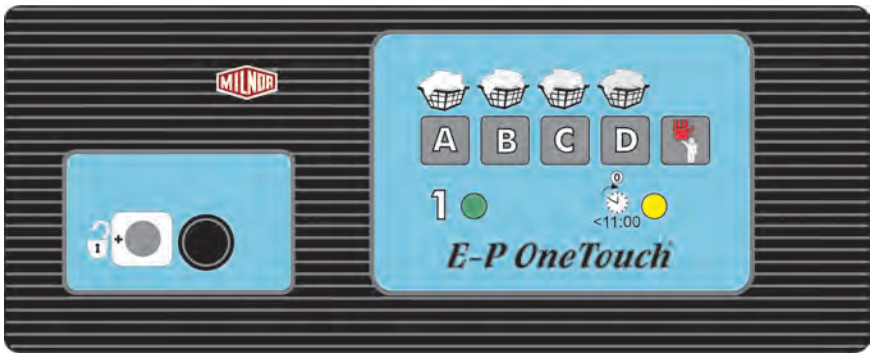
Manual Number: MCCOUB01
Edition (ECN): 2021184

# Controller Reference
# E-P OneTouch®
# Washer-extractors




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

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# Preface



## 1 About This Manual

### 1.1 Scope



This manual provides commissioning, operating, and troubleshooting instructions for washer-extractors in the Milnor® MWR_ & MWT_ line. These machines are equipped with the Milnor® E-P OneTouch®control. See the installation manual for information on machine installation procedures and mechanical requirements. See the service manual for preventive maintenance, service procedures, and mechanical parts identification. See the schematic manual for electrical parts identification and electrical troubleshooting instructions.

**NOTICE:** Milnor MWR_ & MWT_ models sold in North and South America employ the controller board with Milnor® part number 08BT168AT. Similar models sold in Asia may employ controller board 08BT168AT or the controller board with Milnor® part number 08BT168BT. Some minor differences are determined by the market for which any particular machine is manufactured, but operation and most troubleshooting procedures are the same. When necessary for clarity in this manual, specific differences will be identified by the controller board part number.

### 1.2 If this Manual Does Not Have the Necessary Data



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that this manual does not give?** If we get better data or more data after the manual is available, we will add it to a newer version of the manual.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.

## 1.3 Trademarks

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

**Table 1. Trademarks**

| | | | |
|---|---|---|---|
| AutoSpot™ | GreenFlex™ | MilMetrix® | PulseFlow® |
| CBW® | GearTrace™ | MilTouch™ | RAM Command™ |
| Drynet™ | GreenTurn™ | MilTouch-EX™ | RecircONE® |
| E-P Express® | Hydro-cushion™ | MILRAIL™ | RinSave® |
| E-P OneTouch® | Mentor® | Miltrac™ | SmoothCoil™ |
| E-P Plus® | Mildata® | PBW™ | Staph Guard® |
| Gear Guardian® | Milnor® | | |

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# 2 How to Contact Milnor®

Your authorized Milnor® dealer can assist you with your Milnor® machine and knows about the local conditions that may be pertinent to the installation, use, or maintenance of the machine. Contact your dealer first. For assistance from the Milnor® factory, refer to Table 2 for contact information.

**Table 2. Pellerin Milnor® Corporation Contact Information**

| Purpose | Department | Telephone | FAX | E-mail/Web site |
|---|---|---|---|---|
| Order or ask about replacement parts | Parts | 504–712–7775 or 800–299–1500 | 504–469–9777 | parts@milnor.com |
| Get advice on installing, servicing, or using | Customer Service/ Technical Support | 504–712–7780 | 504–469–9777 | service@milnor.com www.milnor.com (Customer Service) |
| Learn about, request, or enroll in Milnor® service seminars | Training | 504–712–7716 | 504–469–9777 | training@milnor.com |
| Determine warranty eligibility or claim status | Warranty Administration | 504–712–7735 | 504–469–9777 | service@milnor.com (Attention: Warranty) |
| Ask about, comment on, or report an error in equipment manuals | Technical Publications | 504–712–7636 | 504–469–1849 | techpub@milnor.com |
| European contacts | Milnor® International | + 32 2 720 5822 | — | milnor@milnor.be |
| Ask about the shipping weight of your machine before it arrives at your facility | Logistics Department | 504–712–7686 | 504–471–0273 | — |

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# 1 Commissioning

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## 1.1 Important Owner/User Information

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The following two procedures must be completed before this machine is placed in service:

1. Ensure the safety of all laundry personnel.
2. Customize the machine controller for the intended machine application.

### 1.1.1 Ensure Safety of All Laundry Personnel

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Ensure that all personnel who will operate or maintain this machine read the safety manual before permitting them to access the machine. Ensure that all user manuals are available to the appropriate personnel and that all precautions explained in all applicable manuals are observed.

### 1.1.2 Customize the Machine Controller

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Customizing the controller includes verifying that it is configured for the particular application (set of four pre-programmed formulas) for which the machine will be used. Always verify the machine configuration when the machine is first placed in service and after replacing the microprocessor controller.

Configure this machine by setting DIP switch SW1 on the microprocessor controller. See Section 2.1 : Configuring E-P OneTouch® Washer-extractor Models, page 15 in this manual for the location of detailed configuration instructions.

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## 1.2 Vital Information About the Forces Imparted to Supporting Structures by Laundering Machines

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This document replaces Milnor® document BIWUUI02.

All laundering machines impart static and dynamic forces to the supporting structures (foundation and soil, floor, and building). Static forces include the machine weight plus the weight of the goods and water. Dynamic forces are those imparted by various machine movements as explained in Section 1.2.2 : Major Design Considerations, page 5. The dynamic forces imparted to supporting structures can cause vibration and noise outside of the laundry room if supporting structures are inadequate.

## 1.2.1 Disclaimer of Responsibility

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Pellerin Milnor Corporation accepts no responsibility for damage or loss as a result of:

- inadequate supporting structures
- interference with the use of the facility caused by machine operation

The facility owner/operator is solely responsible to ensure that:

- supporting structures are strong enough, with a reasonable safety factor, to safely support the operating machine or group of machines
- supporting structures are rigid enough to isolate vibrations and noise to the laundry room

If the owner/operator does not possess the necessary expertise to ensure that the facility can safely and functionally accommodate the equipment, it will be necessary to consult the appropriate expert(s), such as a structural engineer, soils engineer, and/or architect.

## 1.2.2 Major Design Considerations

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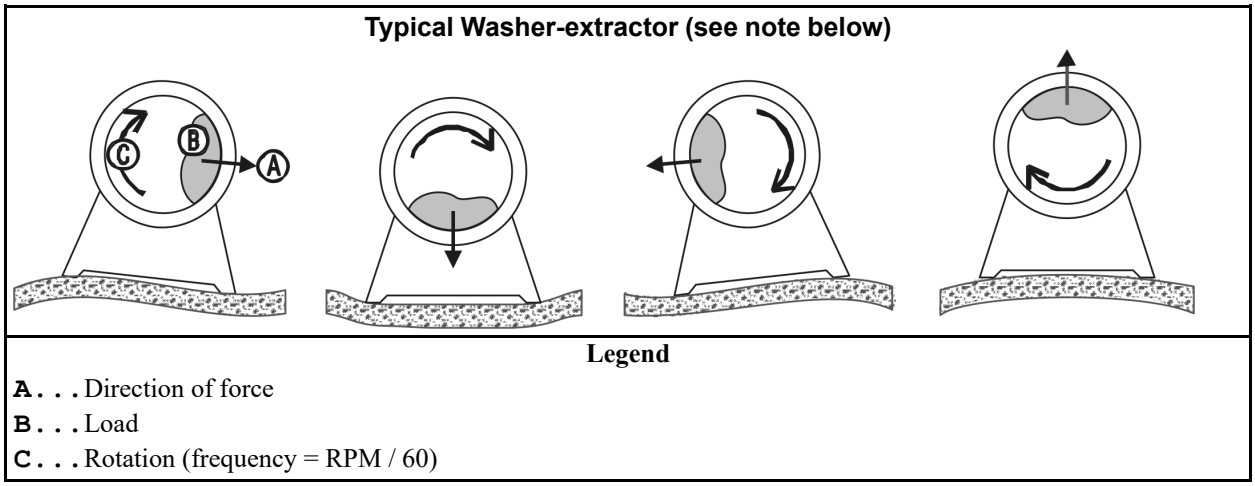
- Vibration and/or noise can be felt or heard outside of the laundry room as a result of the following, if supporting structures are not sufficiently rigid:
  - Extraction (the spinning cylinder) in washer-extractors and centrifugal extractors, imparts sinusoidal forces to supporting structures as shown in Figure 1: How Rotating Forces Act On the Foundation, page 6 . In rigid washer-extractors, these forces are up to 30 times that of suspended washer-extractors of the same capacity.
  - Extraction forces can be magnified many times if the rotation frequency matches the resonant frequency of supporting structures. To avoid this, supporting structures must have a natural resonant frequency many times greater than any possible rotation speed of the machine or combination of rotation speeds of all machines.
  - Each time goods fall in the rotating cylinder of a washer, washer-extractor, centrifugal extractor, or dryer, this can impart a force to the supporting structures.
  - The intermittent start and stop actions of large components inside the machine, particularly in a tilting washer-extractor, press-extractor, or centrifugal extractor, can impart intermittent forces to the supporting structures.
- The possibility of adverse consequences is significantly greater for upper floor installations than for installations at grade. Always consult a structural engineer for such an installation.
- The possibility of adverse consequences is significantly greater for installations at grade if subsidence causes a void between the foundation and the soil or if the soil itself does not provide adequate strength and rigidity. Some possible remedies are the addition of pilings or a deeper foundation, installed as to be monolithic with the existing foundation.
- Machine forces can cause damage to the machine or the floor without the correct anchorage.
- Applicable building codes, even when met, do not guarantee sufficient structural support and isolation of machine forces to the laundry room.

**Figure 1. How Rotating Forces Act On the Foundation**




**NOTE:** This figure applies to both rigid and suspended washer-extractors and to both at-grade and upper floor installations.

## 1.2.3 Primary Information Sources

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Milnor® provides, or can provide the following information of use to engineers and architects, for the given machine model:

- The machine dimensional drawing, found in the installation manual, specifies the machine's required anchorage.
- The Milnor® Service Department can provide static and dynamic load values and frequency (extract speed) values on request.

**NOTICE:** All data is subject to change without notice and may have changed since last printed. It is the responsibility of the potential owner/operator to obtain written confirmation that any data furnished by Milnor® applies for the model number(s) and serial number(s) of the purchased machine(s).

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# 1.3 Prevent Damage from Chemical Supplies and Chemical Systems

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All Milnor® washer-extractors and CBW® tunnel washers use stainless steel with the ANSI 304 specification. This material gives good performance when chemical supplies are correctly applied. If chemical supplies are incorrectly applied, this material can be damaged. The damage can be very bad and it can occur quickly.

Chemical supply companies usually:

- supply chemical pump systems that put the supplies in the machine,

- connect the chemical pump system to the machine,
- write wash formulas that control the chemical concentrations.

The company that does these procedures must make sure that these procedures do not cause damage. **Pellerin Milnor Corporation accepts no responsibility for chemical damage to the machines it makes or to the goods in a machine.**

## 1.3.1 How Chemical Supplies Can Cause Damage

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**Dangerous Chemical Supplies and Wash Formulas** — Some examples that can cause damage are:

- a very high concentration of chlorine bleach,
- a mixture of acid sour and hypo chlorite,
- chemical supplies (examples: chlorine bleach, hydrofluosilicic acid) that stay on the stainless steel because they are not quickly flushed with water.

The book “Textile Laundering Technology” by Charles L. Riggs gives data about correct chemical supplies and formulas.

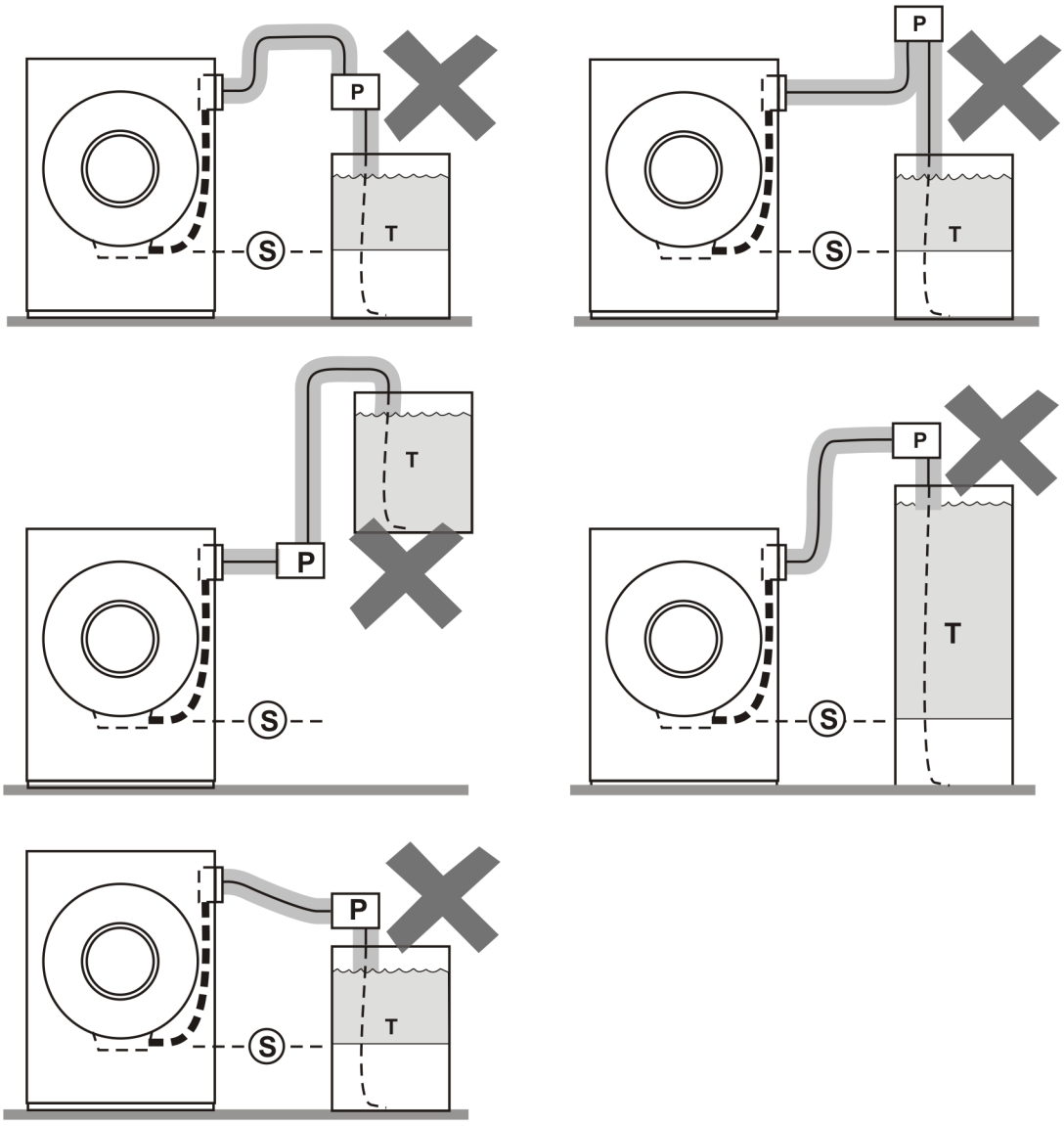
**Incorrect Configuration or Connection of Equipment** — Many chemical systems:

- do not prevent a vacuum in the chemical tube (for example, with a vacuum breaker) when the pump is off,
- do not prevent flow (for example, with a valve) where the chemical tube goes in the machine.

Damage will occur if a chemical supply can go in the machine when the chemical system is off. Some configurations of components can let the chemical supplies go in the machine by a siphon (Figure 2: Incorrect Configurations That Let the Chemical Supply Go In the Machine by a Siphon, page 8 ). Some can let chemical supplies go in the machine by gravity (Figure 3: Incorrect Configurations That Let the Chemical Supply Go In the Machine by Gravity, page 9 ).

**Figure 2. Incorrect Configurations That Let the Chemical Supply Go In the Machine by a Siphon**

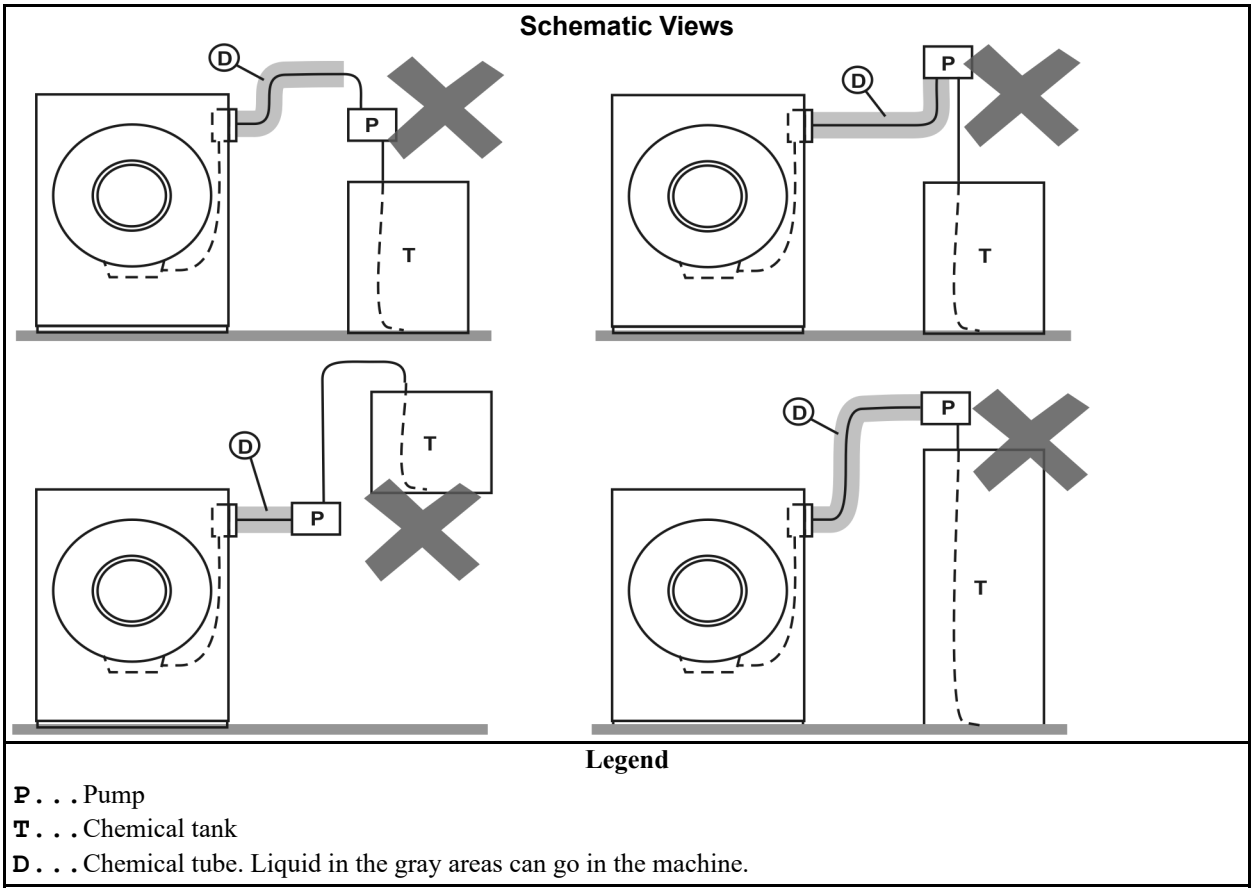
**Schematic Views**




**Legend**

**P . . .** Pump
**T . . .** Chemical tank
**S . . .** The siphon occurs above here. Liquid in the gray parts of the chemical tube and tank can go in the machine.

**Figure 3. Incorrect Configurations That Let the Chemical Supply Go In the Machine by Gravity**




**Legend**

**P . . .** Pump
**T . . .** Chemical tank
**D . . .** Chemical tube. Liquid in the gray areas can go in the machine.

## 1.3.2 Equipment and Procedures That Can Prevent Damage

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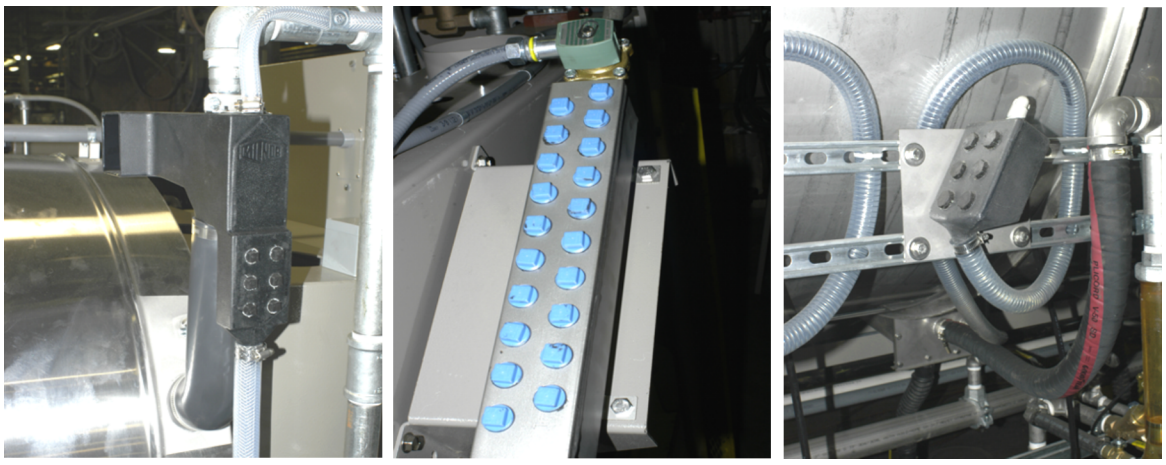
**Use the chemical manifold supplied.** — There is a manifold on the machine to attach chemical tubes from a chemical pump system. The manifold has a source of water to flush the chemical supplies with water.

**Figure 4. Examples of Manifolds for Chemical Tubes. Your equipment can look different.**



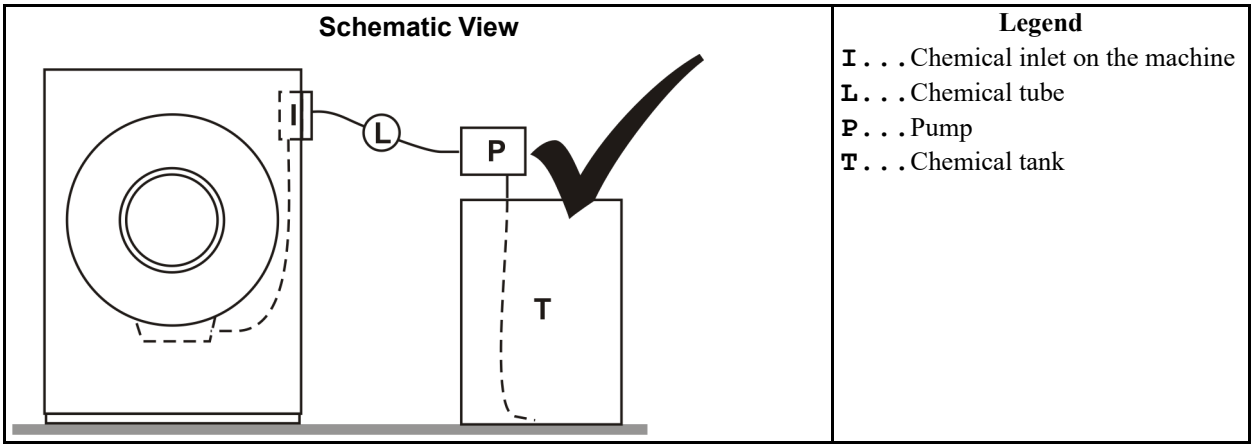
**Close the line.** — If the pump does not always close the line when it is off, use a shutoff valve to do this.

**Do not let a vacuum occur.** — Supply a vacuum breaker in the chemical line that is higher than the full level of the tank.

**Flush the chemical tube with water.** — If the liquid that stays in the tube between the pump and the machine can flow in the machine, flush the tube with water after the pump stops.

**Put the chemical tube fully below the inlet.** — It is also necessary that there is no pressure in the chemical tube or tank when the system is off.

**Figure 5. A Configuration that Prevents Flow in the Machine When the Pump is Off (if the chemical tube and tank have no pressure)**




**Prevent leaks.** — When you do maintenance on the chemical pump system:

- Use the correct components.
- Make sure that all connections are the correct fit.
- Make sure that all connections are tight.

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# 1.4 Electrical Connections for Liquid Chemical Systems

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**WARNING:** **Electric Shock Hazard —** Contact with high voltage electricity will kill or seriously injure you. Even when the machine is not running, three-phase power and control circuit power are still present at several locations within the cabinet and at some electrical components.

**CAUTION:** **Injury and Damage Hazard —** Improper wiring can cause the machine to malfunction, risking injury to personnel, damage to machine components, and damage to goods.

- Electrical and piping connections described in this section must be made only by qualified, authorized personnel.
- Lock off and tag out power at the external disconnect switches for the washer-extractor before proceeding.
- Do not rely merely on the information in this section when wiring. Consult all applicable electrical schematics.
- Do not reroute or rearrange any wires not specifically permitted by this instruction.
- Do not connect a common wire to ground. Use the common terminal furnished.

**CAUTION:** **Risk of Poor or Inconsistent Wash Quality —** Injection times of less than 10 seconds are discouraged because fine adjustments are not possible, and factors such as pump lag time may cause significant variations in the amount of chemical delivered.

- Size pumps or valves small enough for adequate control (i.e., for longer injection times).
- Use two pumps or valves to inject a small or large quantity of the same chemical, if required.

## 1.4.1 Maximizing Chemical Injection Precision

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Injection of a consistent amount of chemical is important in controlling wash quality and using chemicals economically. When chemicals are injected by units of time, as is done with most washer-extractors, injections of short duration can be imprecise because of two reasons:

- Fine adjustments to the delivered quantity are not possible. For example, if an injection of three seconds is extended by one second, the quantity delivered is theoretically increased by more than 30 percent. However, if an injection of 20 seconds is increased by one second, the theoretical quantity is increased by only five percent.
- Variations in the time between the start of the chemical signal and the start of the chemical delivery into the machine can cause significant differences in the quantity of chemical injected. In this case, if a pump starts more slowly some times than others, or if the delivery tubes are partially empty at the start of the inject period, the quantity of chemical delivered may vary significantly. As an example, assume a peristaltic pump moves chemical along the delivery tube at a rate of three feet per second. If the delivery tube is empty for three feet along its length, then one second of the injection time is spent injecting air rather than chemical. If the programmed injection time is only three seconds, then one third of the desired chemical is not being delivered. However, if the programmed injection time is 20 seconds, the chemical delivery is only five percent less than desired.
- Increasing the programmed injection time makes any variation less significant. Use pumps and/or valves sized to allow inject times of at least 10 seconds. If injection times for a specific chemical vary widely from one formula to another, consider using two pumps or valves for

the same chemical. Actuate one pump for injecting small quantities, and use both pumps or valves for larger quantities.

## 1.4.2 Pump Signal Connections

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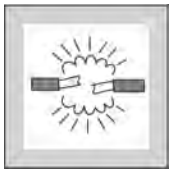
The E-P OneTouch® microprocessor controller used on Milnor® T_E, G_E, and similar models closes certain relay contacts when chemicals are desired and to flush the chemical system after each injection. These signals are 240 volts AC and cannot be made potential-free. Any device driven by this signal can draw up to 37 milliamperes.

**NOTE:** The manifold flush signal is effective only if the chemical supply system provided by others is properly designed and connected to a flushing water source.

**CAUTION:** **Component Damage Hazard —** Board components will burn out and require board replacement if devices driven by inject signals do not meet the above electrical specifications. Pumps usually draw a higher current than specified above, and will cause board damage.



This machine provides signals for three chemicals and a manifold flush. Table 3: Chemical Injection Signals, page 12 contains the connection details for these signals. All chemical signal connections are available on terminal strip TBS, as shown in Figure 6: Pump Signal Connections, page 13 . This terminal strip is located in the electrical enclosure on the left rear of the machine, where the machine power connections are made.

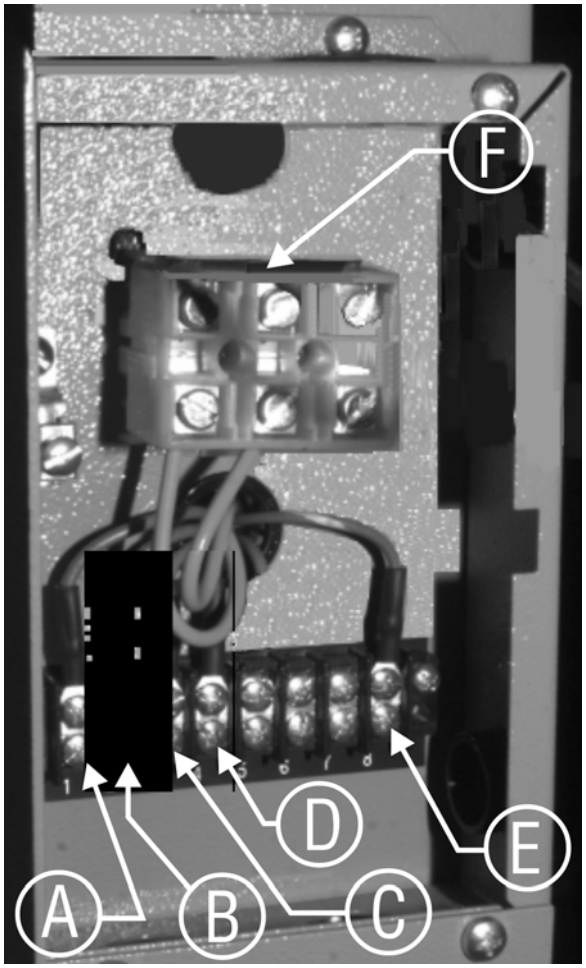
**NOTE:** Unless the “Timer Stop” feature is employed, each chemical signal is enabled for 30 seconds, starting 15 seconds after the desired level (usually low level) is achieved for the bath.

**Table 3. Chemical Injection Signals**

| Signal Component | Chemical | Relay | Processor Board Connection | TBS Terminal Number |
|---|---|---|---|---|
| Chemical 1 | Detergent | K13 | MTA6-7,8 | 1 |
| Chemical 2 | Bleach | K14 | MTA6-3,4 | 2 |
| Chemical 3 | Finishing chemicals | K15 | MTA6-1,2 | 3 |
| Manifold Flush | none | K12 | MTA6-9,10 | 4 |

**Figure 6. Pump Signal Connections**

**Electrical Connections Enclosure**




**Legend**

**A . . .** Detergent signal
**B . . .** Bleach signal
**C . . .** Sour and starch/softener signal
**D . . .** Manifold flush signal
**E . . .** Chemical signal common
**F . . .** Machine power connections

## 1.4.3 Timer Stop Connections

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**This feature is not available on coin-operated machines. Timer stop** is a feature of the E-P OneTouch control which stops the machine timer while a certain input to the microprocessor is grounded. When multiple machines without this feature are connected to a common chemical supply system, the quantity of chemical injected can vary widely if two or more machines request chemical simultaneously. When timer stop is properly wired with the chemical supply system, the supply system stops the timers in certain linked machines when one machine requests chemical. When the chemical injection is completed, the chemical supply system terminates the **timer stop** command, and the stopped timers resume counting.

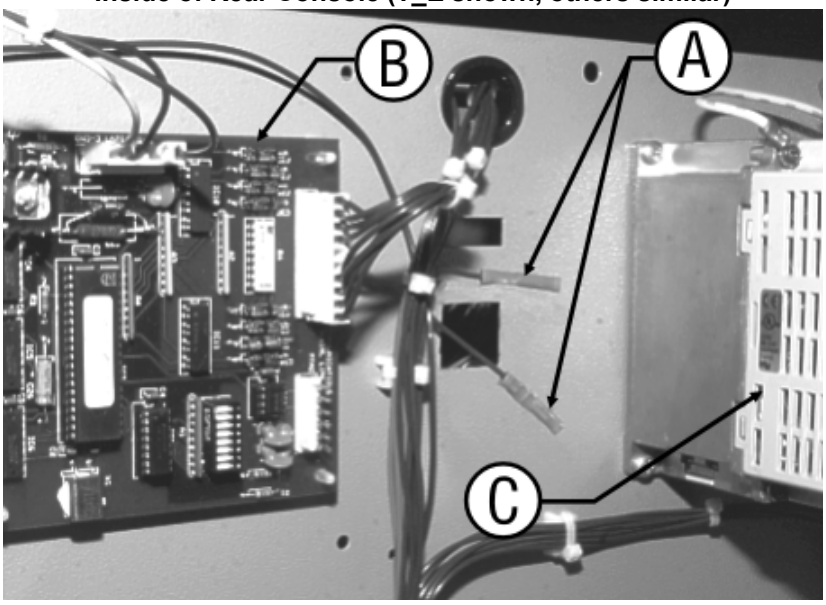
When the timer in a machine is stopped, the current formula event continues until the timer resumes counting. If water valves are open when the timer stops, they will close when the desired level is reached. Chemical injection signals will stop after the designated time, but the manifold flush signal will not occur until the timer starts. All other actions (cylinder reversing, extract

speed, drain speed, etc.) that are in progress when the timer is stopped will continue until the timer starts again and the programmed time for the current event expires.

Milnor provides two wires terminated with butt connectors in the rear console of the machine, as shown in Figure 7: **Timer Stop** Connections, page 14 . One wire originates electrically from pin 4 of MTA7 on processor board 08BT168AT, or pin 9 of MTA3 on processor board 08BT168BT. The other wire is electrically identical to pin 6 of MTS1 on the switch panel board. For **timer stop** to operate, the chemical system should include a normally open contact between these two connectors. When the contact is open, the machine runs normally. When the contact is closed, the machine timer stops until the contact opens again.

**Figure 7. Timer Stop Connections**

**Inside of Rear Console (T_E shown, others similar)**




**Legend**

**A . . .** Timer stop connections
**B . . .** Processor board
**C . . .** Inverter

# 2 Configuring



## 2.1 Configuring E-P OneTouch® Washer-extractor Models



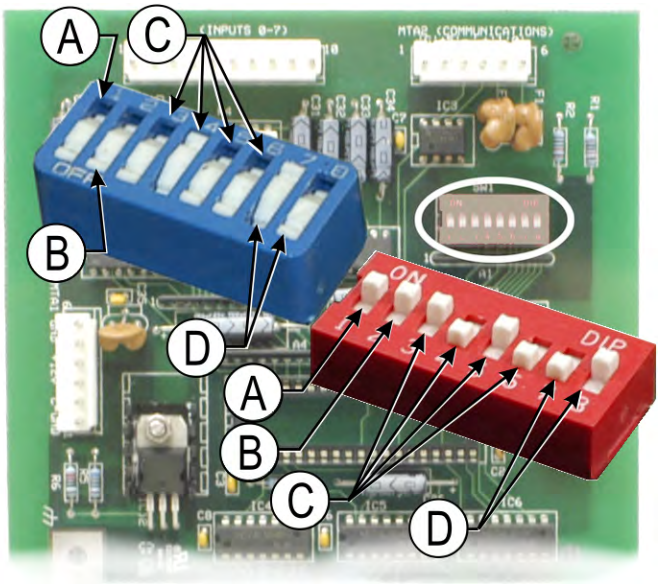
The controller must be configured for your specific machine. Configuration information is controlled by a group of small switches (together called a DIP switch) on the processor board. When power is first applied to the machine, the microprocessor reads the **on** or **off** status of each switch.

### 2.1.1 Is this switch position ON or OFF?



You can set any DIP switch position to **on** or **off**. To turn a position **off**, you must either press down on the side of the switch nearest the word "OFF," or slide the handle toward the position number. To turn a position "on," you either press down on the side of the switch nearest the number, or slide the white handle toward the word "ON." Use a pencil or a stiff wire to set the switch, which will click into position. See Figure 8: Typical DIP switch on 08BT168AT, page 15 for the DIP switch location.

**Figure 8. Typical DIP switch on 08BT168AT**

| Graphic | Legend |
|---|---|
|  | **A . . .** Position 1: **ON** selects formula set 1<br>**B . . .** Position 2: **ON** selects cold final rinse<br>**C . . .** Positions 3 through 6: see Section 2.1.2.3 : Positions 3 through 6: Formula Set Selection, page 16<br>**D . . .** Positions 7 and 8: Normal or diagnostic mode (see Section 2.1.2.4 : Position 7: Normal operation?, page 17 and Section 2.1.2.5 : Position 8: Run formulas?, page 17) |

## 2.1.2 Configuration Decisions for Machines with Controller 08BT168AT or 98CMCR0911

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### 2.1.2.1 Position 1: Use Formula Set #1?

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DIP switch position 1 determines the formula set used. Set this switch position **on** to configure the machine for the four primary formulas (Set #1), which are designed primarily for bed and bath linen. Set this switch **off** to use the alternate set of formulas (Set #2, primarily for kitchen/dining and personal goods). The formulas are listed in Section 2.2 : Available E-P OneTouch® Wash Formulas (softwares WUT5E1A and WUMWR1D), page 17.

### 2.1.2.2 Position 2: Cold final rinse?

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In some locations the temperature of the incoming cold water may be too cold to allow the proper activation of some chemicals. In these locations, turn switch position 2 **off** to cause **both** water valves to open for all sour/softener steps.

### 2.1.2.3 Positions 3 through 6: Formula Set Selection

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DIP switch positions 3, 4, 5, and 6 set which formula set is available. **Set only one of these switches on**. All formula sets are described in Section 2.2 : Available E-P OneTouch® Wash Formulas (softwares WUT5E1A and WUMWR1D), page 17. See Section 2.1.2.1 : Position 1: Use Formula Set #1?, page 16 to choose Formula Set #1 or #2 of any group below.

#### 2.1.2.3.1 Standard Formulas for Hotel and Hospitality

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Set switch position 3 **on** and switch positions 4, 5, and 6 **off** to use the formulas shown in Section 2.2.1.1 : Standard Formulas for Hotel and Hospitality, page 17.

#### 2.1.2.3.2 GreenTurn Formulas for Hotel and Hospitality

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Set switch position 4 **on** and switch positions 3, 5, and 6 **off** to use the formulas shown in Section 2.2.1.2 : GreenTurn™ Formulas for Hotel and Hospitality, page 19.

#### 2.1.2.3.3 Standard Formulas for Healthcare

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Set switch position 5 **on** and switch positions 3, 4, and 6 **off** to use the formulas shown in Section 2.2.2.1 : Standard Formulas for Healthcare, page 21.

#### 2.1.2.3.4 GreenTurn Formulas for Healthcare

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Set switch position 6 **on** and switch positions 3, 4, and 5 **off** to use the formulas shown in Section 2.2.2.2 : GreenTurn™ Formulas for Healthcare, page 23.

#### 2.1.2.4 Position 7: Normal operation?

BNCOUP01.C11 0000189437 B.2 A.10 A.8 1/2/20 1:25 PM Released

The Milnor® factory sets switch position 7 **off** when preparing and testing the board before installation. **Set this switch position on before first commissioning the machine, or before installing this board as a replacement board**. The machine will not enter the diagnostics mode if this position is **on**.

#### 2.1.2.5 Position 8: Run formulas?

BNCOUP01.C12 0000189436 B.2 A.10 A.8 1/2/20 1:25 PM Released

Switch position 8 determines whether the machine is configured for normal operation or for diagnostics. With this position **on**, the machine operates normally by running formulas. **Verify that this switch position is on before first commissioning the machine, or before installing a replacement board**.

When switch position 8 is **off**, the machine is configured for diagnostics. In this configuration, an optional display can be connected to the processor board to aid in diagnosing problems when a qualified technician manually actuates individual outputs.

**BNCOUP02 / 2018253** BNCOUP02 0000189083 A.7 1/2/20 1:25 PM Released

## 2.2 Available E-P OneTouch® Wash Formulas (softwares WUT5E1A and WUMWR1D)

BNCOUP02.C01 0000189082 B.2 A.7 1/2/20 1:25 PM Released

### 2.2.1 Hotel and Hospitality Configuration

BNCOUP02.C02 0000189081 B.2 A.7 1/2/20 1:25 PM Released

#### 2.2.1.1 Standard Formulas for Hotel and Hospitality

BNCOUP02.R01 0000189080 B.2 A.7 1/2/20 1:25 PM Released

**Table 4. Standard Formula Set #1**

| Operation | Formula A: Blankets and Spreads | | | | Formula B: Sheets | | | | Formula C: Towels | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Flush | | | | | | | | | | | | | 2 | | S | Hi |
| Drain | | | | | | | | | | | | | 1.25 | | | |
| Bath | 8 | D | S | Lo | 10 | DB | H | Lo | 7 | D | H | Lo | 10 | D | H | Lo |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | H | Hi | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | | | | | | | | |
| Bath | | | | | | | | | 7 | B | H | Lo | 7 | B | H | Lo |
| Drain | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Rinse | 2 | | C | Hi | | | | | 2 | | H | Hi | 2 | | H | Hi |
| Drain | 1.25 | | | | | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | 1 | | | | 1 | | | | 1 | | | |
| Coast | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |

**Table 4 Standard Formula Set #1 (cont'd.)**

| Operation | Formula A: Blankets and Spreads | | | | Formula B: Sheets | | | | Formula C: Towels | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Rinse | | | | | 2 | | | | 2 | | S | Hi | 2 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | 1 | | | | 1 | | | | 1 | | | |
| Coast | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 7 | | | | 6 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 29.25 | | | | 34.75 | | | | 41 | | | | 47.25 | | | |

**Key to Abbreviations:**

| | | | | | |
|---|---|---|---|---|---|
| D | Usually detergent | H | Hot water | Hi | High level |
| B | Usually bleach | C | Cold water | Low | Low level |
| F | Sour/softener or sour/starch | S | Split water | | |

**Notes:**

1 For any bath step, the timer does not run until the desired level is achieved.

**Table 5. Standard Formula Set #2**

| Operation | Formula A: Colored 100% Poly Table Linen | | | | Formula B: White 100% Poly Table Linen | | | | Formula C: Stain Treatment | | | | Formula D: White Kitchen Goods | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Bath | 10 | D | H | Lo | 10 | D | H | Lo | 20 | DB | H | Lo | 5 | D | H | Lo |
| Carryover | | | | | | | | | | | | | 1 | | H | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | 2 | | H | | | | | | 2 | | H | Hi | | | | |
| Drain | 1.25 | | | | | | | | 1.25 | | | | | | | |
| Bath | | | | | 7 | B | H | Lo | | | | | 8 | D | H | Lo |
| Drain | | | | | 1.25 | | | | | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | S | Hi | 2 | | H | Hi | 2 | | H | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | | | | | | | | | | | | | 7 | B | H | Lo |
| Drain | | | | | | | | | | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | | | | | 1 | | | | 1 | | | |
| Coast | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | | | | | 2 | | S | Hi | 2 | | S | Hi |

**Table 5 Standard Formula Set #2 (cont'd.)**

| Operation | Formula A: Colored 100% Poly Table Linen | | | | Formula B: White 100% Poly Table Linen | | | | Formula C: Stain Treatment | | | | Formula D: White Kitchen Goods | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Drain | | | | | | | | | | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | | | | | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 2.5 | | | | 2.5 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 30 | | | | 35 | | | | 42.75 | | | | 50.25 | | | |

**Key to Abbreviations:**

| | | | | | |
|---|---|---|---|---|---|
| D | Usually detergent | H | Hot water | Hi | High level |
| B | Usually bleach | C | Cold water | Low | Low level |
| F | Sour/softener or sour/starch | S | Split water | | |

**Notes:**

1 For any bath step, the timer does not run until the desired level is achieved.

## 2.2.1.2 GreenTurn™ Formulas for Hotel and Hospitality

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**Table 6. GreenTurn Formula Set #1**

| Operation | Formula A: Blankets and Spreads | | | | Formula B: Sheets | | | | Formula C: Towels | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Flush | | | | | | | | | | | | | 2 | | S | Hi |
| Drain | | | | | | | | | | | | | 1.25 | | | |
| Bath | 6 | D | C | Lo | 8 | DB | H | Lo | 6 | D | H | Lo | 8 | D | H | Lo |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | 2 | | C | Hi | 2 | | H | Hi | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | | | | | | | | |
| Bath | | | | | | | | | 6 | B | H | Lo | 7 | B | H | Lo |
| Drain | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | | | | | 2 | | H | Hi | 2 | | H | Hi |
| Drain | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | 1 | | | | 1 | | | | 1 | | | |
| Coast | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 7 | | | | 6 | | | | 7 | | | | 7 | | | |

**Table 6 GreenTurn Formula Set #1 (cont'd.)**

| Operation | Formula A: Blankets and Spreads | | | | Formula B: Sheets | | | | Formula C: Towels | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 24 | | | | 27.25 | | | | 33.5 | | | | 39.75 | | | |

**Key to Abbreviations:**

| | | | | | |
|---|---|---|---|---|---|
| D | Usually detergent | H | Hot water | Hi | High level |
| B | Usually bleach | C | Cold water | Low | Low level |
| F | Sour/softener or sour/starch | S | Split water | | |

**Notes:**

1 For any bath step, the timer does not run until the desired level is achieved.

**Table 7. GreenTurn Formula Set #2**

| Operation | Formula A: Colored 100% Poly Table Linen | | | | Formula B: White 100% Poly Table Linen | | | | Formula C: Stain Treatment | | | | Formula D: White Kitchen Goods | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Bath | 8 | D | H | Lo | 8 | D | H | Lo | 15 | DB | H | Lo | 5 | D | H | Lo |
| Carryover | | | | | | | | | | | | | 1 | | H | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | | | | | 2 | | H | Hi | | | | |
| Drain | | | | | | | | | 1.25 | | | | | | | |
| Bath | | | | | 7 | B | H | Lo | | | | | 8 | D | H | Lo |
| Drain | | | | | 1.25 | | | | | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | S | Hi | 2 | | H | Hi | 2 | | H | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | | | | | | | | | | | | | 7 | B | H | Lo |
| Drain | | | | | | | | | | | | | 1.25 | | | |
| Rinse | | | | | | | | | 2 | | S | Hi | 2 | | S | Hi |
| Drain | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | | | | | 1 | | | | 1 | | | |
| Coast | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | | | | | 2 | | S | Hi | | | | |
| Drain | | | | | | | | | | | | | | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | | | | | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill.0 | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 2.5 | | | | 2.5 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 21.5 | | | | 29.75 | | | | 39.75 | | | | 57 | | | |

**Key to Abbreviations:**

**Table 7 GreenTurn Formula Set #2 (cont'd.)**

| Operation | Formula A: Colored 100% Poly Table Linen<br>Time / Chemicals / Temp / Level | Formula B: White 100% Poly Table Linen<br>Time / Chemicals / Temp / Level | Formula C: Stain Treatment<br>Time / Chemicals / Temp / Level | Formula D: White Kitchen Goods<br>Time / Chemicals / Temp / Level |
|---|---|---|---|---|
| | D Usually detergent | H Hot water | | Hi High level |
| | B Usually bleach | C Cold water | | Low Low level |
| | F Sour/softener or sour/starch | S Split water | | |
| | **Notes:** | | | |
| | 1 For any bath step, the timer does not run until the desired level is achieved. | | | |

## 2.2.2 Healthcare Configuration

BNCOUP02.C03 0000189078 B.2 A.7 1/2/20 1:25 PM Released

### 2.2.2.1 Standard Formulas for Healthcare

BNCOUP02.R03 0000189077 B.2 A.7 1/2/20 1:25 PM Released

**Table 8. Standard Formula Set #1**

| Operation | Formula A: Blankets and Spreads<br>Time | Chemicals | Temp | Level | Formula B: Sheets<br>Time | Chemicals | Temp | Level | Formula C: Towels<br>Time | Chemicals | Temp | Level | Formula D: Diapers and Pads<br>Time | Chemicals | Temp | Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flush | | | | | 2 | | S | Hi | 2 | | S | Hi | 3 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | 8 | D | S | Lo | | | | | | | | | | | | |
| Flush | | | | | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Flush | | | | | | | | | | | | | 2 | | S | Hi |
| Rinse | 2 | | S | Hi | | | | | | | | | | | | |
| Drain | 1.25 | | | | | | | | | | | | 1.25 | | | |
| Bath | | | | | 7 | D | H | Lo | 7 | D | H | Lo | 7 | D | H | Lo |
| Drain | | | | | 1.25 | | | | | | | | 1.25 | | | |
| Carryover | | | | | | | | | 1 | | H | Hi | | | | |
| Rinse | 2 | | C | Hi | | | | | | | | | 2 | | H | Hi |
| Drain | 1.25 | | | | | | | | 1.25 | | | | 1.25 | | | |
| Bath | | | | | 7 | B | H | Lo | 7 | B | H | Lo | 7 | B | H | Lo |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |

**Table 8 Standard Formula Set #1 (cont'd.)**

| Operation | Formula A: Blankets and Spreads | | | | Formula B: Sheets | | | | Formula C: Towels | | | | Formula D: Diapers and Pads | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Extract | 7 | | | | 6 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 29.25 | | | | 42 | | | | 44 | | | | 50.5 | | | |

**Key to Abbreviations:**

| | | | | | |
|---|---|---|---|---|---|
| D | Usually detergent | H | Hot water | Hi | High level |
| B | Usually bleach | C | Cold water | Low | Low level |
| F | Sour/softener or sour/ starch | S | Split water | | |

**Notes:**

1 For any bath step, the timer does not run until the desired level is achieved.

**Table 9. Standard Formula Set #2**

| Operation | Formula A:Personal Goods | | | | Formula B: White 100% Poly Table Linen | | | | Formula C: Stain Treatment | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Flush | 2 | | S | Hi | | | | | | | | | 2 | | S | Hi |
| Drain | 1.25 | | | | | | | | | | | | 1.25 | | | |
| Bath | 7 | D | H | Lo | 10 | D | H | Lo | 20 | DB | H | Lo | 10 | D | H | Lo |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | 2 | | H | Hi | | | | | 2 | | H | Hi | | | | |
| Drain | 1.25 | | | | | | | | 1.25 | | | | | | | |
| Bath | | | | | 7 | B | H | Lo | | | | | 7 | B | H | Lo |
| Drain | | | | | 1.25 | | | | | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | S | Hi | 2 | | H | Hi | 2 | | H | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | | | | | | | | | 1 | | | |
| Coase | | | | | | | | | | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | | | | | 1 | | | | 1 | | | |
| Coast | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | 2 | | C | Hi | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 6 | | | | 2.5 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 33.75 | | | | 35 | | | | 44.75 | | | | 47.25 | | | |

**Key to Abbreviations:**

**Table 9 Standard Formula Set #2 (cont'd.)**

| Operation | Formula A:Personal Goods<br>Time / Chemicals / Temp / Level | Formula B: White 100% Poly Table Linen<br>Time / Chemicals / Temp / Level | Formula C: Stain Treatment<br>Time / Chemicals / Temp / Level | Formula D: White Heavy Soil<br>Time / Chemicals / Temp / Level |
|---|---|---|---|---|
| | D Usually detergent | H Hot water | | Hi High level |
| | B Usually bleach | C Cold water | | Low Low level |
| | F Sour/softener or sour/starch | S Split water | | |
| | **Notes:** | | | |
| | 1 For any bath step, the timer does not run until the desired level is achieved. | | | |

## 2.2.2.2 GreenTurn™ Formulas for Healthcare

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**Table 10. GreenTurn Formula Set #1**

| Operation | Formula A: Blankets and Spreads<br>Time | Chemicals | Temp | Level | Formula B: Sheets<br>Time | Chemicals | Temp | Level | Formula C: Towels<br>Time | Chemicals | Temp | Level | Formula D: Diapers and Pads<br>Time | Chemicals | Temp | Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flush | | | | | 2 | | S | Hi | 2 | | S | Hi | 3 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | 6 | D | S | Lo | | | | | | | | | | | | |
| Flush | | | | | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Flush | | | | | | | | | | | | | 2 | | S | Hi |
| Rinse | 2 | | S | Hi | | | | | | | | | | | | |
| Drain | 1.25 | | | | | | | | | | | | 1.25 | | | |
| Bath | | | | | 5 | D | H | Lo | 5 | D | H | Lo | 5 | D | H | Lo |
| Drain | | | | | 1.25 | | | | | | | | 1.25 | | | |
| Carryover | | | | | | | | | 1 | | H | Hi | | | | |
| Rinse | 2 | | C | Hi | | | | | | | | | 2 | | H | Hi |
| Drain | 1.25 | | | | | | | | 1.25 | | | | 1.25 | | | |
| Bath | | | | | 5 | B | H | Lo | 5 | B | H | Lo | 5 | B | H | Lo |
| Drain | | | | | | | | | | | | | 1.25 | | | |
| Rinse | | | | | | | | | | | | | 2 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | | | | | 2 | | S | Hi | 2 | | S | Hi | 2 | | S | Hi |
| Drain | | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 7 | | | | 6 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 27.25 | | | | 36.75 | | | | 36.75 | | | | 46.5 | | | |

**Table 10 GreenTurn Formula Set #1 (cont'd.)**

| Operation | Formula A: Blankets and Spreads | | | | Formula B: Sheets | | | | Formula C: Towels | | | | Formula D: Diapers and Pads | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |

**Key to Abbreviations:**

| | | | | | |
|---|---|---|---|---|---|
| D | Usually detergent | H | Hot water | Hi | High level |
| B | Usually bleach | C | Cold water | Low | Low level |
| F | Sour/softener or sour/starch | S | Split water | | |

**Notes:**

1 For any bath step, the timer does not run until the desired level is achieved.

**Table 11. GreenTurn Formula Set #2**

| Operation | Formula A: Personal Goods | | | | Formula B: White 100% Poly Table Linen | | | | Formula C: Stain Treatment | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |
| Flush | 2 | | S | Hi | | | | | | | | | 2 | | S | Hi |
| Drain | 1.25 | | | | | | | | | | | | 1.25 | | | |
| Bath | 5 | D | H | Lo | 8 | D | H | Lo | 15 | DB | H | Lo | 8 | D | H | Lo |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Rinse | 2 | | H | Hi | | | | | 2 | | H | Hi | | | | |
| Drain | 1.25 | | | | | | | | 1.25 | | | | | | | |
| Bath | | | | | 6.5 | B | H | Lo | | | | | 5 | B | H | Lo |
| Drain | | | | | 1.25 | | | | | | | | 1.25 | | | |
| Rinse | 2 | | S | Hi | 2 | | S | Hi | 2 | | H | Hi | 2 | | H | Hi |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | | | | | | | | | 1 | | | |
| Coast | | | | | | | | | | | | | 1.25 | | | |
| Rinse | | | | | | | | | 2 | | S | Hi | 2 | | S | Hi |
| Drain | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Extract | | | | | | | | | 1 | | | | 1 | | | |
| Coast | | | | | | | | | 1.25 | | | | 1.25 | | | |
| Bath | 4 | F | C | Lo | 4 | F | C | Lo | 2 | | C | Hi | 4 | F | C | Lo |
| Note: A DIP switch setting allows configuring this operation for split fill. | | | | | | | | | | | | | | | | |
| Drain | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Extract | 6 | | | | 2.5 | | | | 7 | | | | 7 | | | |
| Coast | 1.25 | | | | 1.25 | | | | 1.25 | | | | 1.25 | | | |
| Run Time | 28.5 | | | | 29.25 | | | | 39.75 | | | | 43.25 | | | |

**Key to Abbreviations:**

| | | | | | |
|---|---|---|---|---|---|
| D | Usually detergent | H | Hot water | Hi | High level |
| B | Usually bleach | C | Cold water | Low | Low level |
| F | Sour/softener or sour/starch | S | Split water | | |

**Table 11 GreenTurn Formula Set #2 (cont'd.)**

| Operation | Formula A: Personal Goods | | | | Formula B: White 100% Poly Table Linen | | | | Formula C: Stain Treatment | | | | Formula D: White Heavy Soil | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level | Time | Chemicals | Temp | Level |

**Notes:**

1 For any bath step, the timer does not run until the desired level is achieved.

# 3 Operating



## 3.1 Determining Load Size



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.

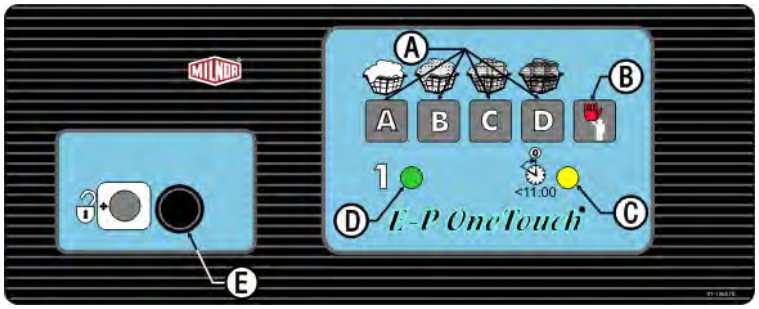


## 3.2 Controls on E-P OneTouch® Model Washer-extractors



Most of the controls on Milnor® E-P OneTouch washer-extractors are membrane push-buttons. Other controls include a mechanical push-button to unlock the door latch, and two lights to indicate that the machine is running and when the machine is nearing the end of a formula

**Figure 9. E-P OneTouch Controls**

| Control Panel | Legend |
|---|---|
|  | **A . . . Formula Selection** buttons<br>**B . . . Terminate** button<br>**C . . . Last Rinse** light<br>**D . . . In Progress** light<br>**E . . . Door Unlock** button |



## 3.2.1 Control Functions During Normal Operation

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**Formula Selection Buttons** — The E-P OneTouch controller provides four pre-programmed formulas that vary according to machine configuration. Start the desired formula by pressing the corresponding **Formula Selection** button (A, B, C, or D) with the machine loaded and the door closed.

Consult with your chemical supplier for the specific formula to use with each type of goods being processed.

**Terminate Button** — The **Terminate** button ( ) ends any running formula. When a formula is ended early, you must restart it from the beginning by pressing one of the **Formula Selection** buttons with the door closed.

**Last Rinse Light** — This light comes on when the last bath step of any formula begins and remains on until the formula ends. If the operator needs to add a chemical during the last bath, such as softener, he should add it as soon as this light comes on. The **Last Rinse** light also alerts the operator that the machine will soon be ready for unloading.

If an error occurs during a formula, this light and the **In Progress** light flash (two seconds on, then two seconds off) for 10 minutes. After 10 minutes, both lights go off. The error can be a malfunction of either the door lock circuit or the inverter. In either case, all machine controls are locked out for 75 seconds to ensure that the cylinder has coasted to a stop. To open the door after an error occurs, press the **Terminate** button ( ) to clear the error condition, then hold the **Door Unlock** button ( ) and turn the door latch handle.

**In Progress Light** — When power is first applied to the machine, this light flashes for 75 seconds to indicate that the power-up delay timer is counting down. The light goes off when the power-up delay expires.

This light is constantly **on** when a formula starts (the door is closed and a formula selection button is pressed). It remains on until the formula ends normally, is terminated by the operator, or an error occurs.

If the formula ends normally by running to completion, the **In Progress** light goes off when the last step of the formula ends. If the operator terminates a formula, this light flashes (two seconds on, then two seconds off) for 75 seconds as the coast timer counts down. After 75 seconds, hold the **Door Unlock** button ( ) and turn the door latch handle to open the door.

**Door Unlock Button** — This button activates a solenoid in the door latch which unlocks the door latch handle, allowing the operator to open the door. To lessen the chance of injury caused by opening the door while the basket is turning, the microprocessor controller disables this button when a formula starts.

The **Door Unlock** button is disabled for 75 seconds after a formula ends, whether the formula ended normally, was ended early by the operator, or ended because of an error.

## 3.2.2 Control Functions During Testing

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Do not attempt to test or troubleshoot a malfunctioning machine using only the information in this document. For complete testing procedures, see Section 4.1 : Troubleshooting Errors, page 32.

The display kit referenced in Section 3.2.2.1 : Formula Selection Buttons, page 28 consists primarily of a vacuum fluorescent display and a wiring harness to temporarily connect the display to the processor board for testing by authorized, qualified technicians. This kit is available from Milnor® (Section 2 : How to Contact Milnor®, page 2).

### 3.2.2.1 Formula Selection Buttons

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**Formula A button (A)** — With the display kit attached and the machine in **normal operation** mode (DIP switch position 8 is **on**), this button stops the formula timer as long as it is held depressed. The timer resumes running when the button is released. Hold this button to simulate the **timer stop** feature. **Timer stop** is used by some chemical injection systems to pause a running formula until the appropriate chemical injection is completed. This feature is described in Section 1.4.3 : **Timer Stop** Connections, page 13.

| Display or Action | Explanation |
|---|---|
| F:A EQ:003 CE:000<br>Level A1/D1 T-Run | Typical display in **normal operation** mode before button A is pressed. |
| F:A EQ:003 CE:000<br>Level A1/D1 T-Stop | Typical display in **normal operation** mode with button A held depressed. |

If the machine is in **testing** mode (DIP switch position 8 is **off** and position 2 is **on**), this button makes **input A** on the testing display and enables the next numerical output. Holding A depressed causes the controller to turn each output **on** for about one half second, then **off** before advancing automatically and testing the next output in the sequence.

**NOTE:** For safety, the controller allows only one output to be turned on at a time in testing mode.

**Formula B button (B)** — This button is ignored if the machine is in **normal operation** mode and a formula is running. In **testing** mode, holding the **Formula B** button depressed makes **input B** to the microprocessor.

| Display or Action | Explanation |
|---|---|
| ABCDEFGH Output #<br>-+------ 00 is On | Typical display in **testing** mode with button B held depressed. |

**Formula C button (C)** — With the display kit attached and the machine in **normal operation** mode (DIP switch position 8 is **on**), this button cycles the display through its four modes: **DIP switch settings, timer display**, **inputs display**, and **outputs display**. Each display is fully described in Section 4.1 : Troubleshooting Errors, page 32.

| Display or Action | Explanation |
|---|---|
| ABCDEFGH Output #<br>---+---- 00 is On | Typical display in **testing** mode with button C held depressed. |

**Formula D button (D)** — This button is ignored if the machine is in **normal operation** mode and a formula is running. In **testing** mode, holding the **Formula D** button depressed makes **input D** to the microprocessor.

| Display or Action | Explanation |
|---|---|
| ABCDEFGH Output #<br>---+---- 00 is On | Typical display in **testing** mode with button D held depressed. |

### 3.2.2.2 Terminate Button

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In **normal operation** mode, this button terminates the formula in progress. All controls are immediately locked out for a safety delay of 75 seconds.

In **testing** mode, the **Terminate** button provides **input F** to the microprocessor.

### 3.2.2.3 Last Rinse Light

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During normal operation the **Last Rinse** light illuminates constantly from the beginning of the last bath step (last rinse) until the formula ends, 75 seconds after the end of the final extract step.

In **testing** mode, the **Last Rinse** light illuminates when **output 8** is **on**.

#### 3.2.2.4 In Progress Light

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In normal operation with the display attached, this light is illuminated when **output j** is present.

| Display or Action | Explanation |
|---|---|
| abcdefghijklmnop<br>--+--+---+------ | Typical display during normal operation with the drain closed (**output c**), the basket turning clockwise (**output f**), and the **In Progress** light illuminated (**output j**). |

In testing mode, the **In Progress** light illuminates when **output 9** is **on**.

#### 3.2.2.5 Door Unlock Button

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In **normal operation** with the display attached, this button is enabled 75 seconds after a formula ends for any reason. The door cannot be unlocked until the 75-second safety delay expires. The safety delay also applies for 75 seconds after power is first applied to the machine.

In **testing** mode, the **Door Unlock** button is energized only when **output 00** is **on**. With output 00 **on**, you should hear the door unlock when this button is pressed.

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## 3.3 E-P OneTouch® Operation

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### 3.3.1 Instructions for Normal Operation

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#### 3.3.1.1 Load the Machine

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1. If the loading door is closed and latched, hold the **Door Unlock** button ( ) to unlock the door while operating the door latch handle with the other hand. If the door does not unlock, verify that the machine is connected to power and that the wall disconnect is functioning properly. The machine must have power available to unlock the door.
2. When the door opens, load the machine according to plant guidelines and Section 3.1 : Determining Load Size, page 26.
3. Close the door firmly.

#### 3.3.1.2 Start a Formula

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##### 3.3.1.2.1 After a Completed Formula (Normal)

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If the previous formula finished normally, simply press the button that matches the formula you want to run. The selected formula will start immediately if the door is closed. The **Formula Running** light ( 1 ) illuminates and the door locks immediately, and the machine fills with water. Once the door is locked, the operator must end the formula early (Section 3.3.2 : How to End a Formula Early, page 31) or wait for the formula to finish before opening the door.

#### 3.3.1.2.2 After Opening the Door during a Formula

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If you ended the previous formula early by opening the door, you must press the **Terminate** button ( ) before you can start the machine again. The **Terminate** button also clears any internal machine error that might have caused the formula to end early.

### 3.3.1.3 Unload the Machine

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When the formula ends, the **Formula Running** light ( ) goes out. Hold the **Door Unlock** button ( ) to unlock the door while turning the door latch handle with the other hand.

## 3.3.2 How to End a Formula Early

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You can end any running formula by pressing the **Terminate** button ( ) on the control panel. A safety delay keeps the door locked for 75 seconds. When the **In Progress** light goes off, hold the **Door Unlock** button ( ) to unlock the door while turning the door latch handle with the other hand.

To resume operation, restart the formula from the beginning by pressing the desired **formula button**.

# 4 Testing and Troubleshooting



## 4.1 Troubleshooting Errors



**Vibration Switch Tripped** — If the machine vibrates excessively during extract, the vibration switch (SMWVB in the electrical schematics) closes to ground an input (MTA3-8) to the microprocessor. When the machine is in an extract step and this input is grounded, the controller immediately ends the extract step and starts the subsequent coast step. The formula then continues normally.

**NOTE:** The input which indicates that the vibration switch is tripped is shared with the high water level pressure switch. Software determines whether to turn off the water valve (s) or to signal the inverter to stop the motor depending on the operation running when the input is grounded

### Door Open

**DANGER:**

**Entangle and Sever Hazards —** Cylinder door interlock—Operating the machine with a malfunctioning door interlock can permit opening the door when the cylinder is turning and/or starting the cycle with the door open, exposing the turning cylinder.

▶ If the basket continues to turn when the door is open, stop using the machine immediately and contact an authorized maintenance person.

When the machine operates normally, relay-contacts 5 and 8 in relay CRDL close and make the input on MTA3-5 to the microprocessor. If the door opens, the input stops. When the input stops, the microprocessor stops the machine. For safety, the machine ignores all controls for 75 seconds after the error.

If the door opens while the machine is operating, the **In Progress** light and the **Last Rinse** light flash. Both lights flash **on** for two seconds, then turn **off** for two seconds, repeating for 10 minutes. After 10 minutes, the lights remain off.

To start the machine again:

1. press the **Terminate** button ( ) to recover from this error,
2. **ensure that the door is securely closed,**
3. then start the formula again.

**Door/Inverter Fault** — This error indicates one of three conditions:

- the operator selected a formula before closing the door,

- the door opened while the machine was operating, or
- the inverter sensed a fault during operation.

**Door/Inverter Fault Before a Formula Starts** — You must close the door before selecting a formula. If the door is open when you press one of the **Formula Selection** buttons, the controller recognizes an error condition.

1. The controller prevents further operation for a safety delay period of 100 seconds.
2. If you close the door, the **In Progress** light and the **Last Rinse** light flash simultaneously.
3. After the safety delay period, the lights continue flashing until the you press the **Terminate** button ( ) to clear the error.
4. The lights stop blinking after 10 minutes unless you clear the error. The error is cleared only when you press the **Terminate** button.

**Door/Inverter Fault During Operation** — When operating normally, the inverter closes an internal contact wired in series with CRDL pins 5 and 8. If the door is closed and the inverter is functioning, the input on MTA3-5 is grounded, as described in Door Open. If the inverter senses a fault, its internal contacts open and the input on MTA3-5 is lost. This same input is also lost if the door opens during operation. Refer to the inverter documentation for specific troubleshooting procedures.

As happens when the door opens during a formula, the microprocessor signals the error by flashing both the **In Progress** light and the **Last Rinse** light simultaneously. Both lights flash **on** for two seconds, then **off** for two seconds, repeating for 10 minutes. After 10 minutes, both lights remain off.

For safety, all machine controls are disabled for 100 seconds after the error occurs. To open the door after this error:

1. You must first wait 100 seconds until the controls are enabled.
2. When the controls are enabled, press the **Terminate** button ( ) to clear the error.
3. Finally, hold the **Door Unlock** button ( ) and unlatch the door.

If the error happens again after you close the door, contact an authorized maintenance person.

After correcting any error with the inverter itself, start the formula again.

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# 4.2 Testing MWR_Washer-extractors

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## 4.2.1 Testing without the Display Kit

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Most functions of this machine can be tested with an accurate digital voltmeter if the schematic diagrams are available and you have a thorough understanding of how the machine normally operates.

The following rules will help you determine the current machine event.

### 4.2.1.1 Chart 1: Operating Sequence Part 1

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1. Formula starts

   The selected formula starts immediately when the operator presses one of the four formula selection buttons.

2. Enable **In Progress** light

   The **In Progress** light on the control panel illuminated when the machine is operating.

3. Lock door

   The controller commands the door latch to lock, preventing opening the door while water is in the cylinder.

4. Go to Section 4.2.1.2 : Chart 2, page 34

### 4.2.1.2 Chart 2: Operating Sequence Part 2

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1. From Section 4.2.1.1 : Chart 1, page 34 or Section 4.2.1.4 : Chart 4, page 36
2. Close drain

   The controller commands the machine drain to close.

3. Open water valve(s)

   The controller commands the desired water valve(s) open to begin filling the machine

4. Wait 2 seconds

   This pause allows the basket to slow before the inverter begins driving the motor in the reverse direction.

5. Rotate basket clockwise

   The controller commands the inverter to drive the basket in the clockwise direction at wash speed for a duration of 20 seconds.

6. Let basket coast (dwell)

   The controller commands the inverter to stop driving the basket. The duration of this pause is 2 seconds.

7. Rotate basket counter-clockwise

   The controller commands the inverter to drive the basket in the counter-clockwise direction at wash speed for a duration of 20 seconds.

8. Is desired water level achieved?

   The controller monitors the water level throughout each bath step.

   - YES: Continue to step 9
   - NO: Return to step 4

9. Close water valve(s)

   The controller commands all water valves closed, stopping the fill. Water valves will open again as necessary to maintain the desired level, but the bath timer will continue running if it was running when level was lost.

10. Go to Section 4.2.1.3 : Chart 3, page 35

### 4.2.1.3 Chart 3: Operating Sequence Part 3

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1. From Section 4.2.1.2 : Chart 2, page 34
2. Is machine configured for external heat?

   External heat is optional on some machines. Improper configuration can prevent the step timer from starting.

   - YES: Continue to step 3.
   - NO: Skip to step 6.

3. Is desired water temperature achieved?

   The controller monitors the bath temperature thermistor throughout each bath step, but does not stop the step timer after the first time the desired temperature is achieved in each step.

   - YES: Skip to step 6
   - NO: Continue to step 4

4. Enable heat

   If the desired temperature is not achieved, the controller enables the heating system.

5. Run timer while heating?

   The machine can be configured to **run** or **hold** the step timer while the heating system is enabled before the desired temperature is first achieved.

   - YES: Continue to step 6
   - NO: Return to step 3

6. Enable step timer

   Chemical injections and subsequent actions are timed according to the step timer, so these actions will not begin until the step timer starts.

7. Wait 15 seconds
8. Enable chemical injection

   For each bath step in which chemicals are programmed, the controller enables the chemical injection signal for 30 seconds, beginning 15 seconds after the step timer starts.

9. Disable chemical injection

   Chemical injection signals stop after 30 seconds

10. Wait 15 seconds

The delay helps ensure that the chemical pumps have stopped delivering chemicals to the machine.

11. Enable flush valve

    The controller flushes the chemical injection manifold with fresh water for 30 seconds to reduce the risk of machine damage from contact with undiluted chemicals.

12. Go to Section 4.2.1.4 : Chart 4, page 36

### 4.2.1.4 Chart 4: Operating Sequence Part 4

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1. From Section 4.2.1.3 : Chart 3, page 35
2. 15 seconds remaining

   The controller begins the end-of-step routine when 15 seconds remain in any bath step.

3. Wait 2 seconds

   This pause allows the basket to slow before the inverter begins driving the motor, possibly in the reverse direction.

4. Rotate basket clockwise

   The controller commands the inverter to drive the basket in the clockwise direction at wash speed for 13 seconds in preparation for distribution.

5. Accelerate basket to distribution speed

   The controller commands the inverter to gradually accelerate the motor from wash to distribution speed.

6. Open drain

   The controller opens the drain 15 seconds after commanding distribution speed, allowing goods to distribute evenly for less vibration. If the next step is a bath step, the controller holds the drain open for 60 seconds, then commands it closed.

7. Distribution speed

   The controller commands the inverter to maintain distribution speed for 45 seconds if the next step is a bath, or for 60 seconds if the next step is an extract.

   **NOTE:** If the next step is a bath, the controller allows the basket to coast for the last 15 seconds of the distribution time.

8. Next step is a bath?

   Each step is either a **bath** step or an **extract** step

   - YES: Go to Section 4.2.1.2 : Chart 2, page 34
   - NO: Continue to step 9.

9. Accelerate basket to extract speed

   The controller commands the inverter to gradually accelerate the motor from distribution to extract speed.

10. Extract speed

    The controller commands the inverter to maintain extract speeds for the programmed duration. When the step timer expires, the controller signals the inverter to stop driving the motor.

11. Wait 75 seconds.

    This pause allows sufficient time for the basket to coast to a stop.

12. Another step?

    - YES: Go to Section 4.2.1.2 : Chart 2, page 34
    - NO: Continue to step 13

13. Unlock door

    The controller unlocks the door latch 75 seconds after the end of the last step in the formula.

## 4.2.2 Testing with the Display Kit

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A kit consisting primarily of a vacuum fluorescent display and a wiring harness to connect the display to the microprocessor controller is available from the Milnor® factory. Contact the Milnor parts department for details.

**CAUTION:** **Avoid machine damage —** Because of the additional power required to operate the display, some components of the microprocessor controller may be damaged if the display is connected for extended periods of time.

- ▶ Connect the display only when testing the machine.
- ▶ Disconnect the display and replace all control panel covers before returning the machine to normal operation.

### 4.2.2.1 Connecting the Display

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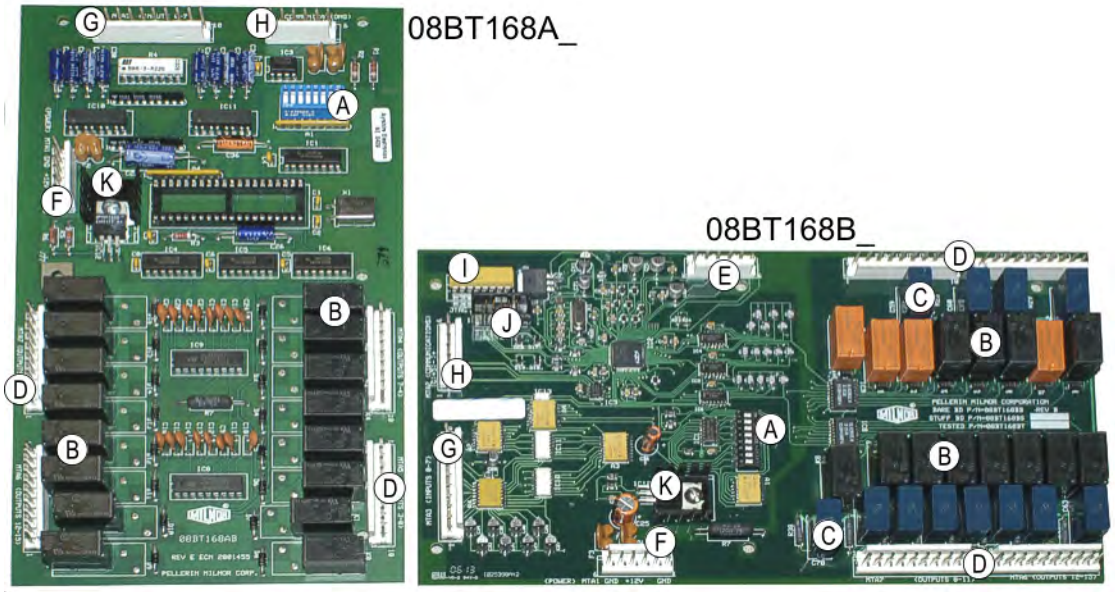
1. **Lock off/tag out** power to the machine.
2. Remove the cabinet top and rear panels to gain access to the microprocessor controller. When viewed from the rear of the machine, the controller is mounted to your left. Don't try to connect the display to the large white Magnetek component (motor inverter) to your right.
3. Connect the flat black connector on the display cable to MTA2 on the controller. Use Figure 10: Processor Boards, page 38 as a reference to properly orient the connector to the pins on the controller. The four wires in the connector should be on the side nearest MTA3, and the two connector sockets without wires are nearest the long side of the board.

   **CAUTION:** **Avoid personal injury and machine damage —** Because the machine must have power available for testing, use extreme caution when working in the area of high voltage and moving mechanical parts.

   - ▶ Lock off/tag out power before reaching into the machine.
   - ▶ Route the display wiring clear of the motor and pulleys.

**Figure 10. Processor Boards**

**Illustration**




**Legend**

**A . . .** DIP switch
**B . . .** Output relays
**C . . .** Snubbers
**D . . .** Outputs connectors
**E . . .** Analog-to-digital connector
**F . . .** Power connector
**G . . .** Inputs connector
**H . . .** Communication connector
**I . . .** Pull-down resistor for JTAG port
**J . . .** JTAG connector
**K . . .** Voltage regulator (5V)

## 4.2.2.2 Displays in Run Mode

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With the display connected and power to the machine, you can select from five display modes without changing the DIP switch settings: **timer**, **DIP switches**, **inputs**, **outputs**, and **analog-to-digital channels**. The **timer display** shows certain general information about the current formula, as explained in Section 4.2.2.2.2 : Timer Display , page 40. The **DIP switches display** shows the on/off status of each DIP switch position. The **inputs display** (Section 4.2.2.2.4 : Inputs Display, page 41) shows the on/off status of each of the eight inputs. The **outputs display**, described in Section 4.2.2.2.5 : Outputs Display, page 42, shows the on/off status of the 16 outputs. The **analog-to-digital channel display** is detailed in Section 4.2.2.2.6 : Analog-to-Digital Channels Display, page 43.

### 4.2.2.2.1 Chart 5: Overview of Run Mode Diagnostics

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1. Start

2. Lock off/tag off power.

   **CAUTION:** Electrocution and Electric Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnects is off.

3. Connect display harness.

   Section 4.2.2.1 : Connecting the Display, page 37 details how to connect the display harness to the machine controller.

4. Restore machine power.

   The power-up safety delay begins counting down when power is restored to the machine. When the delay time expires, the display changes to indicate that the controller is ready to run a formula.

```
Please Wait 99 Secs.
```

▼

```
F:x EQ:xxx CE:xxx
Level Ax/Dx T-Stop
```

5. Start any formula.

   Press a formula button to start the desired formula.

6. View **timer display.**

   The **timer display** appears when the formula starts. The **timer display** is described in Section 4.2.2.2.2 : Timer Display , page 40. When bath level (and optionally, temperature) is achieved, the timer starts.

```
F:A EQ:000 CE:001
Level A1/D1 T-Run
```

7. View **DIP switch display**.

   Press C from the **timer display** to advance to the **DIP switch display**. Details of the **DIP switch display** are described in Section 4.2.2.2.3 : DIP Switch Display, page 41.

```
87654321
+--+---+
```

8. View **inputs**.

   Press C when the **DIP switch display** is present and a formula is running to advance to the **inputs display**. Details of the **inputs display** are described in Section 4.2.2.2.4 : Inputs Display, page 41.

```
ABCDEFGH
----+-+-
```

9. View **outputs**.

   Press C when **inputs display** is present and a formula is running to advance to the **outputs display**. Details of the **outputs display** are described in Section 4.2.2.2.5 : Outputs Display, page 42.

```
abcdefghijklmnop
--+--+---+------
```

10. View **analog-to-digital channels.**

    Press C when the **outputs display** is present and a formula is running to advance to the **analog-to-digital channels display**. This display is described in Section 4.2.2.2.6 : Analog-to-Digital Channels Display, page 43.

```
ADC0  degC  ADC1   mV
1831  0027  0733  0435
```

11. Return to **timer display.**

    Press C when the **analog-to-digital channels display** is present to return to the **timer display**.

12. Return to step 5.

    Press C to cycle through the display again, or press ✋ to end the current formula and return to the **timer display.**

### 4.2.2.2.2 Timer Display

BNCOUT02.C04 0000197358 B.2 A.9 A.6 1/2/20 1:25 PM Released

When power is supplied to the machine, the display shows the time remaining in the power-up safety delay and the **In Progress** light flashes. When you start a formula, the display shows certain information about machine operation as it occurs.

| Display or Action | Explanation |
|---|---|
| `Please Wait 99 Secs. .` | Typical power-up display immediately after applying power to the machine. The **In Progress** light (1) flashes during the delay. |
| `F:x EQ:xxx CE:xxx`<br>`Level Ax/Dx T-Stop` | Typical display when the machine is ready to run, but before starting a formula. |

**F:x** Selected formula, if any. The “x” this field is replaced by A, B, C, or D, when a formula is running.

**EQ:xxx** Elapsed quarters. This field shows how many quarter-minute (15-second) periods have expired since the timer began running.

**NOTE:** Because the timer doesn't start running until the desired level is achieved, this field will not change from 000 to 001 until 15 seconds after level is achieved.

**CE:xxx** Current event. Each of the four available wash formulas is made up of a series of events. These events are numbered upward continuously through all formulas, so formula A contains events 0 through 9, formula B is events 10 through 23, etc

**Level Ax/Dx** Level achieved and desired. Low level is represented by "1," and high level is represented by "2." Achieved level is the number after "A," and desired level is the number after "D." For example, "A0/D2" indicates that level 2 is desired, but the actual level is still below low level. "A2/D2" indicates that level 2 is desired and achieved.

**T-xxxx** Timer status. "T-Run" indicates that the timer is running, while "T-Stop" indicates that the timer is stopped. The timer is stopped while the machine is filling and when the timer stop input is present.

#### 4.2.2.2.3 DIP Switch Display

BNCOUT02.C05 0000197357 B.2 A.9 4/23/20 5:52 PM Released

From the timer display with a formula running, press the **Formula C** button once to view the on/off status of the eight positions of the DIP switch. On this display only, "+" indicates that the switch position is off and "–" indicates that the switch position is on.

| Display or Action | Explanation |
|---|---|
| F:C EQ:026 CE:024<br>Level A1/D1 T-Run | This is a typical timer display. |
| C | Scrolls from the timer display to the DIP switch display. |
| 87654321<br>-++-+-++ | This example of the DIP switch display shows that positions 8, 5, and 3 are **on,** and the other positions are **off.** See Section 2.1.2 : Configuration Decisions for Machines with Controller 08BT168AT or 98CMCR0911, page 16 for the application of each switch position. |

#### 4.2.2.2.4 Inputs Display

BNCOUT02.C06 0000197356 B.2 A.9 A.6 1/2/20 1:25 PM Released

From the DIP switch display with a formula running, press the **Formula C** button once to view the on/off status of the eight controller inputs.

| Display or Action | Explanation |
|---|---|
| ABCDEFGH<br>----+-+- | This is a typical input status display during a bath with a chemical. See Table 12: E-P OneTouch Inputs, page 42 for the input that corresponds to each character on the display. A plus sign (+) appears below each active input; a minus sign (–) appears below each input that is not present. In the example display to the left, inputs E and G are present, indicating that the door is closed and low level is achieved. |

**Table 12. E-P OneTouch Inputs**

| Display Letter | Input Description | Connector and Pin | Notes |
|---|---|---|---|
| A | Formula A button depressed or timer stop commanded | MTA3-1 | Timer stops while button is depressed. |
| B | Formula B button depressed | MTA3-2 | |
| C | Formula C button depressed | MTA3-3 | Can't be tested, but can be assumed functional if you can view the inputs display. |
| D | Formula D button depressed | MTA3-4 | |
| E | Door is closed and inverter functioning | MTA3-5 | Input is lost when door opens or inverter faults during a formula. |
| F | Terminate button is depressed or door open desired | MTA3-6 | Testing terminates current formula. |
| G | Low level achieved | MTA3-7 | |
| H | High level achieved or vibration safety switch closed | MTA3-8 | Water valves close or controller terminates extract step. |

### 4.2.2.2.5 Outputs Display

BNCOUT02.C07 0000197355 B.2 A.9 A.6 1/2/20 1:25 PM Released

From the inputs display, press the **Formula C** button once to view the on/off status of the 16 controller outputs.

**Display or Action**

```
ABCDEFGH
----+-++
```

**Explanation**

This is a typical **input status** display during a flush or rinse bath.


Scrolls from the **inputs** display to the **outputs** display.

```
abcdefghijklmnop
--+--+---+------
```

This is a typical output status display during a bath with a chemical. See Table 13: E-P OneTouch Outputs, page 42 for the output that corresponds to each character on the display. A plus sign (+) appears below each active output; a minus sign (–) appears below each output that is not energized. In the example display to the left, outputs c, f, and j are present, indicating that the drain is closed, the motor is energized in the clockwise direction, and the **Formula Running** light is lit.

**Table 13. E-P OneTouch Outputs**

| Display Letter | Output Number | Output Description | Connector and Pins | Notes |
|---|---|---|---|---|
| a | K0 | Enable Door Unlock button | MTA5 pins 9 and 10 | |
| b | K1 | Signal inverter for drain speed | MTA5 pins 7 and 8 | |
| c | K2 | Close drain | MTA5 pins 3 and 4 | |

**Table 13 E-P OneTouch Outputs (cont'd.)**

| Display Letter | Output Number | Output Description | Connector and Pins | Notes |
|---|---|---|---|---|
| d | K3 | Open hot water valve | MTA5 pins 1 and 2 | |
| e | K4 | Open cold water valve | MTA4 pins 9 and 10 | |
| f | K5 | Signal inverter for clockwise wash | MTA4 pins 7 and 8 | |
| g | K6 | Signal inverter for counter-clockwise wash | MTA4 pins 3 and 4 | |
| h | K7 | Signal inverter for extract speed | MTA4 pins 1 and 2 | |
| i | K8 | Turn on Last Rinse light | MTA7 pins 9 and 10 | light illuminates when last bath step begins; flashes to signal error |
| j | K9 | Turn on In Progress light | MTA7 pins 7 and 8 | light is on throughout formula; flashes to signal error |
| k | K10 | In Progress Slave (08BT168AB) or External Heat (08BT168BB) | MTA7 pins 3 and 4 | actuates when optional external heat is desired |
| l | K11 | Door Lock | MTA7 pins 1 and 2 | |
| m | K12 | Flush chemical manifold | MTA6 pins 9 and 10 | |
| n | K13 | Inject soap | MTA6 pins 7 and 8 | |
| o | K14 | Inject bleach | MTA6 pins 3 and 4 | |
| p | K15 | Inject sour/softener | MTA6 pins 1 and 2 | |

#### 4.2.2.2.6 Analog-to-Digital Channels Display

BNCOUT02.C08 0000197354 B.2 A.9 A.6 1/2/20 1:25 PM Released

**NOTICE:** Analog-to-digital information applies to machines with board 08BT168B_ only.

From the inputs display, press the **Formula C** button once to view the values of the two analog-to-digital channels. The temperature probe is connected to channel 0, and channel 1 is not used.

The electrical resistance of the thermistor temperature probe decreases as the temperature sensed by the probe increases (inverse relationship). The probe connects to the controller board at MTA8. Components on the controller board convert the analog signal from the temperature probe to a digital value. The temperature of the probe is calculated from this digital value.

| Display or Action | Explanation |
|---|---|
| `ADC0 degC ADC1 mV`<br>`1831 0027 0733 0435` | This is a typical display of the analog channels with the temperature probe at room temperature. The top line of the display contains the field names, and the bottom line contains the value of the field. |

| | |
|---|---|
| ADC0<br>1831 | This display shows a value of 1831 for analog-to-digital channel 0. The analog-to-digital components of the controller convert the analog output from the temperature probe to a digital raw counts value. The controller software reads this raw counts value and converts it to a Celsius temperature. |
| degC<br>0027 | The temperature shown here is derived from the displayed raw counts value. This is the current temperature sensed by the temperature probe, in Celsius degrees. |
| ADC1<br>0733 | This display shows a value of 0733 for analog-to-digital channel 1. This channel is not used, but is available for future applications. |
| mV<br>0435 | This is the millivolts reading derived from the analog-to-digital value of channel 1. This value is not used. |

### 4.2.2.3 Displays in Test Mode

BNCOUT02.C09 0000197353 B.2 A.9 A.6 1/2/20 1:25 PM Released

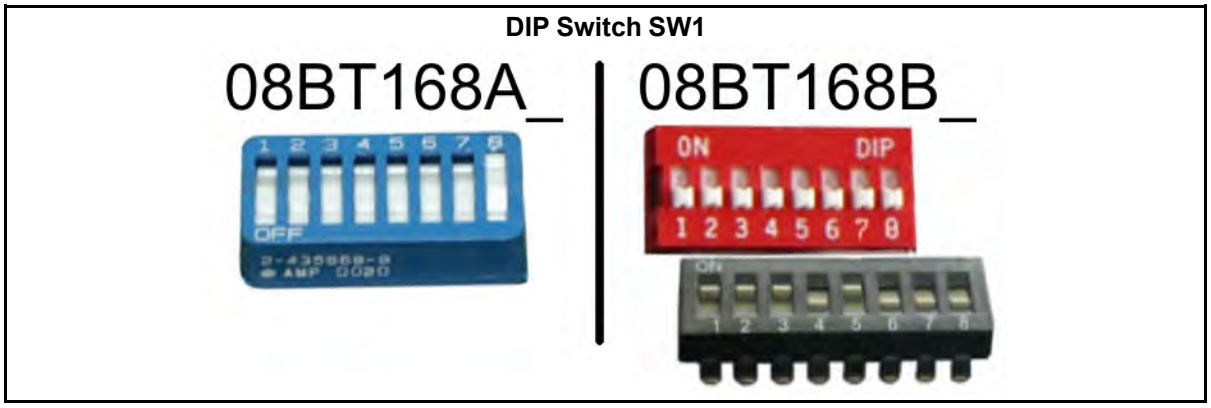
Observing the action of inputs and outputs during normal operation is an important part of troubleshooting the machine. However, testing for a specific problem can often be done more efficiently by actuating specific outputs and grounding inputs individually. The test mode provides a display for viewing input and output status, and for actuating outputs.

#### 4.2.2.3.1 Setting the DIP Switch for Test Mode

BNCOUT02.T07 0000197400 B.2 A.9 A.6 1/2/20 1:25 PM Released

1. Lock off/tag off power to the machine.
2. Remove the cabinet top and rear panels to access the microprocessor controller.
3. Using the instructions in Section 2.1 : Configuring E-P OneTouch® Washer-extractor Models, page 15, turn **off** position 8 of DIP switch SW1. See Figure 11: Test Mode Selected, page 44 .

**Figure 11. Test Mode Selected**




4. Apply power to the machine. The display will appear similar to this:

| Display or Action | Explanation |
|---|---|
| ABCDEFGH Output #<br>-------- 00 is On | Normally, inputs A through H will be **off** (noted by a minus sign [–] below the letter) except perhaps input E. Input E will normally be **on** (noted by a plus sign [+] below the letter) if the machine door is closed. Output **00** is **on**, indicating that the **Door Unlock** button ( ) is enabled. |

#### 4.2.2.3.2 Interpreting the Display

BNCOUT02.C10 0000197420 B.2 A.9 A.6 1/2/20 1:25 PM Released

| Display or Action | Explanation |
|---|---|
| ABCDEFGH Output #<br>----+--- 00 is On | This is the normal testing display as it appears at power-up with the door closed. The eight inputs appear on the left of the display, and each output appears on the right side as it is actuated. This display shows that input E is enabled, indicating that the door is closed. |

#### 4.2.2.3.3 DIP Switch Display

BNCOUT02.C11 0000197419 B.2 A.9 A.6 1/2/20 1:25 PM Released

From the normal testing display, press C one time to view the on/off status of each of the DIP switch positions.

| Display or Action | Explanation |
|---|---|
| 87654321<br>+--+---+ | The switch positions appear on the top line of the display. A plus sign (+) directly under a switch position indicates that the position is off, while a minus sign (–) indicates that the position is on. |

#### 4.2.2.3.4 Viewing Inputs

BNCOUT02.C12 0000197418 B.2 A.9 A.6 1/2/20 1:25 PM Released

Two types of tests can be performed while observing the status of the inputs:

- testing the switch or other auxiliary component that provides the input to the controller, and
- testing the controller and how it behaves when certain inputs are present.

##### 4.2.2.3.4.1 Testing Auxiliary Components

BNCOUT02.C13 0000197417 B.2 A.9 A.6 1/2/20 1:25 PM Released

The E-P OneTouch® controller has eight inputs into the controller, six of which can be actuated from the control panel on the front of the machine. The two level switch inputs require grounding terminals on the level switch.

**CAUTION:** **Avoid personal injury —** When input A is grounded, the machine automatically closes and opens each of the 16 outputs in sequence. This arrangement prevents the motor from turning the cylinder at drain or extract speed, but allows the cylinder to turn at wash speed in either direction if the door is closed.

▶ Never attempt to defeat the safety mechanisms to test cylinder rotation with the door open.

**Formula A and timer stop (Input A)** This input is grounded (changes from – to +) when A is pressed, indicating that the keypad button is working and the processor is correctly interpreting the signal. If the **timer stop** feature of this machine is used (usually by the chemical supply system), grounding this input while the machine is running a formula causes the timer to stop counting until the input is released.

**CAUTION:** **Entanglement hazard —** Because the **Formula A** button (A) also tests the machine outputs, the motor may start and the cylinder may turn when this button is pressed.

- Ensure that no one is near the motor or drive pulley during testing.

**Formula B (Input B)** This input is grounded when B is pressed, indicating that the keypad button is working and the processor is correctly interpreting the signal.

**Formula C (Input C)** This input is grounded when C is pressed, indicating that the keypad button is working and the processor is correctly interpreting the signal.

**Formula D (Input D)** This input is grounded when D is pressed, indicating that the keypad button is working and the processor is correctly interpreting the signal.

**Door Closed and inverter functioning (Input E)** This input is grounded when the processor sees the that door is securely closed and the inverter is functioning properly. The machine will not run if this input is not grounded (+).

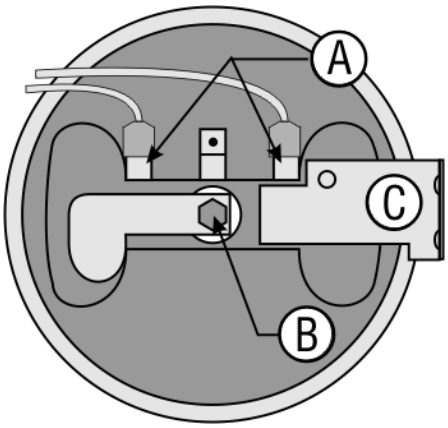
**Terminate button (Input F)** This input is grounded when the **Terminate** button ( ) is pressed.

**Low level achieved (Input G)** This input is grounded when the pressure switch for low level (SPLL on the schematic) is closed. This can be simulated by briefly touching a length of wire between the power and ground terminals (see Figure 12: Level Switch Testing, page 47 ) on the level switch. Do not remove the wires from these terminals for this test.

**High level achieved or vibration safety switch tripped (Input H)** This input is grounded when the pressure switch for high level (SPHL on the schematic) is closed. This can be simulated by briefly touching a length of wire between the power and ground terminals (see Figure 12: Level Switch Testing, page 47 ) on the level switch. Do not remove the wires from these terminals for this test. This input is also made when the vibration safety switch trips. The vibration safety switch can be tested by gently holding the pendulum to one side and watching for the input status to change.

**NOTE:** High level pressure switch SPHL has two wires attached to one of the terminals and one wire attached to the other terminal. Low level pressure switch SPLL has only one wire attached to each terminal.

**Figure 12. Level Switch Testing**

| Typical Level Switch | Legend |
|---|---|
|  | **A . . .** Power and ground terminals<br>**B . . .** Level adjusting screw<br>**C . . .** Mounting bracket |



#### 4.2.2.3.4.2 Testing the Controller

BNCOUT02.C14 0000197415 B.2 A.9 A.6 1/2/20 1:25 PM Released

The input testing procedures described in Section 4.2.2.3.4.1 : Testing Auxiliary Components, page 45 verify that the microprocessor controller is receiving a signal from an external component, processing the signal, and writing the results to the display. Further testing is required if a component is actuated as described above, but the display does not indicate that it's actuated. By using the information in Section 4.2.2.3.4.2 : Testing the Controller, page 47 and the schematic manual, a qualified technician can determine whether the problem lies with the component or the microprocessor controller.

#### 4.2.2.3.4.3 Testing Outputs

BNCOUT02.C15 0000197414 B.2 A.9 A.6 1/2/20 1:25 PM Released

The E-P OneTouch controller operates the chemical system and all other devices in the machine by turning output relays on and off according to specific instructions. For example, output relay K2 is dedicated to the machine drain. When this relay is energized, it closes a circuit between pins 3 and 4 on MTA5 to provide power to the drain valve. Because a spring in the drain valve opens the drain valve when power is not present, the drain is closed only while output K2 is closed.

While all output relays can only be open or closed, two types of results can be achieved from any output, depending on how it is used in the machine:

**Direct outputs** These outputs, such as the **drain output** relay (K2) and the **last rinse output** relay (K8), act as a switch in the circuit for the device to which they are assigned. Output K2 is described above. Output K8 closes when the last bath step of a formula begins, providing power to the **Last Rinse** light on the control panel.

**Indirect (signal) outputs** Indirect outputs signal other devices to operate. The most important of these are the outputs that control how the motor inverter powers the motor to turn the basket. When output K5 is closed, the inverter powers the motor to turn clockwise at wash speed. Output K6 causes the inverter to run the motor counterclockwise, but still at wash speed. When outputs K5 and K7 are on (contacts closed) at the same time, the basket runs clockwise at extract speed. The chemical outputs (K13, K14, and K15) signal the chemical supply system to provide chemical to the machine. Output K12 signals to flush the chemical injection manifold.

**CAUTION:** **Avoid machine damage —** This controller is designed to allow the momentary actuation of outputs to verify proper operation. Continuous manual operation of outputs may cause machine damage, especially if chemicals are actuated and not flushed completely from the machine after testing.

▶ If chemicals are connected to the machine when outputs are tested, always activate the flush output to dilute and flush out any chemical in the manifold and the machine.

| Display or Action | Explanation |
|---|---|
| A | Press and release this button to turn off the current output and select and actuate the next one. For example, if the display says, "Output #3 is On," press A one time and release it to turn off output 3 and turn on output 4. The display then shows, "Output #4 is On."<br>Hold this button depressed to automatically cycle through all 16 outputs. As described above, only one output is actuated at any time. The display will turn each output on for approximately one half second, then advance to the next output in numerical order. |

The goal in testing outputs is to verify that the specified device operates when the controller commands it to operate. Some devices, such as water valves and chemical injections, cause a result that can be seen or heard (water or chemical entering the machine). Others, especially drain and extract speed commands, can only be verified with the proper use of a voltmeter. Use the information below and the electrical diagrams for this machine to test a component.

**Door Unlock button (Output 00)** When this output is enabled, it remains enabled for two seconds before it turns **off**. While enabled, this relay enables relay CRD to lock the door. The **Door Unlock** button ( ) must be held depressed while testing this output or it will not energize.

**Drain Speed inverter signal (Output 01)** This output signals the inverter to run the motor at drain speed. However, both the clockwise wash signal and the drain speed signal must be present for the basket to turn. Test this output relay (K01) by checking for a signal of 24 volts DC between pins 7 and 8 of MTA5 when the relay should be off, dropping to 0 volts when the relay should be on.

**Drain Closed (Output 02)** This output relay closes to energize the normally-open drain valve, causing it to close. Test relay K02 by observing the drain valve under the machine or by checking for control voltage between fuse EF71B and pin 3 of MTA5 when the relay should be closed (drain closed), dropping to 0 volts when the relay should be open (drain open).

**Hot Water Valve On (Output 03)** This output relay closes to energize the normally-closed hot water valve, causing it to open. A voltmeter should indicate control circuit voltage between fuse EF71B and pin 1 of MTA5 when the valve is open and hot water is flowing into the machine, dropping to 0 when the valve is closed.

**Cold Water Valve On (Output 04)** This output relay closes to energize the normally-closed cold water valve, causing it to open. A voltmeter should indicate control circuit voltage between fuse EF71B and pin 9 of MTA4 when the valve is open and cold water is flowing into the machine, dropping to 0 when the valve is closed.

**CAUTION:** **Entanglement hazard —** The machine basket rotates when output 05 or 06 is actuated.

▶ Keep all personnel clear of the motor and drive components when testing these outputs.

**Clockwise Wash Speed inverter signal (Output 05)** This output signals the inverter to run the motor clockwise at wash speed. Test this output relay (K05) by checking for a signal of 24 volts DC between pins 7 and 8 of MTA4 when the relay should be **off**, dropping to 0 volts when the relay should be **on**.

**Counter-clockwise Wash Speed inverter signal (Output 06)** This output signals the inverter to run the motor counter-clockwise at wash speed. Test this output relay (K06) by checking for a signal of 24 volts DC between pins 3 and 4 of MTA4 when the relay should be **off**, dropping to 0 volts when the relay should be **on**.

**Extract Speed inverter signal (Output 07)** This output signals the inverter to run the motor at extract speed. However, both the clockwise wash signal and the extract speed signal must be present for the basket to turn. Test this output relay (K07) by checking for a signal of 24 volts DC between pins 1 and 2 of MTA4 when the relay should be **off**, dropping to 0 volts when the relay should be **on**.

**Last Rinse Light On (Output 08)** Output K08 closes to power the **Last Rinse** light on the control panel. When the output is **on**, a voltmeter will read the control circuit voltage between fuse EF71B and pin 10 of MTA7. When the output is turned **off**, the voltage drops to 0.

**In Progress Light On (Output 09)** When output relay K09 is **on**, the **In Progress** light should be **on** and a voltmeter should read control circuit voltage between fuse EF71B and pin 8 of MTA7.

**In Progress Light slave (Output 10 on controller board 08BT168A_ only)** This relay operates identically to output 09, but is usually used to verify that the machine is running a formula before allowing the chemical supply system to stop the machine timer.

**External Heat On (Output 10 on controller board 08BT168B_ only)** This relay closes when the controller desires external heat to increase the bath temperature. The relay opens when the configured temperature is achieved, the bath step runs to completion, or an error terminates the wash formula.

**Door Lock (Output 11)** When this output is actuated, it remains enabled for two seconds, then turns off. While enabled, this relay powers relay CRE to lock the door.

**Flush Chemical Manifold (Output 12)** When this output is **on**, control voltage flows between fuse EF71B and pin 1 of MTA7. This signal tells the chemical supply system that the chemical injection is complete and the machine desires to flush the chemical injection manifold.

**Inject Detergent (Output 13)** When this output is **on**, control voltage flows between fuse EF71B and pin 7 of MTA6. This signal tells the chemical supply system that the machine desires detergent.

**Inject Bleach (Output 14)** When this output is **on**, control voltage flows between fuse EF71B and pin 3 of MTA6. This signal tells the chemical supply system that the machine desires bleach.

**Inject Sour/softener (Output 15)** When this output is **on**, control voltage flows between fuse EF71B and pin 1 of MTA6. This signal tells the chemical supply system that the machine desires sour/softener or sour/starch.

**Low Level Test (Output 16)** This test is designed primarily for calibrating low level pressure switch SPLL. When this functional test is started, the drain closes and the cold water valve opens. The water valve closes when low level is achieved, indicated on the display by input G changing from a minus sign (–) to a plus sign (+).

**NOTE:** The door must be closed during this test.

**High Level Test (Output 17)** This test is designed primarily for calibrating high level pressure switch SPHL. When this functional test is started, the drain closes if it was open and the cold water valve opens. The water valve closes when high level is achieved, indicated on the display by input H changing from a minus sign (–) to a plus sign (+).

**NOTE:** The door must be closed during this test.

**Basket Speed Test (Output 18)** This test runs the cylinder at each of the three available speeds, as described below:

**NOTE:** The door must be closed during this test.

1. The drain opens and the cylinder begins turning clockwise at wash speed as soon as the technician enters this test. The basket continues turning at this speed until the technician presses D to test drain speed, or A to exit the speed test and return to **Output 00** (**Door unlock button**).
2. Pressing D with the cylinder at wash speed causes it to accelerate to drain speed. The basket continues turning at this speed until the technician presses D to test extract speed, or A to exit the speed test and return to **Output 00** (**Door unlock** button).
3. Pressing D with the cylinder at drain speed causes it to accelerate to extract speed. The basket continues turning at this speed until the technician presses A or the **Terminate** button ( ) to exit the speed test and return to **Output 00** (**Door unlock** button). **If the command to accelerate to extract speed was entered, the basket coasts for 75 seconds with all controls disabled when the speed test is terminated.**