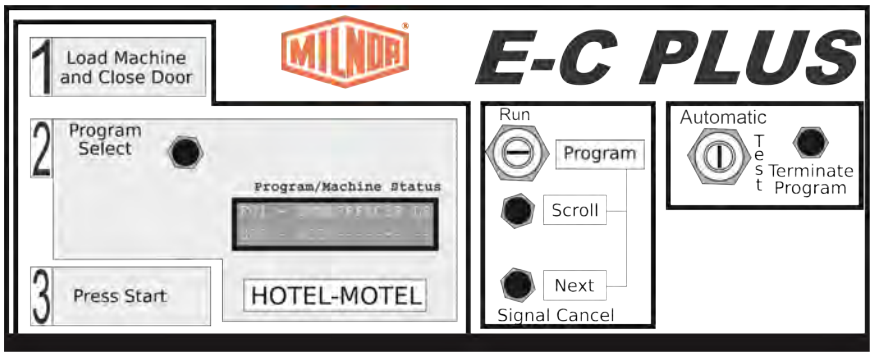
Manual Number: MCCECB01
Edition (ECN): 2020203

Controller Reference

E-C Plus Electronic Chart Controller



PELLERIN MILNOR CORPORATION **Post Office Box 400, Kenner, Louisiana 70063–0400, U.S.A.**

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Preface

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1 About This Manual

1.1 Scope

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This manual tells how to start, program, operate, and repair washer-extractors with the Milnor® E-C Plus microprocessor control. Refer to other machine manuals for all other areas of the machine.

1.2 The Normal Display at Start-up

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The start-up display sequence for the E-C Plus controller is described in Section 4.1 : Running a Formula, page 36 .

1.3 If this Manual Does Not Have the Necessary Data

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This manual has the best data that was available when your machine was made. If you cannot find the necessary data:

- **Are you looking for data about a component not made by Milnor® but used on your machine—for example, a motor or a brake caliper?** We usually do not put the instructions of component manufacturers in Milnor® manuals. You can find some of these instructions in the part of the Milnor® website that gives maintenance data (http://milnortechnicalsupport.force.com/pkbmilnor/). You can also find instructions for many components on the manufacturers' websites.
- **Are you looking for data about a Milnor® component on your machine that this manual does not give?** If we get better data or more data after the manual is available, we will add it to a newer version of the manual. Speak with the Milnor® Customer Support group. They can give you newer instructions if they are available or help you if not.

1.4 Trademarks

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These words are trademarks of Pellerin Milnor® Corporation and other entities:

Table 1. Trademarks

AutoSpot™	GreenFlex™	MilMetrix®	PulseFlow®
CBW®	GreenTurn™	MilTouch™	Ram Command™

Table 1 Trademarks (cont'd.)

Drynet™	Hydro-cushion™	MilTouch-EX™	RecircONE®
E-P Express®	Mentor®	MILRAIL™	RinSave®
E-P OneTouch®	Mildata®	Miltrac™	SmoothCoil™
E-P Plus®	Milnor®	PBW™	Staph Guard®
Gear Guardian®			

2 E-C Plus Pre-installation Safety Check

Thoroughly examine the machine from both mechanical and electrical viewpoints before you begin installing the E-C Plus controller. Troubleshooting the new controller is much easier if all machine functions are known to operate properly before the installation.

The document in Figure 1 is not meant to be comprehensive, but should be used as a guide. After verifying the proper operation of all safety devices, the dealer representative and the customer must each sign and date this form and retain copies for their prospective records.

Figure 1. Minimum Safety Requirements for E-C Plus Retrofit

Verified (Initials)	Models	Requirement
	All models	Vibration switch opens 3-wire relay when tripped.
	All models	Door interlock switch functions properly.
	All models	Door water level switch prevents opening door when water level is above bottom of door.
	All models	Pressing STOP switch with machine in extract opens 3-wire circuit.
	All models	Door can not be opened while basket is moving.
	All models	Stop switch opens 3-wire circuit and disables all motors.
	Tilting models	Down limit switches allow 3-wire circuit only when machine is down in both front and rear cradles.
	All jogging models	Two-hand operation required to jog basket.
	All models with gear reducer drive	Centrifugal switch, belt, and circuitry functioning properly.
	Certain divided-cylinder models	Second brake pressure switch allows 3-wire circuit when second brake is not applied.
	Hydro-cushion models	Excursion switch opens 3-wire relay or causes machine to recycle when tripped.
	Models with brakes	Brake pressure switch allows extract speed only when brake is open.

Safety Verification

Dealer Representative	Date
Customer	Date

1 Installing the Controller

1.1 Retrofitting Miltrol Machines with the E-C Plus Controller

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The Milnor® E-C Plus electronic chart controller is a fully programmable microprocessor control designed to replace an existing Miltrol controller on a single tilting or non-tilting Milnor® washer-extractor. It replaces the fingers and the plastic formula chart in a Miltrol controller with 7, 14, 17, 23, or 34 fingers. Other adaptations are possible with additional interfacing work. All E-C Plus controls have a two-line by 20-character bright fluorescent display.

The E-C Plus control electronically senses and displays water temperature, and controls the commanded water temperature by modulating the hot and cold water valves and/or injecting steam until the commanded temperature is achieved if the machine was previously equipped with these options. The electronic temperature control replaces the combined thermometer/thermostat originally furnished with the Miltrol control. The original Miltrol finger inputs needed for water and steam temperature control are not used with the E-C Plus control.

Other than the electronic temperature control, the electronic chart controller uses all the original Miltrol relay logic for every machine function, including motor control, speed sensing, safety interlocks, liquor level sensing, and all air pilot valves. All the original relay logic components and circuitry must be as originally furnished and in good, safe working order. The E-C Plus control simply replaces the plastic Miltrol chart; installation of this controller without additional work will not restore a mistreated machine to safe working order.

1.1.1 Preparing for Installation

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Before you begin installing the E-C Plus controller, read this entire manual and carefully study the supplied wiring diagrams.

Also, review the options on the machine to be retrofitted. The E-C Plus controller operates options already existing on the machine, but installation of this controller does not add any machine options.

CAUTION: **Electrocution Hazard —** Contact with high voltage can kill you or severely injure you.

▶ Lock off and tag out the machine before beginning any of the following procedures.

1.1.2 Removing the Miltrol Controller

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1. Mark each wire attached to the Miltrol fingers with a description of its function.
2. Remove the switch panel from the Miltrol head and install it on the E-C Plus control. You may need to increase the length of some wires to reach the new mounting location. If the existing Miltrol switch panel is in poor condition, replace it with the blank nameplate provided.
3. Verify that each wire connected to a finger of the Miltron is labelled, then remove the wire from the finger, but leave the other end attached.
4. Mark the chart motor wires for later identification, then cut them near the motor.

1.1.3 Installing the E-C Plus Controller

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1. Connect a wire to each side of the coil of the 3-wire relay in the machine. These wires will connect in parallel to the 3-wire relay (CRS+S) in the E-C Plus controller.
2. Set the electronic power supply in the E-C Plus controller. The power supply is set at 100VAC and tested at 120VAC at the Milnor® factory. If the machine you're retrofitting uses 240VAC as the control circuit voltage, move the jumper on the power supply to the 200VAC position.
3. Mount the supplied snubber board inside the existing control cabinet, but close enough to the mounting location of the E-C Plus control that the supplied wiring harness will extend from the snubber board to the E-C Plus processor board.

   NOTE: The snubber board is an arrangement of capacitor/resistor pairs, each of which reduces the electromagnetic noise produced by a load (e.g., a coil in a relay or valve, or any other output previously operated by a finger of the Miltrol controller). Two connections at the E-C Plus controller output terminal strip are required for each output: 1) the wire that was previously connected to the Miltrol finger, and 2) the snubber connection from the snubber board.
4. Using the supplied wiring harness, connect MTA-31 and MTA-32 to the snubber board connections as labelled.
5. Connect wire 017 in the snubber board harness to terminal X2 of the 24VAC transformer, as shown on the “microprocessor outputs” schematic diagram. If the 24VAC transformer is located in another control box, trace the wire from terminal X2 to make this connection. Use an additional wire between the E-C Plus controller and the transformer if necessary.
6. Connect the common wire that was previously connected to the Miltrol chart fingers to terminal A on terminal strip TBM. This wire provides 24VAC to the E-C Plus controller.

   NOTE: The E-C Plus controller can manage up to 16 total outputs; 10 outputs (See Table 2) are dedicated to functions common to all Miltrol-controlled machines. The user must designate the remaining six outputs to options previously provided in the machine control.

Table 2. E-C Plus Standard Outputs

Terminal	Description		Terminal	Description
TBM-B	Extract		TBM-G	Supply 2
TBM-C	Drain		TBM-H	Supply 3
TBM-D	Cold water		TBM-J	Supply 4
TBM-E	High level		TBM-K	Supply 5
TBM-F	Supply 1		TBM-L	Operator signal

7. Use the microprocessor outputs schematic diagram and Table 2 as references to connect the wires that were formerly on the fingers to terminal strip TBM. Some wires will remain disconnected when this step is completed.
8. Connect the wire from pin A of relay base CRS+S in the E-C Plus controller to pin A of the existing 3-wire relay (usually marked CRS+) in the machine.
9. To complete the "Start" input circuit, connect another wire from pin B of the relay base CRS +S to pin B of the existing 3-wire relay.

CAUTION: **Machine damage and malfunction hazards —** The relays used for CRS+S and CRT01 must correspond to the control circuit voltage of the machine. If the control circuit voltage is higher than the specified voltage of the relay, the relay will likely be destroyed. If the control circuit voltage is less than the specified voltage of the relay, the relay will not work reliably, if at all.

▶ Verify the control circuit voltage of the machine, and choose the relays used for CRS+S and CRT01 to match this voltage.

10. Connect the two wires labelled "Chart motor" or "Timer motor" to pins A and B of relay CRT01.

1.1.4 Monitoring Temperature

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1. If the machine is equipped with thermo-modulated water or steam and the E-C Plus controller was ordered with one or both of these functions, replace the existing mechanical temperature probes with the electronic probes supplied.
2. Refer to the schematics to connect the new temperature probes. Connect the water temperature probe to point P0 (terminals 1 and 2) on analog to digital converter board EEAD.
3. Connect the steam temperature probe to point P1 (terminals 3 and 4) on analog to digital converter board EEAD.

1.1.5 Assigning Additional Options

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The remaining options must be assigned. Review Section 3.3.4 : Configure the Control (Option 2), page 30 in this manual. Six options can be assigned in the order in which they appear; the configuration program will automatically end when the sixth option is assigned.

2 Commissioning

2.1 Important Data About this Machine

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Complete these two procedures before you use this machine:

1. Make sure that all laundry personnel are safe.
2. Change and make a check of the data contained in the memory of the machine (configuration, formulas, and formula accumulator data).

2.1.1 Make Sure That All Laundry Personnel are Safe

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Personnel who will use or do maintenance on this machine must read the safety manual first. Make all user manuals available to the correct personnel. Be sure that all personnel obey all precautions in the applicable manuals.

2.1.2 Change the Data

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1. Make sure that the controller configuration is correct for how you will use the machine.
2. Change the wash formulas if necessary for better results.
3. Make sure that you erased the formula count accumulator to make the formula count accurate.

2.1.2.1 When to Change Data

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Make a check of the data:

- when commissioning the machine
- when required by error message
- after replacing the microprocessor board
- after upgrading the software
- after adding or removing optional equipment

Make the necessary changes.

2.1.2.2 Steps that are Necessary When You Change Data

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1. Make a check of the machine configuration.
2. Write wash formulas.
3. Erase the formula accumulator data, if applicable. See the applicable sections in this manual for instructions.

2.1.2.3 Data Accessibility

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The key switch must be in the **Program** position to change configuration and formula data. The microprocessor controller changes the formula accumulator data while the machine operates. Thus, the key switch can not prevent changes to the accumulator data. You can use the data as given in Table 3 .

Table 3. How to Read and Change Data

Data Type	How to Change Data
Configuration Data	You can read and change data.
Formula Data	You can read, change, and erase data.
Accumulator Data	You can read and erase data.

2.1.2.4 Replace Incorrect Data

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If the microprocessor finds incorrect data, the display will show an error message, usually when the machine first gets power. The error can prevent machine operation. The troubleshooting instructions tell about each error and how to repair it. Obey these instructions to make sure that incorrect data is replaced with correct data. You can cause dangerous operation or damage to the machine if you do not obey these instructions.

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2.2 Determining Load Size

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You will not do damage to the machine with a large load if you follow these rules:

1. The goods are made of common cotton or synthetic materials.
2. The load can balance in the cylinder before the extract step.
3. The extract speed has not been increased above the designed maximum.
4. You do not program so many extract steps that you do damage to the motor.

For common goods, the size of the machine sets the quantity you can put in the machine.

These items determine the maximum load weight of soiled goods:

- the volume of the machine's cylinder, and
- the material and weight of the goods.

Do not try to load the machine to its maximum weight capacity with bulky fabrics.

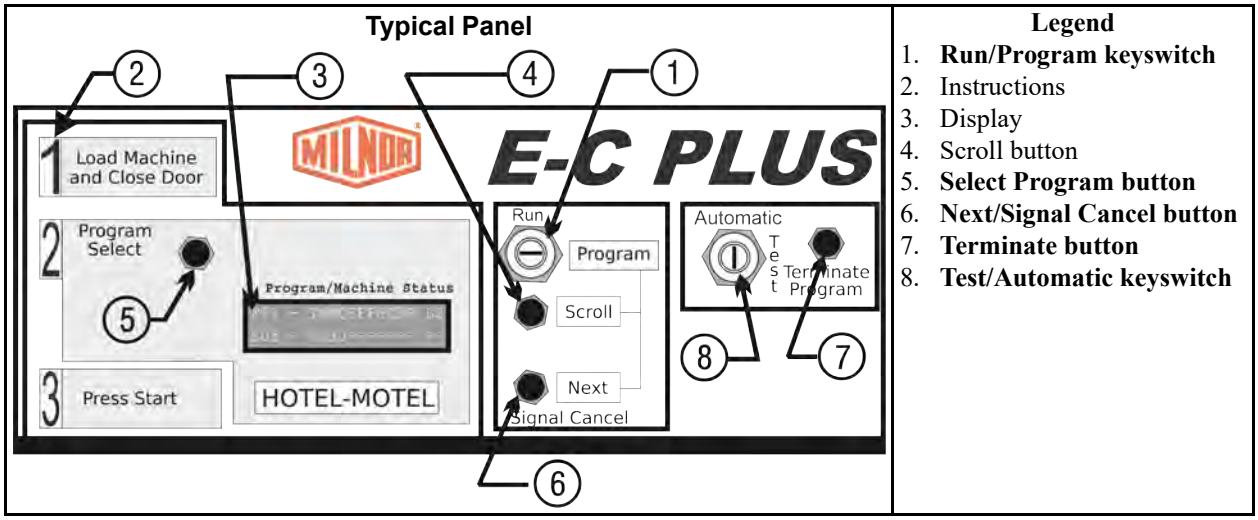
Use the size of the machine, the type of the goods, the amount of soil, and the wash quality when you load the machine.

3 Programming

3.1 Controls on E-C Plus Washer-extractors

The controls on Milnor® E-C Plus washer-extractors are primarily mechanical pushbuttons. Other controls include a keyswitch, a standard emergency stop button, and a switch for main machine power. Some of these controls serve different functions in the three operational modes of the machine. The function of each control in the normal, manual (or testing), and programming modes of this machine is described in detail in this document.

Figure 2. E-C Plus Control Panel



3.1.1 Control Functions During Normal Operation

Normal operation is the state of the machine when the machine control circuit is energized and the **Run/Program** keyswitch is in the **Run** position. The machine may be either idle (waiting to run a formula) or running. If the machine is idle, the message on the display will begin with “Run Formula” and include a formula number on the second line.

1. The **Run/Program** keyswitch must be in the **Run** position unless the machine is being configured or programmed. All control descriptions listed under Section 3.1.1 : Control Functions During Normal Operation, page 10 are based on the keyswitch being in the **Run** position. Refer to Section 3.1.3 : Control Functions During Programming, page 12 for descriptions of how the controls operate with the keyswitch in the **Program** position.
2. Instructions briefly describe the steps required for normal machine operation:

a. Load the machine at or near the rated capacity, then securely close the loading door.
b. Select the appropriate program for the goods loaded in the machine.
c. Press the **Start button**.

3. The display on these machines is a vacuum fluorescent type displaying two lines of twenty characters each.
4. When selecting a specific formula to run, press the **Scroll button** to display the next lower numbered formula in memory. Press this button when the lowest formula is displayed (Formula 01) to select the highest numbered available formula (maximum of 30 formulas).
5. The **Select Program button** functions in much the same manner as the **Scroll button** described above. Press this button to display the next higher numbered formula in memory.
6. In normal operation, pressing the **Next/Signal Cancel button** silences the operator signal buzzer. If a signal is programmed with a chemical injection in any formula, this button must be pressed to confirm that the chemical has been added before operation resumes.
7. The **Terminate Program button** cancels all remaining steps in any running formula and initiates the shutdown procedure for the machine. Formulas ended in this manner cannot be resumed.
8. The **Test/Automatic keyswitch** has no effect while a formula is running. Switching this key to the **Test** position when the display says "**Run Formula xx**" initiates manual mode, where the controls function as described in Section 3.1.2 : Control Functions During Manual Operation, page 11 .

3.1.2 Control Functions During Manual Operation

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Manual operation is used primarily for troubleshooting the machine by activating outputs and viewing inputs.

1. The **Run/Program keyswitch** must be in the **Run** position () unless the machine is being configured or programmed. All control descriptions listed under Section 3.1.1 : Control Functions During Normal Operation, page 10 are based on the keyswitch being in the **Run** position. Refer to Section 3.1.3 : Control Functions During Programming, page 12 for descriptions of how the controls operate with the keyswitch in the **Program** position ().
2. The pictorial instructions apply only to normal operation, not to manual operation or programming.
3. In the **manual menu**, the display presents user prompts and selected information. The software date code and machine configuration are displayed; inputs and outputs and their respective statuses are also shown.
4. When selecting a specific formula to run, press the **Scroll button** to display the next lower numbered formula in memory. Press this button when the lowest formula is displayed (Formula 01) to select the highest numbered available formula (maximum of 30 formulas).
5. The **Select Program button** functions in much the same manner as the **Scroll button** described above. Press this button to display the next higher numbered formula in memory.

6. In manual operation, pressing the **Next/Signal Cancel button** selects the information to be displayed. When testing inputs, this button is indicated by the “C” on the top line, and a plus sign (+) is displayed on the bottom line when the button is held. In the outputs test, the **Next/ Signal Cancel button** actuates the selected output.
7. The **Terminate Program button** returns the controller to the **Manual mode** menu.
8. The **Test/Automatic keyswitch** has no effect while a formula is running. Switching this key to the **Automatic** position while in the **Manual mode** returns the machine to automatic operation, where the controls function as described in Section 3.1.1 : Control Functions During Normal Operation, page 10 .

3.1.3 Control Functions During Programming

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The programming mode is used to modify the actions performed in a wash formula or to create new wash formulas.

1. The **Run/Program keyswitch** must be in the **Program** position when the machine is being configured or programmed. Section 3.1.1 : Control Functions During Normal Operation, page 10 describes the behavior of controls when the keyswitch is in the **Run** position.
2. The instructions on the faceplate apply only to normal operation, not to programming or troubleshooting.
3. The display presents the programming menus and choices within those menus, including all configuration and formula parameters.
4. At the main programming menu, the **Scroll button** scrolls forward through the available programming modes. Within the **Add/Change Program mode**, use this button to select the formula for editing. When a wash formula is selected and the cursor is at the step number, this button scrolls forward through the available formula steps. With a decision selected within a formula, this button scrolls the available choices for the decision.
5. The **Select Program button** functions similarly to the **Scroll button** described above, but scrolls the available choices in the opposite direction.
6. In programming, pressing the **Next/Signal Cancel button** when the display says, “**OK Turn Key to Run**” verifies that the **Run/Program keyswitch** has been set to the **Run** position and that programming is complete. Similarly, this button is used to confirm a decision and advance the cursor to the next decision.
7. If the cursor is at the step number, the **Terminate button** exits a formula being modified, either deleting the formula if it was just created, or abandoning any changes made during this session. When a decision within a step is selected, this button moves the cursor backward through each valid choice. Used with the **Start button**, this key deletes the current step.
8. In **Program mode**, the **Test/Automatic keyswitch** is used along with the **Next** and **Terminate** buttons to insert or delete steps when the cursor is flashing on the step number.

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3.2 Selecting an Industry Formula Set

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The Milnor® E-C Plus electronic chart controller for washer-extractors can be configured for one of eight separate industries. The configuration process consists of setting the DIP switches on the processor board and installing the appropriate industry nameplate. At the owner's discretion, the DIP switch settings controlling the available formulas may be changed in the field to suit the primary use of the machine on which the controller is installed.

To change industry configuration, turn the machine **off**. Then lock off and tag out power to the machine at the wall disconnect before attempting to access the processor board.

DANGER:

Electrocution hazard — Contact with high voltage will electrocute or burn you. Power switches on the machine and the control box do not eliminate these hazards. High voltage is present at the machine unless the main machine power disconnect is off.

The location of the DIP switches on the microprocessor board are shown in Figure 3 , as are examples of the **on** and **off** positions. Set the switches to the desired configuration according to Table 4 . Turn the machine **on**; the display will show the current configuration.

CAUTION:

Risk of improper configuration — On some machines, the processor board is installed in the control box so that the labels printed on the DIP switch appear inverted.

▶ Do not assume that the switch is right side up. Always reference the labels (**OFF**, **ON**, **1**, **2**, etc.) **printed on the switch** when setting DIP switches.

Figure 3. Location of DIP Switches

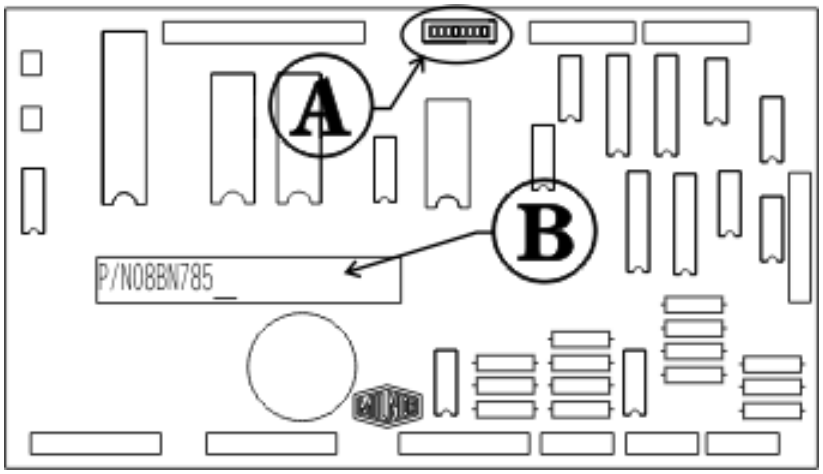

Table 4. DIP Switch Settings for Industry

Industry Configuration	Switch Settings							
	S1	S2	S3	S4	S5	S6*	S7	S8
Correctional	OFF	OFF	OFF	OFF	This switch is not used in these models.	Off prevents/ On allows skipping steps.	These switches are not used in these models.	
Hotel/Motel	ON	OFF	OFF	OFF				
Athletic	OFF	ON	OFF	OFF				
Healthcare	ON	ON	OFF	OFF				
Restaurants	OFF	OFF	ON	OFF				
Commercial	ON	OFF	ON	OFF				
Shirt Laundry	OFF	ON	ON	OFF				
Offshore	ON	ON	ON	OFF				
*** Setting S6 On enables the operator to cancel any step in progress except a drain before an extract.**								

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3.3 Programming the E-C Plus Controller

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The microprocessor controller used in this washer extractor operates in three modes, depending on whether the machine is processing goods (the **Run mode** or **Formula** menu), being programmed with operating characteristics to be used when a wash formula is started (the **Program** mode), or being tested (the **Manual** or **Test** mode). This document describes the available operator actions and display feedback in the **Program** mode.

The **Program** mode is accessible only when the **Run/Program keyswitch** is set to the **Program** position, as described below. From the **Program** menu, there are four options available:

- Option 0: OK TURN KEY TO RUN (detailed in Section 3.3.2 : Return to Run Mode (Option 0), page 15)
- Option 1: ADD/CHANGE FORMULA (detailed in Section 3.3.3 : Add or Change a Formula (Option 1), page 16)
- Option 2: CONFIGURE (Detailed configure instructions are provided elsewhere in the manual. See the table of contents.)
- Option 3: STANDARD FORMULAS
- Option 4: DATA TRANSFER

Each of these options is described in detail in this document. For information on how to start the machine and run a formula, see the appropriate section listed in the table of contents of this manual.

3.3.1 How to Avoid Data Loss

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CAUTION: **Avoid Corrupting Formula Data —** Never turn the **Run/Program key-switch** from the **Program** position to the **Run** position unless the display says **OK Turn Key to Run**.

▶ Failure to follow this direction will result in the loss of all formula modifications entered during the current programming session. Formulas not modified during this session will not be affected.

CAUTION: **Avoid Corrupting Configuration Data —** Never shut off machine power, turn off the **Master switch**, or press the **Emergency Stop button** to exit the **Program** mode.

▶ Once the **Configure** menu has been accessed, all configure decisions must be confirmed by pressing the **Next button** before another action can be taken.

▶ Failure to follow this direction will result in corruption of machine memory.

Use the following procedures to clear corrupted formula and configuration memory and restore valid data.

Display or Action	Explanation
CHECKSUM ERROR, TURN KEY TO PROGRAM	This display indicates that all memory will be cleared. **The machine controller must be reconfigured and any new formulas or modifications to standard formulas must be re-programmed.**
Program	Accesses the first configuration decision.
TEMP CONTROL? 0=NO 1=YES 0	First configure decision.

3.3.2 Return to Run Mode (Option 0)

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Option 0 allows for a safe return from the **Program** mode to the **Formula** menu, preserving any changes that were made during the programming session and maintaining the integrity of programming and configuration data.

Display or Action	Explanation
PROGRAM 0 MENU OK TURN KEY TO RUN	This is **Option 0** of the **Program** menu. From this display, return to the **Formula** menu or select another available menu option.
Run	Returns to **Run** mode (**Formula** menu)

or

Program Select / Scroll	Scrolls the available choices in the **Program** menu.

3.3.3 Add or Change a Formula (Option 1)

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Washer extractors with the Milnor® E-C Plus control system have the capacity for up to 30 unique wash formulas. The space for these formulas is allocated in memory whether or not the formulas are actually used.

3.3.3.1 What are Formulas, Steps, and Decisions?

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In this manual a **wash formula** is all actions automatically performed by the machine from when the operator starts the loaded machine until the machine stops all operations. The end of a formula is usually indicated by an audible operator signal.

Formulas are made up of several types of **steps**, each with several variables which are determined when the operator or other qualified person programs the formula. Steps are either baths or extractions (extracts), each of which can be programmed with certain characteristics. For a typical bath step the formula may cause the basket to alternate between clockwise and counter-clockwise for a specified time, the hot and cold water valves to open until the machine fills to low level, and signal the chemical supply system to inject alkali and detergent. When both the required and user-defined actions of a step are completed, the next step begins. The formula ends and the operator signal is activated after the last programmed step (often a high-speed extract step) is executed.

Each step is formed through several **programming decisions**, which are questions asked by the machine controller. The person programming the formula answers these questions to build the wash formula. Most programming decisions consist of choosing one option from a list of possible answers; for example, the water level decision in a bath step can be answered with either “1” for low level or “2” for high level. Other programming decisions, such as step time and bath temperature, require entry of a specific value.

The user interface employs similar procedures for creating a new formula and for changing an existing formula. Both procedures are detailed below, in Section 3.3.3.5 : Create a New Formula, page 18 and Section 3.3.3.7 : Change an Existing Formula, page 19 . The control system will inform the person programming the machine whether the selected formula has already been programmed.

3.3.3.2 About the Programming Help Screens

BNCJUP36.C03 0000248728 A.3 C.2 A.4 1/2/20 1:16 PM Released

Display or Action	Explanation
F01 - TMMQFFFHC3B LS S01 - 0---------- --	This is **Page A** of the programming menu. The cursor is at the first decision (**T**=Type of Step). Each decision has an associated help screen.
F03 T TYPE OF STEP S01 0 END FORMULA	This is a typical programming help screen. Help screens appear automatically if no valid entry is made within four seconds of accessing the decision.
Next	Accepts the selected value for the current decision and advances the cursor to the next decision, regardless of the status of the help screen.

3.3.3.3 Moving Forward and Backward through Steps and Decisions

BNCJUP36.C04 0000248727 A.3 C.2 1/2/20 1:16 PM Released

Each step has two displays: **Page A** and **Page B**.

Display or Action	Explanation
F03 - TMMQFFFHC3B LS S01	This is **Page A**. In this example, the "F03" at the left end of the display represents the formula number. The "S01" below it represents the step number within that formula.
F03 - CWSSS* D E S01	This is **Page B**. When the cursor is advanced past the last decision on **Page A**, **Page B** appears for the remaining decisions in this step. The **CWSSS*** decisions shown in underline repeat for each chemical programmed in this step. The specific decisions required on both pages vary according to machine model and options.

3.3.3.3.1 Actions when the Cursor is at the Step Number

BNCJUP36.C05 0000248726 A.3 C.2 1/2/20 1:16 PM Released

Display or Action	Explanation
03 TMMQFFFHC SCWSS* 02 xxxxxxxxx xxxxxx	typical display with cursor at **step number**
Scroll / Program Select	Indexes forward/backward through the step numbers in this formula.
Next	Accesses the selected step and positions the cursor at decision **T**, or saves all changes and exits this formula if this is the last step of an existing formula.
Terminate Program	Exits this formula, clearing the formula if it has not been saved, or discarding any changes to a previously existing formula.

3.3.3.3.2 Actions when the Cursor is at a Decision within a Step

BNCJUP36.C06 0000248750 A.3 C.2 A.4 1/2/20 1:16 PM Released

Display or Action	Explanation
03 TMMQFFFHC SCWSS* 02 xxxxxxxxx xxxxxx	typical display with cursor at a **decision** within a step
Scroll / Program Select	Indexes forward/backward through the valid choices for this decision.
Next	Moves the cursor forward among **Pages A** and **B** through each valid decision in a specific step. This accepts the standard or default decision if another choice was not previously made.
Terminate Program	Moves the cursor backward among the two pages, through each valid decision within a specific step, except in the following cases: • If the cursor is at decision **T** on **Page A**, it will move to the step number. • If the cursor is at the first decision on **Page B**, it will back up to the first valid decision on **Page A**.

3.3.3.4 Naming a New Formula

BNCJUP36.C07 0000248787 A.3 C.2 1/2/20 1:16 PM Released

Display or Action	Explanation
FORMULA NAME: FORMULA NUMBER 29	This is a typical default formula name. If desired, use the keystrokes below to edit the formula name. Press **Terminate Program** at this cursor location to accept the current formula name and advance to the formula decisions.
Scroll	advances the character under the cursor **forward** through the available letters, numbers, and symbols
Program Select	advances the character under the cursor **backward** through the available letters, numbers, and symbols
Next	moves the cursor one character **from left to right**
Terminate Program	moves the cursor one character **from right to left**; when the cursor is over the **leftmost** character, this keystroke accepts the current formula name and advances to the formula decisions

3.3.3.5 Create a New Formula

BNCJUP36.C08 0000248786 A.3 C.2 A.5 1/2/20 1:16 PM Released

Creating a new formula with the E-C Plus controller entails adding and defining steps using one of the existing but blank formula numbers.

Display or Action	Explanation
PROGRAM 1 MENU ADD/CHANGE FORMULA	This is **Option 1** of the **Program** menu. From this display, either access a formula by number to change or create, or select another available menu option.
Next	Accesses the formula list for selection of a formula number to change or create.
ADD/CHANGE FORMULA 00 RETURN TO MENU	This is the **Add/Change Formula** display. From this display, either back up to the **Program** menu, or begin creating or changing a formula.
Scroll / Program Select	Scrolls the available formula numbers. These keystrokes select a formula for adding if the formula number hasn't already been programmed. The number is selected for **change** if it has already been programmed.
ADD/CHANGE FORMULA 23 FORMULA NUMBER 23	Formula 23 is available for **adding** because it does not currently exist.
ADD/CHANGE FORMULA 07 FORMULA NUMBER 07	Formula 07 is available for **changing** because it already exists.
Next	Accesses the selected formula for programming. Valid formula numbers are 01 through 30.
FORMULA NAME: FORMULA NUMBER 07	Edit the formula name if desired.
Next / Terminate	Move the cursor one character to the right or left, respectively, without changing the character. Press the **Terminate button with**

	the cursor at the leftmost position to accept the formula name and advance to the first step of the formula.
Program Select / Scroll	Press to change the character at the cursor. Available characters include all letters and numbers, several symbols and punctuation marks, and a blank space.
F07 - TMMQFFFHC LS S01 - 205012510 21	Formula 07, Step 01 selected for programming. Refer to Section 3.3.3.7.2 : The Step Decisions, page 20 for detailed programming instructions.

3.3.3.6 Delete an Existing Formula

BNCJUP36.C09 0000248785 A.3 C.2 1/2/20 1:16 PM Released

Display or Action	Explanation
F03 - TMMQFFFHC LS S01 - 0000----- --	Delete an existing formula by making step 01 an **End** step. Accomplish this by setting the **T** value for step 01 of the formula to 0.

3.3.3.7 Change an Existing Formula

BNCJUP36.C10 0000248784 A.3 C.2 1/2/20 1:16 PM Released

3.3.3.7.1 How to Insert or Delete a Step in an Existing Formula

BNCJUP36.C11 0000248783 A.3 C.2 1/2/20 1:16 PM Released

Display or Action	Explanation
F07 - TMMQFFFHC LS S01 - 205012523 21	Cursor blinking on step number indicates that adding or deleting a step is allowed.
Test	Provides a help screen for inserting and deleting steps, as shown below.
MANUAL + NEXT/TERM INS/DELETE THIS STEP	This is the help screen for inserting and deleting steps.

NOTE: Although the display refers to **Manual**, you must actually set the **Automatic/Test keyswitch** to the **Test** position before pressing either the **Next** or **Terminate buttons**.

Display or Action	Explanation
Automatic	Advances the cursor without deleting or duplicating the selected step. This key accesses the next step and allows for modification of the values there.
Scroll / Program Select	Scrolls through the available choices for the decision indicated by the cursor.

3.3.3.7.1.1 Inserting a Step

BNCJUP36.C12 0000248782 A.3 C.2 A.5 1/2/20 1:16 PM Released

Display or Action	Explanation
Test + Next	Duplicates the selected step to the next numerical position. If this is Step 01, the duplicated step becomes the new Step 01 and all the following steps move to the next higher numerical position.

Duplication of **End Formula** or **Extract** steps is prevented by the controller.

```
F03 - TMMQFFFHC3B LS
S01 NEW STEP01 DUPED
```

This display appears while the **Next button** is depressed, indicating that the new step has been created as a copy of the previous step.

3.3.3.7.1.2 Deleting a Step

BNCJUP36.C13 0000248781 A.3 C.2 1/2/20 1:16 PM Released

Display or Action	Explanation
Test + Terminate	Deletes the selected step. The next step becomes the current step by assuming the number of the step that was just deleted. All following steps move one number lower. Deletion of **End Formula** is prevented in all cases. A **Bath** step cannot be deleted if it falls between two **Extract** steps.
`F03 - TMMQFFFHC3B LS` `S01 STEP DELETED`	This display indicates that the selected step has been deleted from the wash formula.

3.3.3.7.2 The Step Decisions

BNCJUP36.C14 0000248780 A.3 C.2 A.6 1/2/20 1:16 PM Released

A maximum of 30 formulas may be programmed, with a maximum combined total of 225 steps in all formulas.

Display or Action	Explanation
`F07 - TMMQFFFHC3B LS` `S01 - 0---------- --`	This is a typical **Type of Step** decision display. The actual format of the display varies according to the specific machine controller and certain configure decisions.
0	End formula: The last step of each formula must be of type **0**. This step is automatically added as a last step if the previous step is type **6** (final extract). The basket moves or stops as directed by the **How to End** programming decision, described in Section 3.3.3.7.7 : Concluding Decisions, page 26 . A formula may be ended without a final extract by setting the last step to type **0**. If the last step before the **End Formula** step is a type other than final extract, the controller will ask “End Formula #xx?”. Setting the first step of an existing formula to type 0 deletes the formula, as described in Section 3.3.3.6 : Delete an Existing Formula, page 19 .
1	Two-way wash: Washing routine used most commonly. The basket rotates clockwise for some period of time, then pauses for a few seconds before rotating in the opposite direction.
2	Soak wash (available if machine has the cylinder stop option): The cylinder does not turn when this step type is programmed. Use this step type only when no mechanical action is required, as for especially delicate fabrics. Consider chemical concentrations, bath time, and liquor temperature when using this type of step.

3	Intermediate extract (available if machine has the low speed extract option): The lower extract speed is commanded. If this type of step is programmed in a machine without the low speed extract option, high speed extract is commanded.
4	Commands the high speed (final) extract sequence. If the machine is equipped with the low speed extract option, then low speed extract is commanded for approximately 90 seconds before high speed extract begins.
03 - TMMQFFFHC3B LS 01 - 1	Duration of step in minutes, minutes, and quarter minutes.
000	Invalid entry. Controller defaults this entry to 001 (15 seconds).
001	00.25 minutes; 00:15 seconds is minimum programmable time for a bath step.
113	11.75 minutes; 11:45
633	63.75 minutes; 63:45 is the maximum programmable time for any single step. To achieve a bath time longer than 63:45, program two consecutive bath steps with the first ending with a **No Drain**. This effectively doubles the maximum allowable bath time.

The total time required for a formula to run to completion includes factors other than the total of the times of each step in the formula. For these machines, add 60 seconds distribution time each time the machine enters an extract step from a bath step. Between bath steps, include the configured bath-to-bath drain time described in Section 3.3.4.2 : The Configure Decisions, page 30 .

Display or Action	**Explanation**
F03 - TMMQFFFHC3B LS S01 - 1052xxx---- --	Temperature decision appears only if the machine is supplied with and configured for temperature control (**Temp Control** = **Yes**), as described in Section 3.3.4 : Configure the Control (Option 2), page 30 .
- - -	Display if no temperature is commanded, or if commanded temperature is 000. The cursor skips to the next decision.
050°F / 010°C	Minimum temperature in any bath
205°F / 96°C	Maximum temperature in any bath
F03 - TMMQFFFHC3B LS S01 - 1052135x--- --	Control of hot water valve
0	Hot water valve off
1	Hot water valve on
F03 - TMMQFFFHC3B LS S01 - 10521350x-- --	Control of cold water valve
0	Cold water valve off
1	Cold water valve on
F03 - TMMQFFFHC3B LS S01 - 105213511x- --	The **third water** decision appears only if the machine is supplied with and configured for this option.
0	Third water valve off

1 Third water valve on
2 Raises temperature of filling water if connected to a hot water source
3 Lowers temperature of filling water if connected to a cold water source

3.3.3.7.2.1 How to Modulate Water Valves to Regulate Incoming Water Temperature

BNCJUP36.C15 0000248865 A.3 C.2 1/2/20 1:16 PM Released

When programming a thermo-modulated temperature for a bath using both hot and cold water valves, the relationship between the desired temperature and the temperature of a split fill (hot and cold valves open simultaneously) is important.

If the desired temperature is hotter than the normal split temperature, a faster, more accurate fill with a more constant temperature is achieved by programming the hot water valve open (H=1) and the cold water valve to open only to lower the fill temperature (C=3).

If the desired temperature is colder than the normal split temperature, similar results can be achieved by programming the hot water valve to open only to raise the fill temperature (H=2) and the cold water valve to remain open constantly (C=1).

3.3.3.7.3 How to Use Cooldown

BNCJUP36.C16 0000248864 A.3 C.2 A.5 1/2/20 1:16 PM Released

A cooldown bath is used to gradually lower the temperature of goods (usually synthetics and blended fabrics) to reduce the chance of setting wrinkles. When a cooldown is programmed, the drain type for the previous bath step is automatically changed to **Do Not Drain**, so the goods are not cooled too quickly by coming in direct contact with the incoming cooldown water.

These items are required before the controller will allow you to program a cooldown step:

1. The machine must be equipped with a separate **cooldown water valve**. This valve and its associated piping reduces the flow of cold water into the machine so the temperature falls gradually.
2. The machine must be configured for temperature control (**Temp Control** = YES) as described in Section 3.3.4.2 : The Configure Decisions, page 30 .
3. The machine must be configured for cooldown (**Cooldown Error** = 1, 2, or 3) as described in Section 3.3.4.2 : The Configure Decisions, page 30 .
4. The bath step with the high temperature must immediately precede the cooldown step, and it must have a temperature programmed in degrees (for example, 180 degrees Fahrenheit). Failure to program a temperature in the bath preceding a cooldown results in an error message.

Display or Action	Explanation
03 TMMQFFFHC LSCWSS* 03 2050180l0 140----	This is a typical step preceding a cooldown step. Note that a specific temperature is programmed (shown in underline).

A cooldown is programmed as a separate bath step following the bath in which the cooldown is desired. In the cooldown step, command a desired cooldown temperature with all water valves programmed off (0). The E-C Plus control automatically inserts a **no drain** in the previous bath and 010 in MMQ for the cooldown step, for a step time of 1:00.

Display or Action	Explanation
03 TMMQFFFHC LSCWSS* 04 201010000 -------	This is a typical cooldown step. Note that all configured water valves are programmed off. The programmed step time for a cooldown will always be changed to one minute (MMQ = 010). Any valid **bath** step type may be used here (T = 1, 2, or 3)

NOTE: The commanded cooldown temperature must always be at least 15 degrees Fahrenheit (8 degrees Celsius) hotter than the hottest ambient temperature or the hottest cold water temperature that will be encountered. If this rule is not followed, achieving the desired cooler temperature may take a long time, or even be impossible.

During operation, the cooldown bath step starts immediately when the previous (high-temperature) bath ends.

1. The cooldown valve opens when the cooldown step begins. The cooldown valve does not close until the end of the cooldown step.
2. When high water level is achieved, the drain opens until the water level falls below high level, then the drain closes.
3. The drain continues to open and close as needed to maintain high water level.
4. The step timer starts 15 seconds after the desired cooldown temperature is achieved. The timer runs for one minute.
5. When the one-minute step time expires, the cooldown valve closes and the drain opens. The drain remains closed only if the machine was programmed to not drain, as to prolong the cooldown or allow the injection of chemicals into the cooler bath.

Display or Action	Explanation
ILLEGAL COOLDOWN STEP-PRESS TERMINATE	This display results from commanding all water valves off (0) in a bath **following an extract step**, or if a temperature was not specified in the previous bath step.
Terminate	If the machine is configured for cooldown, this keystroke returns the cursor to the time field (MMQ). If the machine is not configured for cooldown, but is configured for temperature control, this keystroke returns the cursor to the temperature field (FFF). If temperature control is not configured, this keystroke returns the cursor to the first water valve field.
F03 - TMMQFFFHC3B LS S01 - 1052135011x --	Fill machine through bottom (1) or door (0).

3.3.3.7.4 How to Select the Bath Level

BNCJUP36.C17 0000248863 A.3 C.2 A.4 1/2/20 1:16 PM Released

Display or Action	Explanation
F03 - TMMQFFFHC3B LS S01 - 10521350111 x-	The values of high and low bath levels are determined by hardware settings on the level switches.
1	Low bath level; usually used for starch baths.

2 Medium bath level; usually used for baths with chemical injections

3 High bath level; usually used for rinsing.

3.3.3.7.5 How to Select the Steam Code

BNCJUP36.C18 0000248862 A.3 C.2 1/2/20 1:16 PM Released

Display or Action	Explanation
	Appears only if the machine is supplied with and configured for temperature control (**Temp control**=yes) and steam (**Steam error** greater than 0).
	0 no steam in this bath

The available steam codes are combinations of two **yes/no** decisions, as described below. These decisions are summarized in Table 5: Summary of E-C Plus Steam Code Choices, page 24 .

- **After** defines whether steam is allowed in this bath after temperature has been achieved once and subsequently fallen below the commanded temperature. A **No** response prevents a second steaming after temperature is first achieved. Use **No** if chemicals or goods may be damaged by steam after a chemical injection (as in bleach baths). Answer **Yes** if temperature should be maintained for the full duration of the bath step and goods or chemistry will not be adversely affected by the introduction of steam into the cylinder.
- **Timer** defines whether the timer runs or stops while steaming up to temperature. **Stops** causes the timer to stop counting until the commanded temperature is first achieved. **Runs** is for use when some temperature fluctuations are acceptable or when it is certain that the commanded temperature will be nearly achieved while filling. Use **Stops** if temperature must be achieved before adding chemicals, otherwise software will suppress this chemical-add choice.

1 After=Yes; Timer=Runs. Control does not start steaming until commanded liquor level is achieved; if necessary, steam is allowed after temperature is first achieved; timer runs while steaming up to temperature.

2 After=No; Timer=Stops. Control does not start steaming until commanded liquor level is achieved; steam is not allowed after temperature is first achieved; timer stops while steaming up to temperature.

3 After=Yes; Timer=Stops. Control does not start steaming until commanded liquor level is achieved; if necessary, steam is allowed after temperature is first achieved; timer stops while steaming up to temperature.

Table 5. Summary of E-C Plus Steam Code Choices

Steam Code	Steaming can occur after temperature is initially achieved	Step timer runs or stops while steaming to the desired temperature
0	No steam allowed in this bath	
1	Yes	Runs

Table 5 Summary of E-C Plus Steam Code Choices (cont'd.)

Steam Code	Steaming can occur after temperature is initially achieved	Step timer runs or stops while steaming to the desired temperature
2	No	Stops
3	Yes	Stops

3.3.3.7.6 Injecting Chemicals

BNCJUP36.C19 0000248897 A.3 C.2 A.4 1/2/20 1:16 PM Released

Display or Action	Explanation
F03 - CWSSS* D SE S01 - x00600 0 --	Chemicals can be added to any bath other than a cooldown bath. A standard chemical injection can be prevented by commanding C = 0 (no chemical in this bath) or by commanding SS = 000 (zero seconds of chemical inject time). Up to five chemical injections per bath step are allowed.
	0 No chemical in this bath
	2 Inject chemical number 2
	5 Inject chemical number 5 (five is maximum number of chemicals)
F03 - CWSSS* D SE S01 - x00600 0 --	Select the point in the step at which this chemical will be injected.
	0 when level is satisfied. This is the only selection available if the steam code for this step is either 0 or 1.
	1 Inject chemical when level and temperature are satisfied. The chemical injection begins only after the commanded bath level and temperature have been achieved.
F03 - CWSSS* D SE S01 - 20060 0 -	Program the duration of the chemical injection in seconds.
	000 Zero seconds, prohibits this chemical injection.
	060 60 seconds. If no specific time is entered, the control automatically inserts a value of 60. Any other value between 00 and 255 may be specified and will override the default duration.
	255 255 seconds (maximum duration)

CAUTION: Risk of Poor or Inconsistent Wash Quality — If the duration of each chemical injection is determined by the E-C Plus controller, chemical injections should always have a duration of at least 10 seconds. With shorter injection times, fine adjustments are not possible, and variations in response times have an exaggerated effect on the quantity delivered.

- Select pumps or valves of the appropriate size to provide for longer injection times.
- If quantities of one chemical must vary greatly among formulas, use two pumps or valves for that chemical.
- If the injection duration is controlled by the chemical supply system (from others), then the injection duration programmed at the washer-extractor controller need only be sufficient to ensure detection by the chemical system.

Display or Action	Explanation
F03 - CWSSS* D SE S01 - 20060 0 --	Is an audible operator signal required when the chemical is desired? The operator signal will not occur until the **When to start chemical injection** decision is satisfied. The commanded chemical injection will not begin until the signal is cancelled.
0	No. A signal is not required with this chemical injection. Chemicals will inject without operator intervention.
1	Yes. A signal is required with this chemical injection. The signal will start when all conditions for the chemical are satisfied. The actual injection will begin only after the signal is cancelled, as below.
Signal Cancel	During normal operation (formula running), this keystroke cancels the operator signal and allows chemical injection to begin if this decision is set to **1**=**Yes**.
F03 - CWSSS* D SE S01 - x00600 0 --	After programming the first chemical, the controller returns to the first chemical decision to allow the programming of a second chemical. Up to five chemicals can be programmed for each bath step.
0	No additional chemical in this bath. The cursor advances to the next decision.
3	Chemical 3 (or any other valid chemical number). Cursor advances to decision **W** for this chemical.

3.3.3.7.7 Concluding Decisions

BNCJUP36.C20 0000248896 A.3 C.2 A.6 1/2/20 1:16 PM Released

Display or Action	Explanation
F03 - CWSSS* D E S01 - x	Select how the basket moves while this bath step is filling and draining, and whether the drain valve opens or remains closed. The available options allow selecting relatively more or less mechanical action during the fill phase (when the water valves are open and the drain valve is closed) and the drain phase (when the water valves are closed and drain valve is open) of the step, when there is less water in the machine to support the goods.

NOTICE: Selected drain type may change automatically. The controller requires that the basket always accelerate to drain speed before advancing to extract speed, even if a stop or bath-speed drain type is programmed.

- **Standard** and **stop at fill** drain types are valid for bath steps followed by any other type of step.
- **Two-way wash speed**, **do not drain**, and **stop at drain** drain types will automatically change to a **standard** drain when an extract is programmed as the next step.
- A **stop at fill and drain** drain type will automatically change to a **stop at fill** drain type when an extract is programmed as the next step.

Table 6. Summary of Drain Type Choices

Drain Type	Help Screen Description	Basket Motion		Drain Valve
		During Fill Phase	During Drain Phase	
0	Standard	set by Type of Step decision for this step	standard drain speed	opens after distribution
1	2-way wash (see Note A below)	set by Type of Step decision for this step	reversing at wash speed	opens after programmed step time
2	Do not drain (see Note A below)	set by Type of Step decision for this step	none—following bath determines basket rotation	does not open
3	Drain + spray (see Note B below)	set by Type of Step decision for this step	clockwise at standard drain speed; spray enabled for last 25 seconds of drain phase	opens after distribution
4	Stop at fill (see Note C below)	stopped until desired level is achieved	clockwise at standard drain speed	opens after distribution
5	Stop at drain (see Notes A and C below)	set by Type of Step decision for this step	stopped	opens after programmed step time
6	Stop fill & dr (see Notes A and C below)	stopped until desired level is achieved	stopped	opens after programmed step time
Note A:	This selection is not valid immediately before an extract step. Refer to the Notice above this table for specifics.			
Note B:	This selection is available only when the machine is equipped and configured for optional Spray Rinse.			
Note C:	This selection is available only when the machine is equipped and configured for optional Cylinder Stop.			

Display or Action	Explanation
0	Standard drain speed: Basket turns clockwise at drain (distribution) speed while draining. Standard drain speed varies by machine model, but is designed to impart about one G of acceleration to the goods. Basket movement while filling is determined by the **Type of step** decision and the specific design of the machine. Standard drain speed is valid for all following step types and with any configuration of options.
1	Two-way wash speed: While draining, the basket reverses at wash speed to provide more mechanical action among the goods. Do not use this selection if the next step will be an extract. If a bath is programmed with this option, then an extract is programmed immediately following the bath step, the controller will change the drain code from **1=Two-way wash speed** to **0=Standard drain speed** (see the notice above Table 6). The **two-way wash speed**

selection is available only if the machine is equipped and configured for the **Special Drain** option.

2 Do not drain: Bath liquor is retained for later operations in this same bath. Chemicals may be added, and temperature or level may be raised without draining. Basket movement during the fill phase of this step is determined by the **Type of step** decision. The next step begins immediately when the time for this step expires. This selection is not available if the next step is an extract. As described in the notice above Table 6 , if a bath is programmed with this option, then an extract is programmed immediately following the bath step, the controller will change the drain code from **2**=**Do not drain** to **0**=**Standard drain speed**.

3 Drain and spray: If the machine is equipped with and configured for the *Spray Rinse* option, the machine will spray for the last 25 seconds of the drain sequence. All other characteristics of this drain type are the same as for **0**=**Standard drain speed**.

4 Stop with fill: If the machine is equipped with and configured for the *Cylinder Stop* option, the basket remains stationary while the cylinder fills for this step, but turns at drain speed (approximately 1 G) while draining. The basket turns at standard drain speed during the drain phase of the step.

5 Stop with drain: If the machine is equipped with and configured for the *Cylinder Stop* option, the basket remains stationary during the drain, allowing no mechanical action. This option is not valid if the next step is an extract.

6 Stop with fill and drain: If the machine is equipped and configured for the *Cylinder Stop* option, the basket is stationary while this step fills and drains. This option is not valid if the next step is an extract.

If machine is equipped and configured for a second drain, select the drain destination for this step.

If machine is equipped and configured for the *Spray Rinse* option, and this is an intermediate extract, select whether or not to spray rinse the goods during the final 25 seconds of the step.

0 No. Use a standard intermediate extract.

1 Yes. Spray the goods during the last 25 seconds of this extract step.

If the machine is equipped and configured for the *Special Drain* option, three choices are available for final extract and end-of-formula steps:

0 Drain speed: how the program normally terminates. The basket continues to turn at drain speed while the signal sounds. To unload the machine, disable the three-wire circuit and press the **Next button**.

1 Reversing (at wash speed): to unload the machine, disable the three-wire circuit and press the **Next button**.

2 Tumbling: this action is similar to reversing. Disable the three-wire circuit to silence the signal, then open the door and pull down any stuck goods. If desired, close the door and enable the three-wire circuit to resume tumbling. After two minutes, the signal sounds again. Disable the three-wire circuit and press the **Next button** to silence the signal, then unload the machine.

NOTE: For Staph Guard® machines, transfer control to the soil side before pressing **Next**.

Display or Action	Explanation
F03 - TMMQFFFHC3 LS S02 - 0-------- --	The cursor returns to this display to program the next step unless the step just programmed is the last step of a formula or if the number of steps exceeds 50, in which case the cursor advances to decision **E**.
F03 - CWSSS* D E S05 - ------ - 0	Determine how this formula should end.

Table 7. Summary of Choices for Ending a Formula

How to End	Help Screen Description	Basket Motion	Operator Signal Action
0	Drain Speed	coasts to stop, then runs clockwise at drain speed	basket reverses with signal enabled until cancelled by operator
1	Reversing	coasts to stop, then reverses at wash speed	basket runs with signal enabled until cancelled by operator
2	Tumbling	coasts to stop, then reverses at wash speed	signal enabled after two minutes of tumbling

Display or Action	Explanation
ADD/CHANGE FORMULA 00 RETURN TO MENU	Appears if step just previously programmed is the last step of the formula. The controller is prepared for adding or editing another formula, or returning to the **Programming menu**.
Next	Returns to the **Program menu**.
PROGRAM 0 MENU OK TURN KEY TO RUN	This is the **Program menu**.
Run, Next	Saves changes and new formulas, then returns to the **Run mode**.
RUN FORMULA 00 OK TO POWER OFF	This is the **Run Formula** display.

3.3.4 Configure the Control (Option 2)

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Because the E-C Plus microprocessor control system replaces the Miltrol controller on several different machine models with a wide variety of options, each unit must be configured to match the specific model and type of washer-extractor on which it is installed. This configuration informs the microprocessor of the characteristics of this machine, such as the number of water valves, the presence of temperature control, cooldown, etc. Such decisions are discrete to the specific machine and must never be changed unless options are later added or removed. In addition to these hardware-specific decisions, certain configuration choices, such as the display of English or metric units, are left to the discretion of the owner/operator.

This controller allows the configuration of up to six option relays, which are assigned in sequence according to the configuration decisions. Before beginning the configuration process, note which options are present on the machine. The options must be physically wired to the option relays in the same sequence as they appear in the configuration decisions.

CAUTION: **Configure Data may be Lost —** If the controller loses power either accidentally or intentionally while in the **Configure mode**, all configuration data may be corrupted. Reconfigure the controller at installation and any time a memory error is detected. Although certain codes are discretionary and are so indicated below, most configure codes must match those shown on the metal configuration nameplate unless optional equipment has been added to or removed from the machine.

3.3.4.1 Moving Forward and Backward in Configure

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Display or Action	Explanation
PROGRAM 2 MENU CONFIGURE	This display indicates that the controller is in **Program mode** with the **Configure menu** selected for access.
Next	Access the **Configure menu** and displays the first configuration decision.
TEMP CONTROL? 0=NO 1=YES 0	The value that appears here may vary according to how the controller was last configured. The control does not allow moving backward through the configure decisions. To exit the **Configure** menu, press **Next** several times to accept the current values and advance through each decision without making any changes.
Next	Accepts the displayed selection and automatically advances to the next configure decision.

3.3.4.2 The Configure Decisions

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Display or Action	Explanation
TEMP CONTROL ? 0=NO, 1=YES 1	Select **0**=**No** if this machine is not equipped with steam, cooldown, or the equipment required to provide or control these optional functions. If no temperature control is configured, the controller next asks if a hot water valve is present.

Select **1**=**Yes** if this machine is equipped with the necessary valves and supply piping to perform steaming and/or cooldown, as well as any necessary electronic boards to control these options. The microprocessor assigns the temperature control functions (thermo-water and steam) to the first output option relay.

```
TEMP UNITS ?
0=°F 1=°C          0
```

This decision appears only if the machine is configured for temperature control. This decision does **not** use one of the available option output relays.

Select **0**=**°F** to use Fahrenheit as the temperature scale. Select **1**=**°C** to use Celsius as the temperature scale.

```
1 PROBE INSTALLED ?
0=NO, 1=YES        1
```

This decision, which appears only if the machine is configured for temperature control, does **not** use one of the available option output relays.

Select **0**=**No** only if your machine is equipped with two temperature probes.

```
STEAM ERROR ?
1 = 05 MINUTES     1
```

This decision appears only if the machine is configured for **temperature control**, and does not use one of the available option output relays.

Select **0**=**No Steam** if the machine is not equipped for steaming, as in the case of a machine with temperature control used exclusively for cooldown.

Select from options 1 through 3 if steam is available: **1** = 5 minutes, **2** = 10 minutes, and **3** = 50 minutes. The number of minutes selected is the maximum time that the machine will steam in an attempt to achieve the desired temperature before a steam error is displayed. This self-clearing error does not stop machine operation. However, for formula steps where the timer is commanded to stop while steaming until the desired temperature is achieved, production may be restricted by steam errors.

```
COOLDOWN ERROR ?
1 = 10 MINUTES     1
```

This decision appears only if the machine is configured for temperature control.

Select **0**=**No Cooldown** if the machine is not equipped for cooldown, as in the case of a machine with temperature control used exclusively for steaming.

Select from options 1 through 3 if cooldown is available: **1** = 5 minutes, **2** = 10 minutes, and **3** = 20 minutes. The number of minutes selected is the maximum time that the machine will cooldown in an attempt to achieve the desired temperature before an error is displayed. This self-clearing error does not stop machine operation. However, production may be restricted by cooldown errors if the cooldown temperature is set lower than the incoming cold water temperature.

```
HOT WATER VALVE ?
0=NO, 1=YES        1
```

Select **0**=**No** if the machine is not equipped with a hot water valve (e.g., only cold and reuse water are available).

```
SPRAY RINSE ?
0=NO, 1=YES          0
```

Select **1**=**Yes** if this machine is equipped with a spray nozzle through the loading door. If this option is enabled, the control allows programming a spray rinse during the final 25 seconds of any intermediate extract step.

```
LOW EXTRACT ?
0=NO, 1=YES          0
```

Select **1**=**Yes** if this machine is equipped with low extract speed.

Configuring for low extract provides one additional extract speed for programming formulas.

```
TWO SPEED WASH ?
0=NO, 1=YES          0
```

Select **1**=**Yes** if this machine is equipped with a two-speed wash motor.

This configuration allows selecting either normal or low speed for two-way wash steps.

```
CYLINDER STOP ?
0=NO, 1=YES          1
```

Select **1**=**Yes** if this machine is equipped with the cylinder stop option.

This configuration decision makes the **soak wash** step type available.

```
SPECIAL DRAIN ?
0=NO, 1=YES          0
```

Select **1**=**Yes** if this machine is equipped for two-way wash speed while draining.

```
3RD WATER VALVE ?
0=NO, 1=YES          0
```

Select **1**=**Yes** only if this machine is equipped with an optional third water valve. Configuring for extra water makes an additional programming decision available for bath steps, allowing reuse of water drained from earlier baths, for example.

```
REUSE DRAIN ?
0=NO, 1=YES          0
```

Select **1**=**Yes** only if this machine is equipped with an optional second drain valve. Configuring for reuse drain makes an additional programming decision available for bath steps, allowing draining to a reuse tank for use in later baths, for example.

```
BOTTOM FILL ?
0=NO, 1=YES          0
```

Select **1**=**Yes** if the machine is equipped to fill from a source other than through the loading door. Select **0**=**No** if the machine can fill only through the loading door.

```
STAPH GUARD ?
0=NO, 1=YES          0
```

Select **1**=**Yes** only if this machine is a Staph Guard® (pass-through) model. These models are equipped with doors and control panels on both ends of the machine, and are usually mounted through a wall separating the clean goods area from the soiled goods area.

Select **0**=**No** for all other machine types.

If this decision is enabled (**Staph Guard** = **Yes**), an output is enabled when the formula ends, transferring control to the clean side. Control is switched back to the soil side when the clean side door is opened and closed unless the following configure decision is enabled.

```
NEXT=SOILSIDE CONTRL
0=NO, 1=YES          1
```

Select **1**=**Yes** if the machine is not equipped with a specific button for transferring control from the clean (unloading) side to the soil (loading) side. If this decision is enabled (**Next** = **Soil Side**

Control = **Yes**), then the soil side controls are not activated until the **Next button** is pressed.

```
BTH-BTH DRAIN TIME
60 SECONDS          0
```

Select the appropriate time for the machine to drain between two adjacent bath steps. This value is determined by the capacity of the machine, the size of the drain valve, and any restrictions in the drain system which cannot be eliminated.

The available choices for this decision are 1=60 seconds, 2=75 seconds, and 3=90 seconds.

3.3.5 Restoring the Standard Formulas

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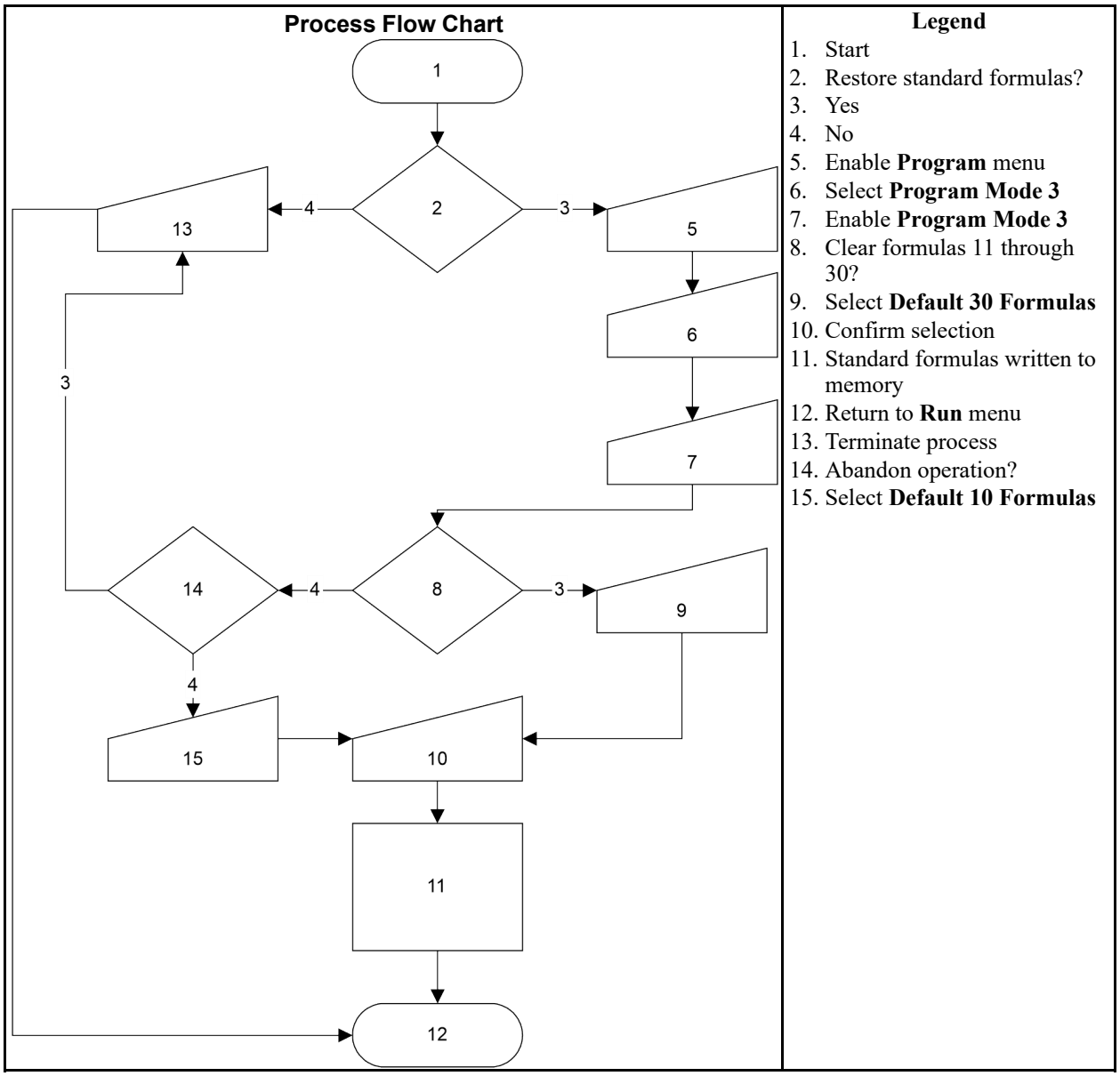
Programming mode 3 allows the owner/operator with access to a programming key to perform either of these two actions:

1. **Option 0** replaces all existing formulas with the factory default formulas for the selected industry configuration. This selection replaces formulas 1 through 10 with the standard industry formulas and removes all data from formulas 11 through 30.
2. **Option 1** replaces only formulas 1 through 10 with the standard industry formulas. This leaves any user-programmed data in formulas 11 through 30 intact.

CAUTION:

Avoid Data Loss — Other than the two methods described above, it is not possible to selectively delete field-modified or field-programmed formulas with this programming mode. This mode erases all field-programmed formulas 1 through 10 or 1 through 30 as specified. For selective deletions and modifications, use **Program mode 1** (Add/Change Formula).

Figure 4. Procedure for Restoring Standard Formulas



The remainder of this document details the procedure for restoring the industry standard formulas on models employing the Milnor® E-C Plus controller.

Display or Action	Explanation
PROGRAM 0 MENU OK TURN KEY TO RUN	This is **Option 0** of the **Program menu**. From this display, either return to **Run mode** or select another menu item.
Scroll / Program Select	Scrolls available choices (0 through 3) in the **Program menu**.
PROGRAM 3 MENU STANDARD FORMULAS	This is **Option 3** of the **Program menu**.
Next	Accesses the **Standard Formulas** option of the **Program menu**.

CORRECTIONAL LAUNDRY **0** DEFAULT 30 FORMULA	**Option 0** (Default 30 Formulas) of the **Standard Formula menu** effectively deletes all 30 formulas, then replaces formulas 1 through 10 with the factory-supplied standard formulas for the configured industry. Formulas 11 through 30 are replaced with blank formulas.
CORRECTIONAL LAUNDRY **1** DEFAULT 10 FORMULA	**Option 1** (Default 10 Formulas) deletes only formulas 1 through 10 and replaces them with the factory-supplied standard formulas for the configured industry. Formulas 11 through 30 are not modifed with this selection.
Scroll / Program Select	Scrolls the available choices (**0 Default 30 Formulas** or **1 Default 10 Formulas**).
Terminate	Cancels this procedure without changing or deleting any formulas.
PROGRAM **0** MENU **OK TURN KEY TO RUN**	If the procedure is cancelled, the display returns to **Option 0** of the **Program menu**.
Next	From either option **0** or option **1**, defaults the selected set of formulas: 1 through 30, or 1 through 10.
PROGRAM **0** MENU **OK TURN KEY TO RUN**	This is **Program menu** item **0**. It's now safe to turn the **Run/Program keyswitch** to the **Run** position.
Run, Next	Save changes and return to **Formula** menu.
** PLEASE WAIT **	Appears for approximately five seconds as the standard formulas are written to memory.
RUN FORMULA **00** OK TO POWER OFF	**Formula menu**; run a formula or shut down the machine.

4 Operating

4.1 Running a Formula

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4.1.1 Applying Power

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Display or Action	Explanation
	The **Run/Program keyswitch** must be set to the **Run** position before the main wall disconnect (fuse or circuit breaker) is closed to provide power to the machine.

When power is first applied to the machine, the display shows the software copyright information, machine name, and the checksum number. The checksum number changes with any programming change. To detect unauthorized programming, record the checksum at the end of each authorized programming session and compare it to the checksum displayed at each power up.

DANGER: **Entanglement Hazard —** The linen inside or hanging partially outside a turning cylinder can suddenly wrap around your hand, arm, or body. The inertia of the spinning cylinder can cause the entangled linen to twist off or sever body parts. You can be killed or seriously injured.

▶ Never put any part of your body inside this machine or touch the linen while the machine is turning.

4.1.2 Selecting and Starting the Formula

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4.1.2.1 Load Machine and Close Door

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Load the machine to the rated capacity and securely close the loading door. Review Section 2.2 : Determining Load Size, page 8 for guidelines on loading machines.

4.1.2.2 Selecting a Formula

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Display or Action	Explanation
RUN FORMULA 00 OK TO POWER OFF	This is the **Run Formula display**. From this display, the operator can disconnect power from the machine without risking damage to electronic parts, or he can select a formula to run, as described below.
Program Select	indexes **forward** through the 30 formulas.

Scroll indexes **backward** through the 30 formulas.

```
RUN FORMULA
07 FORMULA NUMBER 07
```

Example display: Formula 07 selected for running.

Start starts the machine with the selected formula.

```
RUN FORMULA
DOES NOT EXIST
```

indicates that the formula selected for running has not been programmed or is not available. This display appears for three seconds.

4.1.3 Unloading the Machine

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How a formula ends may depend on whether the formula finishes without interruption or is terminated manually.

DANGER:

Entanglement Hazard — The linen inside or hanging partially outside a turning cylinder can suddenly wrap around your hand, arm, or body. The inertia of the spinning cylinder can cause the entangled linen to twist off or sever body parts. You can be killed or seriously injured.

- Never put any part of your body inside this machine or touch the linen while the machine is turning.

When a formula ends normally or is terminated, the door remains locked while the cylinder coasts to a stop.

Most models originally delivered with Miltrol controls and suitable for use with the E-C Plus controller are equipped with a speed switch and braking system, allowing the door to unlock when the basket has slowed to a safe speed and when the water level is below the bottom of the door.

Display or Action	Explanation
WAITING TO UNLOAD U	At the end of the coast time, the operator alarm sounds.
Signal Cancel	Silences the operator alarm. The door unlocks, and the machine may be unloaded.

4.1.4 The Display During Automatic Operation

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Display or Action	Explanation
23:04 F02S01 02:37 dF=A168/D170 LEV 1	These two displays alternate during normal operation.
23:04 STEP 01 02:37 dF=A168/D170 SPD 0	
23:04 F02S01 02:37	23:04 is the time remaining in the formula. F02S01 indicates that the current formula is 02 (F02) and the current step is 01 (S01).

02:37 is the time remaining in this step.

```
dF=A168/D170   LEV 2
```

Temperature in this machine is measured in degrees Fahrenheit or Celsius, according to machine configuration.

dF indicates that temperature is shown in degrees Fahrenheit; dC indicates degrees Celsius.

A168 indicates that the current achieved temperature is 168 degrees. Temperature is displayed only if the machine is equipped with and configured for temperature control.

D170 indicates that the desired temperature for this step is 170 degrees. Temperature displays only if machine is equipped with and configured for temperature control.

LEV 2 indicates that the bath level achieved is Level 2.

```
SPD 0          LEV 2
```

SPD 0 indicates the bath speed (either 0 or 1) for this step.

WAIT FOR LEVEL 2 H indicates that Level 2 is programmed for this step, but is not yet achieved. The H indicates that the hot water valve is open; C indicates cold water, and 3 indicates extra water.

The number for each chemical (up to five may be connected) is displayed as the chemical is injected.

4.1.5 How to Shorten, Terminate, or Suspend a Running Formula

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Display or Action	Explanation
Next + Scroll	Cancels a step. Advances the step timer to zero for any bath, a drain not followed by an extract, or any extract in progress. The next step begins automatically. This operation is possible only if DIP switch 6 on the processor board is in the **on** position, allowing the cancelling of steps.
Terminate Program	Cancels the current formula and returns the machine to the **Run Formula** display.
`RUN FORMULA` `00 OK TO POWER OFF`	This is the **Run Formula** display.

4.1.6 How to Restart after Power Loss

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The E-C Plus control remembers the formula and step it was executing if power fails or if the wall disconnect is turned off while the machine is operating in automatic mode.

Display or Action	Explanation
ENABLE 3-WIRE TO RUN STEP xx - FORMULA yy	This display appears when power is restored. The formula and step which were in progress when power was interrupted are shown.
①	Resumes the formula at the displayed formula and step. If the outage occurred in a bath step, level and temperature (if commanded) must again be satisfied, even if these were already satisfied before power was lost. Any commanded chemicals will be injected again. If the outage occurred during a drain, that step will be repeated, then followed by the next commanded step. If the outage occurred during an extract step, the previous bath will be repeated before the extract step begins.
Terminate Program	Terminates the formula in progress.

4.2 How to Use and Erase the Formula Counter

The microprocessor controller adds one count to a discrete counter for each formula near the end of each formula. The counter holds this value until you set the value to 0. Each formula counter has a maximum value of 999. A counter at the maximum value holds the maximum value until you set it to 0. You can only see or erase the count for each formula when the machine can operate correctly.

CAUTION: **Prevent Incorrect Data —** You can cause damage to the collected data if the machine does not have power for extended periods of time. An electrical surge can also cause damage to the collected data.

▶ Apply power to the machine for 15 seconds in each 48-hour interval too keep the correct formula count. See Section 2.1 : Important Data About this Machine, page 7 for more data.

▶ Make sure that the count is accurate. Record the value in each counter. Set the value in each counter equal to 0 before it increases to 999 counts.

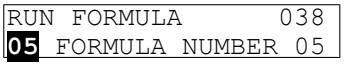
▶ If the display shows an **accumulator error**, set the values in all formula counters to 0. Detailed error messages can be found elsewhere in the manual. See table of contents.

Display or Action	Explanation
RUN FORMULA 00 OK TO POWER OFF	This is the correct display when the machine first gets power.
Program Select / Scroll	Move through the formula numbers (01–30) in one of the two directions to find a formula.

For each formula:

Next

Shows the count in the top right corner of the display.



This machine cleaned 38 cycles with formula 05.

Next + Terminate Program

Sets the count in the formula counter equal to 0.

5 Troubleshooting

5.1 The E-C Plus Manual Menu

5.1.1 The Manual Menu

5.1.1.1 Components

The **Manual menu** contains these selections:

1. **Software Date Code**—a display of the software type and date code, both of which are fixed in the software; and the industry type, which is determined by setting the DIP switches on the processor board.
2. **Test Inputs**—allows viewing of microprocessor inputs for testing when a formula is not running. Devices, including the door latch and the level transducer, provide signals to the microprocessor by grounding certain inputs. The status of these inputs can be monitored in this mode, and changes to the input status will appear instantaneously.
3. **Test Outputs**—allows the actuation of outputs for testing when a formula is not running. Outputs are signals from the microprocessor to other devices, such as chemical pumps and motor contactors.

5.1.1.2 How to Access the Manual Menu

Display or Action	Explanation
RUN FORMULA 00 OK TO POWER OFF	The machine must be idle (power on, but not running a formula) before the **Manual menu** can be accessed. Also, the **Run/Program keyswitch** must be at the **Run** position.
Test	Accesses the **Manual menu**. Press **Next** if the **Manual menu** does not appear within five seconds.
MANUAL MENU 1 SOFTWARE DATE CODE	Reverse type indicates blinking cursor position. Select one of the **Manual menu** modes or return to the **Run mode**, as described below.
Program Select / Scroll	Scrolls forward/backward through the available modes of the **Manual menu**.
Automatic	Returns to the **Run mode**.
RUN FORMULA 00 OK TO POWER OFF	**Run mode** selected; control is awaiting selection of a valid formula number. The formula number that was selected when the **Manual menu** was accessed appears on the display.

5.1.1.3 How to Return to the Run Mode from the Manual Menu

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Display or Action	Explanation
Test	Enters the **Manual menu** from **Run mode**.
MANUAL MENU 1 SOFTWARE DATE CODE	This is the **Manual menu** display.
Automatic	Exits the **Manual menu** to the **Run mode**.
RUN FORMULA 00 OK TO POWER OFF	This is the **Run mode** display. Select a formula to run, or turn off machine power.

5.1.2 Determining the Software Version

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Display or Action	Explanation
Test	Accesses the **Manual menu**.
MANUAL MENU 1 SOFTWARE DATE CODE	**Manual menu** accessed and **Software date code mode** selected.
Next	To view the software date code and machine configuration information, as shown below.
EP-PLUS/M 8A008 CORRECTIONAL LAUNDRY	Machine style (/M = MxJ), software date code (8A008), and configuration (Correctional Laundry).

5.1.3 Viewing Microprocessor Inputs

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The on/off state of each input to the microprocessor can be displayed by using the **Test Inputs** selection of the **Manual menu**. The machine must be idle (not running a formula).

Display or Action	Explanation
Test	Accesses the **Manual menu**.
MANUAL MENU 2 TEST INPUTS	**Manual menu** accessed and **Test Inputs** mode selected.
Next	Accesses the **Test Inputs** mode.
ABCDEFGHIJKLMNOP (-) +--++----+----+- OFF	The input display code on the top row corresponds to a display code in Table 8: E-C Plus Inputs, page 43 . The status of the input is displayed beneath each code. If the input is energized, a “+” appears. Non-energized inputs are represented by “–”.
Terminate Program	Restores the controller to the **Manual menu**.
MANUAL MENU 2 TEST INPUTS	From the **Manual menu**, select another manual function with **Program Select / Scroll** or return to **Run mode** by turning the key to **Automatic**.

Table 8. E-C Plus Inputs

Display Code	Input Name	Connector-Pin
A	Select Program button	MTA4-6
B	Three-wire input	MTA4-5
C	Next/Signal Cancel button	MTA4-4
D	Terminate Program button	MTA4-3
E	Chart input	MTA4-2
F	not used	none
G	Automatic/Test keyswitch	MTA5-6
H	Scroll button	MTA5-5
I	Run/Program keyswitch	MTA5-1
J	Transfer Control switch (Staph Guard® models only)	MTA5-3
K	not used	none
L	not used	none

5.1.4 Actuating Microprocessor Outputs

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Machine functions may be tested individually or in groups by using the **Test Outputs** component of the **Manual menu**. The machine must be idle (not running a formula).

DANGER: **Crushing and Entanglement Hazard —** Bare manual outputs actuate washer-extractor mechanisms. Keep all personnel clear.

Display or Action	Explanation
Test	Accesses the **Manual menu**.
MANUAL MENU 3 TEST OUTPUTS	This is the **Manual menu** display with the **Test Outputs** component selected.
Start	Accesses the output testing selection.
TEST OUTPUTS 01 INJECT CHEMICAL 5	This is the **Output testing** display.
Program Select / Scroll	Indexes forward and backward through the output names.
TEST OUTPUTS 07 COLD WATER VALVE	Example display with output in place to be selected and subsequently actuated.
Next	Accesses the selected output for actuation. All outputs are initially disabled when accessed.
COLD WATER VALVE 0=OFF 1=ON 0	Example display with output accessed and disabled.
Next	Enables the output (turns the output on).

COLD WATER VALVE 0=OFF 1=ON 1	Example display with output enabled. The cold water valve is open.
Next	If the output was already on, this keystroke turns it off.
COLD WATER VALVE 0=OFF 1=ON 0	Example display with output disabled. The cold water valve is closed.
Program Select	Disables (turns off) the output if it was previously enabled, and advances to the next output.
HOT WATER VALVE 0=OFF 1=ON 0	Display after pressing Program Select to advance to the next output.
Terminate Program	Disables the output if it was enabled, then returns to the **Test Outputs** component.
MANUAL MENU 3 TEST OUTPUTS	Display of **Manual menu**.
Automatic	Turns off the output if it was on, then returns to the **Run mode**.
RUN FORMULA 00 OK TO POWER OFF	Display of **Run mode**.

Table 9. E-C Plus Outputs

Display Code	Output Function	Output Number	Connector	Relay Name
1	Extract	K0	MTA25–2	CREXM
2	Close drain	K1	MTA25–5	CRDRM
3	Open cold water valve	K2	MTA25–8	CRCWM
4	High water level	K3	MTA23–1	CRHLM
5	Inject chemical 1	K4	MTA23–4	CRC1M
6	Inject chemical 2	K5	MTA23–6	CRC2M
7	Inject chemical 3	K6	MTA23–8	CRC3M
8	Inject chemical 4	K7	MTA23–10	CRC4M
9	Inject chemical 5	K8	MTA26–9	CRC5M
10	Sound operator signal	K9	MTA26–6	CRSGM
11	Option output 1	K10	MTA26–3	CRO1M
12	Option output 2	K11	MTA24–10	CRO2M
13	Option output 3	K12	MTA24–8	CRO3M
14	Option output 4	K13	MTA24–6	CRO4M
15	Option output 5	K14	MTA24–4	CRO5M
16	Option output 6	K15	MTA24–2	CRO6M

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5.2 Error Messages

BNCJHT09.C01 0000249575 A.3 A.4 1/2/20 1:16 PM Released

5.2.1 Error Messages at Power Up

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If an error message appears during power up, the error must be cleared before the machine can be run or programmed.

Display or Action	Explanation
ACCUMULATOR ERROR TERMINATE TO CLEAR	The microprocessor performs a memory check each time the machine is turned on. This error message appears if the microprocessor detects that the accumulator data is corrupt, in which case all accumulators must be reset to zero.
Terminate Program	Resets all accumulators and clears the error message. See Section 4.2 : How to Use and Erase the Formula Counter, page 39 for more information.
CHECKSUM ERROR, TURN KEY TO PROGRAM	Appears if there is illegal data in the configuration, formula, or industry memory areas. Use the following procedure to clear this error.
MEMORY CHIP FAILED	This message indicates that the microprocessor is not able to read from or write to the EEPROM memory chip. Turn the machine off, then verify that the EEPROM chip is firmly and properly seated in its socket. If the chip is properly seated and the machine still doesn't work, replace the EEPROM.
A/D BOARD IS NOT TALKING	This error message indicates that the analog to digital board is not communicating with the microprocessor.

1. Lock off and tag out power to the machine.
2. Check the connections at both ends of the ribbon cable between the processor board and the analog to digital board.
3. Restore power.
4. If the error persists, lock off and tag out power to the machine. Have a qualified service technician replace the suspect board.

5.2.2 Error Messages during Normal Operation

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If an error message appears on the bottom line of the display while the machine is running, the timer shown on the top line will stop counting. When the error is corrected, the timer resumes counting down. To troubleshoot most errors, suspend the formula in progress and turn power off. Do not terminate the formula if it is to be resumed after the error is corrected. See Section 4.1 : Running a Formula, page 36 for more information.

Display or Action	Explanation
TOO LONG TO STEAM	The configured maximum time to steam up to the desired temperature has been exceeded. Check the steam valve, strainer, main steam header and pressure, etc. Steaming will continue until temperature is achieved, when the error will automatically clear and normal operation will resume.
TOO LONG TO COOL	The configured maximum time to cool down to the desired temperature has been exceeded. Check the cooldown valve and strainer if equipped, cold water pressure, and position of vernier valve on cooldown inlet. Cooldown will continue until the desired temperature is achieved, when the error will automatically clear.
CHECK PROBE	This error message indicates that the resistance of the temperature probe is outside the specified range. Test the probe by disconnecting the probe leads from the processor board and checking the resistance with an accurate digital ohmmeter. Resistance between the two leads must be between 2K and 35K Ohms. Resistance between each lead and ground must be infinite.

6 Supplemental Information

6.1 The E-C Plus Hardware

The Milnor® E-C Plus microprocessor control is designed specifically for Milnor® washer-extractors. Along with certain external electromechanical relay logic and sensing devices, it controls all machine and system functions. Not everyMilnor® microprocessor system includes all the following components.

6.1.1 Keyswitches

6.1.1.1 Run/Program Keyswitch

This keyswitch allows controlling who has the necessary access to modify wash formulas. Formulas can be modified only when this switch is turned from the **Run** position to the **Program** position. To safeguard wash formulas, keep this key in a secure place with restricted personnel access.

6.1.1.2 Automatic/Test Keyswitch

This keyswitch allows controlling who has the necessary access to operate the machine in **Test mode** for troubleshooting. **Test mode** can only be accessed when this switch is turned from the **Automatic** position to the **Test** position. To reduce the risk of personal injury and machine damage, keep this key in a secure place with restricted personnel access.

6.1.2 Display

The display is a vacuum fluorescent display consisting of two lines of 20 characters each. This type of display is easily identified by green characters on a black background when operating, or a nearly black background when not operating.

6.1.3 Power Supply

The power supply serves to provide a regulated specific voltage to the processor board and certain auxiliary boards and devices. It converts control circuit alternating current voltage to +12 volts direct current, –12 volts direct current, and +5 volts direct current. The power supply is switchable between 120 volts and 240 volts alternating current input voltage.

Although the +12VDC and –12VDC are not adjustable, the +5VDC is rather sensitive and the power supply must be adjusted so **the actual voltage at the processor board is between 5.04VDC and 5.06VDC** as measured by an accurate digital voltmeter. If this voltage is not within the stated range, the machine is likely to malfunction.

6.1.4 CPU Processor Board

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The central processing unit (CPU) processes data received from the various inputs, stores information, and responds to each pushbutton entry with the appropriate action. Data is stored in one or more of the following types of memory chips on the CPU board, depending on the machine model.

EPROM **Erasable Programmable Read Only Memory** contains fixed instructions programmed by Milnor® (software) that determine how the machine functions. The standard industry formulas are also stored here.

EEPROM **Electrically Erasable Programmable Read Only Memory** stores all protected memory (30 formulas and configure data) for machines using the 785 processor board. EEPROMs do not require a constant source of power to retain memory.

SRAM **Static Random Access Memory** stores the accumulator (formula count) data as long as the machine has power, or via a capacitor for approximately 24 hours with power off. This type of component is also used to retain the last formula and step in progress when power is turned off at the machine while a formula is running. SRAM is used in all E-P Plus® and E-P Express® controllers.

6.1.5 Outputs

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Depending on the processor board, output relays may be either socket-mounted to a separate output board, or permanently soldered to the processor board.

6.1.6 Option Outputs

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The E-C Plus processor board contains all outputs for both standard and optional features.

6.1.7 Analog to Digital Convertor

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This component converts analog signals, such as from the temperature probe, to a digital signal that can be used by the microprocessor.

6.1.8 Temperature Probe

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A thermistor temperature probe is available for installation in the machine sump if the machine is equipped for optional temperature control. This probe is a resistor that changes value according to temperature.

6.1.9 Pressure Sensor

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E-C Plus models employ electro-mechanical pressure switches to detect the water level in the cylinder.

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6.2 Summary of E-C Plus Configurations and Formulas

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6.2.1 Available Software Configurations

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Washer-extractors with the E-C Plus controller are programmed at the factory to contain default formulas which are always available in the machine. These default formulas can be loaded into the machine's memory, modified, and deleted according to procedures described in the reference manual for this machine. However, a copy of the default formula set as prepared by the Milnor® factory is always retained and available for replacing the modified formulas if necessary.

Each E-C Plus machine can be configured for one of the industries listed in Table 10 . This configuration is accomplished by setting a DIP switch on the microprocessor controller to a specific setting for the desired industry. Complete detailed instructions for configuring your E-C Plus washer-extractor can be found in the reference manual for your machine.

Table 10. Software Configuration for Industries

Available Industry Configurations	
Athletic Laundry	Restaurant Laundry
Correctional Laundry	Shirt Laundry
Hotel-Motel Laundry	Commercial Laundry
Healthcare Laundry	Offshore Laundry

6.2.2 Formulas Available in Each Configuration

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The tables below list the specific default formulas available in each industry configuration of the E-C Plus controller. Detailed descriptions of each formula, including step times and chemical injections, are elsewhere in this manual; see the table of contents.

Table 11. Athletic Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Light Soil
2	Towels	7	Cold Wash
3	Athletic Uniforms	8	Multi-flush
4	Socks and T-shirts	9	Stain Soak
5	Floor Mops	10	Quick Wash

Table 12. Correctional Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Colored Table Linen
2	Sheets	7	White Table Linen and Kitchen Goods
3	Pillowcases	8	Multi-flush
4	Towels and Uniforms	9	Stain Soak
5	Bedspreads and Blankets	10	Quick Wash

Table 13. Hotel-Motel Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Colored Table Linen
2	Sheets	7	White Table Linens and Kitchen Articles
3	Pillowcases	8	Multi-flush
4	Towels and Uniforms	9	Stain Soak
5	Bedspreads and Blankets	10	Quick Wash

Table 14. Healthcare Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Sheepskins
2	Sheets	7	White Table Linens
3	Pillowcases	8	Multi-flush
4	Towels and Personal Goods	9	Stain Treatment
5	Pads and Diapers	10	Quick Wash

Table 15. Restaurant Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Hand Towels and Uniforms
2	Colored Table Linen	7	Floor Mops
3	White Table Linen	8	Multi-flush
4	Wipes	9	Stain Treatment
5	100% Polyester Table Linen	10	Quick Wash

Table 16. Shirt Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Starch and Extract	6	Split Wash—No Starch
2	Starched Goods—White	7	Cold Wash—No Starch
3	Starched Goods—Colored	8	Delicates

Table 16 Shirt Laundry Formulas (cont'd.)

Formula Number	Application	Formula Number	Application
4	Cold Wash—Starched Goods	9	Stain Treatment
5	Hot Wash—No Starch	10	Extract

Table 17. Commercial Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Heavy Soil (White)
2	Light Soil (White)	7	Heavy Soil (Colored)
3	Light Soil (Colored)	8	Multi-flush
4	Medium Soil (White)	9	Stain Treatment
5	Medium Soil (Colored)	10	Bedspreads and Blankets

Table 18. Offshore Laundry Formulas

Formula Number	Application	Formula Number	Application
1	Standard Wash	6	Colored Table Linen
2	Personal Work	7	Greasy Rags
3	Work Clothes—No Bleach	8	Multi-flush
4	Bed and Bath Linen	9	Stain Treatment
5	Kitchen Wipes and Mops	10	Quick Wash

7 Default Formulas

7.1 Standard Athletic Laundry Formulas

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Table 19. Athletic Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	6	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	1	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	3	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 20. Athletic Formula 02: Towels

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	Bleach
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	0	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	8	0				

Table 21. Athletic Formula 03: Uniforms

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	1	1	Soap
2	Two-way bath	0	2	0	1	1	1	
3	Two-way bath	0	7	0	1	1	1	Soap
4	Two-way bath	0	2	0	1	1	1	
5	Two-way bath	0	2	0	1	1	1	
6	Two-way bath	0	2	0	0	1	1	

Table 21 Athletic Formula 03: Uniforms (cont'd.)

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	4	0				

Table 22. Athletic Formula 04: Socks and T-shirts

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	5	0	1	0	1	
3	Two-way bath	0	7	0	1	0	1	Bleach
4	Two-way bath	0	2	0	1	0	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	2	0	1	1	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	4	0	0	1	1	Sour & softener
9	Final extract	0	6	0				

Table 23. Athletic Formula 05: Floor Mops

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	1	1	1	
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	7	0	1	0	1	Soap
4	Two-way bath	0	2	0	1	0	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	2	0	1	1	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	2	0	0	1	1	
9	Final extract	0	6	0				

Table 24. Athletic Formula 06: Light Soil

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				

Table 24 Athletic Formula 06: Light Soil (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 25. Athletic Formula 07: Cold Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	0	1	1	
2	Two-way bath	0 7 0	0	1	1	Soap
3	Two-way bath	0 2 0	0	1	1	
4	Two-way bath	0 2 0	0	1	1	
5	Two-way bath	0 2 0	0	1	1	
6	Final extract	0 3 0				

Table 26. Athletic Formula 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	1	1	
3	Two-way bath	0 2 0	1	0	1	
4	Two-way bath	0 7 0	1	0	1	Soap
5	Two-way bath	0 7 0	1	0	1	Bleach
6	Two-way bath	0 2 0	1	0	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 2 0	1	1	1	
9	Intermediate extract	0 1 0				
10	Two-way bath	0 4 0	0	1	1	Sour & softener
11	Final extract	0 6 0				

Table 27. Athletic Formula 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	2 5 0	1	1	1	(add manually)
2	Two-way bath	0 2 0	1	1	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 2 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 4 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 28. Athletic Formula 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M	Step Duration M	Step Duration Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	5	0	1	0	1	Soap & bleach
2	Two-way bath	0	1	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	1	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	3	0	0	1	1	Sour & softener
7	Final extract	0	5	0				

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7.2 Standard Commercial Laundry Formulas

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Table 29. Commercial Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M	Step Duration M	Step Duration Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	6	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	1	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	3	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 30. Commercial Formula 02: Light Soil White Goods

Step Number	Type of Step (T)	Step Duration M	Step Duration M	Step Duration Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	8	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 31. Commercial Formula 03: Light Soil Colored Goods

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	8	0	1	0	1	Soap
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	3	0				

Table 32. Commercial Formula 04: Medium Soil White Goods

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	Bleach
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	1	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	6	0				

Table 33. Commercial Formula 05: Medium Soil Colored Goods

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	1	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	6	0				

Table 34. Commercial Formula 06: Heavy Soil White Goods

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	1	0	0	1	0	1	Soap
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	7	0	1	0	1	Soap

Table 34 Commercial Formula 06: Heavy Soil White Goods (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
4	Two-way bath	0 7 0	1	0	1	Bleach
5	Two-way bath	0 2 0	1	0	1	
6	Two-way bath	0 2 0	1	1	1	
7	Two-way bath	0 2 0	0	1	1	
8	Two-way bath	0 4 0	0	1	1	Sour & softener
9	Final extract	0 6 0				

Table 35. Commercial Formula 07: Heavy Soil Colored Goods

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	1 0 0	1	0	1	Soap
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 7 0	1	0	1	Soap
4	Two-way bath	0 7 0	1	0	1	
5	Two-way bath	0 2 0	1	0	1	
6	Two-way bath	0 2 0	1	1	1	
7	Two-way bath	0 2 0	0	1	1	
8	Two-way bath	0 4 0	0	1	1	Sour & softener
9	Final extract	0 6 0				

Table 36. Commercial Formula 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	1	1	
3	Two-way bath	0 2 0	1	0	1	
4	Two-way bath	0 7 0	1	0	1	Soap
5	Two-way bath	0 7 0	1	0	1	Bleach
6	Two-way bath	0 2 0	1	0	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 2 0	1	1	1	
9	Intermediate extract	0 1 0				
10	Two-way bath	0 4 0	0	1	1	Sour & softener
11	Final extract	0 6 0				

Table 37. Commercial Formula 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	2	5	0	1	1	1	(add manually)
2	Two-way bath	0	2	0	1	1	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 38. Commercial Formula 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	5	0	1	0	1	Soap & bleach
2	Two-way bath	0	1	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	1	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	3	0	0	1	1	Sour & softener
7	Final extract	0	5	0				

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7.3 Standard Correctional Laundry Formulas

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Table 39. Correctional Laundry Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	6	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	1	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	3	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 40. Correctional Laundry Formula 02: Sheets

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	8	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 41. Correctional Laundry Formula 03: Pillowcases

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	Bleach
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	1	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	6	0				

Table 42. Correctional Laundry Formula 04: Towels and Uniforms

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	Bleach
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	1	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	8	0				

Table 43. Correctional Laundry Formula 05: Bedspreads and Blankets

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	8	0	1	1	1	Soap
2	Two-way bath	0	2	0	1	1	1	
3	Two-way bath	0	2	0	0	1	1	

Table 43 Correctional Laundry Formula 05: Bedspreads and Blankets (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
4	Two-way bath	0 4 0	0	1	1	Sour & softener
5	Final extract	0 6 0				

Table 44. Correctional Laundry Formula 06: Colored Table Linens

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	1 0 0	1	0	1	Soap
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	
6	Two-way bath	0 7 0	0	1	1	Sour & softener
7	Final extract	0 3 0				

Table 45. Correctional Laundry Formula 07: White Table Linens

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	1 0 0	1	0	1	Soap
3	Two-way bath	0 7 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 7 0	0	1	1	Sour & softener
9	Final extract	0 3 0				

Table 46. Correctional Laundry 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	1	1	
3	Two-way bath	0 2 0	1	0	1	
4	Two-way bath	0 7 0	1	0	1	Soap
5	Two-way bath	0 7 0	1	0	1	Bleach
6	Two-way bath	0 2 0	1	0	1	
7	Intermediate extract	0 1 0				

Table 46 Correctional Laundry 08: Multi-flush (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
8	Two-way bath	0 2 0	1	1	1	
9	Intermediate extract	0 1 0				
10	Two-way bath	0 4 0	0	1	1	Sour & softener
11	Final extract	0 6 0				

Table 47. Correctional Laundry 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	2 5 0	1	1	1	(add manually)
2	Two-way bath	0 2 0	1	1	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 2 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 4 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 48. Correctional Laundry 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 5 0	1	0	1	Soap & bleach
2	Two-way bath	0 1 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 5 0				

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7.4 Standard Healthcare Laundry Formulas

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Table 49. Healthcare Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 6 0	1	0	1	Soap & bleach
2	Two-way bath	0 2 0	1	0	1	
3	Intermediate extract	0 1 0				

Table 49 Healthcare Formula 01: Standard Wash (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 50. Healthcare Formula 02: Sheets

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 8 0	1	0	1	Soap & bleach
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	
6	Intermediate extract	0 1 0				
7	Two-way bath	0 4 0	0	1	1	Sour & softener
8	Final extract	0 6 0				

Table 51. Healthcare Formula 03: Pillowcases

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 7 0	1	0	1	Soap
3	Two-way bath	0 7 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 4 0	0	1	1	Sour & softener
9	Final extract	0 6 0				

Table 52. Healthcare Formula 04: Towels and Personal Work

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 7 0	1	0	1	Soap
3	Two-way bath	0 2 0	1	1	1	
4	Two-way bath	0 7 0	1	0	1	Bleach
5	Two-way bath	0 2 0	1	0	1	

Table 52 Healthcare Formula 04: Towels and Personal Work (cont'd.)

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
6	Intermediate extract	0	1	0				
7	Two-way bath	0	2	0	1	1	1	
8	Intermediate extract	0	1	0				
9	Two-way bath	0	4	0	0	1	1	Sour & softener
10	Final extract	0	8	0				

Table 53. Healthcare Formula 05: Pads and Diapers

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	1	1	1	
2	Two-way bath	0	2	0	1	1	1	
3	Two-way bath	0	8	0	1	0	1	Soap
4	Two-way bath	0	7	0	1	0	1	Bleach
5	Two-way bath	0	2	0	1	0	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	2	0	1	1	1	
8	Intermediate extract	0	1	0				
9	Two-way bath	0	4	0	0	1	1	Sour & softener
10	Final extract	0	6	0				

Table 54. Healthcare Formula 06: Sheepskins and Cubicle Curtains

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	0	1	1	
2	Two-way bath	0	7	0	1	1	1	Soap
3	Two-way bath	0	2	0	1	1	1	
4	Two-way bath	0	2	0	0	1	1	
5	Two-way bath	0	2	0	0	1	1	
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	3	0				

Table 55. Healthcare Formula 07: Kitchen and Table Linen

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	1	1	1	
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	1	2	0	1	0	1	Soap
4	Two-way bath	0	2	0	1	0	1	

Table 55 Healthcare Formula 07: Kitchen and Table Linen (cont'd.)

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
5	Two-way bath	1	2	0	1	0	1	Bleach
6	Two-way bath	0	2	0	1	0	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	2	0	1	1	1	
9	Intermediate extract	0	1	0				
10	Two-way bath	0	4	0	0	1	1	Sour & softener
11	Final extract	0	3	0				

Table 56. Healthcare Formula 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	1	1	1	
2	Two-way bath	0	2	0	1	1	1	
3	Two-way bath	0	2	0	1	0	1	
4	Two-way bath	0	7	0	1	0	1	Soap
5	Two-way bath	0	7	0	1	0	1	Bleach
6	Two-way bath	0	2	0	1	0	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	2	0	1	1	1	
9	Intermediate extract	0	1	0				
10	Two-way bath	0	4	0	0	1	1	Sour & softener
11	Final extract	0	6	0				

Table 57. Healthcare Formula 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	2	5	0	1	1	1	(add manually)
2	Two-way bath	0	2	0	1	1	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 58. Healthcare Formula 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 5 0	1	0	1	Soap & bleach
2	Two-way bath	0 1 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 5 0				

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7.5 Standard Hotel and Motel Laundry Formulas

BNCJUP32.C01 0000221187 A.3 A.6 A.4 1/2/20 1:16 PM Released

Table 59. Hotel and Motel Laundry Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 6 0	1	0	1	Soap & bleach
2	Two-way bath	0 2 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 60. Hotel and Motel Laundry Formula 02: Sheets

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 8 0	1	0	1	Soap & bleach
2	Two-way bath	0 2 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 2 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 4 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 61. Hotel and Motel Laundry Formula 03: Pillowcases

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 7 0	1	0	1	Bleach
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	
6	Intermediate extract	0 1 0				
7	Two-way bath	0 4 0	0	1	1	Sour & softener
8	Final extract	0 6 0				

Table 62. Hotel and Motel Laundry Formula 04: Towels and Uniforms

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 7 0	1	0	1	Bleach
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	
6	Intermediate extract	0 1 0				
7	Two-way bath	0 4 0	0	1	1	Sour & softener
8	Final extract	0 8 0				

Table 63. Hotel and Motel Laundry Formula 05: Bedspreads and Blankets

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 8 0	1	1	1	Soap
2	Two-way bath	0 2 0	1	1	1	
3	Two-way bath	0 2 0	0	1	1	
4	Two-way bath	0 4 0	0	1	1	Sour & softener
5	Final extract	0 6 0				

Table 64. Hotel and Motel Laundry Formula 06: Colored Table Linens

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	1 0 0	1	0	1	Soap
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	

Table 64 Hotel and Motel Laundry Formula 06: Colored Table Linens (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
6	Two-way bath	0 7 0	0	1	1	Sour & starch
7	Final extract	0 3 0				

Table 65. Hotel and Motel Laundry Formula 07: White Table Linens

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	1 0 0	1	0	1	Soap
3	Two-way bath	0 7 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 7 0	0	1	1	Sour & starch
9	Final extract	0 3 0				

Table 66. Hotel and Motel Laundry 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	1	1	
3	Two-way bath	0 2 0	1	0	1	
4	Two-way bath	0 7 0	1	0	1	Soap
5	Two-way bath	0 7 0	1	0	1	Bleach
6	Two-way bath	0 2 0	1	0	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 2 0	1	1	1	
9	Intermediate extract	0 1 0				
10	Two-way bath	0 4 0	0	1	1	Sour & softener
11	Final extract	0 6 0				

Table 67. Hotel and Motel Laundry 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	2 5 0	1	1	1	(add manually)
2	Two-way bath	0 2 0	1	1	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 2 0	1	1	1	

Table 67 Hotel and Motel Laundry 09: Stain Soak (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
5	Intermediate extract	0 1 0				
6	Two-way bath	0 4 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 68. Hotel and Motel Laundry 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 5 0	1	0	1	Soap & bleach
2	Two-way bath	0 1 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 5 0				

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7.6 Standard Offshore Laundry Formulas

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Table 69. Offshore Laundry Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 6 0	1	0	1	Soap & bleach
2	Two-way bath	0 2 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 70. Offshore Laundry Formula 02: Personal Work

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 7 0	1	0	1	Bleach
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				

Table 70 Offshore Laundry Formula 02: Personal Work (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
5	Two-way bath	0 2 0	1	0	1	
6	Intermediate extract	0 1 0				
7	Two-way bath	0 4 0	0	1	1	Sour & softener
8	Final extract	0 8 0				

Table 71. Offshore Laundry Formula 03: Work Clothes (Heavy Soil)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	1 0 0	1	0	1	Soap
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 7 0	1	0	1	Soap
4	Two-way bath	0 7 0	1	0	1	
5	Two-way bath	0 2 0	1	0	1	
6	Two-way bath	0 2 0	1	1	1	
7	Two-way bath	0 2 0	0	1	1	
8	Two-way bath	0 4 0	0	1	1	Sour & softener
9	Final extract	0 6 0				

Table 72. Offshore Laundry Formula 04: Bed and Bath Linens

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 7 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 4 0	0	1	1	Sour & softener
9	Final extract	0 6 0				

Table 73. Offshore Laundry Formula 05: Wipes and Kitchen Goods

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 8 0	1	0	1	Soap

Table 73 Offshore Laundry Formula 05: Wipes and Kitchen Goods (cont'd.)

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
4	Two-way bath	0	6	0	1	0	1	Soap
5	Two-way bath	0	7	0	1	0	1	Bleach
6	Two-way bath	0	2	0	1	0	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	2	0	1	1	1	
9	Intermediate extract	0	1	0				
10	Two-way bath	0	3	0	0	1	1	Sour
11	Final extract	0	6	0				

Table 74. Offshore Laundry Formula 06: Floor Mops

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	Bleach
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	1	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	6	0				

Table 75. Offshore Laundry Formula 07: Greasy Rags

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	8	0	1	0	1	Soap
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	2	0	1	0	1	
4	Two-way bath	0	8	0	1	0	1	Soap
5	Two-way bath	0	2	0	1	0	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	2	0	1	1	1	
8	Intermediate extract	0	1	0				
9	Two-way bath	0	2	0	0	1	1	
10	Final extract	0	6	0				

Table 76. Offshore Laundry Formula 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	1	1	1	
2	Two-way bath	0	2	0	1	1	1	
3	Two-way bath	0	2	0	1	0	1	
4	Two-way bath	0	7	0	1	0	1	Soap
5	Two-way bath	0	7	0	1	0	1	Bleach
6	Two-way bath	0	2	0	1	0	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	2	0	1	1	1	
9	Intermediate extract	0	1	0				
10	Two-way bath	0	4	0	0	1	1	Sour & softener
11	Final extract	0	6	0				

Table 77. Offshore Laundry Formula 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	2	5	0	1	1	1	(add manually)
2	Two-way bath	0	2	0	1	1	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	6	0				

Table 78. Offshore Laundry Formula 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	5	0	1	0	1	Soap & bleach
2	Two-way bath	0	1	0	1	0	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	1	0	1	1	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	3	0	0	1	1	Sour & softener
7	Final extract	0	5	0				

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7.7 Standard Restaurant Laundry Formulas

BNCJUP34.C01 0000221263 A.3 A.4 1/2/20 1:16 PM Released

Table 79. Restaurant Formula 01: Standard Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 6 0	1	0	1	Soap & bleach
2	Two-way bath	0 2 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 80. Restaurant Formula 02: Colored Table Linens

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	1 0 0	1	0	1	Soap
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	
6	Two-way bath	0 7 0	0	1	1	Sour & starch
7	Final extract	0 3 0				

Table 81. Restaurant Formula 03: White Table Linens and Aprons

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 9 0	1	0	1	Soap
3	Two-way bath	0 8 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 7 0	0	1	1	Sour & starch
9	Final extract	0 3 0				

Table 82. Restaurant Formula 04: Wipes

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	2	0	1	1	1	
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	8	0	1	0	1	Soap
4	Two-way bath	0	6	0	1	0	1	Soap
5	Two-way bath	0	7	0	1	0	1	Bleach
6	Two-way bath	0	2	0	1	0	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	2	0	1	1	1	
9	Intermediate extract	0	1	0				
10	Two-way bath	0	3	0	0	1	1	Sour
11	Final extract	0	6	0				

Table 83. Restaurant Formula 05: Stain Treatment

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	8	0	1	0	1	Soap
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	8	0	1	0	1	Bleach
4	Two-way bath	0	2	0	1	0	1	
5	Intermediate extract	0	1	0				
6	Two-way bath	0	2	0	1	1	1	
7	Intermediate extract	0	1	0				
8	Two-way bath	0	4	0	0	1	1	Sour & softener
9	Intermediate extract	0	3	0				

Table 84. Restaurant Formula 06: Hand Towels and Uniforms

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0	7	0	1	0	1	Soap
2	Two-way bath	0	7	0	1	0	1	Bleach
3	Two-way bath	0	2	0	1	0	1	
4	Intermediate extract	0	1	0				
5	Two-way bath	0	2	0	1	1	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	4	0	0	1	1	Sour & softener
8	Final extract	0	6	0				

Table 85. Restaurant Formula 07: Floor Mops

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 7 0	1	0	1	Soap
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 2 0	0	1	1	
9	Final extract	0 6 0				

Table 86. Restaurant Formula 08: Multi-flush

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	CSoaphemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 2 0	1	1	1	
3	Two-way bath	0 2 0	1	0	1	
4	Two-way bath	0 7 0	1	0	1	Soap
5	Two-way bath	0 7 0	1	0	1	Bleach
6	Two-way bath	0 2 0	1	0	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 2 0	1	1	1	
9	Intermediate extract	0 1 0				
10	Two-way bath	0 4 0	0	1	1	Sour & softener
11	Final extract	0 6 0				

Table 87. Restaurant Formula 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	0 5 0	1	1	1	(add manually)
2	Two-way bath	0 2 0	1	1	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 2 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 4 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 88. Restaurant Formula 10: Quick Wash

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 5 0	1	0	1	Soap & bleach
2	Two-way bath	0 1 0	1	0	1	
3	Intermediate extract	0 1 0				
4	Two-way bath	0 1 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 3 0	0	1	1	Sour & softener
7	Final extract	0 5 0				

BNCJUP35 / 2019104 BNCJUP35 0000221359 A.4 1/2/20 1:16 PM Released

7.8 Standard Shirt Laundry Formulas

BNCJUP35.C01 0000221358 A.3 A.4 1/2/20 1:16 PM Released

Table 89. Shirt Laundry Formula 01: Starch and Extract

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	0	1	1	Starch
2	Final extract	0 6 0				

Table 90. Shirt Laundry Formula 02: White Starched Goods

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 7 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 7 0	0	1	1	Sour & starch
9	Final extract	0 6 0				

Table 91. Shirt Laundry Formula 03: Colored Starched Goods

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	1 2 0	1	0	1	Soap
2	Two-way bath	0 2 0	1	0	1	
3	Intermediate extract	0 1 0				

Table 91 Shirt Laundry Formula 03: Colored Starched Goods (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
4	Two-way bath	0 2 0	1	1	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 7 0	0	1	1	Sour & starch
7	Final extract	0 6 0				

Table 92. Shirt Laundry Formula 04: White Goods without Starch

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 2 0	1	0	1	
3	Two-way bath	0 7 0	1	0	1	Bleach
4	Two-way bath	0 2 0	1	0	1	
5	Intermediate extract	0 1 0				
6	Two-way bath	0 2 0	1	1	1	
7	Intermediate extract	0 1 0				
8	Two-way bath	0 4 0	0	1	1	Sour & softener
9	Final extract	0 6 0				

Table 93. Shirt Laundry Formula 05: Colored Goods without Starch

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 7 0	1	0	1	Soap
2	Two-way bath	0 7 0	1	0	1	Soap
3	Two-way bath	0 2 0	1	0	1	
4	Intermediate extract	0 1 0				
5	Two-way bath	0 2 0	1	1	1	
6	Intermediate extract	0 1 0				
7	Two-way bath	0 4 0	0	1	1	Sour & softener
8	Final extract	0 6 0				

Table 94. Shirt Laundry Formula 06: Delicates

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 2 0	1	1	1	
2	Two-way bath	0 5 0	1	1	1	Soap
3	Two-way bath	0 2 0	1	1	1	
4	Two-way bath	0 2 0	1	1	1	
5	Two-way bath	0 2 0	0	1	1	

Table 94 Shirt Laundry Formula 06: Delicates (cont'd.)

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Final extract	0	3	0				

Table 95. Shirt Laundry Formula 07: Stain Treatment

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	1	0	0	1	0	1	Soap
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	2	0	1	0	1	
4	Two-way bath	0	7	0	1	0	1	Bleach
5	Two-way bath	0	2	0	1	0	1	
6	Intermediate extract	0	1	0				
7	Two-way bath	0	2	0	1	1	1	
8	Intermediate extract	0	1	0				
9	Two-way bath	0	4	0	0	1	1	Sour & softener
10	Final extract	0	6	0				

Table 96. Shirt Laundry Formula 08: Oxygen Bleach

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	1	3	0	1	0	1	Soap & bleach
2	Two-way bath	0	2	0	1	0	1	
3	Two-way bath	0	2	0	1	1	1	
4	Two-way bath	0	2	0	1	1	1	
5	Two-way bath	0	2	0	0	1	1	
6	Two-way bath	0	4	0	0	1	1	Sour & softener
7	Intermediate extract	0	6	0				

Table 97. Shirt Laundry Formula 09: Stain Soak

Step Number	Type of Step (T)	Step Duration M	M	Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Stationary bath	0	5	0	1	1	1	(add manually)
2	Two-way bath	0	2	0	1	1	1	
3	Intermediate extract	0	1	0				
4	Two-way bath	0	2	0	1	1	1	
5	Intermediate extract	0	1	0				

Table 97 Shirt Laundry Formula 09: Stain Soak (cont'd.)

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
6	Two-way bath	0 4 0	0	1	1	Sour & softener
7	Final extract	0 6 0				

Table 98. Shirt Laundry Formula 10: Extract Only

Step Number	Type of Step (T)	Step Duration M M Q	Hot Water Valve (H)	Cold Water Valve (C)	Bath Level (L)	Chemical Names
1	Two-way bath	0 1 0	1	1	1	None
2	Final extract	0 6 0				