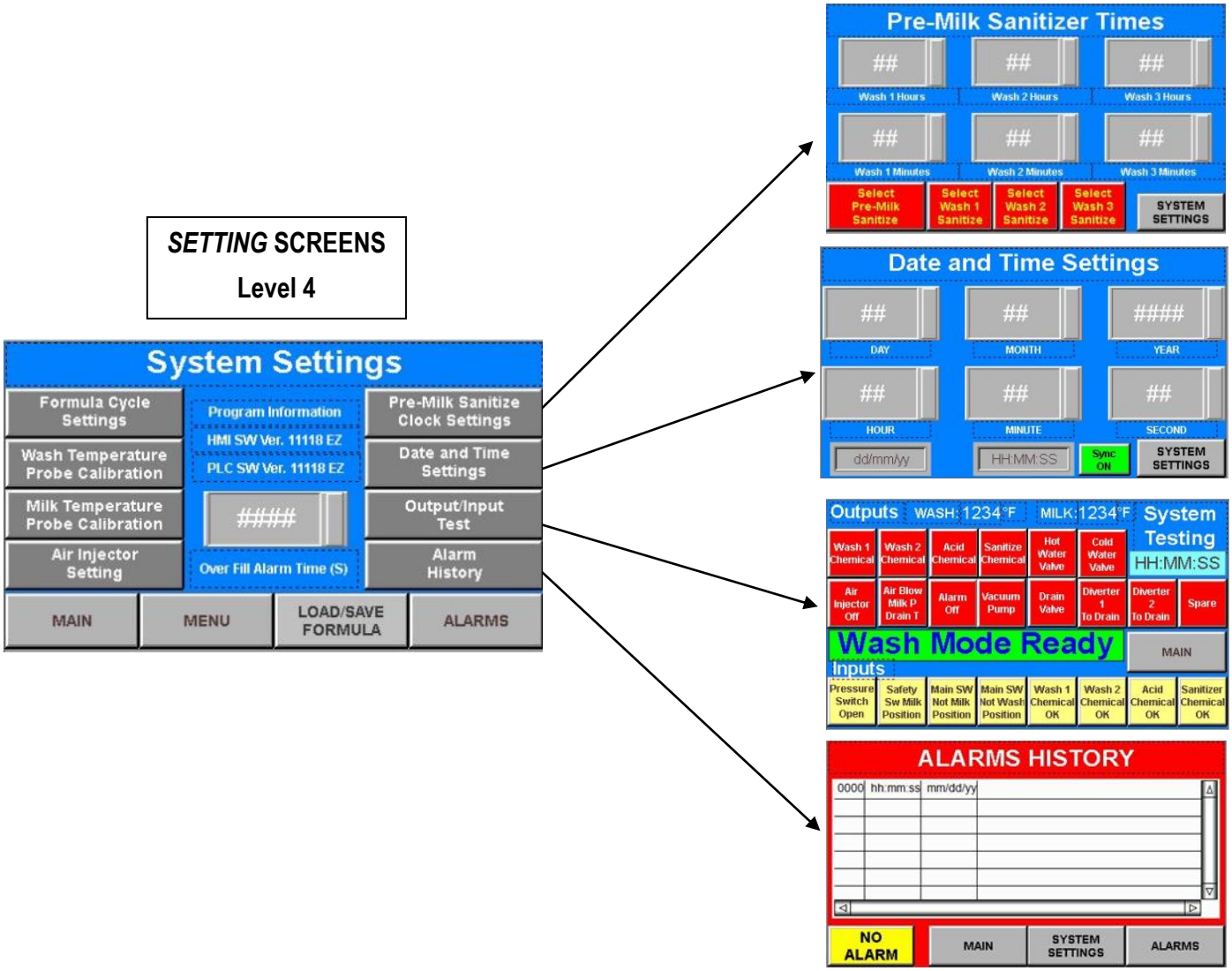
The *Temperature* settings are factory set to keep the Low & High Temp Alarms deactivated with the above factory settings in place. Also, the factory settings above must be in place, or a Temperature Probe connected, in order to keep the no Temperature Signal Alarm deactivated.

Air injector Setting

Air On Timer Set this for how long the Air Injector is leaking air into the system. Factory setting is at 5 seconds.

Air Off Timer Set this for how long the Air Injector is not leaking air into the system to produce the best slugging of Wash Water. Factory setting is at 5 seconds.

System Settings - Right Side Buttons



Pre-milk Sanitizer Times

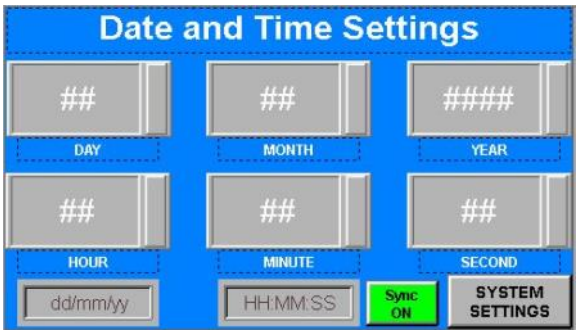
Wash Times

Set Wash hour 1 and the Wash Minute 1 for the time you wish to sanitize automatically before you Milk the first Milking. Set Wash hour 2 and the Wash Minute 2 for the time you wish to sanitize automatically before you Milk the 2nd Milking. Set Wash hour 3 and the Wash Minute 3 for the time you wish to sanitize automatically before you Milk the third Milking (if you Wash 3 times a day) Note: Hours are in Military Time (24Hour).

Select Washes Press and Select the Washes you want to do these for. When the **SELECT WASH SANITIZE** button is red it is disabled and when it is green, it is enabled.

Select Pre-sanitize When the **SELECT PRE-SANITIZE** button is red it is disabled and when it's green, it is enabled.

Date and Time Settings



Set the date and time if not correct. Make sure the **SYNC** button is off and appears grey.

Having the correct date and time will provide an accurate time stamp in the Alarm History for troubleshooting if needed later and will make the Pre-milk Sanitizing activate at the correct time. Once date and time is set, turn **SYNC** button on so it appears green so it can sync up the PLC to the HMI.

There is also a real-time Clock and Date / Month / Year Window on display to view.

NOTE: Your system should be synced after installing and after Power is off for several days.

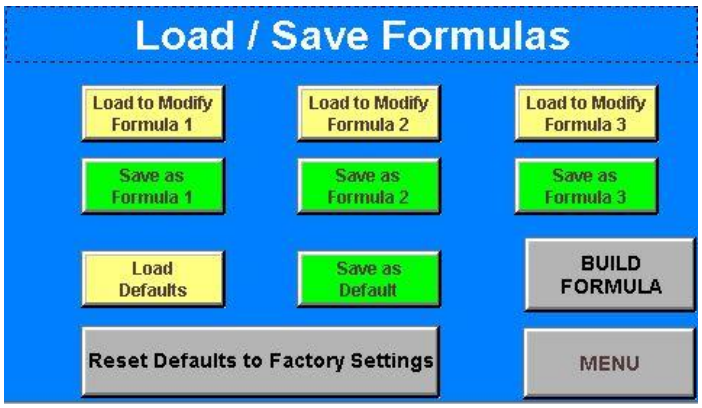
Reset Defaults to Factory Settings Button

For the **RESET DEFAULTS TO FACTORY SETTINGS** button to work at restoring Factory Defaults to the factory settings, you must have one of the three **LOAD TO MODIFY FORMULA 1 / 2 / 3** buttons pressed to have it Reset. Note this is NOT the **LOAD DEFAULTS** button.

For Example: In Load / Save Formulas, select **LOAD TO MODIFY FORMULA 1**, then press the **RESET TO DEFAULTS TO FACTORY SETTINGS** button followed by pressing the **LOAD DEFAULTS** button. Once that's loaded with the default settings, press and enter the **BUILD FORMULA** button to see that it did reset. See Pages 65-71 for Default Settings.

NOTE: All Formulas are set to Default Factory Settings before your unit is shipped.

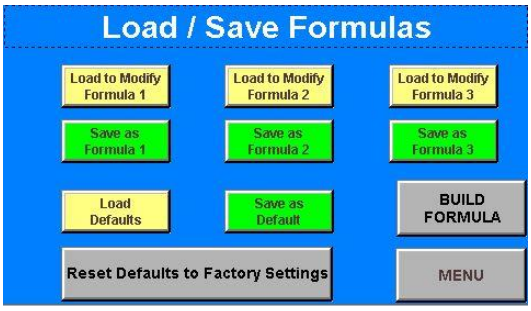
You're now ready to save as a Formula at Factory Setting. You will still need to select the cycles as well as the Hot and Cold Water Valves . If using Temperature Probes, you'll also need to enter for each cycle you've selected the Wash Fill Temps Setting and the Low Temp Alarm Setting.



System Formula Programming

Load Formulas

Level 3



Passwords

Main Settings & Timers	000
Save as Formula 1	111
Save as Formula 2	222
Save as Formula 3	333
Save as Default Formula	000

Select the formula you wish to Load, Modify or View in the Build Formula Section Level 4.

After building or adjusting a new formula, make sure to save as the Correct Formula. You only need to set the Timers for the cycles you are going to use.

Refer to Pages 27-30 to get details on each Wash Cycle Timer. You can Print Formula Forms from the Test Kit File on the USB Flash Drive or you can get them online at ***www.ezmilking.com***.

NOTE: See Page 31 for important information on Saving Procedures.

Loading Default Formula

Level 4

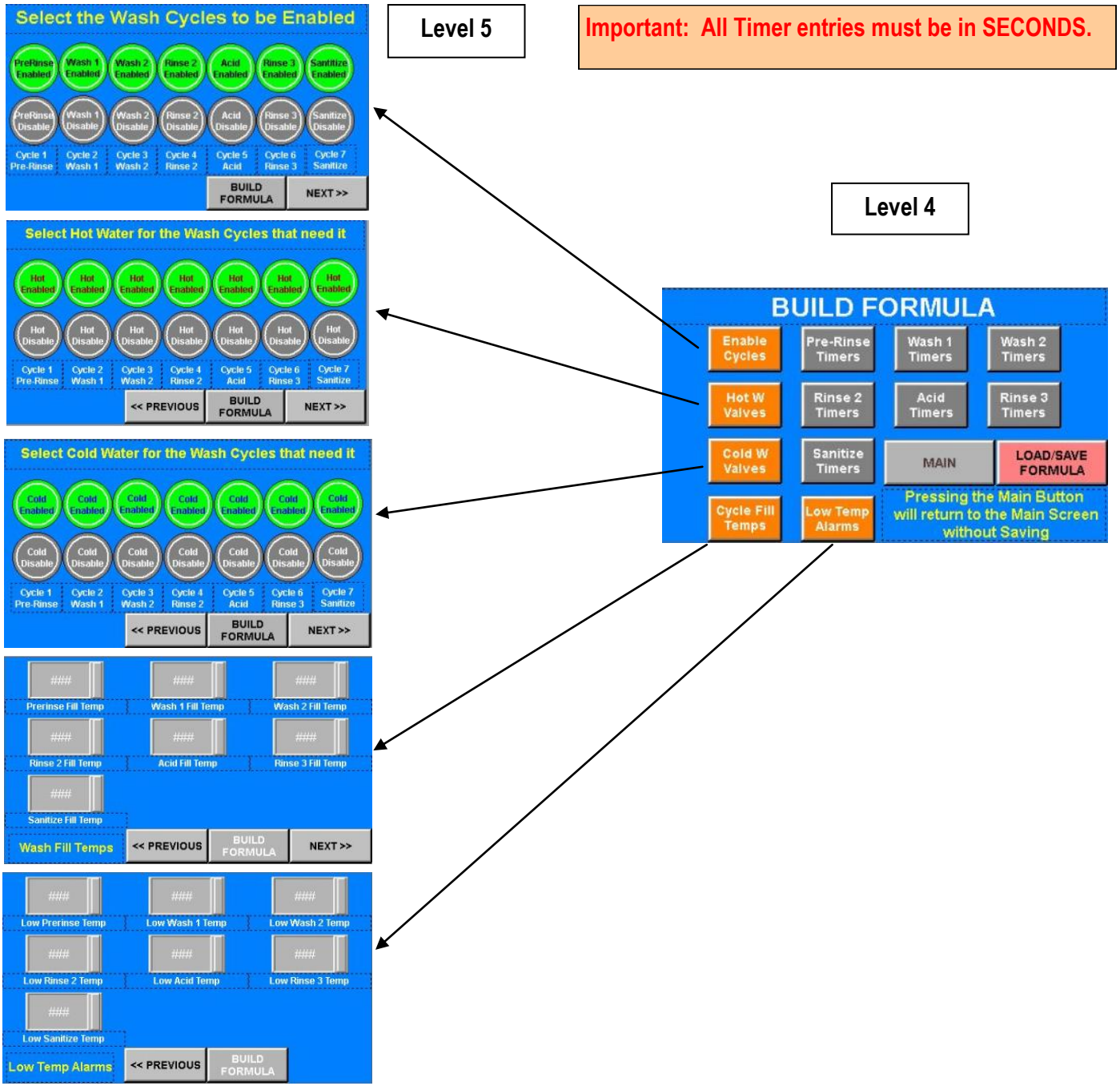
You can Upload Default Formula and Save as Formula 1, 2 or 3. (Note: These settings are similar to settings of the Holdren Model 23) .Then upload any of them to modify them to your preference.

Touch the **ORANGE** **ENABLE CYCLES** button to enter the *Select the Wash Cycles to be Enabled* Screen.

To reset changes to the Default Formula, all **LOAD** buttons must be non selected and appear yellow in color, not red.

Build Formula Screen Orange Buttons Level 4

Use the Build Formula Forms to pre-plan and layout the settings you want. They go into detail on what you are setting for the timers. If a wash temperature probe is installed, both **HOT W VALVE** and **COLD W VALVE** must be selected for the cycles you want to Temperature Fill at. Keep in mind, the Low Temp Alarm will go off if not set properly.



Level 5

Press to make the button turn green for enabled or turn red for disabled. Select only the cycles you wish to build for that formula.

Once done, press the **NEXT** button to advance to the setting.

Select only the hot water valves needed for the cycles you are building.

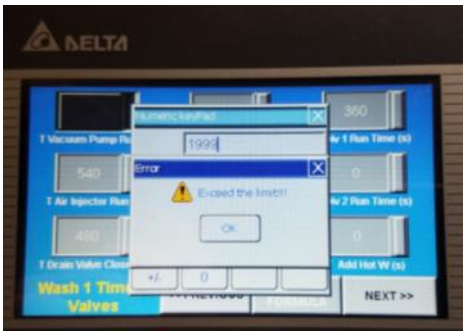
Select only the cold water valves needed for the cycles you are building.

Password Entry

Touching a Timer Entry Window or an **ENABLE** or **DISABLE** button for the first time in *Build Formula* will ask you for a password to allow you to make changes. See Page 21.

Once the password is entered, you'll be able to change the Timer to any value outlined in red (Example: 1-900).

Note: All Timer settings are in seconds.



If you enter a number not within the Timer range, this screen will appear.

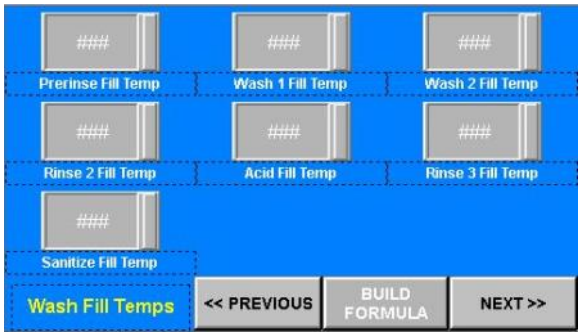
You only need to change the timers for the cycles you are using.

Example: You only want a Pre-rinse, a Wash 1 for Detergent and an Acid cycle. Only change the Timers in those three cycles. On those cycles, set the Timers you do not need to "0".

Fill Temp

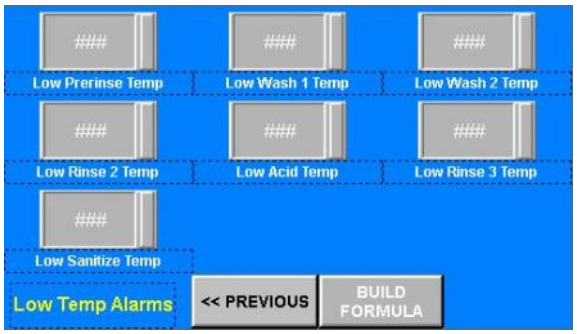
Touch the **GREY ENTRY WINDOW** button to enter the cycles you are programming for the devices to activate at. They will appear as shown on the following screens.

If using a wash temperature probe, you can adjust the following on the cycles you are building to the fill temp you want. If not using the temperature probe, you must have all set to 25.



Low Temp Alarm Function

If using a wash temperature probe, you can adjust the following on the cycles you are building. You'll want to enter the MINIMUM temperature for this cycle. An alarm will occur if the wash temp falls below that setting after the Alarm Fill Temp Time has expired. This setting also monitors the temp while in Wash Cycle and Diverter 1 is active and re-circulating wash water back to the sink. If the temperature drops below the Low Temp Setting, Diverter 1 will stop re-circulating and send it to the drain. It will also set off an alarm to bring attention to the issue. If not using the temperature probe, you must have Temperature Input set to "0".



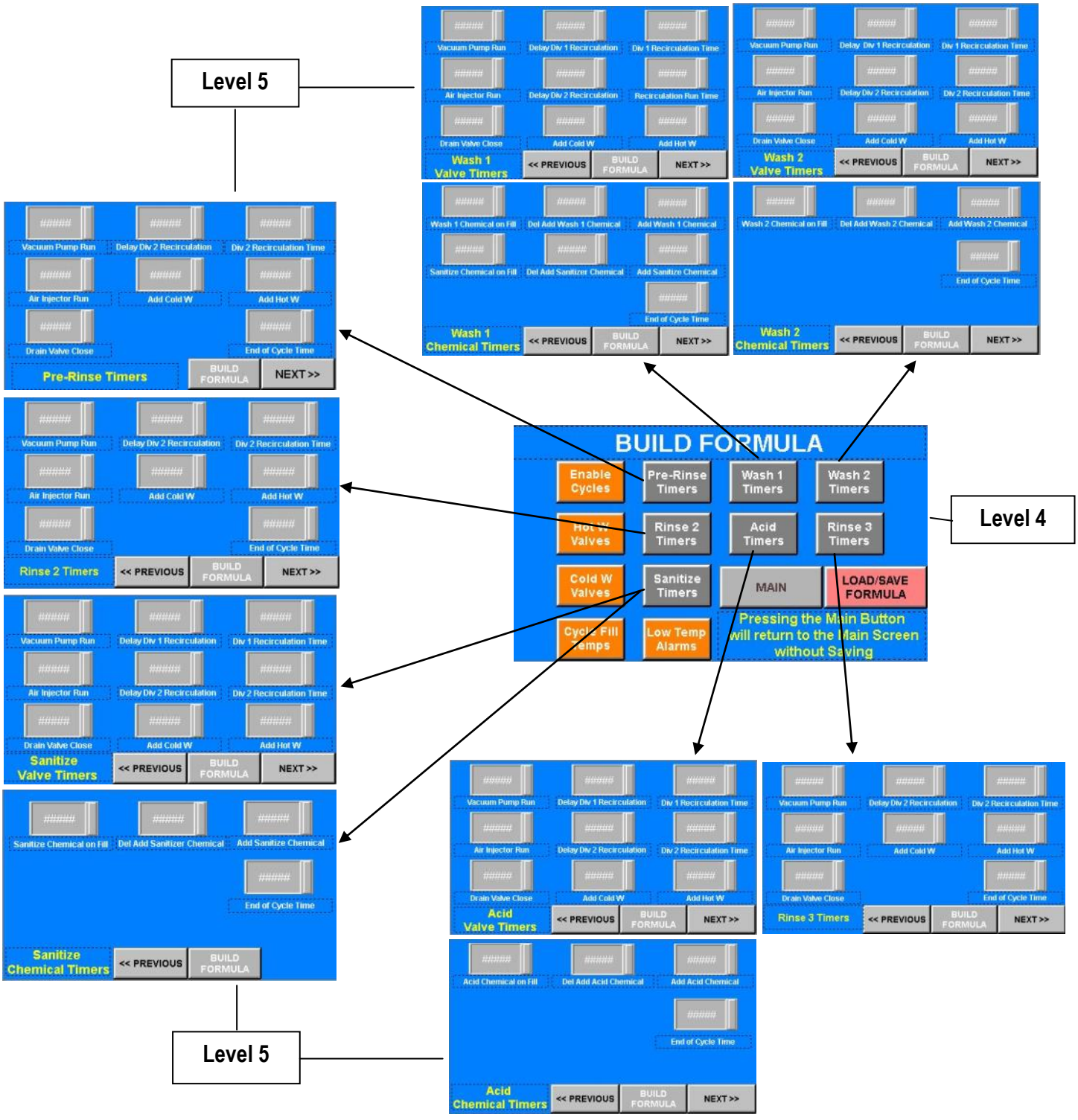
Press the **BUILD FORMULA** button to return to the *Level 4 Build Formula* Screen.

Touch the **GREY CYCLE** button to enter the cycles you are programming for the devices to activate. They will appear as shown on the screens on the following page.

Build Formula Screen Gray Buttons

Press **GRAY TIMER** button to enter Timer to set in each cycle.

Important: All Timer entries must be in SECONDS and saved when done. See Page 31.



Wash Build Formula Timers and Their Function

The following Cycle Settings explain in detail what each Timer is for within the 7 cycles which are available. They are factory set to do a 10-minute Wash Cycle for the Detergent Cycles 2 & 3, Wash 1 and Wash 2. All other Cycles 1, 4, 5, 6 and 7, Pre-Rinse, Rinse 2, Acid, Rinse 3 and Sanitize are 5 minutes long.

See Pages 22 and 23. The Wash Cycles you select here for the Formula you're building will determine which Cycles on the following lists you can adjust to the Pipeline System for the best cleaning. The other Cycle Settings can be left the way they are for now.

Once a Wash Formula is set up and saved, you can also build an identical one and save it into either of the remaining Cycles. If you're going to use the Cycling feature to switch between different Wash Formulas, you can easily modify the 2nd Formula to do a boost on extra chemicals, Hot water instead of Cold or Warm and to use a different chemical.

When setting up the Timing for a Wash Cycle length, normally the Vacuum Pump Run Time setting determines the length of the Cycle. Example: If you want it to last 5 minutes after it starts when the wash water in the Sink/Vat reaches its fill level, set the Vacuum Pump Timer to 300 seconds. Set the Drain Valve, Air Injector and Diverters to shorter times than the Vacuum Pump Run Time. Keep in mind if any Delay Timers are available for a Device, you'll also need to figure that timing in with the Run Time of that Device. Example: If you have a delay of 60 seconds and a Run Time of 180 seconds, that Device will start 1 minute after the Fill Switch activates, run 3 minutes and then stop 4 minutes into the Cycle. The remaining minute of the Cycle will be the vacuum pump running because it's set to run 300 seconds (5 min). This will run 1 minute longer (or more) than some of other device timer settings to allow air to enter in the Sink/Vat Pickup Line to dry the pipeline if the volume of water to clean is set up properly for the size of system you have.

After all the Cycle Timers have elapsed, there is an End-of-Cycle Timer that will run to delay for the next Cycle to start and to add more drain time. This also has a Relay Output to run a Milk Pump or Air Blow Valve to clear the Pipeline Quicker.

All Timer entries must be in seconds. Select only the Timers in the cycles you have programmed. On those cycles, set the Timers you do not need to "0". Blank Build Formula Worksheets are available at end of this manual, online or in Test Kit Software.

Cycle 1 Pre-Rinse	
1	**Pre-Rinse Wash Fill Temp**: What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Pre-Rinse Low Temp Alarm**: Active only during fill of Sink / Tank set for temperature you want it to alarm too
3	**Pre-Rinse Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Pre-Rinse Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Pre-Rinse Drain Valve Close:** Closed on fill and time after Fill Switch, normally set shorter time than Vacuum Pump Timer
6	**Pre-Rinse Diverter Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
7	**Pre-Rinse Diverter Valve 2 Recirculation Time:** Or send to Holding Tank to use water elsewhere after Delay timer setting
8	**Pre-Rinse End of Cycle:** Timer for Air Blow Off, Milk Pump or Draining time before next cycle after last Timer expires in cycle
9	**Pre-Rinse Add Cold W:** Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
10	**Pre-Rinse Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed

All Timer entries must be in seconds. Select only the Timers in the cycles you have programmed. On those cycles, set the Timers you do not need to "0". Blank Build Formula Worksheets are available at end of this manual, online or in Test Kit Software.

Cycle 2 Wash 1	
1	**Wash 1 Fill Temp:** What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Wash 1 Low Temp Alarm:** This is also the Diverter 1 temperature to automatically stop recirculation
3	**Wash 1 Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Wash 1 Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Wash 1 Drain Valve Close:** Closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer
6	**Wash 1 Diverter Valve 1 Delay Recirculation:** This timer keeps diverter 1 power off so it sends wash water to drain
7	**Wash 1 Diverter Valve 1 Recirculation Time:** Time to re-circulate after the diverter 1 delay timer expires
8	**Wash 1 Diverter Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
9	**Wash 1 Diverter Valve 2 Recirculation Time:** Or send to Holding Tank to use water elsewhere after the Delay timer setting
10	**Wash 1 End of Cycle:** Timer for Air Blow Off, Milk Pump or Draining time before next cycle after last Timer expires in cycle
11	**Wash 1 Add Cold W:** Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
12	**Wash 1 Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed
13	**Wash 1 Chemical on Fill**: During water filling before fill level switch starts the cycle
14	**Wash 1 Delay Add Wash 1 Chemical:** After fill level switch starts the time to delay adding in more chemical
15	**Wash 1 Add More Wash 1 Chemical**: Timer for adding more chemical after Delay Add Chemical timer has expired
16	**Wash 1 Sanitizer Chemical on Fill:** During water filling before fill level switch starts the cycle
17	**Wash 1 Delay Add Sanitizer Chemical:** After fill level switch starts the time to delay adding in more chemical
18	**Wash 1 Add Sanitizer Chemical:** Timer for adding more chemical after Delay Add Chemical timer has expired

Cycle 3 Wash 2	
1	**Wash 2 Fill Temp:** What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Wash 2 Low Temp Alarm** : This is also the Diverter 1 temperature to automatically stop recirculation
3	**Wash 2 Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Wash 2 Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Wash 2 Drain Valve Close:** Closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer
6	**Wash 2 Diverter Valve 1 Delay Recirculation:** This timer keeps diverter 1 power off so it sends wash water to drain
7	**Wash 2 Diverter Valve 1 Recirculation Time:** Time to re-circulate after the diverter 1 delay timer expires
8	**Wash 2 Diverter Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
9	**Wash 2 Diverter Valve 2 Recirculation Time:** Or send to Holding Tank to use water else where after the Delay timer setting
10	**Wash 2 End of Cycle:** Timer for Air Blow Off , Milk Pump or Draining time before next cycle after last Timer expires in cycle
11	**Wash 2 Add Cold W:** Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
12	**Wash 2 Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed
13	**Wash 2 Chemical on Fill:** During water filling before fill level switch starts the cycle
14	**Wash 2 Delay Add Wash 2 Chemical:** After fill level switch starts the time to delay adding in more chemical
15	**Wash 2 Add More Wash 2 Chemical:** Timer for adding more chemical after Delay Add Chemical timer has expired

All Timer entries must be in seconds. Select only the Timers in the cycles you have programmed. On those cycles, set the Timers you do not need to "0". Blank Build Formula Worksheets are available at end of this manual, online or in Test Kit Software.

Cycle 4 Rinse 2	
1	**Rinse 2 Fill Temp:** What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Rinse 2 Low Temp Alarm:** Active only during fill of Sink / Tank set for temperature you want it to alarm too
3	**Rinse 2 Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Rinse 2 Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Rinse 2 Drain Valve Close:** Closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer
6	**Rinse 2 Diverter Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
7	**Rinse 2 Diverter Valve 2 Recirculation Time:** Or send to Holding Tank to use water else where after the Delay timer setting
8	**Rinse 2 End of Cycle:** Timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle
9	**Rinse 2 Add Cold W:** Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
10	**Rinse 2 Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed

Cycle 5 Acid Wash	
1	**Acid Wash Fill Temp:** What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Acid Wash Low Temp Alarm:** This is also the Diverter 1 temperature to automatically stop recirculation
3	**Acid Wash Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Acid Wash Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Acid Wash Drain Valve Close:** Closed on fill and time after Fill Switch, normally set shorter time than Vacuum Pump Timer
6	**Acid Wash Diverter Valve 1 Delay Recirculation:** This timer keeps diverter 1 power off so it sends wash water to drain
7	**Acid Wash Diverter Valve 1 Recirculation Time:** Time to re-circulate after the diverter 1 delay timer expires
8	**Acid Wash Diverter Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
9	**Acid Wash Diverter Valve 2 Recirculation Time:** Or send to Holding Tank to use water elsewhere after Delay timer setting
10	**Acid Wash End Cycle:** Timer for Air Blow Off, Milk Pump or Draining time before next cycle after last Timer expires in cycle
11	**Acid Wash Add Cold W:** Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
12	**Acid Wash Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed
13	**Acid Wash Chemical on Fill:** During water filling before fill level switch starts the cycle
14	**Acid Wash Add Acid Chemical:** After fill level switch starts the time to delay adding in more chemical
15	**Acid Wash Add More Acid Chemical:** Timer for adding more chemical after Delay Add Chemical timer has expired

All Timer entries must be in seconds. Select only the Timers in the cycles you have programmed. On those cycles, set the Timers you do not need to "0". Blank Build Formula Worksheets are available at end of this manual, online or in Test Kit Software.

Cycle 6 Rinse 3	
1	**Rinse 3 Fill Temp:** What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Rinse 3 Low Temp Alarm:** Active only during fill of Sink / Tank set for temperature you want it to alarm too
3	**Rinse 3 Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Rinse 3 Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Rinse 3 Drain Valve Close:** Closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer
6	**Rinse 3 Diverter Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
7	**Rinse 3 Diverter Valve 2 Recirculation Time:** Or send to Holding Tank to use water elsewhere after the Delay timer setting
8	**Rinse 3 End of Cycle:** Timer for Air Blow Off, Milk Pump or Draining time before next cycle after last Timer expires in cycle
9	**Rinse 3 Add Cold W**: Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
10	**Rinse 3 Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed

Cycle 7 Sanitize Wash	
1	**Sanitize Wash Fill Temp:** What you want water temperature to fill at if both Hot / Cold Water Valves are selected
2	**Sanitize Wash Low Temp Alarm:** This is also the Diverter 1 temperature to automatically stop recirculation
3	**Sanitize Wash Vacuum Pump Run:** Use this also for maximum time for the cycle to determine the rest of the timers settings
4	**Sanitize Wash Air Injector Run:** Normally set for shorter time than the Vacuum Pump Timer
5	**Sanitize Wash Drain Valve Close:** Closed on fill and time after Fill Switch, normally set shorter time than Vac Pump Timer
6	**Sanitize Wash Div Valve 1 Delay Recirculation**: This timer keeps diverter 1 power off so it sends wash water to drain
7	**Sanitize Wash Div Valve 1 Recirculation Time:** Time to re-circulate after the diverter 1 delay timer expires
8	**Sanitize Wash Div Valve 2 Delay Recirculation:** This timer keeps diverter 2 power off so it sends wash water to drain
9	**Sanitize Wash Div Valve 2 Recirculation Time:** Or send to Holding Tank to use water elsewhere after Delay timer setting
10	**Sanitize Wash End Cycle:** Timer for Air Blow Off, Milk Pump or Drain time before next cycle after last Timer expires in cycle
11	**Sanitize Wash Add Cold W:** Add more cold water after fill level switch starts, works the Wash Temp Probe if installed
12	**Sanitize Wash Add Hot W:** Add more hot water after fill level switch starts, works with the Wash Temp Probe if installed
13	**Sanitize Wash Chemical on Fill:** During water filling before fill level switch starts the cycle
14	**Sanitize Wash Add Wash 2 Chemical:** After fill level switch starts the time to delay adding in more chemical
15	**Sanitize Wash Add More Sanitize Chemical:** Timer for adding more chemical after Delay Add Chemical timer has expired

Saving Formulas

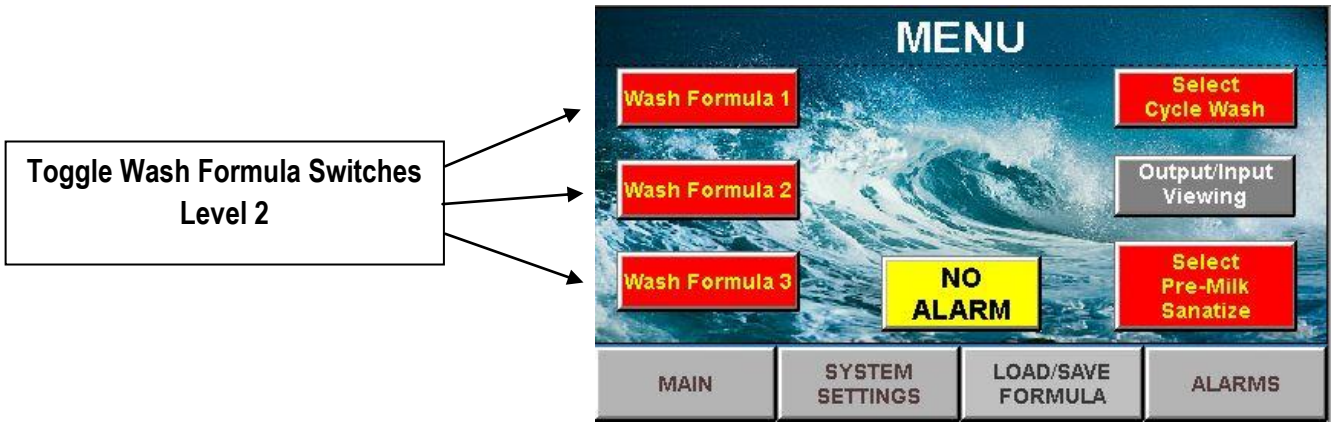
When done, press the **BUILD FORMULA** button to exit to the main *Build Formula Level 4* Menu, then press the pink **LOAD / SAVE FORMULA** button to get to the *Load / Save Current Formula* Screen.

Once in that screen, press the green **SAVE AS FORMULA 1, 2, 3 OR DEFAULT** which corresponds to the formula you want to build. Make sure you are selecting the correct one before saving.

Example: You built Formula 1 and saved it and you'd like to build another Formula for 2 or Formula 3 when many of the cycles and timers are going to be the same, you should do the following:

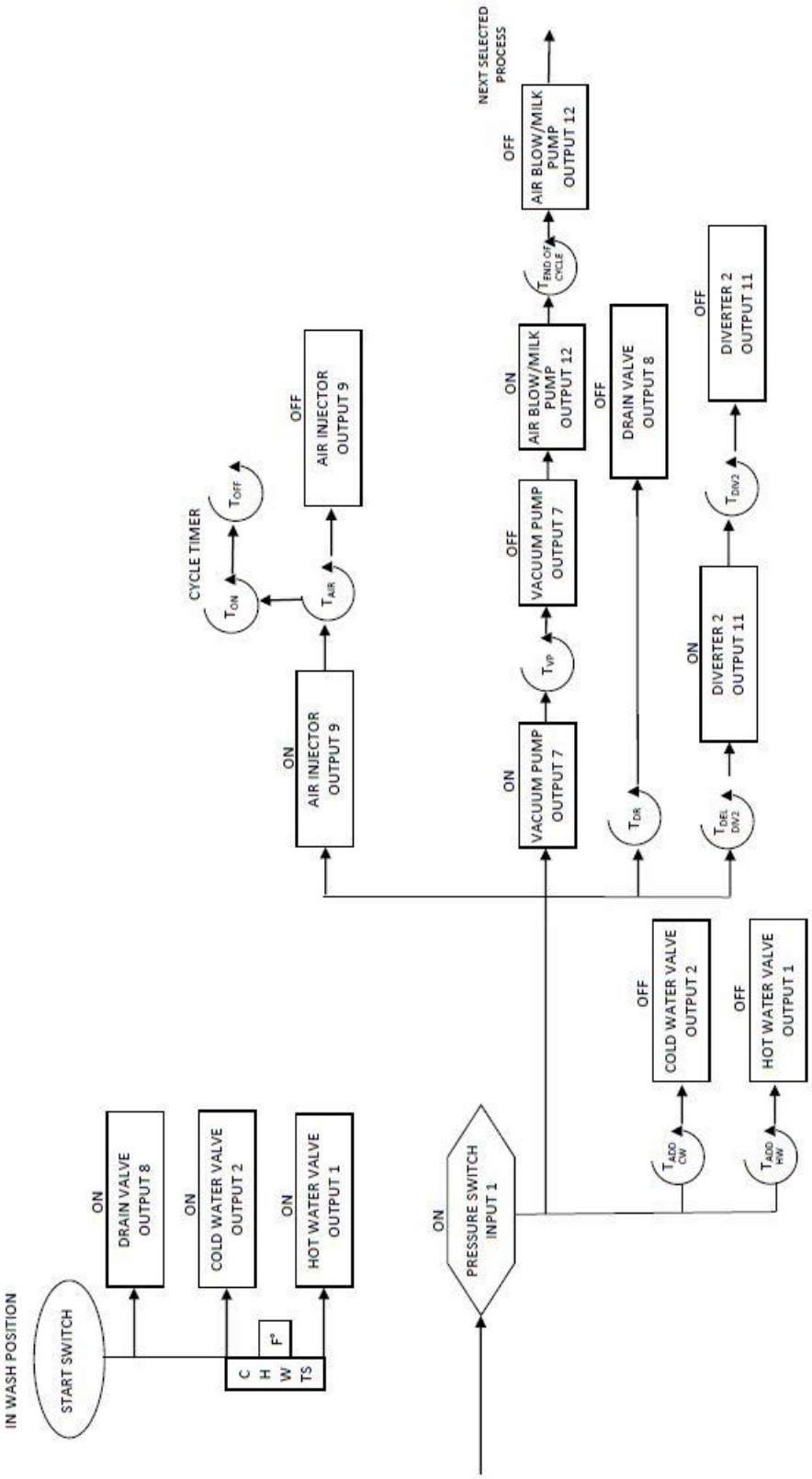
Load to build Formula 1, go in and make the changes to what cycles you want, water valves, temperature settings or amount of chemical you want dispensed, then go back and save as Formula 1, 2 or 3.

IMPORTANT: When done with any formula building or modifying changes and they are saved, you must go to the *Menu* Screen *Level 2* to toggle the **WASH FORMULA** buttons to make sure the changed settings upload the new changes for proper operation with the new settings.

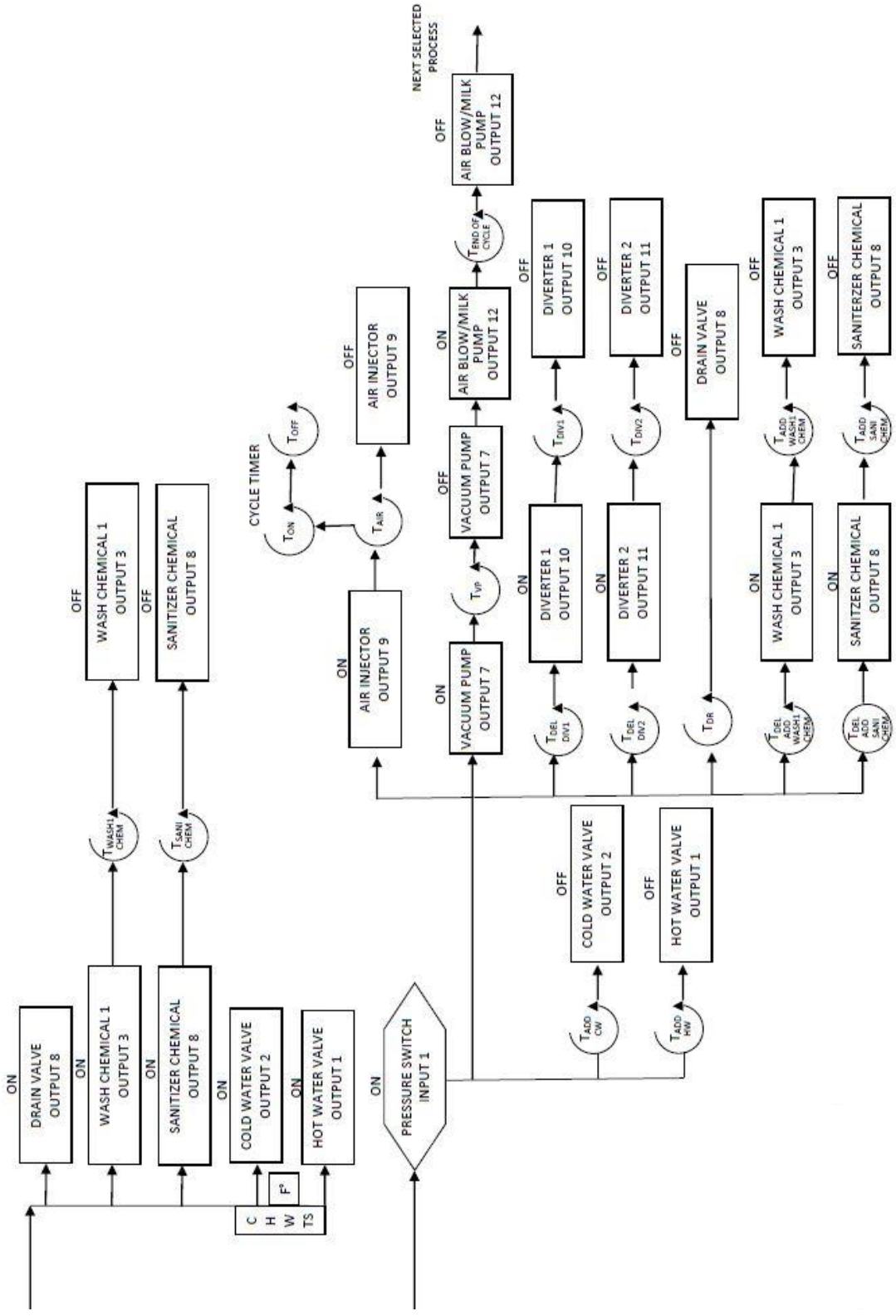


Kleen Flo Wash System Flow Charts

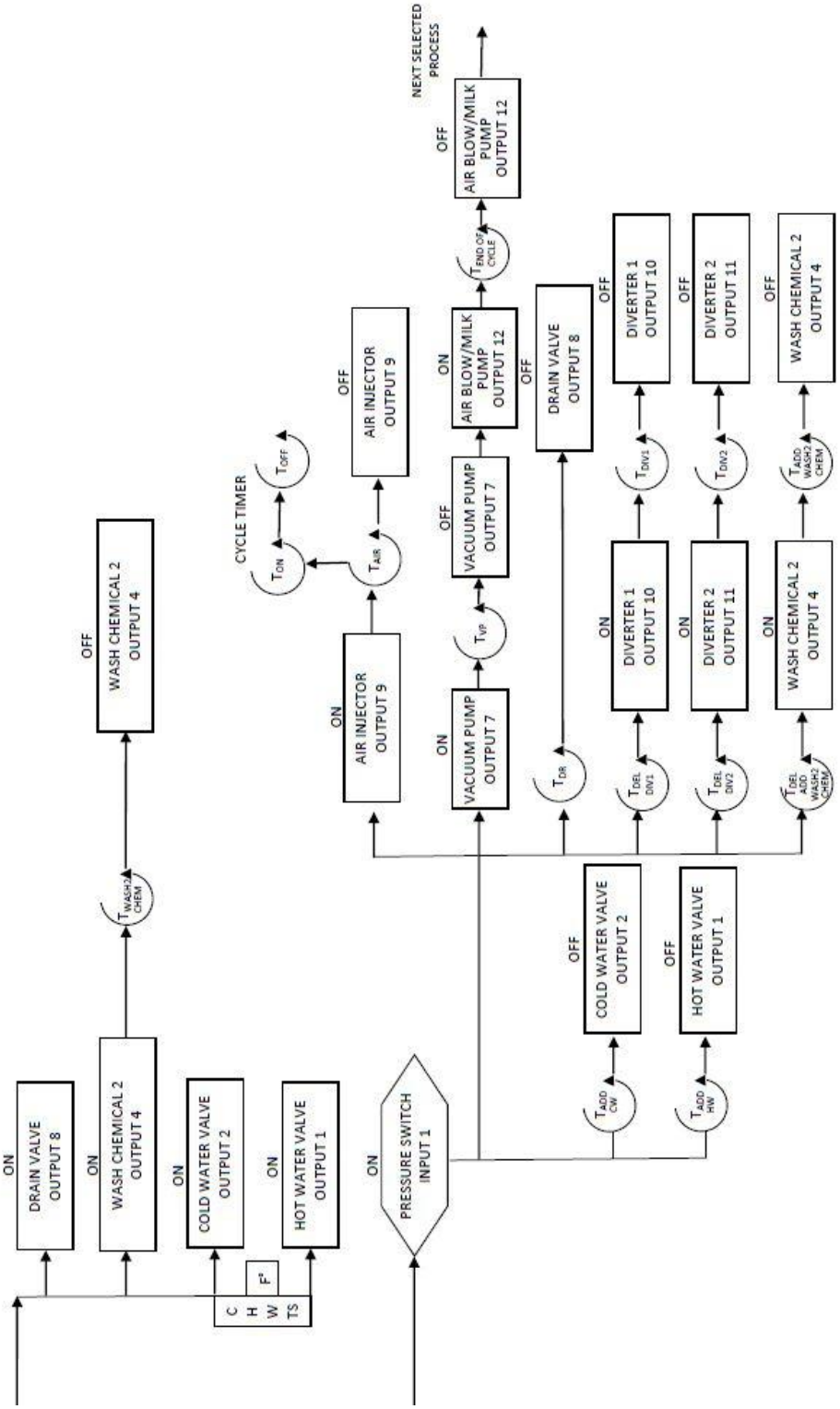
Cycle 1 Pre-Rinse



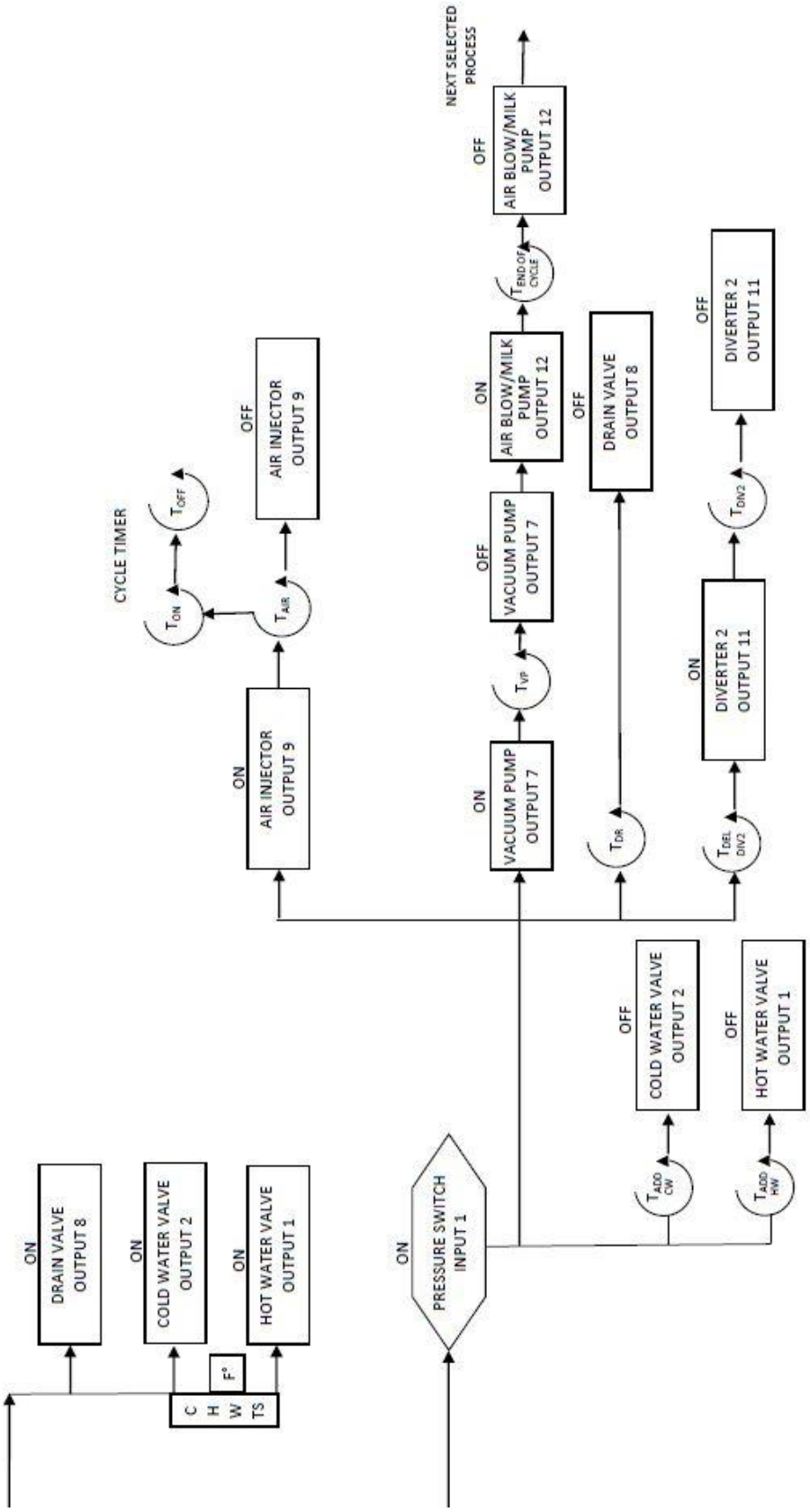
Cycle 2 Wash 1



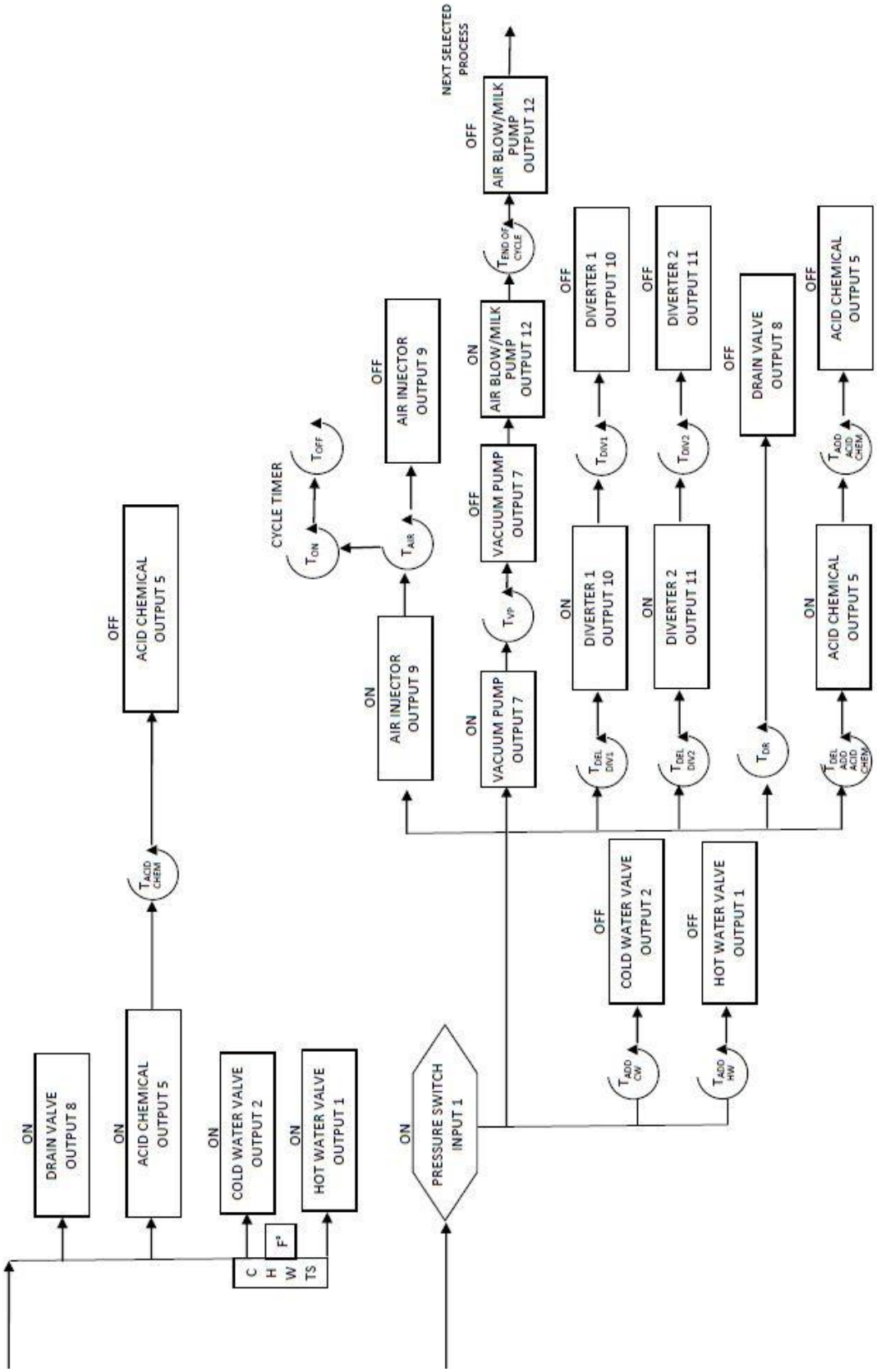
Cycle 3 Wash 2



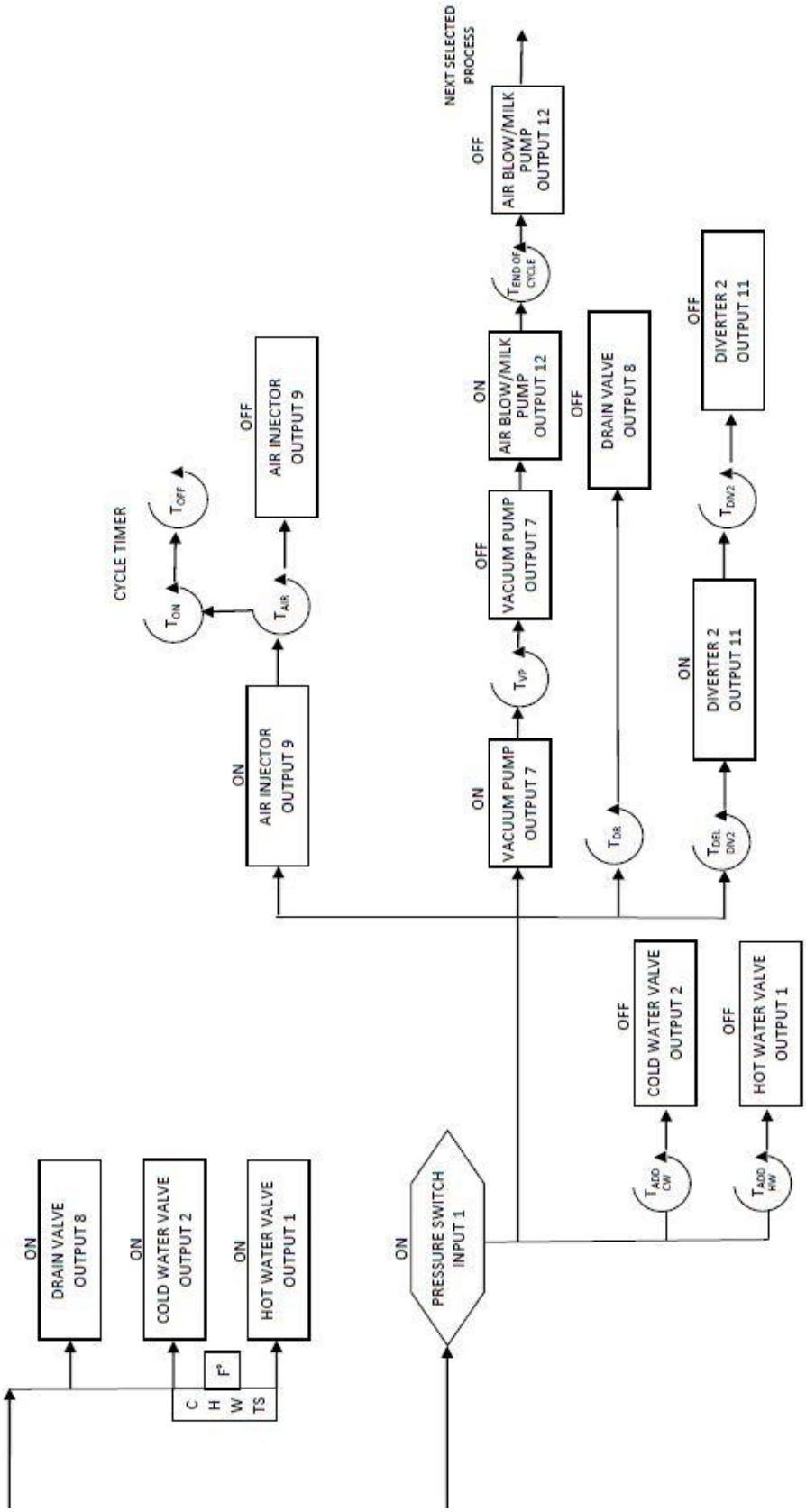
Cycle 4 Rinse 2



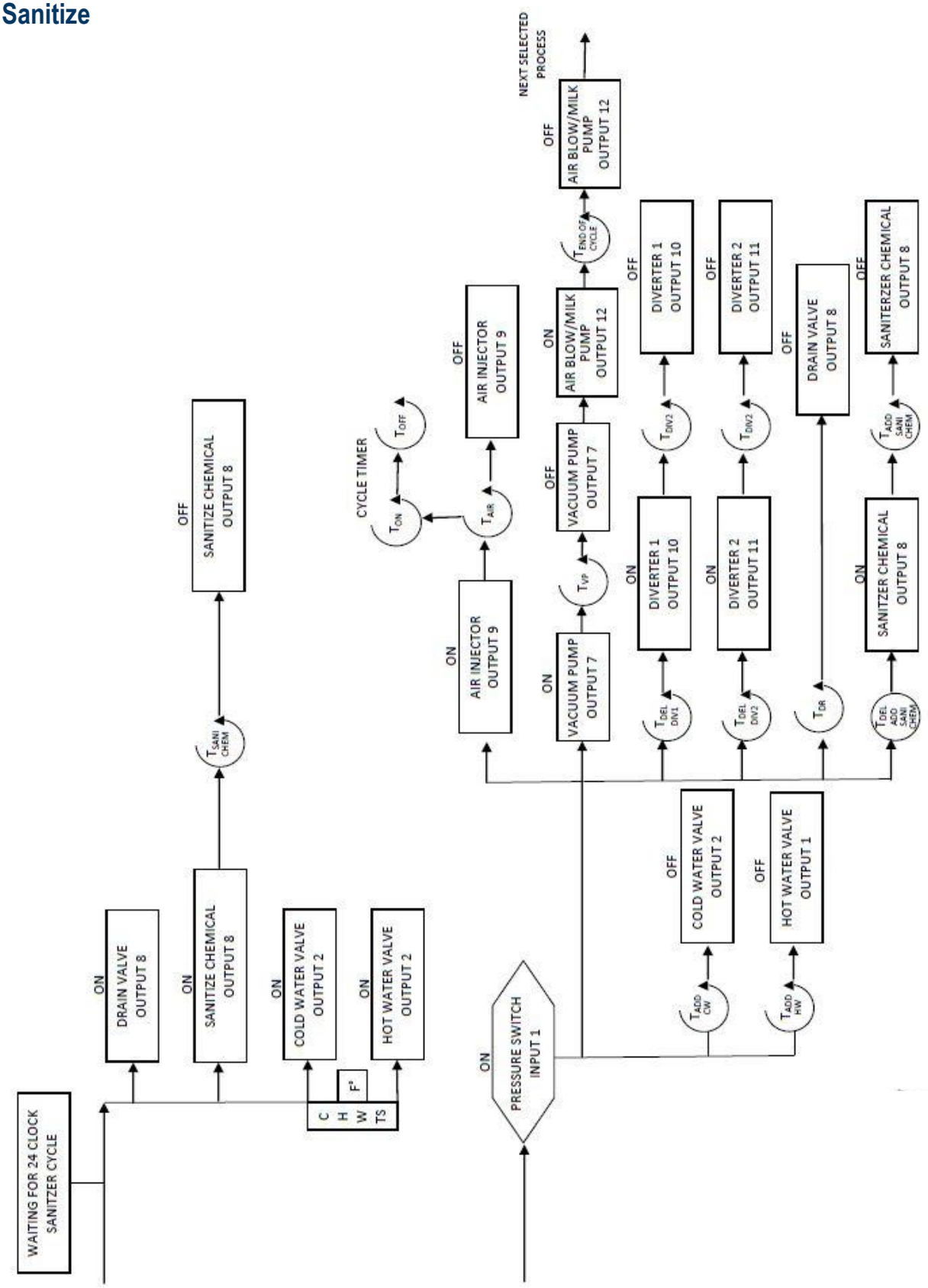
Cycle 5 Acid


ON
DRAIN VALVE OUTPUT 8
ON
ACID CHEMICAL OUTPUT 5
ON
COLD WATER VALVE OUTPUT 2
ON
HOT WATER VALVE OUTPUT 1
C
H
W
TS
F
ON
PRESSURE SWITCH INPUT 1
OFF
ACID CHEMICAL OUTPUT 5
CYCLE TIMER
ON
AIR INJECTOR OUTPUT 9
OFF
AIR INJECTOR OUTPUT 9
ON
VACUUM PUMP OUTPUT 7
OFF
VACUUM PUMP OUTPUT 7
ON
AIR BLOW/MILK PUMP OUTPUT 12
OFF
AIR BLOW/MILK PUMP OUTPUT 12
NEXT SELECTED PROCESS
ON
DIVERTER 1 OUTPUT 10
OFF
DIVERTER 1 OUTPUT 10
ON
DIVERTER 2 OUTPUT 11
OFF
DIVERTER 2 OUTPUT 11
OFF
DRAIN VALVE OUTPUT 8
ON
ACID CHEMICAL OUTPUT 5
OFF
ACID CHEMICAL OUTPUT 5
OFF
COLD WATER VALVE OUTPUT 2
OFF
HOT WATER VALVE OUTPUT 1

Cycle 6 Rinse 3

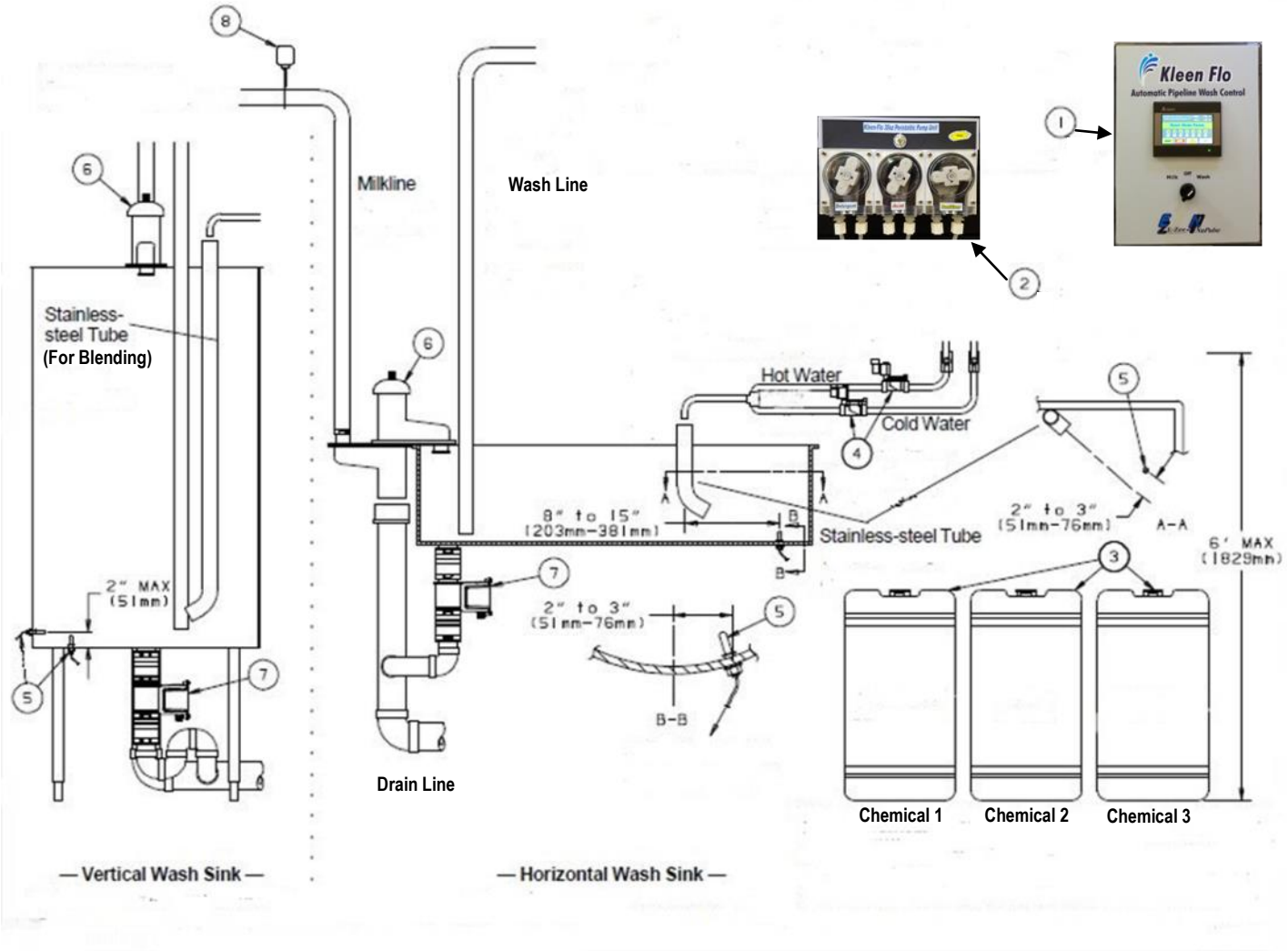


Cycle 7 Sanitize



System Layout

Sink System



1) Kleen Flo Wash Controller
2) Peristaltic Pump Unit or Bender 9740 3-Jar Unit
3) Chemical Drums
4) Water Valves
5) Wash Temperature Probe
6) Diverter 1 Valve
7) Drain Valve
8) Whisker Safety Switch for Swing Pipe

Installation

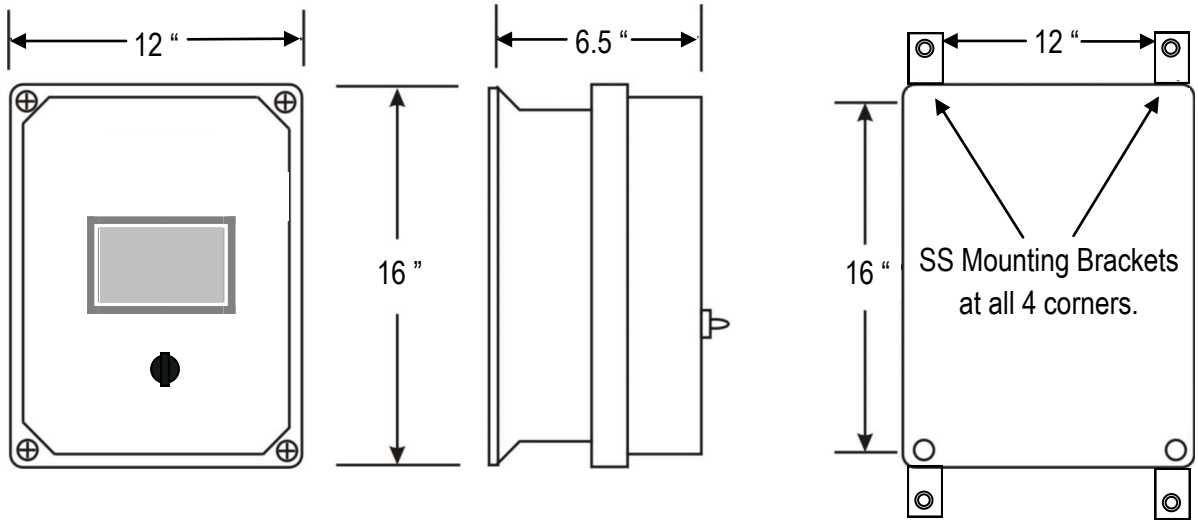
Location

Choosing a location is important. Do not mount Kleen Flo Wash System near the sink in order to keep the water or steam away from the Controller.

This is the system's master controller, so choose a location that allows easy access for the operator.

Mounting

The Kleen Flo Wash Controller is enclosed in a plastic enclosure. On the backside, there are four stainless steel mounting brackets that will need to be turned out and positioned to allow mounting to the wall.



Physical Dimensions

- » Allow 6" above, below and in front of the controller for cooling air circulation.
- » Cable access may be from the bottom or from very bottom of either side of the enclosure.
- » Do not allow any conductive material to enter the enclosure or damage may result.
- » The controller should be located in a vibration free environment.
- » The operating temperature range is 32º F to 104º F. Do not mount the controller in direct sunlight, on hot surfaces, near heat producing equipment or over the sink or vat.
- » Mount controller vertically.
- » Power should be left on continuously to controller unless performing service. This aids in keeping the electronics dry.

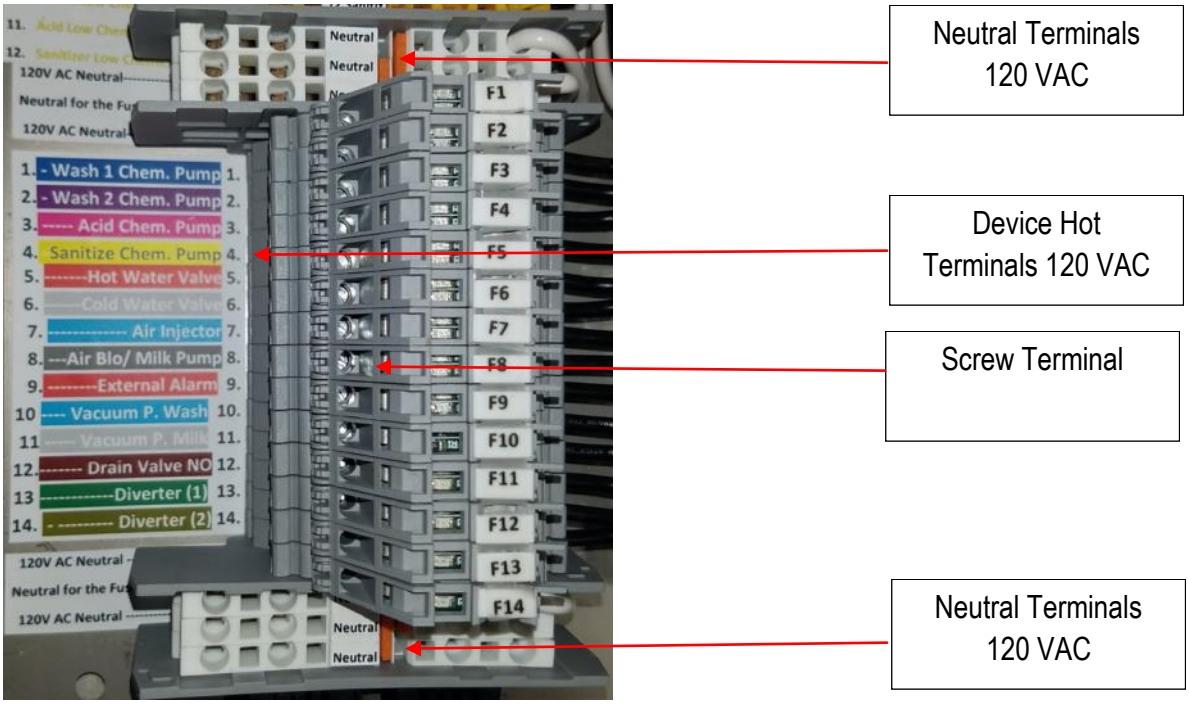
Main Power

The provided Surge Protector should be used for any extended use and is mandatory to install on the final Installation. The flat rotating power plug makes it easy to install in sealed flip-up AC outlet cover available at most electric stores. (Note the flip-up AC outlet cover should be one that covers BOTH power plug and surge protector. The 120VAC 15 amp service provided at installation should be dedicated for the Wash Controller ONLY.)

Use the Surge Protector provided and install it as shown.
The flip-up AC outlet cover should be one that covers BOTH power plug and surge protector.
The 120VAC 15 amp service provided at installation should be dedicated for the Wash Controller ONLY.

Connecting Output Devices

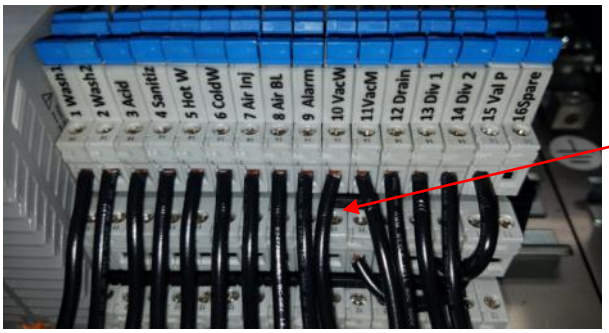
There are 14 fused 120 VAC outputs for the wash system devices to connect to as illustrated below. See Page 53 on more details on the connections.



Loosen terminal contact with a flat blade screwdriver. Then insert wire for device and connect other wire to device to a neutral terminal. See Page 10 on how to connect to the neutral terminal.

Vacuum Pump

Remove the black jumper fork on output of vacuum pump relays if you want a different vacuum pump 120VAC signal for Milk and Wash.



Drain Valve, Diverter Valve 1 and 2 Wiring

The Kleen Flo Wash Controller is Pre-wired for Normally Open (NO) Valves What this means is there will be no power to the valve when the Kleen Flo Controller's Main Switch is in the OFF position or in the MILK position. All these valves will be set to the Drain position.

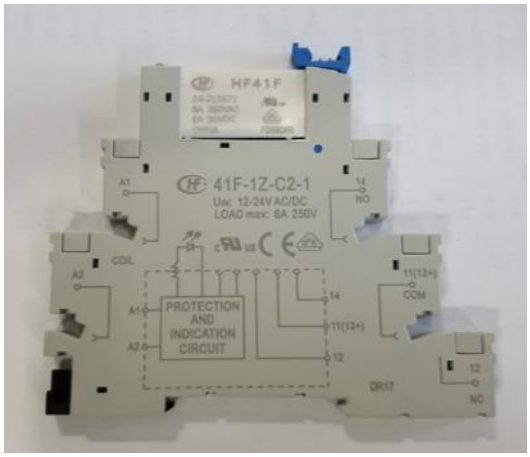
Drain Valve With the Main Switch in the WASH position, and after the **TOUCH SCREEN START** button is pressed, it will power the drain valve to close for fill of the wash sink / vat. After the Pressure Switch activates, set the timer for the amount of time (in seconds) to stay closed for the rest of the cycle.

Diverter Valves 1 & 2 In the WASH position and after the **TOUCH SCREEN START** button is pressed, no power is sent to the diverter valve to open it to recirculate during the Fill of the wash sink / vat. But after the Pressure Switch activates we can put in a delay time and program in a run time that to stay in the Recirculate the Wash Water then turn it off to Drain before the cycle end of the cycle. Also if a wash temperature probe is installed, the Diverter 1 will switch to drain if below the Low Wash Temperature Threshold *S*etting.

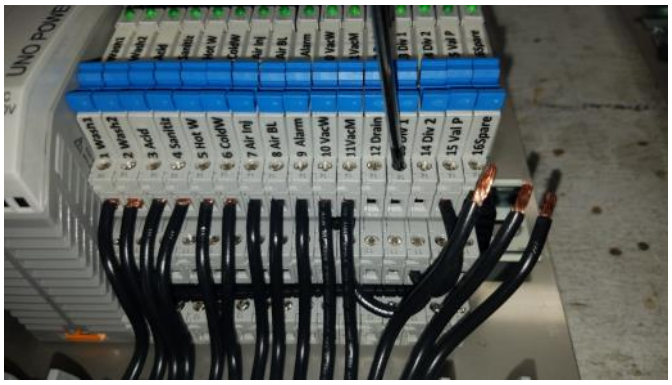
For Normally Closed Valves on a Milk / Wash Vat Receiver You will need to reconfigure the output wires on the relay (s) for the valve(s) from the Normally Open (NO) terminal to the Normally Closed (NC) terminal on that relay.

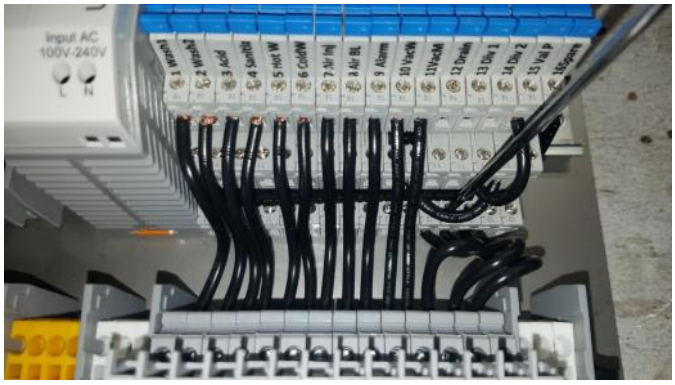
Relay shown at right.

.



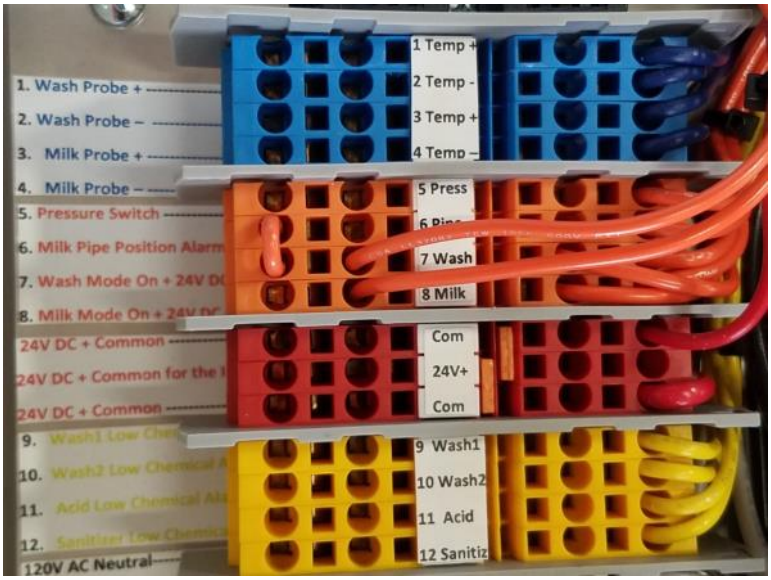
Remove from the Normally Open (NO) to Normally Closed (NC).





Connecting Input Devices

Connect the input devices into the input terminals as shown in the illustration below. See Page 10 on how to connect and Page 55 for more details on connections.



The orange and yellow inputs are looking for a connection from the 24(+)VDC red terminals to make the activation of the device.

The temperature sensors have an 18/2 cable that will connect + to + (White) and - to – (Black).

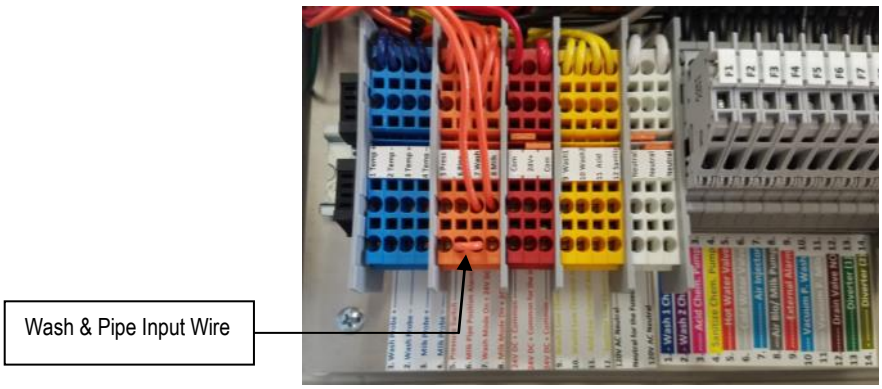
Safety Switch Connection

You will need to use a DPDT Switch like the E-Zee Milking Limit Switch Part #78495.

Wash Mode

The controller has an input for pipe in wash mode that currently has an orange jumper across it and the wash input terminals.

Remove this jumper and run a 4-conductor cable and connect to the limit switch's contact that makes them connect for the WASH position of the milk pipe. Then connect these to where the jumper was removed on the pipe and wash inputs.



Milk Mode

For Milk Mode you will disconnect the orange wire shown in picture below from the milk input terminal.

You will then insert from the 4-conductor cable one of the remaining pair of wires to the milk input terminal you just removed the orange wire from. Then connect the other remaining wire to the loose orange wire. This orange wire feeds the 24(+)VDC to the milk vacuum pump relay coil in the controller.

Connect the remaining pair of wires at the limit switch to the terminals that make them connect for the milk pipe when in the MILK position.

Wash Probe Temperature Sensors

Refer to the system layout diagram on Page 39 to see where the thermocouple should be installed.

The wash sensor thermocouple comes with a 4-ft lead that connects to a transmitter puck mounted in a waterproof enclosure. This transmitter takes the thermal couple temp signal and converts it to a 4-20Ma signal to wire over to the Kleen Flo Wash Controller. See the diagram pictures below on how to wire them.

Various accessories are required for proper operation of the Washer system. Of particular importance for proper control of the water temperature when filling the sink are the size of the water solenoid valves, relative to the sink size (see table below), and the location of the temperature sensor and the water outlet as shown on Page 39.

Recommended Size of Water Solenoid Valves - Sink Volume Sizes with Valve Sizes

18 to 29 Gallon	***1/2 or 3/4 inch***
39 to 48 Gallon	***3/4 inch***
57 to 132 Gallon	***1 inch***
166 Gallon	***1-1/2 inch***

For best temperature control, the sink should fill in 5 minutes. This fill time will allow the temperature sensor and water valves (usually taking 3 to 5 seconds to turn off) to respond to the temperature changes.

Temperature Sensor

Drill an 11/16" (17.5 mm) hole in the wash sink (directly in the bottom of vertical sinks, offset 2" to 3" from the bottom center line in horizontal sinks) where fill water will enter the sink.

Remove burrs from the hole. Then insert the temperature sensor in the hole from inside the sink. Tighten the nut to compress the gasket and to seal the hole. Do not over tighten it. Wire this accessory to the Wash 4-20mA Temperature Transmitter shown below

The valves listed above are sized to meet that fill time in systems with low flow rate and about 6 feet of outlet pipe. Systems with high flow rate may require a restrictor to limit water flow. The restrictor may be partially-closed water valves or a separate device installed on the water-supply line either before each water solenoid valve or after the tee on the outlet pipe. (Note that filling the sink faster than 5 minutes may leave the sink 5 to 10 degrees colder or hotter than the desired fill temperature when the fill switch closes.)

To ensure that water and chemicals will blend properly and that the temperature of blended solutions will be accurately
sensed, provide water-supply lines whose outlet ends as shown on Page 39. Then, provide a stainless steel pipe with a 45° bend aimed the way as shown so to direct water to the bottom of the sink near the temperature sensor.

After determining the valve size and providing proper piping to the sink, install accessories as shown on Page 39.

Water Solenoid Valves

Water solenoid valves automatically regulate the flow of hot and cold water according to temperatures you program at the
washer. Either install one in each water-supply line (as shown) or at the faucets. If installing them at the faucets, use garden hose-to-NPT adapters.

When routing water lines place the cold water lines under the hot water line. This prevents condensation from dripping on the hot water valve and causing a failure.

NOTE: When routing water lines, place the cold water lines under the hot water line. This prevents condensation from dripping on the hot water valve and causing a failure.

Calibrating the Wash Temperature Sensor

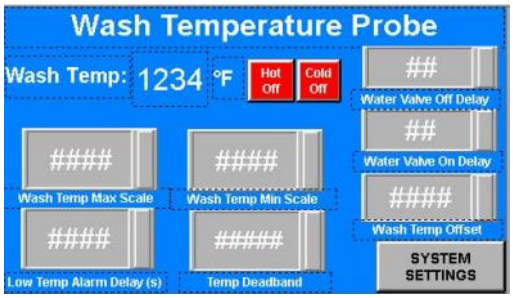
To ensure that water dispenses into the sink at set temperatures, calibrate the temperature sensor with a thermometer (known to be accurate) as follows:

1. Put about 3 to 6" of warm water in the sink, allow the water temperature to stabilize for about 5 minutes, then measure it with the thermometer.

2. If the temperature shown in the display's *Wash Temp S*creen does not match the actual temperature, RETURN through the menu to the System Settings to the Wash Temperature Probe Calibration and change the "Wash Temp Offset " value.

3. Enter the difference between the temperatures (For instance, if the displayed temperature is 76°F and the actual temperature is 81°F, resulting in a difference of 5°, you would choose the '5'.)

Water Valve Off Delay
This delay smooths out the Off Activation to stop Water Valve Pulsing. This is factory set at 6 seconds.



Water Valve On Delay
This delay smooths out the On Activation to stop Water Valve Pulsing. This is factory set at 6 seconds.

Wash Temp Max Scale
This is the Maximum temp range setting. If using a Wash Temp Probe, it should be set to 220° F to match our Wash Temperature 4-20mA Transmitter Setting.

Wash Temp Min Scale
This is the Minimum temp range setting. If using a Wash Temp Probe, it should be set to 0° F to match our Wash Temperature 4-20mA Transmitter Setting.

Low Temp Alarm Delay
This will allow you to delay the Low Temp Alarm during the Sink Fill so everything can warm up in the sink. This is factory set at 120 seconds.

Temp Dead Band
The tolerance at which the washer holds both the Hot and Cold-Water Valves on together while the sink fills. The factory setting is 10° F which will keep both valves on at +/- 5° F of the Formula Cycle Fill Temp settings.

The following settings are found in the Formulas:

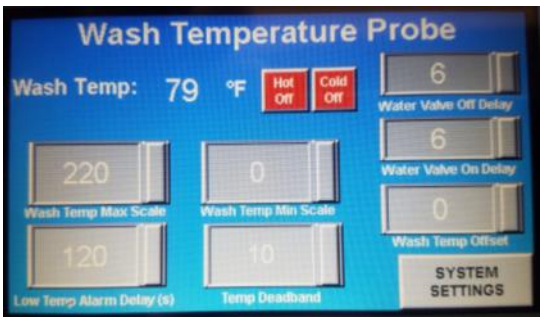
Cycle Fill Temperature
The desired temperature of water as it fills the sink. This is found in each of the Formulas and for every Cycle. For a Temperature Fill to work both Water Valves must be selected in the Formula. (NOTE: It is best to set this a little higher than target TEMP.)

Cycle Low Temperature Setting
A temperature somewhat lower than Fill Temperature, and will activate an alarm if water drops below this. A reasonable setting is 10° to 15° F below Fill Temperature on most cycles. Set this temperature setting to when you want to send the Divert 1 to drain if the Temp drops below this setting. The Formula Cycles that are using the Diverter 1 for Recirculation are the ones you wish to have this go to drain at the selected temp. Formula Cycles where you do not want an Alarm to activate should be left set at "0". *(Example: Hot Wash Fill Temp is set to 160 F° and Low Temp is set to 110 F°.)*

***IMPORTANT:* If using Temperature Probes for Fill, make sure both a Hot and Cold-Water Valve is selected in each Formula for the Cycles you wish to Regulate the Precise Temperature on Filling the Vat.**

The Kleen Flo Wash Controller will need to have the following settings programmed depending on if it does or does not have a Temp Probe installed. Refer to Pages 27-30 for details on the Formula settings.

System Settings with NO Wash Temp Probe



System Settings with a Wash Temp Probe

Formula Settings with NO Wash Temp Probe

Formula Settings * with a Wash Temp Probe

Formula Settings with NO WashTemp Probe

Formula Settings * with a Wash Temp Probe

*** NOTE: These can be set to temperatures you want rather than just using the suggested ones shown here.**

Milk Probe Temperature Sensor

The milk sensor thermocouple comes with a 4-ft lead that connects to a transmitter puck mounted in a waterproof enclosure. This transmitter takes the thermocouple temp signal and converts it to a 4-20Ma signal to wire over to the Kleen Flo Wash Controller. See the diagram pictures below on how to wire them.

Milk Temperature Sensor

Clamp the Milk Temperature Sensor to the Output side of the Milk Plate Cooler Outlet. Insulate it with foam to encase it so it will not fluctuate the Temperature from outside air on that Pipe location. Wire this accessory to the Wash 4-20mA Temperature Transmitter shown below

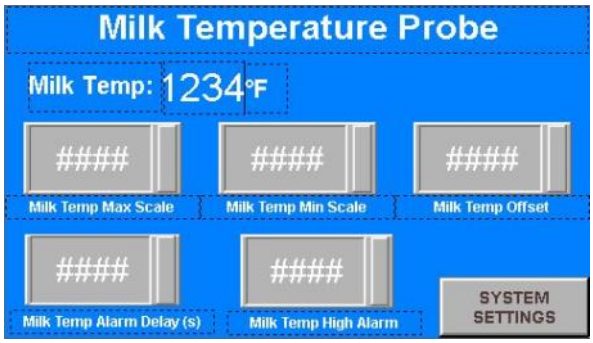
Calibrating the Milk Temperature Sensor

You can calibrate the temperature sensor with a thermometer (known to be accurate) as follows:

1. Run a Cold Water Wash Cycle measure it with the thermometer at the return Line to the Sink.

2. If the temperature shown in the display's *Milk Temp* Screen does not match the actual temperature, RETURN through the "Menu" to the "System Settings" to the "Milk Temperature Probe Calibration" and change the "Milk Temp Offset " value.

3. Enter the difference between the temperatures (For instance, if the displayed temperature is 50°F and the actual temperature is 45°F, resulting in a difference of 5°, you would change it to " -5".)



Milk Temp Max Scale

This is the Maximum temp range setting. If using a Milk Temp Probe it should be set to 220° F to match our Wash Temperature 4-20 mA Transmitter Setting. This is factory set at 0° F when NO Temp Milk Probe is used.

Milk Temp Min Scale

This is the Minimum temp range setting. If using a Wash Temp Probe, it should be set to 0° F to match our Wash Temperature 4-20 mA Transmitter Setting. This is factory set at 20° F when NO Temp Milk Probe is used.

Milk Temp Offset

This is where you calibrate the Temperature if it is not correct. This is factory set at 0° F.

Milk Temp Alarm Delay

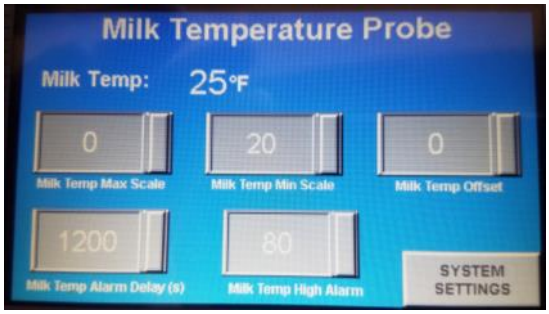
This will allow you to delay the Milk Temp Alarm during the beginning Until they have been Milking for a while and the Milk Pump Starts. This Timer starts the minute you switch the Main Switch to "Milk". This is factory set at 1200 seconds.

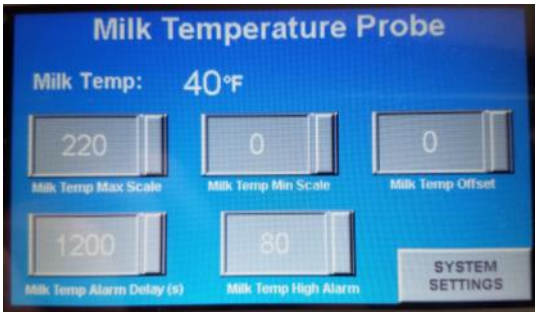
Milk Temp High Alarm

This is the Temperature you wish to have the Milk Temp Alarm at that there's an issue. This is factory set at 80° F.

The Kleen Flo Wash Controller will need to have the following settings programmed depending whether or not a Temp Probe is installed.

System Settings with No Milk Temp Probe





System Settings with a Milk Temp Probe

Optional Connections

Additional Relays must be ordered separately for these Optional Connections and can be added to the Kleen Flo Wash Controller's din rail to the right of Relay #16.

Plate Cooler Cold Water Valve - Milk Switch Input Orange Terminal #8 - 24VDC(+) and a 24VDC(-).
Milk Pump VSD to Wash - Wash Input Orange Terminal #7 - 24VDC(+) and a 24VDC(-).
Pulsation On / Off - Vacuum Pump Fused Outputs Terminals #10 and #11 - and a Neutral.
IMPORTANT NOTE: You may need 2 relays if the vacuum pump jumper is removed.
Plate Cooler Hot Water - The Diverter 1 Fused Output #14 and a Neutral.

Available Relays for Optional Connections Above

» 24V AC/DC rated coil with 6 amp SPDT contacts (E-Zee Part #P29751NP)
» 120V AC/DC rated coil with 6 amp SPDT contacts (E-Zee Part #P29752NP)
» 12V AC/DC rated coil with 6 amp SPDT contacts (E-Zee Part #P29750NP)
» 220V AC/DC rated coil with 6 amp SPDT contacts (E-Zee Part #P29753NP)

Milk / Wash Receiver Systems - Making a milk pump not run during Wash Fill**.** We recommend having the relay(s) installed in the milk pump LLC / VSD enclosure.

Method 1

Connect a SPDT relay with 120 VAC coil in the milk pump controller box to the Kleen Flo vacuum pump for WASH. (Note: If using a separate vacuum signal for MILK, you will need to wire in another relay for connecting the probe for milking.)

On the relay, connect the run command wire of the probe to the milk pump to COM and then with the NO terminal, run it back to the run command terminal in the milk pump controller.

Method 2

If you have a separate milk and wash vacuum pump signal, you'll need two diodes and only one relay with a 24V coil SPDT.

You can use the spare relay in the Kleen Flo Wash Controller or connect a SPDT relay with 24VDC coil and mount it in the milk pump controller box to the Kleen Flo vacuum pump for WASH.

On the relay, connect the run command wire of the probe to the milk pump to COM and then with the NO terminal, run back to the run command terminal in the milk pump controller.

Put the two diodes into the "A1" terminal of this relay and solder the 18/2 (or smaller gauge) cable to them. Next run them back into the vacuum pump relays 10 & 11 and connect into the "A1" coil of those relays leaving the other wires in place sharing the same connection. The other wire in the cable will need to go to the black 24V- power terminal or terminal "A2" on those relays (24V-).

Optional Equipment - External Alarm

An External Alarm is an optional addition to your system which will sound an audible alarm and flash a strobe if Controller sets off an alarm.

- Available with bright Amber strobe (E-Zee Part #R35505NP) or Red strobe (E-Zee Part #R35506NP)
- 32 adjustable tones with volume up to 110 dB at 1 meter
- 2 tones from one alarm
- Base: 103mm tall, waterproof IP65 with PG16 entry
- Acoustical frequency range for the 32 tones is .4 to 3.0 KHz
- Temperature range is -10 C to 55 C
- White ABS plastic, polycarbonate lens
- IP54 with short base or IP65 with tall, surface-mount base
- 100 to 240VAC Input Adapter Base
- CE approval

Testing and Troubleshooting

Output Glossary

All outputs are factory wired to switch 120VAC to the external wash devices.

Chemical Dispensers

There are 4 chemical outputs available. There are no external timers needed since the dispensing timers are in the controller's formula cycles.

1	**Wash 1**	Usually the main Detergent is used on this output for Wash 1 cycle. If blending with chorine from the sanitizer output, use this output for the other chemical to mix with it.
2	**Wash 2**	This output is for a different detergent than Wash 1 cycle and is normally used in conjunction with the cycling feature on this washer. This makes it possible to use a cheaper detergent on Wash I cycle, but Wash 2 is used to run a better or different chemical at times to give a boost to prevent cleaning issues over time.
3	**Acid**	This output is reserved for the Acid cycle. The cycling feature of the controller will allow you to run a boosted amount or as Hot Acid Wash instead of Warm when set up as another formula.
4	**Sanitize**	This output is reserved for the Sanitize cycle. The 24-hour timer works in conjunction with this cycle.

Water Valves

5	**Hot Water**	This output will activate the water valve to turn on for the formula cycles it's selected for.
6	**Cold Water**	This output will activate the water valve to turn on for the formula cycles it's selected for.
7	**Air Injector**	This output powers the air Injector On / Off with the times set in this controller.
8	**Air Blow Valve / Milk Pump**	This output can run either an air blow valve or a milk pump run command (with an optional relay). The controller's End of Cycle Timer in each of the three formula cycles can be programmed for running this output after the very last timer (vacuum pump) has run to end the cycle. Also, an additional drain could be used to speed the drain time before the next cycle be-
9	**External Alarm**	This output can power on an external alarm device remotely to alert the operator of an issue. The controller's display will have the alarm showing and a press of a button will turn the current external alarm off and ready for the next one.

Vacuum Pumps

There is a jumper on the Output of the Relays tying both the Wash & Milk Activations together. Refer to Page 42 on it's removal for use on two different vacuum pumps or VSD signals like that of a Reflex System.

10	**Wash Vacuum Pump**	With the factory jumper removed, connect this output to the SECOND vacuum pump starter or the VSD for signal for wash.
11	**Milk Vacuum Pump**	If leaving the factory jumper installed and only needing one vacuum pump or VSD signal connect to this output. With the factory jumper removed, connect this output to the FIRST vacuum pump starter or the VSD signal for milk.

Drain, Diverter 1 & 2 Valves

12	**Drain Valve**	This output comes set up to run Normally Open (NO) valves, but can be configured to operate Normally Closed (NC) valves also. See Page 42 for information on how to configure for NC Valves.
13	**Diverter Valve 1**	This output comes set up to run Normally Open (NO) valves, but can be configured to operate Normally Closed (NC) valves also. See Page 42 for information on how to configure for NC
14	**Diverter Valve 2**	This output comes set up to run Normally Open (NO) valves, but can be configured to operate Normally Closed (NC) valves also. See Page 42 for information on how to configure for NC Valves.

If not using Diverter 2 output, but need to run a device during the running or circulation of cycle(s), you can use this output and program the cycle(s) in the Formula to come on when you wish and for how long.

White Neutral Terminals

These are for the common connections from the device you are wiring into the fused output terminals 1 thru 14. There are three rows of these terminals on each side of the fused outputs for a total of 21 available connections. These are pre–wired for 120 VAC devices.

Input Glossary

Temperature Probes 4-20 ma Inputs (Blue Terminals)

1	**Temperature Probe 1 +**	This input receives the signal from the 4-20 mA transmitter from the Wash Temperature Probe.
2	**Temperature Probe 1**	This input feeds the negative signal to the 4-20 mA transmitter from the Wash Temperature Probe.
3	**Temperature Probe 2 +**	This input receives the signal from the 4-20 mA transmitter from the Milk Temperature Probe.
4	**Temperature Probe 2**	This input feeds the negative signal to the 4-20 mA transmitter from the Milk Temperature Probe.

The following Inputs from Devices Only devices with Dry Contact Switches can be used (Orange Terminals).

5	**Pressure Switch**	This input, when switched on by a dry contact and the other leg of the device is connected to the red terminals, will send a 24VDC + Positive signal to activate which will shut off the water valves during the fill after the **START** button is activated during a *Wash* cycle.
6	**Pipe Safety SW**	This input, when switched on by a dry contact, and the other leg of the device is connected to the red terminals, will send a 24VDC + Positive signal to allow you to wash when the Main Control Switch is in the *Wash* position. When the same switch contact is open, it will activate the *Check Milk Pipe* Alarm. This indicates that the milk pipe is not set up for *Wash* and this will NOT allow you to start the *Wash*. You need to use a DPDT limit switch like E-Zee Milking Part #78495 on the other contact for *Milk* mode.
7	**Wash Mode**	This output is the controller's Milk / Off / Wash Switch and is connected from the factory. You can remove those wires and wire in a remote Milk / Off / Wash Switch. It also can be used to run external signals to relays with 24VDC coils to control other devices that need to know when in Milk, Wash or Off.
8	**Milk Mode**	This output is the controller's Milk / Off / Wash Switch and is connected from the factory. You can remove those wires and wire in a remote Milk / Off / Wash Switch. It also can be used to run external signals to relays with 24VDC coils to control other devices that need to know when in Milk, Wash or Off.

Red Common 24VDC Terminals

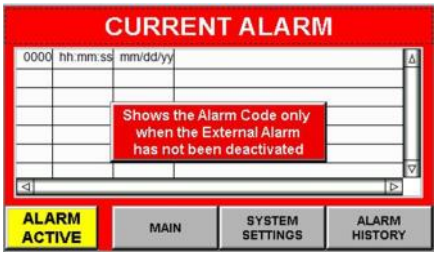
There are 11 available red Terminals for connecting the other leg of the devices you connect to the orange and yellow terminals. Use this common connection to use with Pressure SW, Pipe SW, External Milk & Wash SW and the Low Chemical Alarm Probe SW.

Low Chemical Alarms Inputs from Devices with Dry Contact Switches only can be used. (Yellow Terminals)

9	**Wash 1 Low Chemical**	This input, when switched on by a dry contact like in the E-Zee Milking Low Chemical Alarm Probe #40116NP. When one leg to the device is connected to the red terminals, it will send a 24VDC + Positive signal to activate an Alarm for *Wash 1 Low on Chemical* on the other leg.
10	**Wash 2 Low Chemical**	This input, when switched on by a dry contact like in the E-Zee Milking Low Chemical Alarm Probe #40116NP. When one leg to the device is connected to the red terminals, it will send a 24VDC + Positive signal to activate an alarm for *Wash 2 Low on Chemical* on the other leg.
11	**Acid Low Chemical**	This input, when switched on by a dry contact like in the E-Zee Milking Low Chemical Alarm Probe #40116NP. When one leg to the device is connected to the red terminals, it will send a 24VDC + Positive signal to activate an alarm for *Acid Low on Chemical* on the other leg.
12	**Sanitize Low Chemical**	This input, when switched on by a dry contact like in the E-Zee Milking Low Chemical Alarm Probe #40116NP. When one leg to the device is connected to the red terminals, it will send a 24VDC + Positive signal to activate an alarm for *Sanitize Low on Chemical* on the other leg.

Alarms & Alarm History

During an Active Alarm the *Current Alarm* Screen will come on and display a code description of what's wrong.



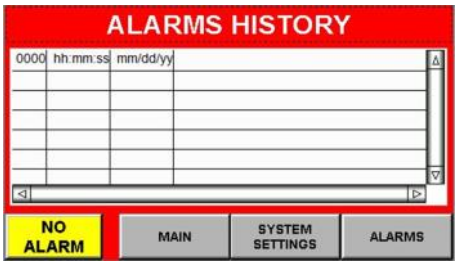
An Active Alarm will pop up on the *Main* Screen as shown at right. The 0000 line will display date and time the alarm occurred and what caused it to be tripped. Also, the **ACTIVE ALARM** button will flash yellow / blue and the external output for the audible / flashing strobe will sound off.

Touching the **ACTIVE ALARM** button will shut off the external alarm. The active alarm will disappear from the *Current Alarm* Screen, then an XXXX line will appear in the *Alarm History Window Level 4*, showing when the alarm was acknowledged.

If a second alarm is active, it will not show up until the first alarm is acknowledged and is removed from the *Current Alarm* Screen. Then when you press the **ACTIVE ALARM** button to deactivate it, and if another alarm is present, it pops up on the *Current Alarm* Screen and so on each time you press the button if further alarms are present.

If the screen is blank and no codes are shown, it's because the alarm has been deactivated from the *Current Alarm* Screen. If the **ACTIVE ALARM** button is flashing, the *Alarms History* Screen will show a list of the most recent alarms.

At any time, you can view what alarms occurred by pressing the **ALARMS HISTORY** button to display the last 100 alarms.



If the yellow button at bottom left shows as a **NO ALARM** button, the alarm is not active and the problem went away.

The *Current Alarm* Screen will remain until you exit or return to the *Main* Screen to alert you that an alarm took place.

There are 12 possible Alarm Codes which can appear on the Controller. See following page for Possible Causes and Actions to be taken.

1	**Check Milk Pipe**	7	**Sanitize Low On Chemical**
2	**Wash Temperature Too Low**	8	**Pressure Switch On**
3	**Milk Temperature Too High**	9	**All Formulas are Set at Zero**
4	**Wash 1 Low On Chemical**	10	**Water On Too Long**
5	**Wash 2 Low On Chemical**	11	**Wash Temp Sensor Failure**
6	**Acid Low On Chemical**	12	**Milk Temp Sensor Failure**

#	Alarm Message	Possible Cause	Action
1	CHECK MILK PIPE	1. Switch not installed, but will be used. 2. Switch is not activated. 3. Switch is not wired properly. 4. Switch is faulty. 5. Switch will not be used, but Jumper not in.	1. Remove Orange Jumper & install Limit Switch. 2. Correct milk line position. 3. Inspect wiring. 4. Replace switch. 5. Install Orange Jumper in Pipe to Wash Input.
2	WASH TEMPERATURE SENSOR FAILURE	1. Sensor was not installed, but will be used. 2. Sensor not enabled for Wash. 3. Sensor is open (or shorted).	1. Disable Sensor Input (See Page #___). 2. Install Temp Sensor and enable as per Page #__. 3. Inspect wiring. Replace sensor.
3	MILK TEMPERATURE SENSOR FAILURE	1. Sensor was not installed, but will be used. 2. Sensor not enabled for Wash. 3. Sensor is open (or shorted).	1. Disable Sensor Input (See Page #___). 2. Install Temp Sensor and enable as per Page #__. 3. Inspect wiring. Replace sensor.
4	FILL SWITCH STILL ON	1. Switch closed before fill started. 2. Switch is faulty. 3. Switch stayed closed.	1. Inspect wiring. 2. Replace switch. 3. Replace switch.
5	OVER FILL OF WASH SINK	1. Fill Time Alarm time was set too short. 2. Water valves are not working properly. 3. Fill Switch not activating. 4. Water Supply issue.	1. Change setting to longer time. 2. Inspect wiring to valves. Use Test Mode. 3. Replace or repair Fill Switch. 4. Inspect water-supply system.
6	WASH TEMP TOO LOW	1. Cycle Fill Temp set too high. 2. Cycle Low Temperature was set too high. 3. Diverter 1 Timer set too long for Chemical Cycle. 4. Water is not hot enough. 5. Not holding water.	1. Change setting to lower temperature. 2. Change setting to lower temperature. 3. Change setting to shorter time. 4. Check hot water supply. 5. Check Drain Valve.
7	MILK TEMP TOO HIGH	1. Alarm Temp Set too low. 2. Plate Cooler water off. 3. Milk not cold enough. 4. Milk Temp Alarm Delay set too short.	1. Change setting. 2. Turn on Plate Cooler Water. 3. Check Cold water supply to Plate Cooler. 4. Check Milk Temp Alarm Delay and set longer.
8	WASH 1 LOW ON CHEMICAL	1. Out of Chemical in that Drum. 2. Chemical Probe is laTemphed on or stuck.	1. Replace Chemical Drum or refill it. 2. Replace or repair Chemical Probe.
9	WASH 2 LOW ON CHEMICAL	1. Out of Chemical in that Drum. 2. Chemical Probe is laTemphed on or stuck.	1. Replace Chemical Drum or refill it. 2. Replace or repair Chemical Probe.
10	ACID LOW ON CHEMICAL	1. Out of Chemical in that Drum. 2. Chemical Probe is laTemphed on or stuck.	1. Replace Chemical Drum or refill it. 2. Replace or repair Chemical Probe.
11	SANITIZER LOW ON CHEMICAL	1. Out of Chemical in that Drum. 2. Chemical Probe is laTemphed on or stuck.	1. Replace Chemical Drum or refill it. 2. Replace or repair Chemical Probe.
12	ALL FORMULA CYLES ARE SET AT ZERO	1. Check Formula Settings are not at “0”.	1. Must have a Wash Formula Programmed & enabled.

Function Testing

See Page 11 for Function Testing details.

Output Device Malfunction

Fused Output Terminals

If a device for any of the Kleen Flo Wash Controller connections has failed, go to the *Menu* Screen and select the *Output / Input Viewing* Screen to open up the *System Test* Screen.

Open the Controller to see the fused outputs.

Now on the device output in question, press and hold that **OUTPUT** button to see if the fuse holder's red LED lights up.

If so, the fuse is blown but that device should be checked for a short or be replaced before replacing the fuse.

The following photos show how to flip up the top portion of the fuse terminal for access to replace the fuse, E-Zee #40137NP - Cartridge Fuse 250V 5A 5x20mm Fast Acting.

It is important to turn Power OFF to the controller when replacing the fuses.

Relays for the Devices

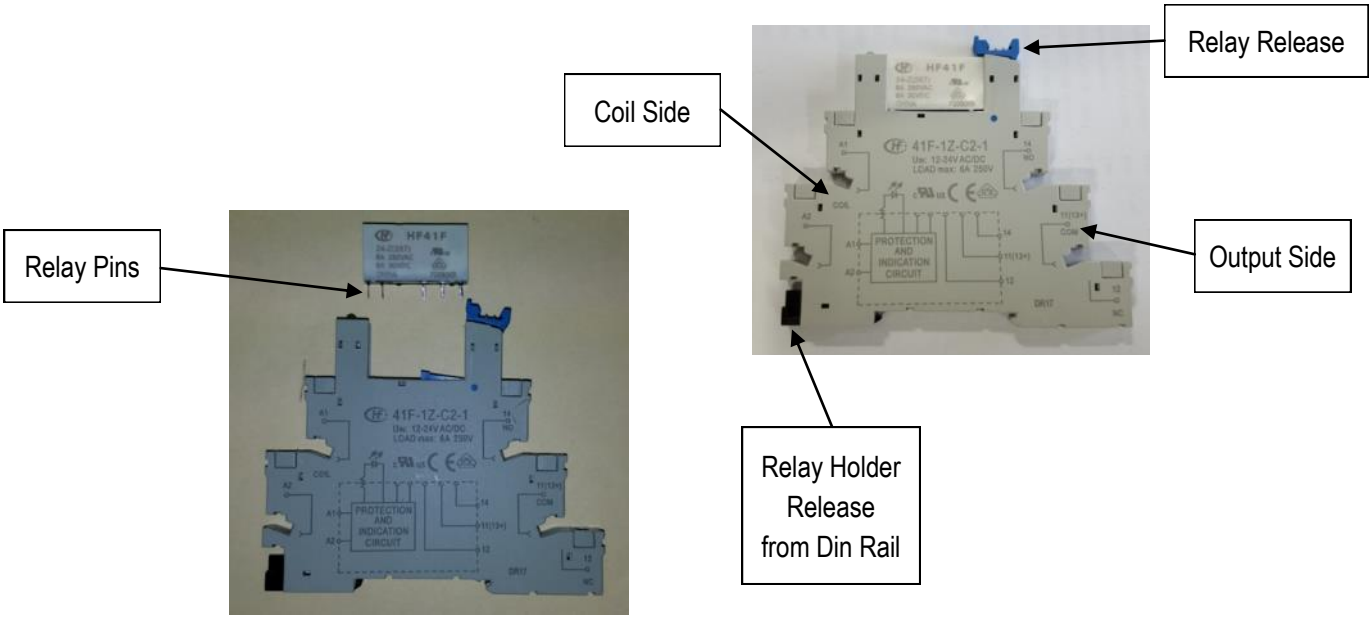
If the fuse is not blown, there is a possibility that the relay for the device is bad. Measure that there is output voltage present when the device is active (On). Refer to next page for more info on these relays.

Relay Outputs

There are16 relays and 14 of them are wired for 120 VAC outputs for the wash system. Relay #15 Val P (valve power) is wired to kill power to the outputs during the *Milk* mode for the Drain Valve, Diverter 1 & 2 Relay Outputs. Relay #15 is only active during *Wash*. There is a spare #16 relay with a Common 24(-)VDC connected to its 24 volt coil. Relay #16 can be activated by wiring in a 24(+)VDC from another accessory device you'd like this relay to activate with. The output of relay #16 can be used as a dry contact switching a leg of power voltages from 12 thru 250 volts at 3 amps of power to the device to power it on. (Note: Relays are rated at 6 amps.)

Relays and their placement are shown at left.

All 16 relays are as shown below and include a quick release tab to make it easy to remove from the holder when having to replace a relay. They all have a green LED light to indicate the coil has been activated to switch the #11/13 COM (common) connection from the NC (normally closed) to the #14 NO (normally open) terminal. The relay coil A1 is pre-connected to the 24(+)VDC coming from the CPU / Output Module and the relay coil A2 is pre-connected to 24(-)VDC power from the system's power supply.



Make sure the relay contact pins are not bent and line up properly with the relay holder sockets.

Temperature Sensor Failure

Alarms at *Wash Temperature Probe Failure*

Check that the wash probe connections and the System Settings are set properly for the sensor. Refer to Page 48.

You can remove the wash sensor leads from the blue terminals in the Kleen Flo Wash Controller (1 & 2) and test the input with the test POT for *Wash.* Or, you can use a 1.5K resistor to see if it will read a temp around 160°F.

If the above tests ok, replace the sensor. If you have no replacement sensor with temperature sensor leads removed, program the System Settings *for Wash* to settings as shown on the three screens on left side of Page 48 for No Milk Temp Probe.

This will make the display read 25°F and allow the system to wash, but the *Temp Fill* will not work properly & *Low Temp* alarms will activate. They are found in the Formula Settings and would need to be re-set as shown on Page 48.

Alarms at *Milk Temperature Probe Failure*

Check that the milk probe connections and the System Settings are set properly for the sensor as shown on Page 50.

You can remove the wash sensor leads from the blue terminals in the Kleen Flo Wash Controller (3 & 4) and test the input with the test POT for *Milk.* Or, you can use a 3.9K resistor to see if it will read a temp around 40°F.

If the above tests ok, replace the sensor. If you have no replacement sensor with temperature sensor leads removed, program the System Settings for *Milk* to settings as shown on Page 50.

This will make the display read 25°F and allow the system to milk with no alarms.

Component Replacement

CPU and Output Module

Replacing the CPU / Output Module turn off power and detach the COM 1 Cable from the HMI Touch-Screen Display.

Remove the grey plug in connectors from the Modules Top & Bottom.

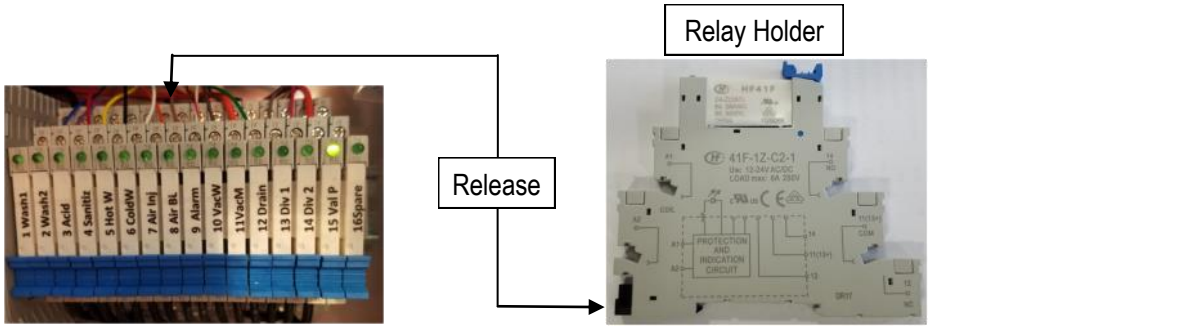
The CPU / Output Module can be removed from the din rail by releasing the 3 white tabs on the bottom side of the modules.

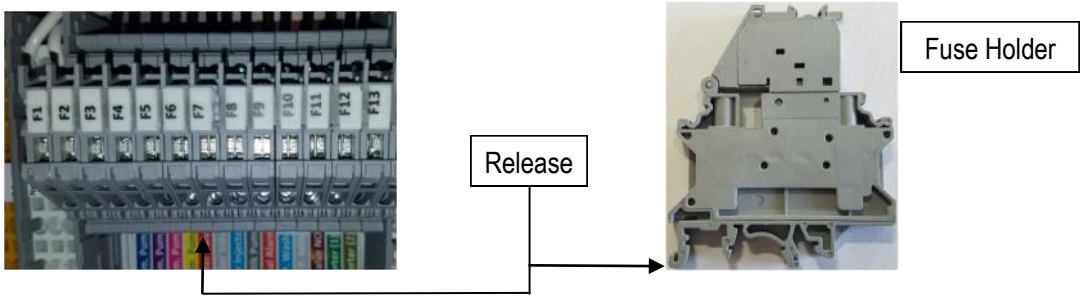
They pull down as shown at right.

The CPU and the Output Module can be separated by releasing the 2 white tabs.

Remember to have the Stop / Run Switch in the "Run" position on the replacement CPU if replacing it.

Relay and Fuse Holder Removal





Internal System Connections

Output Relay Coil Connections to the Delta CPU

	RELAY #	DELTA OUTPUT	WIRE COLOR
1	Wash Chemical 1 Pump	Y2 CPU	Blue
2	Wash chemical 2 Pump	Y3 CPU	Violet
3	Acid Chemical Pump	Y0 Output Module	Red
4	Sanitize Chemical Pump	Y1 Output Module	Yellow
5	Hot Water Valve	Y0 CPU	Black
6	Cold Water Valve	Y1 CPU	White
7	Air Injector	Y4 Output Module	Orange
8	Milk Pump / Air Blow V.	Y7 Output Module	Tan
9	External Alarm	Y4 CPU	White / Red
10	Wash Vacuum Pump	Y2 Output Module	Brown
11	Milk Vacuum Pump	None Milk / Wash Sw	Orange
12	Drain valve	Y3 Output Module	Green
13	Diverter Valve 1	Y5 Output Module	Gray
14	Diverter Valve 2	Y6 Output Module	Pink
15	Valve Power Wash Mode	None Milk / Wash Sw	Orange
16	Spare	None	

Internal Wiring

Input Terminal Connections to Delta CPU Inputs

TERMINAL #	INPUT	CPU	WIRE COLOR
1 & 2	Wash Temperature Sensor	24(-)VDC & CPU V10	Blue
3 & 4	Milk Temperature Sensor	24(-)VDC & CPU V11	Blue
5	Pressure Switch DPST	X0 CPU	Orange
6	Safety Switch Pipeline Position	X1 CPU	Orange
7	Wash Main SW	X3 CPU	Orange
8	Milk Main SW	X2 CPU	Orange
9	Wash 1 Chemical Low	X4 CPU	Yellow
10	Wash 2 Chemical Low	X5 CPU	Yellow
11	Acid Chemical Low	X6 CPU	Yellow
12	Sanitizer Chemical Low	X7 CPU	Yellow

	Wash Build Formula Timers Cycle 1 Pre-Rinse	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Pre-Rinse Wash Fill Temp** (what you want water temperature to fill at if both Hot/Cold Water Valves are selected)	25			
2	**Pre-Rinse Low Temp Alarm** (active only during fill of Sink/Tank set for temperature you want it to alarm too)	0			
3	**Pre-Rinse Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	300			
4	**Pre-Rinse Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	260			
5	**Pre-Rinse Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	240			
6	**Pre-Rinse Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	120			
7	**Pre-Rinse Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	180			
8	**Pre-Rinse End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
9	**Pre-Rinse Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
10	**Pre-Rinse Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			

	Wash Build Formula Timers Cycle 2 Wash 1	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Wash 1 Fill Temp** (what you want water temperature to fill at if both Hot/Cold Water Valves are selected)	25			
2	**Wash 1 Low Temp Alarm** (this is also the Diverter 1 temperature to automatically stop recirculation)	0			
3	**Wash 1 Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	600			
4	**Wash 1 Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	540			
5	**Wash 1 Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	480			
6	**Wash 1 Diverter Valve 1 Delay Recirculation** (this timer keeps diverter 1 power off so it sends wash water to drain)	120			
7	**Wash 1 Diverter Valve 1 Recirculation Time** (time to re-circulate after the diverter 1 delay timer expires)	360			
8	**Wash 1 Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	0			
9	**Wash 1 Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	0			
10	**Wash 1 End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
11	**Wash 1 Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
12	**Wash 1 Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			
13	**Wash 1 Chemical on Fill** (during water filling before fill level switch starts the cycle)	60			
14	**Wash 1 Delay Add Wash 1 Chemical** (after fill level switch starts the time to delay adding in more chemical)	120			
15	**Wash 1 Add More Wash 1 Chemical** (timer for adding more chemical after Delay Add Chemical timer has expired)	0			
16	**Wash 1 Sanitizer Chemical on Fill** (during water filling before fill level switch starts the cycle)	0			
17	**Wash 1 Delay Add Sanitizer Chemical** (after fill level switch starts the time to delay adding in more chemical)	120			
18	**Wash 1 Add Sanitizer Chemical** (timer for adding more chemical after Delay Add Chemical timer has expired)	0			

	Wash Build Formula Timers Cycle 3 Wash 2	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Wash 2 Fill Temp** (what you want water temperature to fill at if both Hot/Cold Water Valves are selected)	25			
2	**Wash 2 Low Temp Alarm** (this is also the Diverter 1 temperature to automatically stop recirculation)	0			
3	**Wash 2 Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	600			
4	**Wash 2 Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	540			
5	**Wash 2 Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	480			
6	**Wash 2 Diverter Valve 1 Delay Recirculation** (this timer keeps diverter 1 power off so it sends wash water to drain)	120			
7	**Wash 2 Diverter Valve 1 Recirculation Time** (time to re-circulate after the diverter 1 delay timer expires)	360			
8	**Wash 2 Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	0			
9	**Wash 2 Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	0			
10	**Wash 2 End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
11	**Wash 2 Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
12	**Wash 2 Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			
13	**Wash 2 Chemical on Fill** (during water filling before fill level switch starts the cycle)	60			
14	**Wash 2 Delay Add Wash 2 Chemical** (after fill level switch starts the time to delay adding in more chemical)	120			
15	**Wash 2 Add More Wash 2 Chemical** (timer for adding more chemical after Delay Add Chemical timer has expired)	0			

	Wash Build Formula Timers Cycle 4 Rinse 2	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Rinse 2 Fill Temp** (what you want water temperature to fill at if both Hot/Cold Water Valves are selected)	25			
2	**Rinse 2 Low Temp Alarm** (active only during fill of Sink/Tank set for temperature you want it to alarm too)	0			
3	**Rinse 2 Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	300			
4	**Rinse 2 Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	260			
5	**Rinse 2 Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	240			
6	**Rinse 2 Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	120			
7	**Rinse 2 Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	180			
8	**Rinse 2 End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
9	**Rinse 2 Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
10	**Rinse 2 Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			

	Wash Build Formula Timers Cycle 5 Acid Wash	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Acid Wash Fill Temp** (what you want water temperature to fill at if both Hot/Cold Water Valves are selected)	25			
2	**Acid Wash Low Temp Alarm** (this is also the Diverter 1 temperature to automatically stop recirculation)	0			
3	**Acid Wash Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	300			
4	**Acid Wash Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	260			
5	**Acid Wash Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	240			
6	**Acid Wash Diverter Valve 1 Delay Recirculation** (this timer keeps diverter 1 power off so it sends wash water to drain)	60			
7	**Acid Wash Diverter Valve 1 Recirculation Time** (time to re-circulate after the diverter 1 delay timer expires)	0			
8	**Acid Wash Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	60			
9	**Acid Wash Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	0			
10	**Acid Wash End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
11	**Acid Wash Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
12	**Acid Wash Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			
13	**Acid Wash Chemical on Fill** (during water filling before fill level switch starts the cycle)	60			
14	**Acid Wash Add Acid Chemical** (after fill level switch starts the time to delay adding in more chemical)	0			
15	**Acid Wash Add More Acid Chemical** (timer for adding more chemical after Delay Add Chemical timer has expired)	0			

	Wash Build Formula Timers Cycle 6 Rinse 3	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Rinse 3 Fill Temp** (what you want water temperature to fill at if both Hot/Cold Water Valves are selected)	25			
2	**Rinse 3 Low Temp Alarm** (active only during fill of Sink/Tank set for temperature you want it to alarm too)	0			
3	**Rinse 3 Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	300			
4	**Rinse 3 Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	260			
5	**Rinse 3Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	240			
6	**Rinse 3 Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	120			
7	**Rinse 3 Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	180			
8	**Rinse 3 End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
9	**Rinse 3 Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
10	**Rinse 3 Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			

	Wash Build Formula Timers Cycle 7 Sanitize Wash	DEFAULT Settings	Formula # 1 Settings	Formula # 2 Settings	Formula # 3 Settings
1	**Sanitize Wash Fill Temp** (what you want water temperature to fill at if both Hot/ Cold Water Valves are selected)	25			
2	**Sanitize Wash Low Temp Alarm** (this is also the Diverter 1 temperature to automatically stop recirculation)	0			
3	**Sanitize Wash Vacuum Pump Run** (use this also for maximum time for the Cycle to determine the rest of the timers settings)	300			
4	**Sanitize Wash Air Injector Run** (normally set for shorter time than the Vacuum Pump Timer)	260			
5	**Sanitize Wash Drain Valve Close** (closed on fill and the time after Fill Switch, normally set shorter time than Vacuum Pump Timer)	240			
6	**Sanitize Wash Diverter Valve 1 Delay Recirculation** (this timer keeps diverter 1 power off so it sends wash water to drain)	60			
7	**Sanitize Wash Diverter Valve 1 Recirculation Time** (time to re-circulate after the diverter 1 delay timer expires)	0			
8	**Sanitize Wash Diverter Valve 2 Delay Recirculation** (this timer keeps diverter 2 power off so it sends wash water to drain)	60			
9	**Sanitize Wash Diverter Valve 2 Recirculation Time** (or send to Holding Tank to use water elsewhere after the Delay timer setting)	0			
10	**Sanitize Wash End of Cycle** (timer for Air Blow Off or Milk Pump or Draining time before next cycle after last Timer expires in cycle)	5			
11	**Sanitize Wash Add Cold W** (add more cold water after fill level switch starts, works the Wash Temp Probe if installed)	0			
12	**Sanitize Wash Add Hot W** (add more hot water after fill level switch starts, works with the Wash Temp Probe if installed)	0			
13	**Sanitize Wash Chemical on Fill** (during water filling before fill level switch starts the cycle)	60			
14	**Sanitize Wash Add Wash 2 Chemical** (after fill level switch starts the time to delay adding in more chemical)	0			
15	**Sanitize Wash Add More Sanitize Chemical** (timer for adding more chemical after Delay Add Chemical timer has expired)	0			

Additional blank Build Formula Worksheets are available online or in Test Kit Software.

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