L5000Plus

Programming Guide

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Safety

These symbols on or inside the unit mean:

Use caution to avoid personal injury or damage to equipment.

Caution! Risk of electrical shock.

Always wear the required Personal Protective Equipment (including gloves and goggles that must be worn when potentially exposed to any hazardous materials and when carrying out hazardous work tasks). Turn the dispenser off during cleaning and note that parts may be contaminated with product. If possible, flush tubing out with water prior to carrying out any maintenance. For information on products that are used in this dispenser, please carefully read the product label and Material Safety Data Sheet (MSDS).

Disconnect all power to this unit before servicing. Electrical installation of this dispenser should only be performed by trained personnel in accordance with local electrical wiring regulations. Before working on this dispenser, isolate it from any electrical source and lock out/tag out.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Auxiliary enclosure ground wire must be connected to the right ground lug stud under the lock nut.

Trigger voltages must all be either above or below 42 VAC/60 VDC. Do not mix trigger voltages less than 42 VAC/60 VDC and greater than 42 VAC/60 VDC on the same unit.

Adding or replacing pumps, pump tubes or other components should only be performed by qualified personnel.

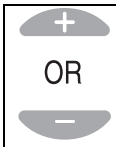
Grounding is required for safety. It also increases the dispenser's resistance to electrical noise. Failure to properly ground the system may cause the system to exceed emissions standards.

The ground wire must be no longer than the mains wires.

If wires are routed through holes, the holes must also be plugged using cable glands, conduit, etc.

L5000 Plus Programmer Keys

All programming, data retrieval, and system diagnostics are done from the programmer, using the following keys:

	+ or – keys change the value of the blinking number or letter. Pressing + and – simultaneously will change any alphanumeric character to “M”, and will change any numeric field to its minimum value.
	CURSOR key: Moves the cursor around the screen, changing which field is selected.
	ACTION key: Initiates an action such as priming. This button does not change settings.
	MENU key: Advances to the next menu screen.

Passwords

Passwords are used to control access to programming and technician levels of the system. The screens and functions of the L5000Plus are organized into 3 levels of access: Operator, Technician and Programmer

Operator level requires no password. The screen access of this level is limited to diagnostic screen viewing and formula selection.

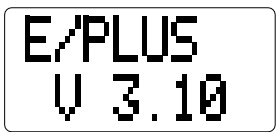
Technician level is accessed by entering the default password “123” (you can change this later with Programmer access) This level permits pump priming, viewing of formula count logs, viewing of pump run time and several diagnostic screens.

Programmer level is accessed by entering the default password, “890”. At the Programmer level, you will have complete access to all screens and features. This access includes the ability to change passwords. It cycles through the Technician screens before the Programming screens.

L5000Plus Programming Access Levels

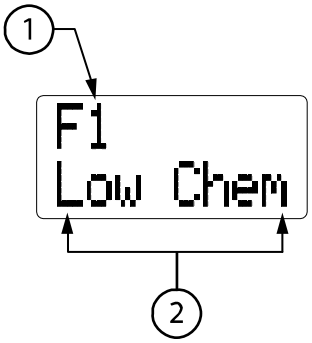
Operator-Level Access (no password entry required)

When you power up the L5000Plus, the software version of the programmer displays on the bottom line of the display. After that, the software version of the pump box displays for 2 seconds, along with the pump box selection “E/Plus” or “XL”, which displays for 2 seconds.



Then the Formula Select screen appears.

After the Power-Up screen disappears, the following screen appears:



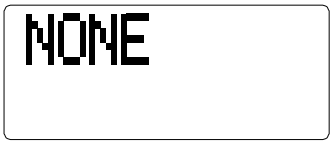
1. Name or number of formula most recently used.
2. Alarm conditions, if present.

Screen 0: Formula Select Screen

Pressing "+" displays the next formula (F2)*.

*When Automatic Formula Selection (AFS) is used, the programmer's "+" and "–" keys cannot be used to manually select the formula.

When AFS is in use, either at power-up after a formula has ended or when the T8 trigger has qualified but has not yet deactivated, END formula "F0" is active and the Operator-Level access screen will display "NONE" as the current formula selection until AFS selects a new formula. For more information about AFS, see "**Automatic Formula Selection**" in the **Programmer Level Access** Chapter under **"Setting Modes and Units of Measure"**.



Once you have programmed names to each of your formulas, this screen will display the 2-line name of the formula most recently used as shown in Screen 0. The exception to this is TAFS Mode, which displays "None" at power-up and then formula names as they are selected by triggers from the washer.

If an alarm condition(s) exists, the bottom line will alternately flash the alarm message(s) with the second line of the name of the formula most recently used. The top line name will not flash. For example, let's say you have a formula named "White Sheets", and Low Chemical and No Flow alarms occur. The top line will continue to say "White", while the bottom line will flash alternately between "No Flow", "Low Chem" and "Sheets".

If in Sequence Mode AND a sequence cycle is active AND the second line of the selected formula name is not blank, then the second line of the formula name will be displayed periodically on the bottom line of the LCD display, along with any alarm messages.

You can cancel alarm messages by pressing the ACTION key, or correcting the alarm condition. No-flow alarms will clear when the "End" pump runs. If a no-flow alarm is displayed continuously, you probably need to change the "End" pump setting. Pressing the ACTION key will only cancel the alarm displayed on the screen. You will need to press the ACTION key once for each separate alarm while the alarm message is displayed on the screen.

Alarm Messages

"Low Chem" Alarm

If you have connected a low-level sensor to the "Level" input on the pump box I/O board, a "Low Chem" message appears when the contact closure is closed. If you clear this alarm without correcting the low-

product condition, the alarm will again reactivate after 15 minutes. As the intent of the low-level alarm is to warn the operator that the product supply is about to run out, the L5000Plus will continue pumping despite the alarm.

"No Flow" Alarm
A no-flow alarm occurs when:

- An electrical or mechanical problem prevents a pump from working.
- In a system equipped with a flush manifold, flow is insufficient, or in the case of XL, water pressure exceeds 20 psi during a flush. The pressure is monitored during the entire feed process.
- If a no flow alarm occurs, the planned feed aborts. The dispenser will attempt to perform later feeds, aborting them if the no flow condition continues. Feeds will only start again when flow and pressure meet the requirements.
- A trigger is active for longer than 5 minutes in Smart Relay Mode. In this mode, each trigger has a 5-minute time limit. If a trigger is active for longer than 5 minutes, then the L5000Plus assumes that the trigger is "stuck", and a no flow alarm will occur. No more feed commands will be sent to the pump box for that trigger until the trigger turns off and then turns back on.
- The pump box detects that a pump has been running continuously for 5 minutes, at which point it turns off and a No Flow alarm is issued.

The "End" pump automatically clears any "No Flow" alarms. See **Assigning an End Pump** section for more information.

Hygiene Alarm
A Hygiene alarm occurs when wash water temperature fails to maintain the programmed minimum temperature for the programmed time duration required for a specific formula. For example, if hygiene codes require that wash water for a certain application be 85° Celsius (185° Fahrenheit) for 4 minutes, and the water temperature drops below 85° after 2 minutes, the Hygiene alarm message will appear at the end of the cycle. The dispenser will continue feeding normally during a Hygiene alarm condition.

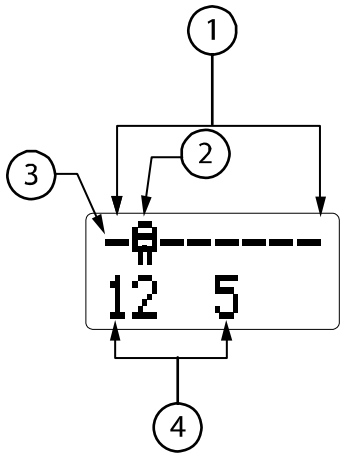
A Hygiene error will be logged if a Low Chem alarm occurs while a formula is running. In this case, both Hygiene and Low Chem alarms will be logged.

System Alarm
A system alarm indicates system components (trigger board, pump box, or programmer), cannot communicate.

System alarms cannot be cancelled. They will be cleared automatically by the system only when the fault is corrected.

Diagnostic Information (for Formula, Latched, TAFS and Smart Relay Modes)

When in Operator-Level access, pressing and holding the CURSOR key displays diagnostic information.



1. Indicates which pumps (1-8) are currently running.
2. Icon displays and spins when pump is running
3. Indicates an inactive pump (if flashing, pump is active but delayed).
4. Numbers indicate existing triggers. Flashing numbers indicate triggers are present but not qualified.

Screen 1. Diagnostic Information for Formula, Latched Smart Relay and TAFS Modes

Screen 1 shows an example of some system diagnostic information. From this screen, we can see that pump 2 is currently running, and pumps 1, 3, 4, 5, 6, 7 and 8 are not. Triggers 1, 2, and 5 are active, and triggers 3, 4, 6 and 7 are not.

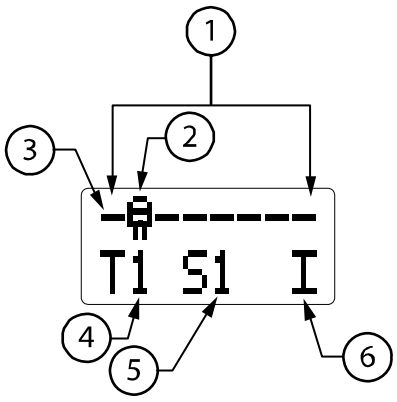
NOTE

If Automatic Formula Selection (AFS) is selected in Formula or Latched Modes, you can use this screen to verify that T8 is active even though it cannot be used for pump actions. For more information about AFS, see "**Automatic Formula Selection**" in the **Programmer Level Access** Chapter under **"Setting Modes and Units of Measure"**.

If a trigger is active, but not yet qualified, its number flashes. See **Trigger Qualification** sections for more information.

Diagnostic Information for Sequence Mode

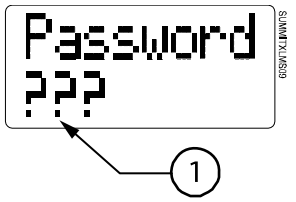
The status of the "Sequence" is displayed on the bottom line. For this example, the bottom line shows that trigger 1 (T1) is active, you are on step 1 (S1), and that the function of S1 is "I"(Ignore trigger). The other sequence status options are "E" for "End" a blank space for a delay or flush, or a pump icon if one or more pumps are running.



1. Indicates which pumps (1-8) are currently running.
2. Icon displays and spins when pump is running.
3. Indicates an inactive pump (if flashing, pump is active but delayed).
4. Trigger number (1-8)
5. Step number (1-16)
6. Sequence status ("I" for "ignore", "E" for "end" or a pump icon for a pump action).

Screen 1a. Diagnostic Information, Sequence Mode

Password Screen (to get to Technician or Programmer Level Programming)
Pressing and holding the MENU key for 5 seconds takes you to the Password screen. The default Technician-Level password is 123. The default Programmer-Level password is 890. See **Change Passwords** section for directions on setting passwords.



1. Represents value “000” until changed.

Screen 2. Password Screen

The bottom line will display “???” represents a value of “000” until you change it to your password.

Use the “+” or “–” keys to enter the correct number, and press the CURSOR key to navigate to the next number until you’ve entered the entire password. If you enter an incorrect password, you will return to Operator Level access.

Press MENU key to advance to the next level of menu screens.

Once in Technician or Programmer-Level access, holding down the MENU button for 5 seconds will send you back to Operator-Level access. To prevent the unit from being inadvertently left in Technician or Programmer-Level access, the screen returns to Operator access if no buttons are pressed for 15 minutes.

Technician-Level Access Screens (Technician or Programmer Password Entry Required)

L5000Plus will still respond to triggers in Technician-Level access.

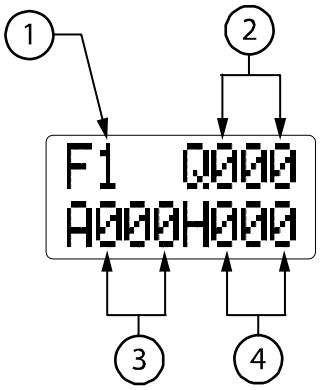
Prime Pumps

Select pumps 1 through 8 using the “+” or “–”keys. Press and hold the ACTION key to prime the selected the pump.

Screen 3. Prime Pumps

The displayed pump icon spins to indicate that it is priming. Press MENU key to proceed to next screen.

Formula Count



1. Formula number (F1-F16)
2. Number of times displayed formula has run
3. Total number of alarms issued for displayed formula
4. Total number of hygiene alarms issued to displayed formula

Screen 4. Formula Count Values

Screen 4 automatically updates to show the latest formula count values. The formula number (F) in the upper-left corner is selectable between 1 and 16 using the "+" or "–" keys. The letters Q, A, and H represent different formula count values as noted above.

To view the total count for all formulas, select "FAll".

Screen 4a. Counts for All Formulas

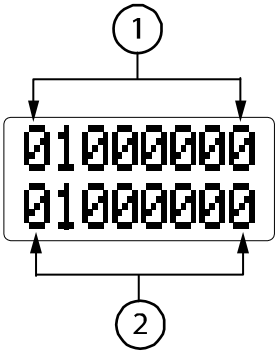
- A formula can only log one "A" and one "H" alarm for each time it runs.
- Alarms will not be logged if they occur between formulas in Sequence Mode.
- With Programmer-Level access, you can clear all logged counts for the selected formula by pressing and holding the ACTION key for 2 seconds.
- To clear formula counts for all formulas at once, go to Programmer-Level access and press and hold the ACTION key for 2 seconds.

In TAFS Mode, the formulas are logged as complete as soon as the dispenser receives the first batch transfer signal (See **L5000Plus Installation and Setup Guide** for TAFS Mode definitions).

Trigger Status and Counter

This screen can be used to view the current trigger state (active/inactive) of the supply trigger signals. It can also be used to "capture" trigger events that occur during the wash cycle. This screen automatically updates to show the latest trigger status.

This screen can also be used to log trigger counts for Sequence, TAFS and Formula Mode programming or to troubleshoot wrong or unwanted signals issued by the washer controller.



1. Active triggers (1-8)
2. Trigger counts (0-9)

Screen 5. Trigger Status

Trigger 1 is on the left and trigger 8 is on the right. Once a trigger's count has reached 9, it remains there until a new wash load begins. With Programmer-Level access, pressing the ACTION key resets the selected trigger's count to 0.

The Screen 5 example shows that trigger 2 is active, and that the remaining 7 are inactive. Trigger 2 has executed once, and the remaining 7 triggers have never executed.

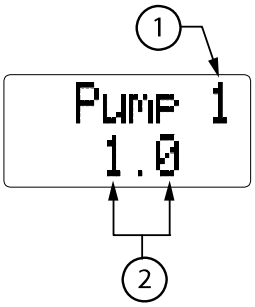
NOTE

For a trigger to be counted, it must meet the Trigger Qualification screen's criteria (See **Trigger Qualification, Screen 15**) for duration and voltage. If it doesn't, the L5000Plus will read the signal as electrical noise and disregard it.

Smart Relay Mode has no filter time, so the programmer will count triggers of any duration.

Pump Run Times

This screen automatically updates to show total run time for the selected pump.



1. Pump number (1-8)
2. Number of minutes pump has run in its lifetime (in minutes and tenths of minutes). The maximum value for this screen is 6500.

Screen 6. Pump Run Times

NOTE

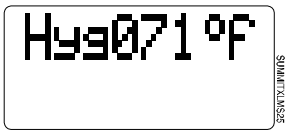
Because we test our systems prior to shipment, your L5000Plus might show a pump runtime value such as 0.1 instead of 0.0 at its initial power-up.

The pump run time data may be reset to zero (in Programmer-Level access only) by pressing and holding the ACTION key for 2 seconds.

Temperature Probe Reading

This screen only appears if at least one formula is set to use hygiene verification. This value includes the offset value entered in Screen 20. The screen shows current water temperature in real time so technicians can demonstrate compliance with health regulations to inspectors.

Fahrenheit is abbreviated as “f” rather than “F” because the upper case indicates Formula.



Screen 7. Temperature

The temperature is displayed as 000-099º C (if units are set to “ml” in Screen 8) or 032-210º F (if units are set to “oz” in Screen 8).

If no temperature probe is connected, “---” is displayed as the temperature.

Programmer-Level Access

From the password screen, enter the Programmer-Level access password (890). The following screens and functions will then be presented:

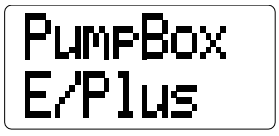
L5000Plus will not respond to triggers in Programmer-Level access.

Entering Programmer-Level access in TAFS Mode will reset the memory of which load classes are located in which tunnel module at that moment.

System Select

This screen allows you to change a PCB to be used in either an L5000Plus or XL, so the same spare can be used in either unit. Default setting for PCB is “E/Plus”, changeable to “XL” using the “+” or “–” key. The L5000Plus units will have this set to “E/Plus” and XL units will have it set to “XL” before shipment so you only need to use this screen with spares.

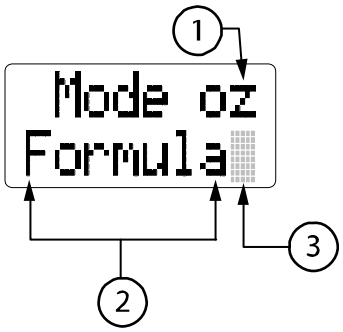
Once programmed, the selected pump box type will always appear on the programmer when you power-up.



Screen 7a. System Select

Never set up a Plus up as an XL, because the unit could draw too much power and reset, cancelling pump feeds. Changing the pump box size will reset all calibration values. Press and hold the “+” or “–” key for several seconds to change this setting.

Setting Mode and Units of Measure



1. Units of measure (“oz” or “ml”)
2. Trigger mode (Formula, Latched, Smart Relay, Sequence or TAFS)
3. AFS selection. Selectable values are A, B, C, D, E or F. Default is a blank field as shown (AFS not selected). See **Automatic Formula Selection (AFS)** below.

Screen 8. Setting Mode and Units of Measure

The Screen 8 example shows the units of measure set to “oz”, and the mode set to “Formula.” Because “oz” is the default unit of measure, press the “+” or “–” keys to select “ml”.

Press the CURSOR key to move to the bottom line and select trigger mode (Formula, Latched, Smart Relay Sequence or TAFS).

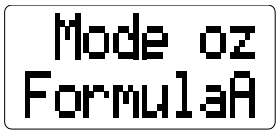
Press and hold the “+” or “–” key for 2 seconds to scroll between “Formula”, “Latched”, “Relay”, “Sequence” and “TAFS”.

Automatic Formula Selection (AFS)
AFS can be programmed from the Setting Modes and Units of Measure screen as shown in the Screen 8 example.

AFS allows the dispenser to automatically select the desired formula or load class based on the timing of electrical signals from the washer to trigger 8 (T8) on the TR-8000 L trigger module. **AFS is only available for Formula and Latched Modes**.

If you would like to use AFS, CURSOR to the character after “FORMULA” then press and hold the “+” or “-” for 5 seconds on each value (A-F) until you reach the desired value. The A-F values correspond to different timing schemes of other dispensers. This can make transitioning from a different dispenser to L5000Plus easier. See **Appendix C: Timing Schemes for Other Dispensers** to find the desired value.

If you are not replacing a dispenser (or are replacing one that is not on the chart in Appendix C), select the timing scheme that best corresponds to your desired scheme.



Screen 8a. Setting Modes and Units of Measure Screen with AFS (value “A”, Clax Revoflow) selected

Once you have selected “oz” or “ml”, all subsequent units of measure will be based on it.

DOSE VERIFICATION

When using a flush manifold, it is VERY important that you disconnect the discharge tube from it before starting the dose verification procedure. Dose verification ignores the presence of a flush manifold and if you attempt to run dose verification without disconnecting the discharge tubing from the flush manifold, chemical will enter into the manifold without water flushing, potentially creating a chemical--mixing hazard.

Dose verification allows you to verify accuracy of programmed pump volumes without starting the washer in Formula or Latched triggering modes. With the dose verification feature, you verify the dose by running the pump and catching the amount that flows out of the discharge tube of the pump.

Follow these steps to perform a dose verification:

1. Use a graduated cylinder or other measuring container.
2. Using the programmer, CURSOR to the desired pump number and volume for that formula (P110.0 on the screen below).
3. Ensure that the cursor is on one of the numbers of the displayed pump volume. For example, in Screen 8b below, you would want it to be on the “1” or the “0” of the 10.0 ounces.

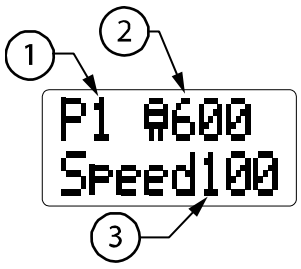
Screen 8b. Formula or Latched Mode Screen

4. Press and hold the ACTION key for 5 seconds to begin the selected volume dose. You must keep the ACTION key pressed during the entire verification time. Releasing the ACTION key in the middle of the dose verification process will automatically stop the pump.
5. Release the ACTION key when the desired volume of chemical has dosed into the measuring container. Look at the value on the screen and make sure it matches the volume in the container.

The resulting pump volume shown on the programmer screen is based on the current calibration of the pump. If the dose is inaccurate, the calibration for that pump may be the problem. Refer to **Pump Calibration** section.

Dose verification does not wait for delay times to elapse; the pump activates immediately.

Speed Control and Pump Size



1. Pump number
2. Pump size
3. Speed percentage

Screen 9a. Speed Control

We recommend reducing pump speed for viscous chemicals (such as built detergents). This will help to maximize dosing accuracy and tube life. Generally, if a chemical’s flow rate is 1/2 that of thinner

chemicals, we recommend reducing pump speed to 40%. If the flow rate is only 1/3 less than other chemicals, reduce the flow rate to 60%.

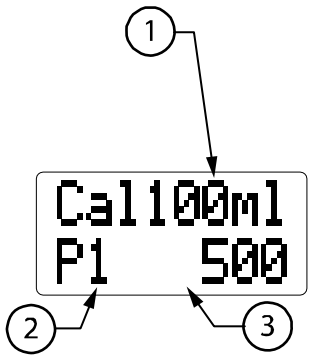
Always recalibrate after changing the speed because the flow rate can change.

The pump size is factory preset. You will not need to change it during installation. But if you change the size of a pump or add a pump, you will need to change it. To change the setting:

1. Select the pump number and press the CURSOR key to highlight the pump size.
2. Hold down the "+" or "–" key for two seconds. You can select a pump size of 100 or 600 Series.

Pump Calibration

L5000Plus pumps chemical based on volumetric calibration. This means that once you have calibrated the pumps, you will not need to adjust your formula for differing flow rates when changing chemicals or compensating for tube wear. In Smart Relay Mode, you will define the volumes you want to pump without having to use the calibrated flow rate in defining trigger on-time.



Screen 9. Calibration

1. Volume of chemical upon which calibration rate is based, up to 6500 ml/220 oz (default=either 100 ml/min or 4 oz/ min for 600 Series pumps, 30 ml/min or 1 oz/min for 100 Series pumps)
2. Pump number (1-8)
3. Calibration rate (default=100 ml/min or 3.4 oz/min for 100 Series pumps, 500 ml/min or 16.9 oz/min for 600 Series pumps).

Screen 9 shows that pump 1 (P1) pumps 500 ml (16.9 ounces) per minute, calibrated from a pump volume of 4 ounces. Calibration rate is displayed in the lower right corner. The calibration rate is displayed as xxxx if "ml" is selected, and xxx.x if "oz" is selected.

How to Calibrate L5000Plus Pumps

1. Position the end of the selected pump's discharge tube over measuring cylinder.
2. The volume to pump is shown on the top right of the screen: 100 ml (4 oz) for the 600 Series pump, 30 ml (1 oz) for the 100 Series pump.
3. Press and hold the ACTION key, collecting the calibration amount in a measuring cylinder. The calibration rate field is replaced with a spinning pump icon.
4. When the calibration amount has been pumped, release the ACTION key.

The new flowrate will be automatically calculated, displayed in place of the default setting, and saved to memory.

As you approach the desired amount, you may "nudge" the pump on and off one or two times, until the proper amount is pumped. Calibration is not "memorized" until you exit the calibration screen or change the pump number selection.

Try to get to the calibration amount within 2-3 presses of the ACTION key, because tapping the ACTION key repeatedly to pump the whole calibration amount will make the calibration inaccurate. If you have to press the ACTION key more than three times, it is best to change the pump number back, and recalibrate the ensure maximum accuracy.

If you do not run the pump long enough to create a realistic calibration value, "----" will be displayed. Press the ACTION key again to resume calibration.

If you overshoot the calibration amount, switch to another pump, and then switch back and repeat steps 1-4.

Creating Formula Names

L5000Plus lets you use both the top and bottom lines of the screen to name your formulas. The top line is called "Line 1" and the bottom line is "Line 2". Entering formula name data is not required for system operation.

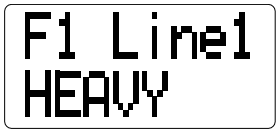
Screen 10a. Creating Formula Names, Line 1

You will begin by naming the top line of F1.

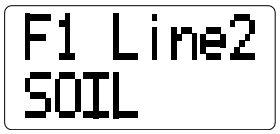
If the programmer language selected is Japanese, only Japanese katakana characters will be selectable.

"Line 1" flashes on the top line.

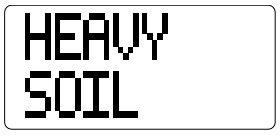
1. Use the "+" and "–" keys to change each digit of the bottom line.
2. Press "+" and "–" simultaneously to change the "F" to "M". Use the CURSOR key to advance to the next character.



3. CURSOR back to top line of the screen, and then press the "+" or "–" key to change to "Line 2", and repeat steps 2 and 3 to name the second line of F1.



Screen 10b. Assigning Formula Names, Line 2



Screen 10c. 2-Line Formula Name

4. Once you have entered the first formula name, press the CURSOR key to return to the top line.
5. Press the "+" key to enter the next formula (F2) name. Repeat steps 1 to 4 for all formulas.

Making Formulas Non-selectable

There is a simple method to prevent a specific formula number from being selectable, so formulas not being used are not displayed on the programmer.

1. Go to the Formula Names screen and CURSOR to one of the characters in the formula name.
2. Press and hold the ACTION key for 5 seconds. The formula name will change to blank characters and the formula will not appear in during formula runs.

Mode Programming

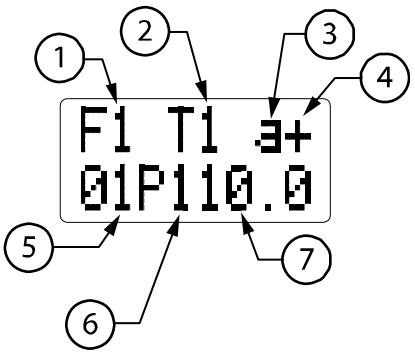
Only the selected Mode's programming screen will appear on the programmer.

When scrolling through the different Modes you must press and hold the "+" or "–" key for 2-3 seconds on each Mode until you reach the one you want.

Formula Mode Programming

In Formula Mode, you can program as many as 3 separate pump actions ("a", "b", and "c") for each trigger. Pump actions consist of a delay (bottom left of screen) and a pump amount (bottom right of screen).

Only triggers T1-T7 are available for pump actions.



Screen 11a. Formula Mode Programming

1. Current formula (F1-F16)
2. Current trigger (1-7)
3. Current pump action (a, b or c)
4. A "+" indicates "b" and/or "c" pump actions exist
5. Pump action delay (10-990 seconds, in 10-second units)
6. Current pump number
7. Pump volume (up to 6500 ml or 220 oz)

Screen 11a shows each Formula Mode programming element, with examples of programmed parameters. These parameters show that in Formula 1 we want trigger 1 (T1), to tell pump 1 (P1) to pump 10 oz of formula 1 (F1) after a 10-second delay.

The "+" to the right of the "a" indicates we have programmed T1 to initiate additional pump actions ("b" and/or "c").

1. Using the "+" and "–" keys, scroll to the formula (F1 to F16) that you will program.
2. CURSOR to the trigger (T) field, and scroll to desired trigger. Remember that T8 is not available for pump actions in Formula and Latched Modes.
3. CURSOR past the "a", and set pump delay time (if any) for pump action "a" in 10-second increments.
4. CURSOR to pump (P) number field and scroll to select the number of the pump that will perform pump action "a".
5. CURSOR to the pump amount field and select the volume of chemical for the pump to dispense following any delay programmed in Step 3.
6. Repeat steps 3-5 for pump actions "b" and/or "c" for selected trigger.

7. Repeat steps 2-6 for all triggers for selected formula.
8. Repeat steps 1-7 for all formulas.

Once a trigger is received and qualified (see **Trigger Qualification**), the pumps will initiate their assigned delays and actions whether the trigger stays on or not. If the trigger occurs twice, the pump will perform the action for the formula twice. Use Latched Formula Mode if you want the L5000Plus to only react to each trigger once per load.

Changing Formulas Mid-Cycle
This can be done in Formula or Latched Mode, but with the following stipulations:

- The current pump action will complete.
- You must change formula prior to basing any later pump actions on it. Because the last "End" pump is usually counted as formula completion, the new formula is the one that would be logged. An exception to this would be if the "End" pump setting was left as P1, and P1 ran prior to switching the formula name.

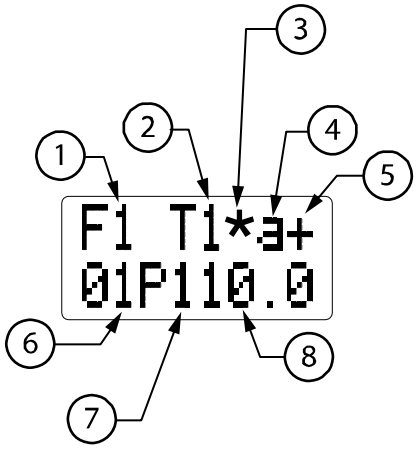
Latched Mode Programming

Latched Mode is the same as Formula Mode, except triggers are ignored or "latched out" after they have occurred once.

NOTE

You cannot use the Mainwash Hot/Cold fill option or the Add Prewash to Mainwash options in Latched Mode with AFS.

You will program the same as with Formula Mode, but you will also need to assign an "End" pump (See **Screen 12, End Pump Assignment**) so the L5000Plus knows when the formula has completed and can "unlatch" the trigger.



1. Current formula (F1-F16)
2. Current trigger (1-8)
3. Select "*" to add prewash feeds to main wash (default setting is blank)
4. Current pump action (a, b or c)
5. A "+" indicates that "b" and/or "c" pump actions exist
6. Pump action delay (10-990 seconds in 10-second units)
7. Current pump number (1-8)
8. Pump volume (up to 6500 ml or 220 oz)

Screen 11b. Latched Mode Programming

NOTE

For washers where the main wash trigger comes from either hot or cold solenoids, see the following section.

Some Notes On Latched Mode

- The "latch" function operates on the trigger signal. It will unlatch whenever the "End" pump's signal is received.

- If the "*" is selected (by highlighting the space with right arrow key and pressing "+" to select), it will be on for all formulas. It can't be turned on for some and off for others.
- If "*" is selected, T2 or T7 triggers both T1 and T2 pump actions (or just T2 if T1 has already occurred). If "*" is not selected, T2 or T7 triggers just T2.

If using AFS, you can select "F0" as the new "End" formula after a load has run. If you choose "F0", the next formula will be "NONE" until AFS selects a new formula. You can also select F1-16 as "End" formulas, but with AFS the default "End" formula is "F0". If you are not using AFS, the default "End" formula is the current formula number.

T2 and T7 are latched out after either signal is received, until the "End" pump signal is received.

Changing any "End" pump will reset all latches.

Smart Relay Mode Programming

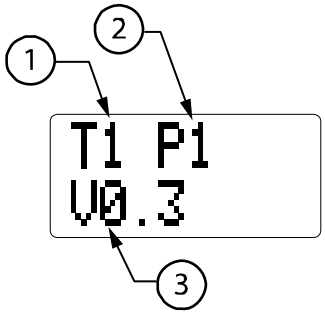
In Smart Relay Mode, size of the chemical dose is simply the call rate volume on the screen, multiplied by the number of seconds the trigger is on.

So, for a 177 ml (6-ounce) dose, use the default call rate of 60 ml (2.0 oz), and program a 3-second trigger from the washer. For a 592 ml (20 oz) dose, use the same 60 ml (2.0 oz) call rate and a 10-second trigger.

The advantage of programming chemical volumes as (call rate/trigger time) is that it makes the math easy. You don't need to factor in the calibrated flow rate, which varies from pump to pump. You only have to program chemical volumes using call rate and trigger time. The L5000Plus will calculate the actual pump run time based on the amount it has been instructed to pump and its calibrated flow rate.

Never use a trigger time of 1 second or less.

At lower call rates, the L5000Plus will pulse the pump on and off while pumping the programmed volume. To avoid this, use the default call rate of 10 ml (0.3 oz)/second with 600 Series pumps and 3 ml (0.1 oz) per second with 100 Series pumps. Preventing the pump from pulsing will maximize dosing accuracy and tube life. Allowing the pump to pulse can also cause a service call if laundry workers see it and think it is malfunctioning.



Screen 11c. Smart Relay Mode Programming

1. Current trigger (1-8)
2. Current pump
3. Call rate per second: Volume of chemical to be pumped per second of trigger on-time (000-250 ml or 0.0 to 8.5 oz) Default call rate is 10 ml or 0.3 oz.

1. Use the “+” and “–” keys to select trigger (T) and pump (P) numbers.
2. CURSOR to the bottom of the screen, and input desired call rate (if different from default). The only time you need to use a smaller call rate than is recommended is when using small doses. For smaller doses, we recommend using a smaller call rate and longer trigger. For example, rather than pumping a 0.5 ounce dose with a 0.5 call rate and 1-second trigger, use a 0.1 call rate and a 5-second trigger. This will ensure consistent dosing and wash quality.
3. Repeat for all triggers.

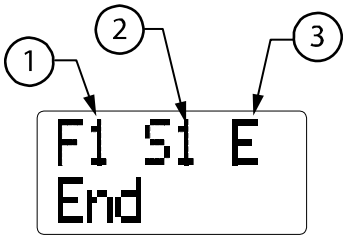
In Smart Relay Mode, each trigger has its own independent time limit of 5 minutes. If a trigger is active for longer than 5 minutes, then the system assumes that the trigger is “stuck on” and will issue a No Flow alarm. No more feed commands will be sent to the pump box for that trigger until either:

- You press the ACTION key to cancel the alarm. Pumping will resume after the alarm is cancelled, but will stop again in 5 minutes if the trigger is still present.
- The trigger is deactivated. Subsequent triggers will then be accepted.

Sequence Mode Programming

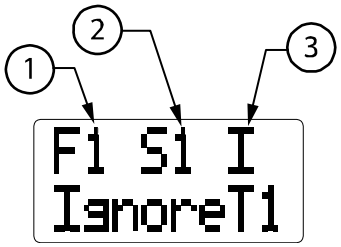
In contrast to Formula Mode’s usual use of fill-valve signals to trigger chemical pumps, Sequence Mode typically uses the drain valve signal to indicate a drain has just ended, and a wash or rinse is beginning. By counting the number of drains, you determine when to dose chemical. For example, if for “ bright colors” (or some other load class), we find that the washer drains twice before pre-wash, we would program step 1 and step 2 as “I” (Ignore).

Step 1 is performed when the sequence is started, typically by pressing the ACTION button. Step 2 would be performed when the first drain signal is received after the pre-wash. We would program a pump action for step 3, which would be dosing the main wash. If there were 2 rinses after main wash, before final rinse, we would set steps 4 and 5 to “I” (Ignore), and step 6 to a pump action to add softener. We would then set the step after the last pump action to “E” (End), which logs the load as completed in the Formula Count screen.

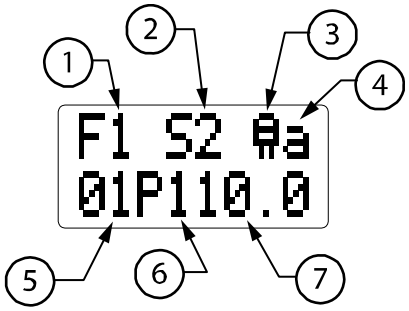


Screen 11d. Sequence Mode Programming, End Pump

1. Sequence formula number (F1-F16)
2. Step number (1-16)
3. Step action (“E” for End, “I” for Ignore and a pump icon for a pump action)



Screen 11e. Sequence Mode Programming, Ignore T1



Screen 11f. Sequence Mode Programming, Pump Action

1. Formula number (F1-F16)
2. Step number (1-16)
3. Pump icon; appears if selected step is a pump action
4. Value assigned to pump action (a, b or c)
5. Pump delay time (in 10-second increments)
6. Pump number to which step is assigned (1-8)
7. Volume to be pumped (up to 6500 ml or 220 oz)

“E”(End) is the default value for each step and is used as the last step in a sequence.

Use the “+” and “–” keys to scroll to desired step (S) and formula (F) numbers, and to the step action (“E”, for End “I” for Ignore, or pump icon for a pump action) to be associated with each sequence step.

“I”(Ignore) selection on the far right causes the system to skip a trigger.

Programming Pump Actions
In the Screen 11f example, step 2 (S2), pump action “a” consists of pump 1 (P1) taking a 10-second delay before pumping 10 ounces of formula 1 (F1). If there were one or more other pumps actions for S2, a “+” sign would appear in place of the “a” in the top right of the screen. No other pump actions exist for S2 in this example.

The pump information on the second line of Screen 11f only appears when a pump action (rather than “I” or “E”) is assigned for the step action.

To program a pump action:

1. Select desired formula (F) number.
2. CURSOR to step number (S) and use the “+” and “–” keys to select desired number.
3. CURSOR to the bottom line, and select a pump delay time, if desired, in 10-second increments.
4. CURSOR to the pump (P) field and enter the desired pump number.
5. CURSOR to the right side of the pump (P) field and input the volume of the formula to be pumped following the delay.
6. If you want to program “b” and/or “c” pump actions for this step, repeat steps 3 – 5.
7. Repeat these steps for all sequences.

Pressing the ACTION key while a step number is flashing inserts a new step and shifts the previously-displayed step number down (e.g., the previous S2 becomes S3) and the new step’s default state value is “I” (IgnoreT1).

Sequence Mode Operational Details

- T1 and T2 are ignored during pump delays, pump actions, and flushes.
- While T2 is active, consecutive pump steps run without needing T1 triggers to activate them.
- If the first step (S) #1 is a pump action (instead of “I”), the pump will start immediately when the sequence is started (after any delay programmed for that step).
- The “E” event is initiated by the completion of the previous (last) pump event. There need not be an actual T1 event.
- If the same pump receives a second instruction to feed while already feeding, it will wait until the first feed is complete before beginning the second feed. The second feed will not be cancelled, nor will its volume be reduced.

Sequence Mode Configuration Options

Washer with No Triggers
To run sequences without a T1 signal, set T2 to “–” in the **Trigger Qualification** screen (Screen 15). Sequences will rely on pump delay times to “know” when to pump during the wash cycle.

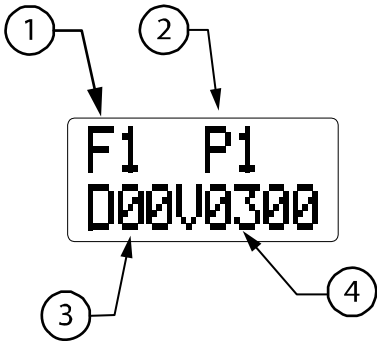
The sequence is started when the operator presses the ACTION key. The sequence will then run to completion. After completion of the formula sequence, pressing the ACTION key will start another formula sequence.

Automatic start
If trigger 3 (T3) is attached to the washer-on signal, the sequence displayed on the programmer will start automatically. This eliminates the need to push the ACTION button, though you will still need to select the correct load type/sequence name. Leave the T2 default setting as “+” to wait for a T1 signal before starting each successive step.

Automatic start with no T1 drain triggers
Set T2 to "–" in the Trigger Qualification menu and connect the washer-on signal to T3. Sequences of pump steps will occur automatically when the washer-on signal is received.

Tunnel Automatic Formula Select (TAFS) Mode Programming

In TAFS Mode you assign pump volumes and delays per pump per formula. It allows you to program up to 4 pumps to be assigned to each tunnel module (up to 30 modules). The pump box knows when to dose the amount based on the assignment of pumps to tunnel modules, and batch transfer signals which allow the pump box to track the load through the tunnel so the pump box knows which load is in which module.



Screen 11g. TAFS Mode Programming

1. Formula number (F1-F16)
2. Pump number (1-8)
3. Delay time prior to pumping after batch transfer signal is qualified
4. Pump volume, 300 ml in Screen 11g example

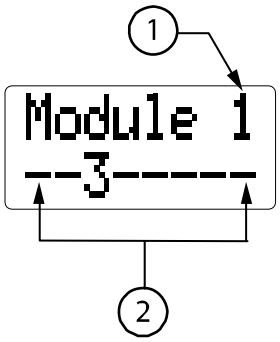
In the Screen 11g example, pump 1 will deliver 300 ml of chemical whenever a formula 1 load is in the module to which pump 1 is assigned.

D = delay time prior to pumping after the batch transfer signal is qualified.

V = pump volume, 300 ml in the Screen 11g example.

For more information on how TAFS mode works, see the **Appendix A** and **Appendix B.**

Tunnel Module Pump Assignment
This screen appears if the flush mode is set to "Xprt Tunl", either by changing the flush type in Smart Relay Mode, or by selecting TAFS Mode. This screen is used to assign pumps to modules, which is required so TAFS can track loads through the tunnel and dose at the right time.



Screen 11h. Tunnel Module

1. Module number (selectable from 1-30)
2. Pump 1-8

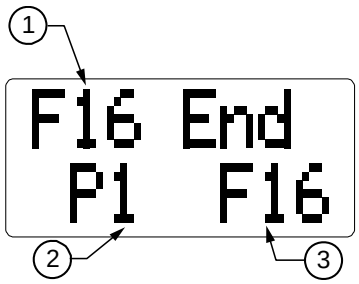
For each module to receive chemical, select the module number and change the pump's "–" to its number to assign the pump to the module number on the top line. In the example below, pump 3 will pump to module 1. You must assign the pumps. If the pumps are not assigned to modules, they will not run.

End Pump Assignment (for Formula, Latched and Smart Relay Modes)

The "End Pump" determines which pump action will log the formula as complete, resets the trigger latches and allows the system to change the formula number automatically when a formula ends.

Pressing the MENU key from Formula, Latched or Smart Relay programming screens takes you to the End Pump Assignment screen. The "End Pump" determines which pump action will log the formula as complete, and allows the system to change the formula number automatically when a formula ends.

The default "End" pump is P1.You will select the pump that will signal the end of the selected formula (F1-F16), and log the formula as complete. Each formula can have a different "End" pump.



Screen 12. End Pump/End Formula Assignment

1. Formula number (F1-F16)
2. Pump which will end the formula and have the dispenser log the formula as complete
3. "End" formula, which will automatically run with the next load

The Screen 12 example shows pump 1 (P1) will be the last pump that runs for formula 16 (F16). Once P1 has finished its assignment, F16 will log as complete in the Formula Counts screen.

1. Use the "+" and "–" keys to scroll to the formula number (F) for which you will create an "End" pump.
2. CURSOR to the bottom line, and make sure it says "End" on the left side.
3. CURSOR to the pump (P) field, and use the "+" and "–" keys to select the "End" pump.

General Notes on End Pump Assignment

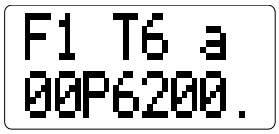
- Make sure that the "End" pump always has a pump action within the formula it is assigned to. For example, if the "End" pump is set to pump 8 on a washer using only 3 triggers, and none of those 3 triggers has a pump action for pump 8, the L5000Plus will perform each pump action once, and then wait indefinitely for the pump 8 action that will reset the latch for the next wash load. Because that action never occurs, the latch never resets and the L5000Plus continues ignoring signals.

  Changing the formulas will not reset the latch, because the dispenser will still be waiting for pump 8, but turning the power off and on will reset the latches.

- This menu does not appear in Sequence Mode. In Sequence Mode, the formula is logged as complete when the "E" step is reached.
- Formulas will be logged as complete regardless of whether an alarm occurred. Alarms will be logged at the same time as the formulas are logged.
- **If your last chemical pumped will be softener and the trigger signal is taken from a solenoid, please read the following:**

  If the solenoid turns on and off during final rinse, the softener pump will not be an acceptable "End" pump because each time the "End" pump signal is received the formula will be counted as complete in the data. In this situation perform the following steps:

1. Add a second pump action after the softener, running pump 8 with a “0” volume with enough delay time for the load to finish.
2. Set pump 8 to be the End pump, so the latch won’t clear until pump 8’s pump action completes. For example, if your last pump action for formula 1 was as follows:



You would change the “a” to a “b” so that there would be a second pump action for T6 as follows:

With P8 as the End pump, the latch will clear 10 minutes after T6 is received, giving enough time for the rinse to complete, due to the 10-minute (600-second) delay.

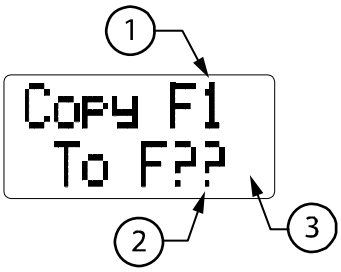
New Formula Assignment

This option allows another formula to be automatically chosen when a certain formula is complete. This is useful for preventing the unwanted addition of bleach if the operator forgets to select the appropriate formula for the next load.

Any formula number can be assigned as the “End” formula (F1-16). The default “End” formula is the current formula.

Formula Copy (for Formula, Latched and Sequence Modes)

The Formula Copy feature allows you to copy an existing formula and all of its properties to another formula for faster programming.



Screen 13. Formula Copy

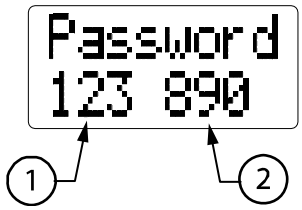
1. Formula number to copy from (F1-F16)
2. Formula number to copy to (F1-F16 or “All”)
3. A “+” in this position indicates that a formula already exists for that formula number

Press and hold the ACTION key for 2 seconds to copy the formula shown on the top line to the formula shown on the bottom line.

Copying a formula to “all” will overwrite all other formulas.

When a “+” is displayed in the lower right corner, a formula already exists for the formula number to which you are copying. The existing formula will be overwritten after you press the ACTION key.

Change Passwords



Screen 14. Creating Technician/Programmer-Level Passwords

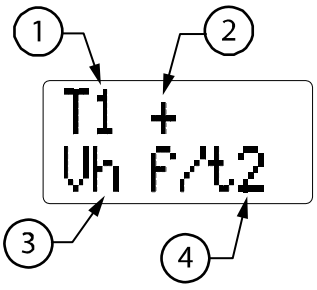
1. Technician-level access password (default=123)
2. Programmer-level access password (default-890)

Change passwords using the “+” and “–” keys and the CURSOR key to move across the screen.

Entering a “000” password for either level means that no password is required for that level of access. Entering 000 for the Programmer level access will allow anyone access to all screens, and the ability to alter programming data, regardless of whether the technician level access is 000.

Trigger Qualification

Set voltage and filter time parameters in this screen to accept either high or low voltage triggers and protect against false or intermittent signals.



Screen 15. Trigger Setup

1. Trigger number (1-8)
2. Trigger polarity - Indicates whether trigger edge is “rising” (“+”) or “falling (“–“)
3. Trigger voltage either “h” (high – 65-240VAC) or “L” (low – 24-240VAC)
4. Filter time (2 or 15 seconds)

The Screen 15 example shows that trigger 1 (T1) is “rising” (+). A rising trigger edge indicates that the trigger activates when voltage is present, where a “falling”(–) trigger edge indicates that the trigger activates when voltage disappears. Default setting is “+”. The most common reason for changing trigger polarity is changing the T1 signal when in Sequence Mode.

Screen 15 also shows that the trigger is high (h) voltage, indicating that it is between 65 and 240 VAC. Either the “h” or “L” setting can be used with 24-120 VDC.

The trigger circuit is designed to withstand voltages up to 240 VAC independent of the threshold setting. No damage will occur if you select an inappropriate setting. The trigger voltage selection is a detection threshold setting only.

The filter time (f/t) is the amount of time you want the trigger to be active before the dispenser acts upon it. Screen 15 shows that the L5000Plus will begin the trigger action after the signal has been active for the default time of 2 seconds. Select 15 if your system is particularly vulnerable to erroneous triggering caused by electrical noise.

1. Using the “+” and “–” keys, select the trigger you wish to qualify.

2. Use the CURSOR key to move to the bottom line, and select high (“h”) or low (“L”) voltage.
3. Use the CURSOR key to move to the filter time (f/t) field, and select a filter time of either 2 or 15 seconds.

Filter time is not applicable to TAFS and Smart Relay Mode triggering. The voltage selection applies to all modes. +/- selection applies to all modes except Smart Relay.

Copying (“Cloning”) Washer Setup Data from One Pump Box to Another

This feature allows you to copy or “clone” setup information from the L5000Plus main pump box to a programmer, and then download this setup information to other pump boxes. This allows you to do all programming for several L5000Plus’s at one time, rather than having to configure each washer or account individually. Even if you are copying to a dispenser with different pump and dose sizes for a different-size washer, copying will save you time because you won’t need to re-enter formula names. Also, it is faster to adjust a formula rather than re-enter it completely.

This feature can also be used when troubleshooting, to overwrite an L5000Plus’s programming with either blank settings or different settings.

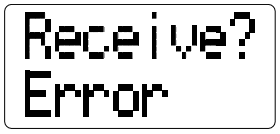
The only information that cannot be copied is pump run time data, trigger counts, calibration amounts and formula counts.

Receiving Cloned Setups (Pump Box to Programmer)

Screen 17. Receiving Cloned Setups

Pressing the ACTION key from Screen 17 “clones” all of the L5000Plus’s programmed setups from its main pump box to the programmer. During cloning, a right arrow icon flashes in the lower left-hand corner of the display.

If an error occurs during cloning, “Error” will be displayed at the bottom of the screen. If this occurs, check the cable connections and try again.

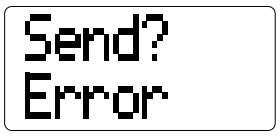


When cloning (upload from pump box to programmer) is done, the bottom line returns to its original state as shown in Screen 17.

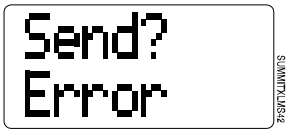
Sending Cloned Setups (Programmer to Pump Box)

Screen 18. Sending Cloned Setups

Pressing the ACTION key from Screen 18 copies all data from the programmer to the L5000Plus's main pump box memory. Any existing run time data, trigger counts, and calibration amounts in the pump box will remain the same. During cloning, a right arrow icon flashes in the lower left-hand corner of the display.



If an error occurs during cloning, the screen will display the word "Error" on the bottom line. If this occurs, check the cable connections and try again.



Language Selection

Pressing the "+" or "– "keys takes you through the different language options.

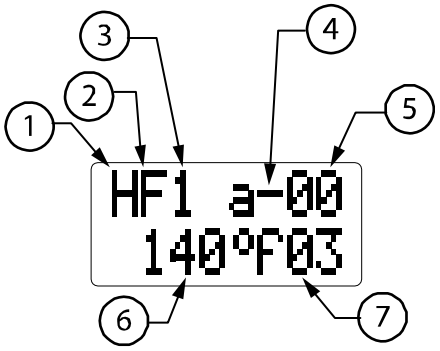
Screen 19. Language Selection

Available language selections are English, Portuguese ("Portuges"), French-Canadian ("FrCanada"), Finnish, Turkish, French, German, Spanish and Japanese. Default language is English.

Hygiene Verification

The Hygiene Verification issues an alarm whenever the wash water fails to maintain a certain temperature for a certain amount of time.

- By default, all 3 different criteria, (a, b, or c) are turned off. This is intended to accommodate time/temperature options such as 90ºC for 3 minutes OR 80ºC for 10 minutes.
- Only ONE criterion needs to pass per formula. An alarm will only occur if the formula fails ALL criteria. For example, if a, b OR c is met, the formula passes. If neither a, b NOR c is met, the formula fails.



Screen 20. Hygiene Verification

1. "Hygiene"
2. "Formula"
3. Formula number (1-16)
4. Indicates whether a, b or c criteria is off (-) or on (+)
5. Temperature-offset value to be applied to probe reading (00 – 40 Celsius or 00 – 72 degrees Fahrenheit)
6. Temperature setpoint (0-99°C if ml is selected or 32-210°F if oz is selected)
7. Minutes (continuous) required at temperature setpoint

Screen 20 shows that criterion "a" requires that the wash water maintain a temperature of 140 degrees Fahrenheit for 3 minutes. The "–" in the top center of the screen indicates that for formula 1 (F1), criterion "a" is turned off. This means that temperature and duration requirements for "a" do not apply to F1, but may apply to another formula.

Temperature Offset Value

Screen 20 shows a "temperature offset value" of "00". The temperature offset value can be set to correct for a temperature probe that may vary a few degrees from the actual temperature. For example, if you know that your temperature probe reading is 10 degrees below the actual temperature of the wash water, you can create an offset value of 10. The programmer will incorporate this offset value in its temperature reading, so you will always see the actual temperature of the wash water when you view this screen.

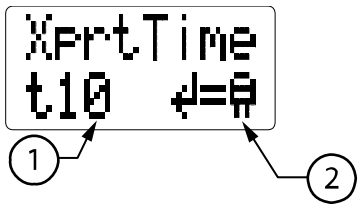
1. By default, criterion "a" is turned off, as indicated by the "–" in the top center of the screen. If you want criterion "a" active for the current formula, use the "+" or "–" key to change the "–" to a "+".
2. CURSOR to the top right of the screen to enter an offset value, if desired, between 0 and 40 degrees Fahrenheit if oz is selected or Celsius if ml is selected.
3. Advance to the bottom line using the CURSOR key, and set the temperature and duration requirements for criterion "a".
4. Repeat for criteria "b" and "c".
5. Repeat for all formulas that have hygiene requirements, setting the "+"/"–" appropriately based on hygiene requirements.

Changing a criterion affects all other formulas using that criterion. a, b, and c are the same for all formulas.

To pass hygiene "a" criterion, the formula's time at or above the temperature setpoint must occur over a continuous time period.

Flush Transport Time

This screen is only visible when the flush manifold wire harness is plugged into the pump box PCB prior to turning on power. If screen does not appear, turn off power to pump box and turn back on. If you do not turn power off then on again, you will get a "No Flow" error with every feed. See **Disconnecting a Flush Manifold** for instructions removing a flush manifold from the programming.



1. Transport flush time (01-99 seconds)
2. Pump icon (spins while flush is in progress)

Screen 21. Flush Transport Time

The transport time setting (t) tells the system how long the flush water must flow after pumping chemical. The example shows that the flush water will flow for 10 seconds after pumping chemical. Set the flush time to one second per 3 feet (1 meter) to the washer, thus for a 15-foot distance to the washer use a transport time of t05. If you suspect low water pressure, use a flush time of one second per two feet (0.6 meters).

- This screen defaults to “Xprt Time” with a time of 10 seconds (“t10”) and is the programming screen used for E and XL manifolds. If you are using a Tunnel Flush manifold, press the “+” or “-” button to select “Xprt Tunl” if it does not appear.
- In TAFS Mode, the top line will be displayed as “Xprt Tunl”. When using a tunnel flush with Smart Relay Mode, use the CURSOR key to select “Time” and the “+” key to change it to “Tunl”. This will permit chemicals to be dosed simultaneously for each module. Chemicals will be dosed sequentially if more than one product exists for one individual module in the tunnel.
- Use the “+” and “– ” keys to set the transport flush time (t), 0 to 99 seconds (default setting is 10).
- To initiate a manual flush, press the ACTION key. Press the ACTION key again to stop the flush.

Disconnecting a Flush Manifold

1. Change the transport time to “0” on the Flush Transport Time screen.
2. Use the MENU key to scroll away from the Flush Transport Time screen.
3. Disconnect the manifold from the dispenser.
4. Turn the dispenser’s power off and then on again. If disconnection procedure was successful, the Flush Transport Time screen will be missing when you scroll through the programming screens.

Appendix A.

Tunnel Automatic Formula Select (TAFS) Mode Details

Definitions

Formula Triggers

In TAFS Mode, trigger signals from the tunnel washer are used to select the wash formulas using a code so that a combination of up to 5 trigger signals (Formula Triggers) gives up to 16 washer formulas. They are used to *create* Qualified Formula Triggers (see definition below) that are then used to select a formula.

Qualified Formula Triggers

These are the codes used by the L5000Plus and derived from the combinations of Formula Triggers that determine which wash formula to use. Qualified Formula Triggers are derived as follows:

- When a combination of Formula Triggers has been on for 2 seconds, then the associated Qualified Formula Trigger will turn on,
- When all the Formula Triggers have been off for 10 seconds, then the associated Qualified Formula Triggers will turn off.

See table in **Appendix B** for the combinations of Formula Triggers which give each Qualified Formula Trigger.

Set Formula Trigger

The purpose of this trigger is to “set” or read the combination of Formula Triggers present at the moment when the Set Formula Trigger is received from the washer and choose the Qualified Formula Trigger and its associated wash formula.

Batch Transfer Trigger

The Batch Transfer Trigger tells the L5000Plus to associate the currently-set formula with the wash load currently entering the tunnel washer. The Batch Transfer Trigger is connected at the T8 terminal.

TAFS Mode Explanation

TAFS Mode uses Formula Triggers, a Set Formula Trigger, and a Batch Transfer Trigger. The Formula Triggers are used to determine Qualified Formula Triggers that are used to determine which formula to use.

Figure 1 in **Appendix B** defines which Qualified Formula Triggers must be active to select a specific formula.

Figure 2 in **Appendix B** shows an example of the association between Formula Triggers and Qualified Formula Triggers. It also shows the use of the Set Formula Trigger and the Batch Transfer Trigger.

An analogy that may help to understand the correlation between Formula Triggers and Qualified Formula Triggers is to think of the Formula Triggers as push buttons and the Qualified Formula Triggers as lights. Each button has a light it turns on just as each Formula Trigger has a Qualified Formula Trigger it turns on. If you press a button for two seconds, its light turns on and stays on whether you turn the button on or off afterwards. The lights will all go off if you don’t push any of the buttons for 10 seconds. When it’s time to determine which formula to use, you look at which lights are turned on (Qualified Formula Triggers), NOT which buttons are currently pressed (Formula Triggers from the washing machine).

TAFS Mode Principles

- A Formula Trigger must be ON for 2 seconds to qualify (in other words, to cause its associated Virtual Formula Trigger to go on).
- Formula Triggers can be activated simultaneously and/or sequentially to turn on their associated Virtual Formula Triggers.
- If you want, you may use a single signal for Set Formula and Batch Transfer, connecting the signal wire to T7 and jumping it to T8. If you do this you have to be sure that at least one of the Formula Triggers stays on until at least 10 seconds before the Set Formula/Batch Transfer signal is sent.

- If any Formula Trigger is left on continuously, the Qualified Formula Triggers will not clear, and those Qualified Formula Triggers will continue to be used to determine which formula to use when the Set Formula Trigger occurs.
- Any receipt of a Formula Trigger combination that is invalid will result in no chemical being dispensed for that load as it moves through the tunnel. Example: if the L5000Plus received a Formula Trigger combination of T1+T5, the L5000Plus would interpret it as Formula 17, which does not exist because it only has a 16-formula capacity.

The simplest TAFS programming involves the following:

1. Turning off all trigger signals off for 10 seconds minimum (to ensure all the Qualified Formula Triggers are cleared).
2. Turn on the Formula Triggers required for 5 seconds (to ensure the two-second minimum is met) in order to set the proper Qualified Formula Triggers.
3. After the desired Formula Triggers have been on for five seconds, turn on the Set Formula Trigger.
4. Turning on the Batch Transfer Trigger (T8) for five seconds when the next transfer occurs.
5. After the Batch Transfer Trigger has been on for five seconds, immediately repeat steps 1-5.

Appendix B. TAFS Mode Charts

Formula Number	T1	T2	T3	T4	T5
No Chem					
1	ON				
2		ON			
3	ON	ON			
4			ON		
5	ON		ON		
6		ON	ON		
7	ON	ON	ON		
8				ON	
9	ON			ON	
10		ON		ON	
11	ON	ON		ON	
12			ON	ON	
13	ON		ON	ON	
14		ON	ON	ON	
15	ON	ON	ON	ON	
16					ON

Figure 1. Active Qualified Trigger Sequences for Each of 16 Formulas

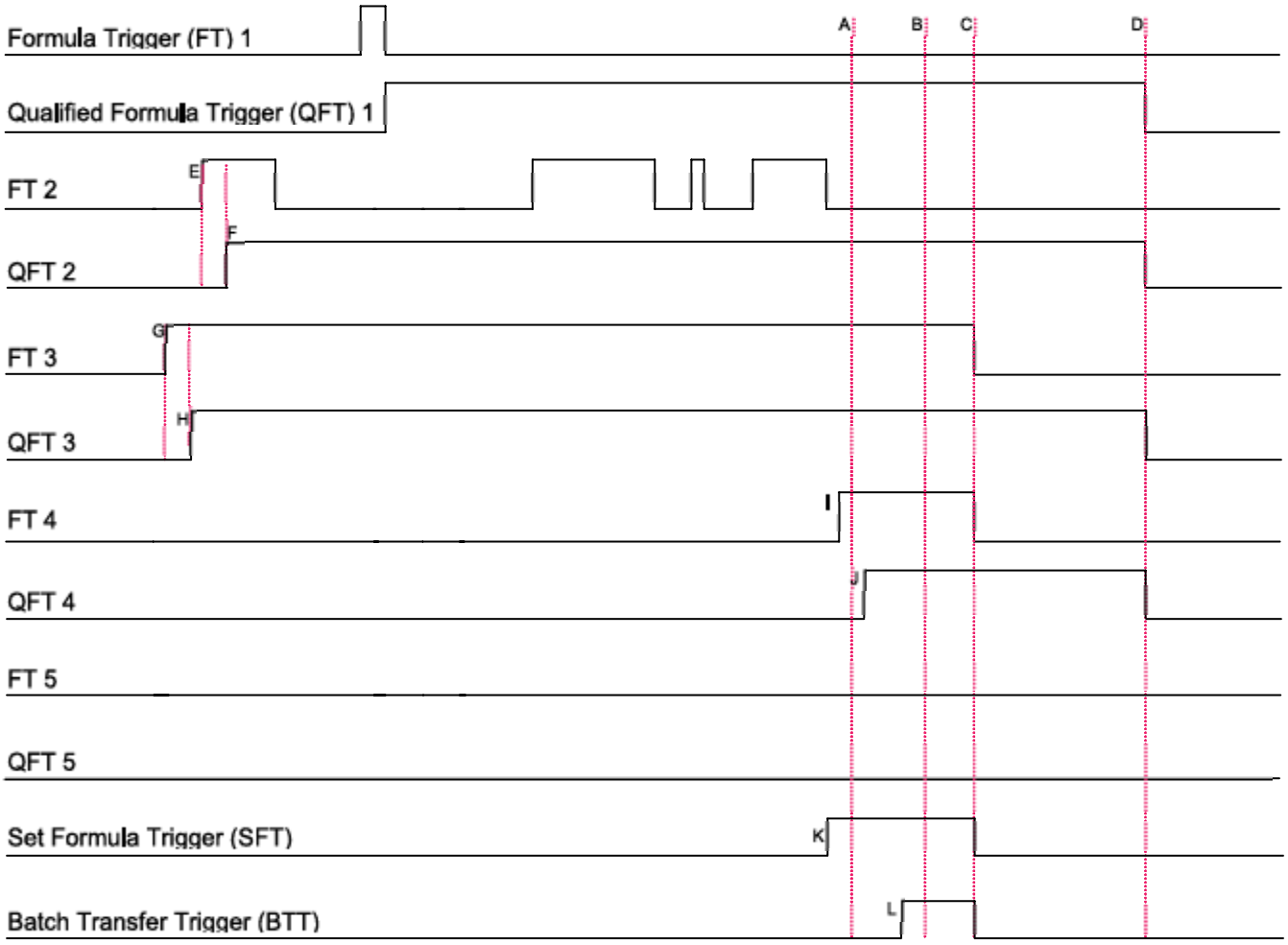


Figure 2. Timing diagram showing an example of the correlation of Formula Triggers to Qualified Formula Triggers and the use of the Set Formula and Batch Transfer Triggers.

Noteworthy points of time and durations are as follows:

- A – Formula is set. The Qualified Triggers on are 1, 2, and 3 (QFT4 isn't on yet) so F7 is used.
- B – We now associate the Formula Set at point A with the batch of laundry that will be entering the tunnel washer at point B. Note that even though QFT4 is now on, it is not used in determining the formula because the formula was determined at point A.
- C – All Formula Triggers, SFT, and BTT are turned off.
- D – All Formula Triggers, SFT, and BTT have been off for 10 seconds so all the Qualified Triggers are turned off.
- I-A and A-J – One second elapses between these points.
- E-F, G-H, I-J, K-A, L-B – Two seconds elapse between these points.
- C-D – Ten seconds elapses.

Appendix C. AFS Timing Schemes for Other Dispensers

Use this chart if you want to use AFS and are replacing one of these commonly-used dispensers with XL. If you are not replacing any of the listed dispensers, review the timing schemes listed here and select the value (A-F) that best corresponds to your desired timing scheme.

Formula Selection	*Clax Revoflow (A)*	*Nova (B)*	*Dema (C)*	*Knight-1 (D)*	*Knight-2 (E)*	*Knight-5 (F)*
unchanged	*< 1.5 sec*	*< 1 sec*	*< 0.5 sec*	*< 0.5 sec*	*< 1 sec*	*< 2.5 sec*
1	*2 sec (1.5-3.9)*	*2 sec (1-2.9)*	*1 sec (0.5-1.9)*	*1 sec (0.5-1.4)*	*2 sec (1-2.9)*	*5 sec (2.5-7.4)*
2	*6 sec (4-7.9)*	*4 sec (3-4.9)*	*3 sec (2-3.9)*	*2 sec (1.5-2.4)*	*4 sec (3-4.9)*	*10 sec (7.5-12.4)*
3	*10 sec (8-11.9)*	*6 sec (5-6.9)*	*5 sec (4-5.9)*	*3 sec (2.5-3.4)*	*6 sec (5-6.9)*	*15 sec (12.5-17.4)*
4	*14 sec (12-15.9)*	*8 sec (7-8.9)*	*7 sec (6-7.9)*	*4 sec (3.5-4.4)*	*8 sec (7-8.9)*	*20 sec (17.5-22.4)*
5	*18 sec (16-19.9)*	*10 sec (9-10.9)*	*9 sec (8-9.9)*	*5 sec (4.5-5.4)*	*10 sec (9-10.9)*	*25 sec (22.5-27.4)*
6	*22 sec (20-23.9)*	*12 sec (11-12.9)*	*11 sec (10-11.9)*	*6 sec (5.5-6.4)*	*12 sec (11-12.9)*	*30 sec (27.5-32.4)*
7	*26 sec (24-27.9)*	*14 sec (13-14.9)*	*13 sec (12-13.9)*	*7 sec (6.5-7.4)*	*14 sec (13-14.9)*	*35 sec (32.5-37.4)*
8	*30 sec (28-31.9)*	*16 sec (15-16.9)*	*15 sec (14-15.9)*	*8 sec (7.5-8.4)*	*16 sec (15-16.9)*	*40 sec (37.5-42.4)*
9	*34 sec (32-35.9)*	*18 sec (17-18.9)*	*17 sec (16-17.9)*	*9 sec (8.5-9.4)*	*18 sec (17-18.9)*	*45 sec (42.5-47.4)*
10	*38 sec (36-39.9)*	*20 sec (19-20.9)*	*19 sec (18-19.9)*	*10 sec (9.5-10.4)*	*20 sec (19-20.9)*	*50 sec (47.5-52.4)*
11	*42 sec (40-43.9)*	*22 sec (21-22.9)*	*21 sec (20-21.9)*	*11 sec (10.5-11.4)*	*22 sec (21-22.9)*	*55 sec (52.5-57.4)*
12	*46 sec (44-47.9)*	*24 sec (23-24.9)*	*23 sec (22-23.9)*	*12 sec (11.5-12.4)*	*24 sec (23-24.9)*	*60 sec (57.5-62.4)*
13	*50 sec (48-51.9)*	*26 sec (25-26.9)*	*25 sec (24-25.9)*	*13 sec (12.5-13.4)*	*26 sec (25-26.9)*	*65 sec (62.5-67.4)*
14	*54 sec (52-55.9)*	*28 sec (27-28.9)*	*27 sec (26-27.9)*	*14 sec (13.5-14.4)*	*28 sec (27-28.9)*	*70 sec (67.5-72.4)*
15	*58 sec (56-59.9)*	*30 sec (29-30.9)*	*29 sec (28-29.9)*	*15 sec (14.5-15.4)*	*30 sec (29-30.9)*	*75 sec (72.5-77.4)*
16	*62 sec (60-63.9)*	*32 sec (31-32.9)*	*31 sec (30-31.9)*	*16 sec (15.5-16.4)*	*32 sec (31-32.9)*	*80 sec (77.5-82.4)*

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