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Technical Reference—

Mark II, III, IV and V 100 Formula, Single Motor Washer-Extractor

Read the separate Safety Manual before installing, operating, or servicing

PELLERIN MILNOR CORPORATION POST OFFICE BOX 400, KENNER, LOUISIANA 70063-0400, U.S.A.

Please Read

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for MATOUTWRAE/2007473A
Mark II, III, IV and V 100 Formula, Single Motor Washer-Extractor

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ABOUT THIS MANUAL

Scope—This reference manual provides commissioning, programming, operating, and troubleshooting information for the Milnor Mark II, III, IV, and V 100 formula, single motor washer-extractor controllers. 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.

Normal Display Sequence at Each Power Up—Verify that the messages appearing on the display at start up are as shown in "OPERATING THE MARK II, III, IV, AND V 100 FORMULA, SINGLE MOTOR WASHER-EXTRACTORS." (see Table of Contents). Any other message(s) indicate an error condition that must be corrected before the machine will operate. See "100 FORMULA, SINGLE MOTOR WASHER-EXTRACTOR ERROR MESSAGES."

Manual Number/Date Code (When To Discard or Save)—The manual number/date code is located on the inside front cover, upper right corner just above the manual name. Whenever the manual is reprinted with new information, part of this number changes. **If the *date code* after the "/" changes, the new version applies to all machines covered by the old version, but is improved— thus the old version can be discarded. If the *manual number* before the "/" changes, the new manual covers only new machines.** Example: Discard MATMODELAE/8739**C**V when MATMODELAE/8739**D**V is received (minor improvements). Also, discard MATMODELAE/87**39D**V when MATMODELAE/87**46A**V is received (major improvements). But keep MATMODEL**A**E/8746FV when MATMODEL**B**E/8815AV is received, since the new manual no longer applies to machines originally shipped with the old manual.

Documents and Change Bars—The individual documents comprising this manual use the same revision criteria as the manual. Text documents also display change bars. Example: When sectionMSOP0599AE/9135**B**V becomes MSOP0599AE/9135**C**V, change bars with the letter "C" appear next to all changes for this revision. For a major rewrite (e.g., MSOP0599AE/92**26A**V), all change bars are deleted.

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Section 1

Commissioning

Important Owner/User Information—Machines with a Keypad

Take the following important steps before placing this machine in operation:

1. Ensure safety of laundry personnel.
2. Protect against data loss.
3. Customize data (configure, formula, and productivity data).

1. Ensure Safety of Laundry Personnel

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

2. Protect Against Data Loss

Follow the safeguards listed below to protect against data loss caused by human tampering, electromagnetic interference (EMI), physical damage to the data storage medium, or loss of power to random access memory (RAM).

1. Keep the *Run/Program* keyswitch set to *run* () and secure the keys. Users must understand proper use of this control. See "ABOUT THE USER CONTROLS. . ." (see Table of Contents).
2. Keep all electric box doors closed and locked. Secure the keys.
3. Leave machine power on for 48 hours before customizing data. This fully charges the microprocessor battery, which will then supply power to the RAM for 90 days even if machine power is off.
4. Replace the battery board every five years. A capacitor on the processor board can supply power to the RAM for several hours with the battery removed.
5. Keep electronic back-up data and/or a printed record of all field-programmed data (e.g., wash formulas, configure values, step names, chemical names) in case of data loss. See the instructions for downloading and printing this data if the machine has this capability.
6. For machines that accumulate productivity data (e.g., count of loads processed), transcribe any needed data frequently, as described in the instructions for data accumulation.

3. Customize Data

3.1. When to Customize Data

- When commissioning the machine
- When restoring a machine to service after a lengthy shutdown
- When required by error message
- After replacing the CPU board
- After upgrading software (replacing EPROMs)
- After adding or removing optional equipment

3.2. What Customizing Requires—Verify configuration. Program formulas and clear productivity data, if applicable. See the programming and operating sections in this manual for instructions.

3.3. Data Accessibility—Configure and formula data can only be altered while the keyswitch is in the *program* position (data is keyswitch-protected). Producitvity data, because it is accumulated in the run mode, cannot be keyswitch-protected and is accessible to anyone. Data is accessible to the extent described in the following table:

Table 1: Data Type and Accessibility

			Ways Data Can Be Used and Altered				
			Data can be read	Data can be over-written	Data can be up/downloaded	Data can be cleared	Contents after clearing
Type of Data		**Machines Data Applies To**					
Configure Data		dryer (includes gains)	Yes	Yes	Yes	Yes	example values
		shuttle, single-stage press	Yes	Yes	No	Yes	zeros
		two-stage press, Cobuc, Linear Costo, discharge sequencer	Yes	Yes	No	No	n.a.
		washer (and textile)-extractor, centrifugal extractor	Yes	Yes	Yes	No	n.a
Formula Data	**step, chemical names**	washer (and textile)-extractor	Yes	Yes	Yes	Yes	example values
	formulas	washer (and textile)-extractor, centrifugal extractor, dryer	Yes	Yes	Yes	Yes	empty
Productivity Data		washer (and textile)-extractor, centrifugal extractor, dryer	Yes	No	No	Yes	empty

3.4. If Data Becomes Corrupt—If the microprocessor senses that data is unusable or unreliable, an error message will appear (usually at power-up), possibly preventing machine operation. The consequences and appropriate actions for each error message are explained in the troubleshooting instructions. Follow these instructions exactly to ensure that corrupt data is completely eliminated and replaced with valid data. Failure to do so may result in unsafe operation or machine damage.

— End of BICM3K01 —

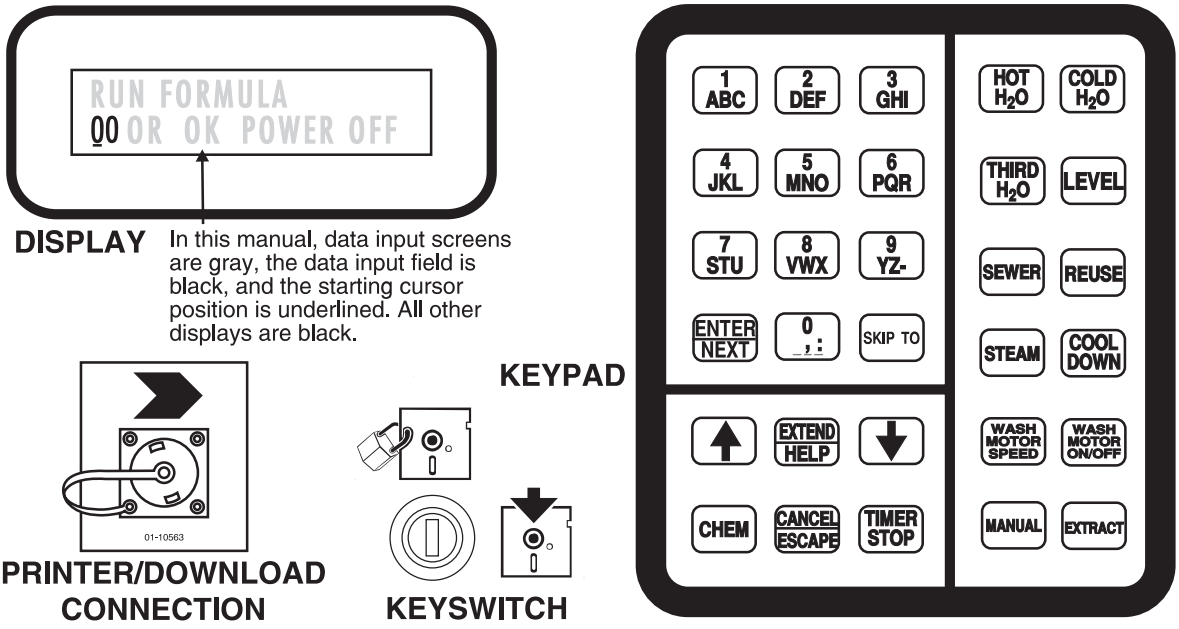
ABOUT THE USER CONTROLS— MACHINES WITH A KEYPAD

User controls are of two types—electro-mechanical controls (switches, buttons, and status lights) and microprocessor interface controls (display, keypad, keyswitch, and printer/download connection). Controls are mounted on one or more nameplates on the machine or a separate electric box.

NOTE: Do not attempt to use your machine merely by referring to the descriptions of controls. Read the operating, programming, and troubleshooting instructions throughout this and the operator manual.

Electro-Mechanical Controls

Electro-mechanical controls vary with machine model and are explained in the machine-specific operator manual furnished with the machine.



Example Key Symbols Used in the Text

Symbology	What It Means
B	
, ENTER/NEXT	Turn the *keyswitch* clockwise to *program* ( ), then press and release the *Enter/Next key*.
, ENTER/NEXT	Turn the *keyswitch* counterclockwise to *run* ( ), then press and release the *Enter/Next key*.
↑	Press and release the key shown.
↑ / ↓	A slash between symbols means use either key shown. The *up* and *down arrow keys* are often shown this way (i.e., scroll up or down the menu choices).
6 PQR, ↑, 5 MNO, ↑, 4 JKL, ↑, 9 YZ-	Typical example of a **word entry** (spells out "POLY"). In *word (alphanumeric)* data fields, press the *up* or *down arrow* key to move right or left to the next character position. Press each key until the desired character appears (e.g., press 6 PQR until "P" appears). A comma between symbols means press and release each key sequentially.
1 ABC, 5 MNO, 5 MNO	Typical example of a **number entry** (enters the value 155). In *numeric* data fields, the cursor automatically advances to the next character position when each numeral is entered.
4 JKL + 5 MNO + 6 PQR	A " + " between symbols means press *and hold* each key in the order shown until all keys are depressed *at the same time*, then release all keys.
hold 8 VWX + 1 ABC	Key(s) must be held depressed for the intended action to occur. Action will stop when key(s) is (are) released.
<xx> **<response>** **<password>**	This is an alternative way of depicting word and number entries when the exact values are determined by the user. <xx> means enter a two digit number. <response> means enter the value prompted for by the display. <password> means enter the password (or numeric passcode).
⓪	Press and release the *Stop button* (⓪).
B ①	Press and release the *Start button* (①).

FIGURE 1 (MSOP0235BE)
Microprocessor Interface Controls and Example Key Symbols

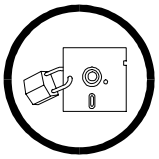
Microprocessor Interface Controls

These controls, shown in FIGURE 1, include the *keyswitch, display,* and *keypad*, located on the main nameplate (position on nameplate varies), and the *printer/download connection*, located on its own nameplate. These controls permit the user to pass data to and from the microprocessor controller.

NOTE: This section folds out so that you may continue to refer to FIGURE 1 as you review the remainder of this manual.

Keyswitch—This key-operated switch provides security for all field-programmed data in memory. With the *keyswitch* set to *run* ( ), this data cannot be changed. The key cannot be removed in the *program* ( ) position.

⚠ CAUTION ⚠



DATA LOSS HAZARD—Improper use of the *keyswitch* may corrupt program data.

- **Return to the run mode only when the display says *Ok Turn Key to Run*.**
- **Only power off or on with the *keyswitch* at *run*.**
- **Do not leave the key accessible to unauthorized personnel.**

Display—This two- or four-line device displays *messages* and *data entry screens. Messages* inform the user as to the machine's operating status or alert the user to conditions that must be satisfied before operation can continue. ***Message displays*** **in this manual are normally black.**

Data entry screens prompt the user to enter data at the keypad. As keys are pressed, the data appears in the data input field on the display. A blinking *cursor* always shows where the next character will be entered. ***Data input screens*** **in this manual are gray, the data input field is black, and the starting cursor position is underlined.**

Keypad—The 12- or 30-key keypad is used for programming, making selections (e.g., selecting formulas in a washer-extractor), responding to display messages, certain normal operating procedures, and manual operation. Applicable procedures are explained in the remainder of this manual and depicted using symbols to indicate pressing keys on the keypad. These symbols are explained in the "Example Key Symbols Used in the Text" in FIGURE 1. Keep FIGURE 1 folded out when reviewing procedures elsewhere in the manual that require the keypad.

NOTE: Some keys on the 30-key keypad are not used on some machines.

Printer/Download Connection (if so equipped)—Connect a Milnor®-supplied printer here to print field-programmed data (e.g., formulas) and accumulated data (e.g., count of loads processed), if applicable. Connect a Milnor®-supplied serial downloader here or interconnect between machines to copy field-programmed data between devices. Printing and downloading, if applicable, are explained elsewhere in this manual.

Section 2

Programming

PROGRAMMING THE MARK II, III, IV, AND V 100 FORMULA, SINGLE MOTOR WASHER-EXTRACTOR CONTROLLER

D F

Fold out FIGURE 1 in "ABOUT THE USER CONTROLS . . ." (see Table of Contents) for the meaning of the display and key symbols used in this section.

Selections on the Program Menu

0 =Ok Turn Key To Run—Safely return to the *run mode*. See caution below.
1 =Add/Change Formula—Add a new formula, change or delete an existing formula, and add/delete steps.
2 =Copy Old To New—Copy existing formula to unused formula number.
3 =Change Step Names—Assign names to step name numbers for use when programming formulas.
4 =Change Chem Names—Assign names to chem name numbers for use when programming formulas.
5 =Configure —Tell the controller which model and options it is controlling.
6 =Down Load—Copy data electronically to avoid repetitive programming and provide secure backup.
7 =Clear All Memory (voluntarily)—Clear memory before completely reprogramming the machine.
8 =Print Data—Print out current formulas, configure codes, chemical names and step names.

To Access the Program Menu

```
RUN FORMULA
00 OR OK POWER OFF
```

```
PROGRAM  0 MENU
OK TURN KEY TO RUN
```

Program menu with selection 0 displayed

Underline indicates cursor position

When the *Run Formula menu* and *selection 00* is displayed as shown at left,

, ENTER NEXT **Accesses the *Program Menu.*** All *program modes* are available.

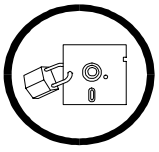
When the *Program Menu* is displayed as shown at left,

/ **Scrolls the available *program modes*.**

or <x> **Selects a *program mode***, where <x> is a number from 0 to 8. See following pages for how to access and utilize each program mode.

or (0), , ENTER NEXT Returns to the *Run Formula menu (run mode)*.

⚠ CAUTION ⚠



DATA LOSS HAZARD—Improper use of the *Program/Run keyswitch* may corrupt program data.

- **Return to the *run mode* only when the display says *OK Turn Key To Run.***
- **Only power *off* or *on* with the *Program/Run keyswitch* at *run*.**
- **Do not leave key accessible to unauthorized personnel.**

If `FORM xx INCOMPLETE TURN KEY TO PROG` **or** `CLEAR MEMORY NOW PRESS 4+5+6` **ever appears, data is unreliable and must be deleted.**

See "100 FORMULA, SINGLE MOTOR WASHER-EXTRACTOR ERROR MESSAGES" for more.

1 = ADD/CHANGE FORMULA

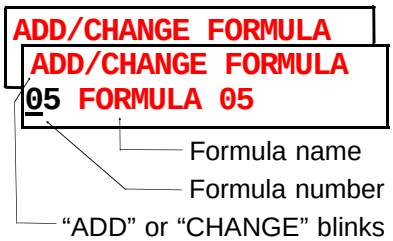
At the start of formula programming, the controller prompts for a *formula number* and *formula name*. At the start of each step (e.g., flush, break, intermediate extract), the controller prompts for a *step name* and pauses to permit *deleting or duplicating the step*. Once in a formula, you may *move around* to specific data and use the *help screens*. You may *end the formula* with a bath or an extract. You may *abort a new formula* or *delete an existing formula*. When you end a formula, the controller prompts for *type of rotation* to end with. *Formulas 01* through *98* are available for programming.

NOTE: Two non-programmable formulas are also furnished—*formula 00*, used to commission a new machine (see "RUNNING . . ") and *formula 99*, used to develop new formulas (see "MODIFYING FORMULAS . . .").

When the *Program Menu* and *mode 1, Add/Change Formula* is displayed,

ENTER/NEXT — **Accesses *mode 1* and prompts for a *formula number*.**

To Select a Formula Number



With the cursor at *formula number* as shown at left,

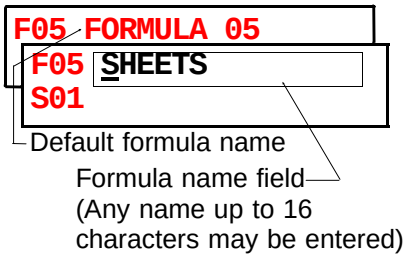
↑ / ↓ — **Scrolls the *unused* formula numbers.**

SKIP TO + ↑ / SKIP TO + ↓ — **Scrolls the *existing* formulas.**

ENTER/NEXT — **Accesses the selected formula.** Cursor goes to *formula name field.*

or CANCEL/ESCAPE — **Aborts formula programming** and returns to *Program Menu.*

To Name or Rename a Formula—Every formula initially has the *default formula name* "FORMULA xx" where *xx* is the formula number. This may be overwritten with any name up to 16 characters.



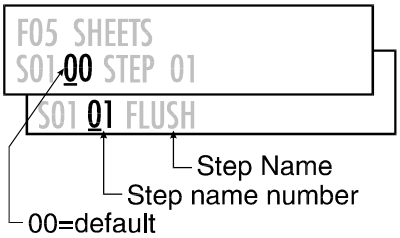
With the cursor in the *formula name field*, as shown at left,

↑ / ↓ — **Moves the cursor right/left within the *formula name field.***

<x> — **Enters a character at the cursor** where <x> is any letter, number, or symbol on the alphanumeric keypad. **Press key one or more times until desired character appears.**

ENTER/NEXT — **Accepts *formula name*** and prompts for first step name.

To Select a Step Name—Step names are selected *by number* from the 16 pre-named step names available (see *3= CHANGE STEP NAMES*). The default is *00* which names the step "STEPxx," where *xx* is the *step number*. With the cursor at the *step name number*, as shown at left,



↑ / ↓ — **Scrolls the *step names*.**

<xx> — **Enters a *step name* by number,** where <xx> is a number from 00 to 15.

ENTER/NEXT — **Accepts selected *step name*.** *Page A* of this step appears with *no cursor* to permit deleting or duplicating this step, if desired.

or SKIP TO — **Only if this is step 1, returns to *formula name.***

To Delete or Duplicate a Step

F05 TMMQFFFHC3WLL S S01

When *page A*, shown at left, first appears *with **no** blinking cursor*, the current step may be *deleted* or *duplicated.*

CANCEL ESCAPE + ENTER NEXT — **Deletes this step.** The next higher step becomes the current step. The controller prevents deleting an *End Formula* or a bath between two extracts. To *delete an entire formula*, see "To Abort a New Formula in Step 1 or Delete an Existing Formula" in this section.

or EXTEND HELP + ENTER NEXT — **Duplicates this step.** If this is *step 1*, the duplicated step becomes the new *step 1* and all following steps move one number higher. Controller prevents duplicating an *End Formula* or an extract.

or ENTER NEXT — **Advances to *T (Type of Step)* without deleting or duplicating this step.**

To Move Around in the Steps and Use the Help Screens—Each *step* has a *step name screen* and three *data pages* (*pages A, B,* and *C*). Each data page has several *decisions* (e.g., duration, bath temperature, chemicals) represented by letters on *pages A, B,* and *C*. Move around among steps, screens, pages, and decisions as shown in FIGURE 1, below. See "The Step Decisions" in this section for a full explanation of each step decision.

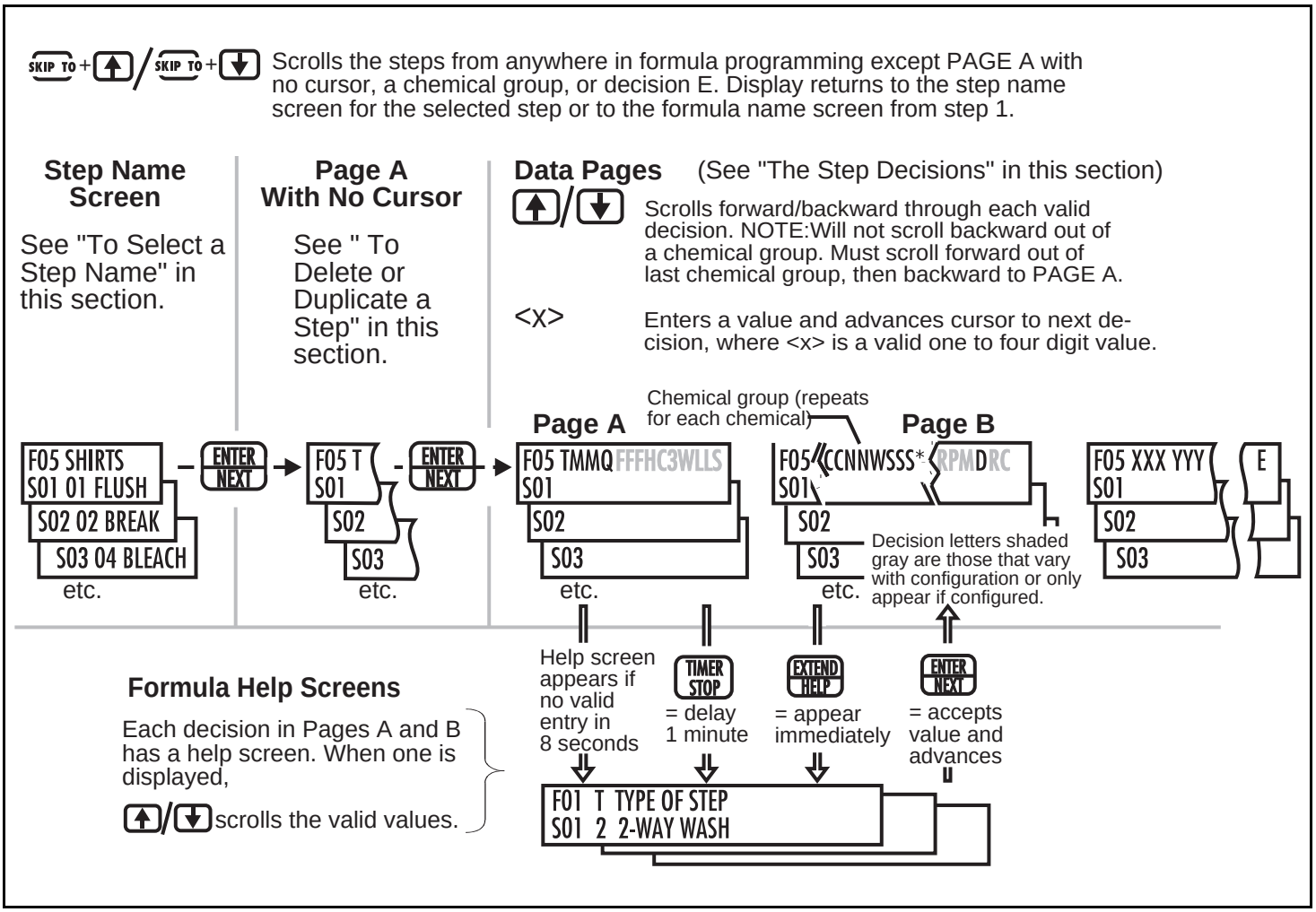


FIGURE 1 (MSOP0266AE)
How To Move Around In a Formula and Use the Help Screens

To End a Formula *Without* a Final Extract (Following a Bath)

With the cursor at page A, decision T (as shown below),

```
F05 TMMQCCCHC3WLL  S
F05 T TYPE OF STEP
S06 0 END FORMULA
```

0 or ENTER/NEXT — **Commands *End Formula*** and prompts:

```
END FORMULA #05 ?
0 NO [1=YES]
```

1 ABC, ENTER/NEXT — **Confirms ending the formula** and prompts *How to End?*

or

(0), ENTER/NEXT — **Cancels ending the formula** and returns to *Type of Step*.

To End a Formula *With* a Final Extract

With the cursor at page A, decision T of the final extract (as shown be-

Page A

```
F05 TMMQCC
S06 6050
```

Page B

```
RPMDRC
----0--
```

<T> **Commands one of three types of final extract,** where <T> is 4, 6, or 7, and prompts for a *duration (MMQ)*. See "The Step Decisions."

<MMQ> **Commands a duration** where <MMQ> is a 3-digit number and prompts for a *drain destination* if applicable.

<R> **Commands a *drain destination***, where <R> is 0 or 1 and prompts *or How to End?*

To Abort a New Formula in Step 1 or Delete an Existing Formula

Scroll to step 1, page A, decision T. when display is as shown be-

```
F05 TMMQCCCHC3WLL  S
F05 T TYPE OF STEP
S01 0 END FORMULA
```

(0), ENTER/NEXT — **Commands *End Formula* at step 1** and prompts:

```
DELETE FORMULA #05?
0 NO [1=YES]
```

1 ABC, ENTER/NEXT — **Confirms deleting the formula** and returns to the *Program Menu*.

or

(0), ENTER/NEXT — **Cancels deleting the formula** and returns to *Type of Step*.

After confirmation, the *Program Menu* reappears.

```
**PLEASE WAIT**
PROGRAM 0 MENU
OK TURN KEY TO RUN
```

NOTE: Whether ending with or without a final extract, decisions continue as explained below.

To Specify Cylinder Rotation at End of Formula (How To End)—When a formula ends *without* a final extract, selections 0, 1, and 2, explained below are available. When the formula ends *with* a final extract, all of the following selections are available:

```
F05 XXX YYY          E
F05 HOW TO END?      E
S06 STOPPED          0
    REVERSING        1
    DRAIN SPEED      2
    BREAK CAKE       3
    TUMBLING         4
```

Operator presses 0 or CANCEL/ESCAPE to silence the signal.

(at wash speed)–Operator press 0 or CANCEL/ESCAPE to *end*.

Operator presses 0 or CANCEL/ESCAPE to *end*.

Cylinder sequences through various motions for three minutes, then stops. Use to loosen goods that remain plastered to the cylinder after the formula ends. Operator presses 0 or CANCEL/ESCAPE to silence the signal.

Like *reversing* except permits operator to press 0 (to stop cylinder), open door, pull down any plastered goods, close door, and press 1 (to continue tumbling).

/ **Scrolls the valid choices.**

<x> **Enters a valid choice**. <x> is 0, 1, or 2 when following a final bath step. <x> is 0, 1, 2, 3, or 4 for a final extract.

ENTER NEXT **Accepts the selected choice.** This ends programming for this formula.

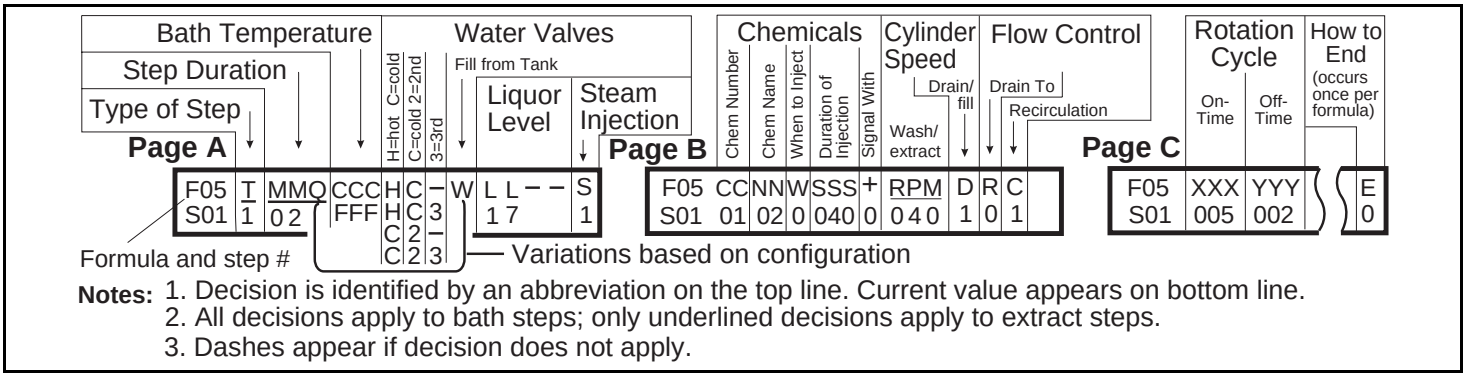
```
**PLEASE WAIT**
PROGRAM 0 MENU
OK TURN KEY TO RUN
```

Program Menu reappears.

The Step Decisions

As shown in FIGURE 2, several programming decisions on *pages A and B* vary with configuration. For example, *bath temperature* may be configured for Fahrenheit *(FFF)* or Centigrade *(CCC)* units and *Third Water (3)* only appears if enabled. Most decisions following *Type of Step (T)* only apply to bath steps, not extract steps. Applicable step decisions repeat for each step.

Up to 98 *formulas* with a total of 499 *steps* may be programmed.

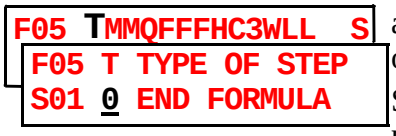


Notes: 1. Decision is identified by an abbreviation on the top line. Current value appears on bottom line.
2. All decisions apply to bath steps; only underlined decisions apply to extract steps.
3. Dashes appear if decision does not apply.

FIGURE 2 (MSOP0266AE)
The Step Decisions at a Glance

Type of Step: Types of Baths and Extracts Available

—*End Formula*, three types of *bath* step, and four types of *extract* step are available. The control prevents an extract as step 01 or step 02 if step 01 is a no water bath. It also prevents two successive extract steps.



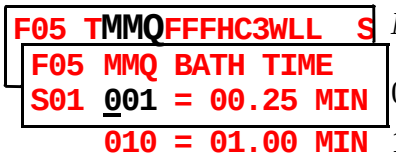
See "To End a Formula Without a Final Extract. . .," and "To Abort a New Formula in Step 1 or Delete an Existing Formula" in this section.

1 1-WAY WASH	Increases mechanical action and saves energy. Use for small pieces which cannot tangle.
2 2-WAY WASH	Reverses cylinder. Use for sheets or other large pieces which tangle unless cylinder reverses.
3 SOAK WASH	*Cylinder does not turn.* Use for delicate fabrics and overnight bath soak (see below).
4 PRE+FIN EXT (pre+final extract)	Performs motions toward cycle end to loosen plastered goods. Minimum time =180 seconds. Machine extracts for 90 seconds, then the timer stops while the cylinder stops, jogs, and redistributes. Then machine extracts (with a 90-second low speed extract before accelerating to E2 if the machine has E1 and E2) for the remaining commanded extract time. Use only for goods that tend to plaster, as this function may cause unwanted extract recycles.
5 INT EXTRACT (intermediate extract)	For extracts between baths and for final extract at low (E1) speed if machine is equipped with two-speed extract.
6 FINAL EXT	E1 duration dictated by *configure decision G* then E2 for remainder of commanded extract time.
7 DOUBLE EXT	Purges trapped water from goods. Minimum time = 180 seconds. Machine extracts for 90 seconds. Timer stops as cylinder slows and runs at drain speed for 30 seconds then re-enters extract for remaining commanded time. Use for mats.

Type of Step: Using *Soak Wash* To Create an Overnight Bath Soak Formula

—To create an overnight bath soak formula, for *step 1*, command *Type of step (T)=3 (Soak Wash)*, *duration of step (MMQ)=600 (one hour)*, and *drain type (D)=2 (Do Not Drain)*. Then command the temperature, water valves, and level desired. For *Step 2*, accept *End Formula* to exit, then return to the formula and duplicate *step 1* as many times as hours of soak are desired. See "To Delete or Duplicate a Step" in this section. Modify the formula to add chemicals and/or perform other functions where desired. Take care to delete any unnecessarily duplicated functions from steps. **Power, air pressure, and steam (if used) must remain on as long as this formula is running.**

Duration of Step



MMQ indicates minutes (*MM*) and quarter minutes (*Q*).

001 = 00.25 MIN	0 minutes and 15 seconds (minimum)
010 = 01.00 MIN	1 minute (default)
113 = 11.75 MIN	11 minutes and 45 seconds (example)
633 = 63.75 MIN	63 minutes and 45 seconds (maximum)

Bath Temperature—Appears if *temp probes* enabled (*configure decision T*). Accessible if this is a *bath step* (other than a *no water* bath). *FFF*(Fahernheit) or *CCC*(Centigrade) appears per *configure decision A*. If a temperature is commanded, thermo-modulation or steaming is required; otherwise, the cursor returns here for temperature correction.

```
F05 TMMQFFFHC3WLL  S
F05      FFF
S01      000 TEMP  °F
```

000 TEMP °F No temperature requirement for this bath. Value displayed reverts to "---."

050 TEMP °F = 50° F. 010 TEMP °C = 10° C (default and minimum, if 000 not commanded)

205 TEMP °F = 205° F. 095 TEMP °C = 95° C (maximum).

Water Valves: Available Valves and Ways To Control Them—*Configure decision K* determines which of the four combinations of water valves shown below is displayed. Valves are accessible if this is a bath step. The water valve(s) will function as commanded here either 1) at the start of fill, if *tank fill* is not commanded for this bath (see "Water Valves: Fill From Tank" in this section), or 2) when the tank valve closes, if level is not yet achieved.

hot* and *cold **or *hot, cold*, and *3rd***

```
          hot  cold  3rd
F05 TMMQCCCHC3WLL  S
S01
```

Each water valve is a separate decision. 3rd water appears only if enabled. Unless stated otherwise, all selections apply to each valve.

OFF	**0**	*Off* for this bath
ON	**1**	*On* during fill
↑°**C**(or↑°**F**)	2	*On* during fill if actual temperature is *below* commanded (*raises* temp). Not available for *cold* water valve.
↓°**C**(or↓°**F**)	3	*On* during fill if actual temperature is *above* commanded (*lowers* temp). Not available for *hot* water valve.

Example:

```
F05 TMMQCCCHC3WLL  S
S01        110
```

Split *hot/cold*

001 *3rd* only

or

cold* and *2nd **or *cold, 2nd*, and *3rd***

```
          cold  2nd  3rd
F05 TMMQCCCC23WLL  S
S01
```

OFF	**0**	*Off* for this bath
ON	**1**	*On* during fill

No other selections are available.

Example:

```
F05 TMMQCCCC23WLL  S
S01        110
```

Split *cold/2nd*

001 *3rd* only

Water Valves: Regulating Incoming Water Temperature With *Thermo-Modulation*

Accessible if hot water valve enabled (*configure decision K*). *Thermo-modulation* regulates incoming water temperature by turning the water valve(s) on and off during fill to maintain commanded temperature. When programming, it is helpful to know the *split water temperature* (temperature achieved by opening hot and cold simultaneously).

```
F05 TMMQCCCHC3WLL  S
S01        230
```

230 — *Hot and cold both modulate*. Use this method when desired temperature is *near split* or when split water temperature is unknown or varies significantly.

130 — *Hot=on, cold =modulates*. This provides a faster more accurate fill (fewer temperature swings) when the commanded temperature is known to be *hotter than split*.

210 — *Hot=modulates, cold=on.* This provides a faster more accurate fill (fewer temperature swings) when the commanded temperature is known to be *colder than split*.

NOTE 1: If desired, modulate *hot* and *3rd* when *3rd* is *cold* water, or *cold* and *3rd* when *3rd* is *hot* water.
NOTE 2: Modulation controls the *average* temperature of the *incoming* water. Bath temperature may vary due to inconsistant incoming water temperature/pressure and because it is influenced by the temperature of the preceding bath.

Water Valves: Fill From Tank—Accessible if this is a bath step. If tank fill is called for in this bath, the tank valve opens until either 1) level is achieved, or 2) the time specified in *configure decision I* (*fill error*) expires, after which, the water valve(s) continue filling to the commanded level.

```
F05 TMMQCCCHC3WLL  S
S01            0
```

0 — Do not fill from tank.

1 — Fill from tank.

Water Valves: Lowering Bath Temperature with *Cooldown*—A bath with *cooldown* consists of two bath steps with *no drain* between them. In the second step, specify the desired *cooler* temperature, *all water valves off*, and *any* bath level. The controller will automatically insert a one minute duration *(MMQ=010)* in the current step and *Do Not Drain (D=2)* in the former step. **The cooldown temperature must always be 15°-20°F (8°-11°C) higher than the hottest ambient temperature or cold water temperature that will be encountered, or it may take a long time or be impossible to achieve the commanded cooldown temperature.** Commanding *no water* (all water valves *off*) in a step following an extract or in a machine with no *cooldown (configure decision J)*, will result in the error:

```
F05 COOLDOWN ILLEGAL
S01 PRESS NEXT
```

If the display at left appears,

ENTER NEXT **returns the cursor to the first water valve decision.**

Liquor Level: Specifying Inches or Centimeters (Electronic Level Sensing)

```
F05 TMMQFFFHC3WLL  S
F05 LEVEL          LL
S02                00
```

Accessible if this is a bath step. Units are *inches* or *centimeters* as specified in *configure decision A*. Value is two digits.

00 No water

<xx> Minimum level for a bath not preceding an extract, where <xx> is the value specified in the *Low Level configure decision* .

<yy> Minimum level for a bath preceding an extract, where <yy> is the value specified in the *Med Level configure decision*. If a value lower than <yy> is entered and an extract is programmed for the next step, the controller will automatically replace this lower value with <yy>.

<zz> Maximum level for any bath, where <zz> is the value specified in the *High Level configure decision.*

17 17 inches (or centimeters)—example.

Steam Injection and How To Select the Steam Code—Steam enabled (*configure decision H*). Accessible if this is a *bath step* . No steam and six steaming choices are available. Each steaming choice specifies the value shown in the list of choices below left, for each of three conditions (*early*, *after*, and *timer*) explained in the box below right.

```
F05 TMMQFFFHC3WLL  S
EARLY AFTER TIMER  S
   NO STEAM        0
```

NO	YES	RUNS	1
NO	NO	STOPS	2
NO	YES	STOPS	3
YES	YES	RUNS	4
YES	NO	STOPS	5
YES	YES	STOPS	6

Early: Yes starts steaming at lowest level. Use *yes* when machine has only cold water valve or when plant has only low-temperature hot water. ***No*** starts steaming when commanded level achieved. Use *no* when machine has both hot and cold water valves if commanded temperature is lower than hot water temperature.

After: Yes resumes steam in this bath if temperature falls below commanded, once initially achieved. ***No*** prohibits further steam once temperature is achieved. Use *no* if chemicals or goods may be harmed by steam after chemical injection (as in bleach baths), otherwise use *yes*.

Timer: Runs while steaming or ***stops*** until temperature first achieved. Use *runs* if temperature need not be exactly maintained throughout bath and/or when it is certain that commanded temperature will be nearly achieved while filling. Use *stops* if temperature must be achieved before adding chemicals; otherwise, software will suppress this chemical-add choice.

Chemicals: Applicable Decisions—Chemical decisions are only accessible if this is a *bath* step, but any number of available chemicals can be commanded in the same bath. The available chemicals are those enabled in the *# of Chem Valves configure decision*. **For *each* chemical desired, the control repeats the chemical decisions highlighted at left**, including *chemical number (CC), chemical name (NN), when to start injection (W), duration of injection (SSS),* and *signal with chemical (*).* If *chemical number 16 (signal only)* is selected, the control skips *SSS* and *. If optional *chemwait (chemsave)* is functioning on this machine when a chemical injection is called for, the machine timer will stop in response to a *wait* signal from the chemical system. See "HOW CHEMWAIT WORKS."

```
F05 CCNNWSSS*RPMDRC
S01
```

This Chemical: Number (*CC*) and Name (*NN*)

```
F05 CCNNWSSS*RPMDRC
CCNN CHEM# AND NAME
0000  NO CHEMICAL
```

Although *chemical number* and *chemical name* are separate decisions, they share the same help screen.

No chemicals (or no additional chemicals) in this bath (default). Skips *SSS* and *.

0200 CHEMICAL 02 — *Chemical 02* (example). Cursor advances to *NN* from any valid *chemical number*.

xx00 ILLEGAL CHEM — An invalid value was entered, where xx is a number outside the range specified in the *# of Chemical Valves configure decision*. Cursor remains at *CC* for correction.

1600 CHEMICAL 16 — Operator signal sounds *without* chemical being injected. Cursor advances to *NN*, then *W*, but skips *SSS* and *. Operator must cancel signal to resume operation.

0100 CHEMICAL 01 — Names *chemical 01* (example) by chemical number (default).

0301 ALKALI — Gives *chemical 03* the name *Alkali* (which was previously assigned to *chemical name 01*) (example). See "4= Change Chem Names" in this section.

ENTER NEXT — **In the help screen, accepts the *chemical number and name*.** The cursor advances to *W* for a valid chemical or to the next decision following the chemical decisions for *chemical 00 (no chemical)*.

This Chemical: When To Start Injection

```
F05 CCNNWSSS*RPMDRC
F05     W WHEN START
S01     0 WITH FILL
```

Use this decision to ensure that chemicals are injected into the bath safely (e.g., acceptable concentrations and bath temperatures). To avoid injecting two or more chemicals simultaneously, use *Do Not Drain* (*programming decision D=drain type*) to combine two or more bath steps into one bath, with one injection in each.

0 WITH FILL — As the machine is filling.

1 LEVEL OK — When level is satisfied.

2 LEV+ °C OK or 2 LEV+ °F OK - When level and temperature are both satisfied (only available when steaming to a specified temperature with *timer **stops** while steaming* is commanded).

This Chemical: Duration of Injection (in seconds)

```
F05 CCNNWSSS*RPMDRC
F05      SSS
CHEM ADD 001 SECS
```

One second (minimum and default).

CHEM ADD 127 SECS — 127 seconds (maximum). This value automatically inserted if any higher value entered.

This Chemical: Signal With Chemical

```
F05 CCNNWSSS*RPMDRC
F05 SIGNAL? *
S01 NO      0
S01 YES     1
```

The signal occurs at the time specified by the *when to start injection* decision. **The commanded injection will not start until the signal is cancelled by the operator.**

Cylinder Speed—Accessible if this is not a *soak wash* (see "Type of Step . . ." in this section). Wash and extract speeds are programmable. Value is *percent of normal*. During bath steps, the cylinder will rotate at the speed commanded here, during the on-time commanded below (see "Cylinder Rotation On-Time . . ." in this section).

```
F05 CCNNWSSS*RPMDRC
F01 SPEED     RPM
S01 WASH      015
    WASH      005
    WASH      040
    EXTRACT   200
    EXTRACT   835
```

15 RPMs wash speed (example)
5 RPMs—Minimum allowable wash speed
40 RPMs—Maximum allowable wash speed
200 RPMs—Minimum allowable extract speed
835 RPMs—Maximum allowable extract speed

Cylinder Rotation During Draining and Previous Fill (Drain Type)—Accessible if this is a bath step and *not a cooldown*.

```
F05 CCNNWSSS*RPMDRC
F05 DRAIN TYPE    D
STD DRAIN SPD     0
2-WAY WASH SPD    1
DO NOT DRAIN      2
STOP W DRAIN      3
STOP W FILL       4
STP FILL+DRAIN    5
STP FILL+NO DR    6
```

Because the machine must enter extract from drain (distribution) speed, if the next step is an *extract*, the control changes a selected 1, 2, or 3 to 0; or a 5, 6, or 7 to 4.
Basket turns clockwise at drain (distribution) speed.
Wash speed, reversing; more mechanical action while draining.
Use for functions later in this bath such as to inject chemicals, raise temperature or level or change basket speed without draining. Also see "Type of Step: Using Bath Soak To Create an Overnight Soak Wash Formula" in this section.
Basket stationary; no mechanical action while draining.
Basket stationary during *previous* fill; drain speed while draining.
Basket stationary during draining and *previous* fill.
Basket stationary during *previous* fill; no drain.

Drain Destination (Sewer or Tank)

```
F01 CCNNWSSS*RPMDRC
F05 DRAIN TO      R
S02 SEWER         0
S02 TANK          1
```

Accessible if this is a bath step and *not a Do Not Drain* or if this is an extract step.
Drain to sewer (default)
Drain to tank

Recirculation

```
F05 CCNNWSSS*RPMDRC
F05 RECIRCULATION C
S03 NO   [1=YES]  0
    YES  [0=NO]   1
```

Accessible if this is a bath step.
Do not recirculate.
Recirculate.

Cylinder Rotation On-Time and Off-Time—Accessible if this is a bath step and ***not*** *a soak wash* (see "Type of Step . . ." in this section). Cylinder rotates intermittently, as commanded here.

```
F05 XXX YYY      E
```
On-time

```
F05 ON TIME
S03 003
```
3 seconds (example)

`000` Cylinder does not rotate (minimum)

`999` 999 seconds (maximum)

```
F05 XXX YYY      E
```
Off-time

```
F05 OFF TIME
S03     003
```
3 seconds (example)

`001` One second (minimum)

`999` 999 seconds (maximum)

```
F05 XXX YYY      E
```
How to end

```
F05 OFF TIME
S03             0
```
Finished

`1` Reversing

`2` Drain speed

`3` Break cake

`4` Tumbling

2 = COPY OLD TO NEW

PROGRAM 2 MENU COPY OLD TO NEW	When the *Program Menu* and *mode 2, Copy Old to New* is displayed, ENTER NEXT **Accesses *mode 2*** and waits for the user to scroll existing formulas.

For Quick Return to Program Menu

CANCEL ESCAPE **Aborts *mode 2* and returns to the *Program Menu* any time during the following procedure.**

COPY OLD TO NEW	When this display appears, ▲ / ▼ **Scrolls the *existing* formulas** (must scroll, cannot select by number).
COPY SOURCE xx SHEETS	When scrolling begins, this display appears, where *xx* is the formula number and *Sheets* is an example formula name. When the desired *source* formula appears, ENTER NEXT **Confirms this is the *source* formula** and prompts for a *destination*.
COPY DESTINATION 00	When this display appears, ▲ / ▼ **Scrolls the *unused formula numbers,*** **or <xx>** **Enters a *destination formula number,*** where <xx> is a number from 01 to 98.
COPY DESTINATION xx ALREADY EXISTS	This display appears if the selected formula already exists, where *xx* is the *existing formula number*. **The control prevents overwriting an existing formula.**
COPY DESTINATION yy FORMULA yy	This display appears if the selected formula is unused, where *yy* is the *unused formula number*. ENTER NEXT **Copies the source formula to the destination formula number** except that the source formula name is not copied. The new formula is named the same as the formula number (e.g., *Formula 12*).
PROGRAM 0 MENU OK TURN KEY TO RUN	*Program Menu* re-appears.

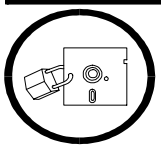
3 = CHANGE STEP NAMES

The following are the *default English step names* supplied with the controller.

00 This names the step the same as the step number and is not available for field-programming.	**01** = Flush **02** = Break **03** = Wash **04** = Bleach	**05** = Rinse **06** = Antichlor **07** = Sour **08** = Soursoft	**09** = Softener **10** = Mildcide **11** = Finish **12** = Starch	**13** = Name me **14** = Name me **15** = Name me

Equivalent non-English names, in one other language specified by the customer, are also supplied. *Configure decision B (Language)* determines which language (English or foreign) is displayed. The names associated with step name numbers 01 through 15 may be field-changed. Because step names are selected *by number* when programming formulas, any change to a step name will change the name in all formulas its step name number is used in.

⚠ CAUTION ⚠



DATA LOSS HAZARD—All field-changed step names are erased and lost whenever memory is cleared or *configure decision B (Language)* is changed. The English default step names or their foreign language equivalents will reappear.

+ **ALWAYS re-enter any field-changed step names whenever memory is cleared.**
+ **ALWAYS configure language (English or foreign) before changing step names.**

```
PROGRAM 3 MENU
CHANGE STEP NAMES
```

When the *Program Menu* and *mode 3, Change Step Names* is displayed,

ENTER/NEXT — **Accesses *the step name menu,*** and displays step name 01.

For a Quick Return to the Program Menu

CANCEL/ESCAPE — **Aborts *mode 3* and returns to the *Program Menu* any time during the following procedure. Any changes are retained.**

```
CHANGE STEP NAMES
01 FLUSH
```

Step name

Step name number. When cursor is here, you are at the *step name menu.*

When this display appears, where *01* is the *step name number* and *Flush* is the *step name*,

↑ / ↓ — **Scrolls the step names,**

or 0 , 3 GHI — **Selects step name 03 (example) and displays the name associated with this number** (can enter any number from 01 to 15).

ENTER/NEXT — **Accesses the selected step name.**

```
CHANGE STEP NAMES
03 WASH
```

Step name 03 accessed

Example: Step name 03 can now be changed. Enter up to eight characters.

↑ / ↓ — **Moves the cursor right/left within the eight character field.**

S, ↑, U, ↑, D, ↑, S — **Enters *Suds* (example).** Press each key one or more times until the desired character appears.

```
CHANGE STEP NAMES
03 SUDS
```

When the new step name is entered,

ENTER/NEXT — **Returns to the *step name menu*** (select another step name to change),

or CANCEL/ESCAPE — **Returns to the *Program Menu.***

4 = CHANGE CHEM NAMES

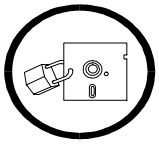
The following are the *default English chemical names* supplied with the controller.

00 This names the chemical the same as the chem number and is not available for field-programming.

01 = Alkali
02 = Soap
03 = Detergent
04 = Soap+alkali
05 =Deterg+alkali
06 = Chlorine Bleach
07 = Oxygen Bleach
08 = Antichlor
09 = Sour
10 = Softener
11 = Sour+softener
12 = Starch
13 = Anti-mildew
14 = Anti-bacteria
15 = Finishing Chems
16-64 = Chem Name xx

Equivalent non-English names, in one other language specified by the customer, are also supplied. *Configure decision B, Language*, determines which language (English or foreign) is displayed. The names associated with chem name numbers 01 through 64 may be field-changed. Because chemical names are selected *by number* when programming formulas, any change to a chemical name will change the name in all formulas its chem name number is used in.

⚠ CAUTION ⚠



DATA LOSS HAZARD—All field-changed chemical names are erased and lost whenever memory is cleared or *configure decision B (Language)* is changed. The English default chemical names or their foreign language equivalents will reappear.

+ **ALWAYS re-enter any field-changed chemical names whenever memory is cleared.**
+ **ALWAYS configure language (English or foreign) before changing chemical names.**

```
PROGRAM 4 MENU
CHANGE CHEM NAMES
```

When the *Program Menu* and *mode 4, Change Chem Names* is displayed,

ENTER/NEXT — **Accesses *the chemical name menu*** and displays the first editable name.

For a Quick Return to the Program Menu

CANCEL/ESCAPE — **Aborts *mode 4* and returns to the *Program Menu* any time during the following procedure. Any changes are retained.**

```
CHANGE CHEM NAMES
01 ALKALI
```

Chemical name

Chemical name number
When cursor is here, you are at the *chemical name menu.*

When this display appears, where *01* is the *chemical name number* and *Alkali* is the *chemical name,*

↑ / ↓ — **Scrolls the chemical names,**

or 1 ABC , 3 GHI — **Selects chemical name 13 (example) and displays the name associated with this number** (can enter any number from 01 to 64).

ENTER/NEXT — **Accesses the selected chemical name.**

```
CHANGE CHEM NAMES
13 ANTI-MILDEW
```

Chemical name 13

Example: Chemical name 13 can now be changed. Enter up to 15 characters.

↑ / ↓ — **Moves the cursor right/left within the 15 character field.**

M, ↑, I, ↑, L, ↑, D, I, ↑, S **etc. Enters *Mildistat* (example).** Press each key one or more times until desired character appears.

```
CHANGE CHEM NAMES
13 MILDISTAT
```

When the new chemical name is entered,

ENTER/NEXT — **Returns to the *chemical name menu*** (select another name to change),

or CANCEL/ESCAPE — **Returns to the *Program Menu.***

5 = CONFIGURE (and Why It Is Necessary)

Because the controller software is written to accommodate different machine models and options as well as certain user preferences (e.g., which language to display), it is necessary to *configure* the controller to match each specific machine. Hardware-based configure decisions must match the machine hardware and they must be changed to match subsequent hardware changes. User preferences may be set and subsequently changed as desired.

Where To Find Configure Requirements—See "IMPORTANT OWNER/USER INFORMATION . . ." (see Table of Contents) for the circumstances that require reconfiguring and reprogramming. The metal *configure nameplate* on the machine shows factory configuration. Make all hardware-based configure decisions conform to this nameplate, except to conform to any subsequent hardware changes. All configure decisions are explained in this section. Decisions are marked to indicate which are discretionary and which are hardware-based.

How To Access, Move Through, and Exit Program Mode 5, CONFIGURE and Use the Help Screens—The *configure mode* has two *pages* consisting of several *decisions*, each with a *help screen*. It also has several *additional screens*. **Once you have accessed *configure*, you must move through all decisions to exit** and return to the *Program Menu*. However, you need not view the help screens.

PROGRAM 5 MENU
CONFIGURE

When the *Program Menu* and *mode 5, Configure* is displayed,

ENTER NEXT

Accesses *mode 5, Configure* and displays *page AT*. See FIGURE 3.

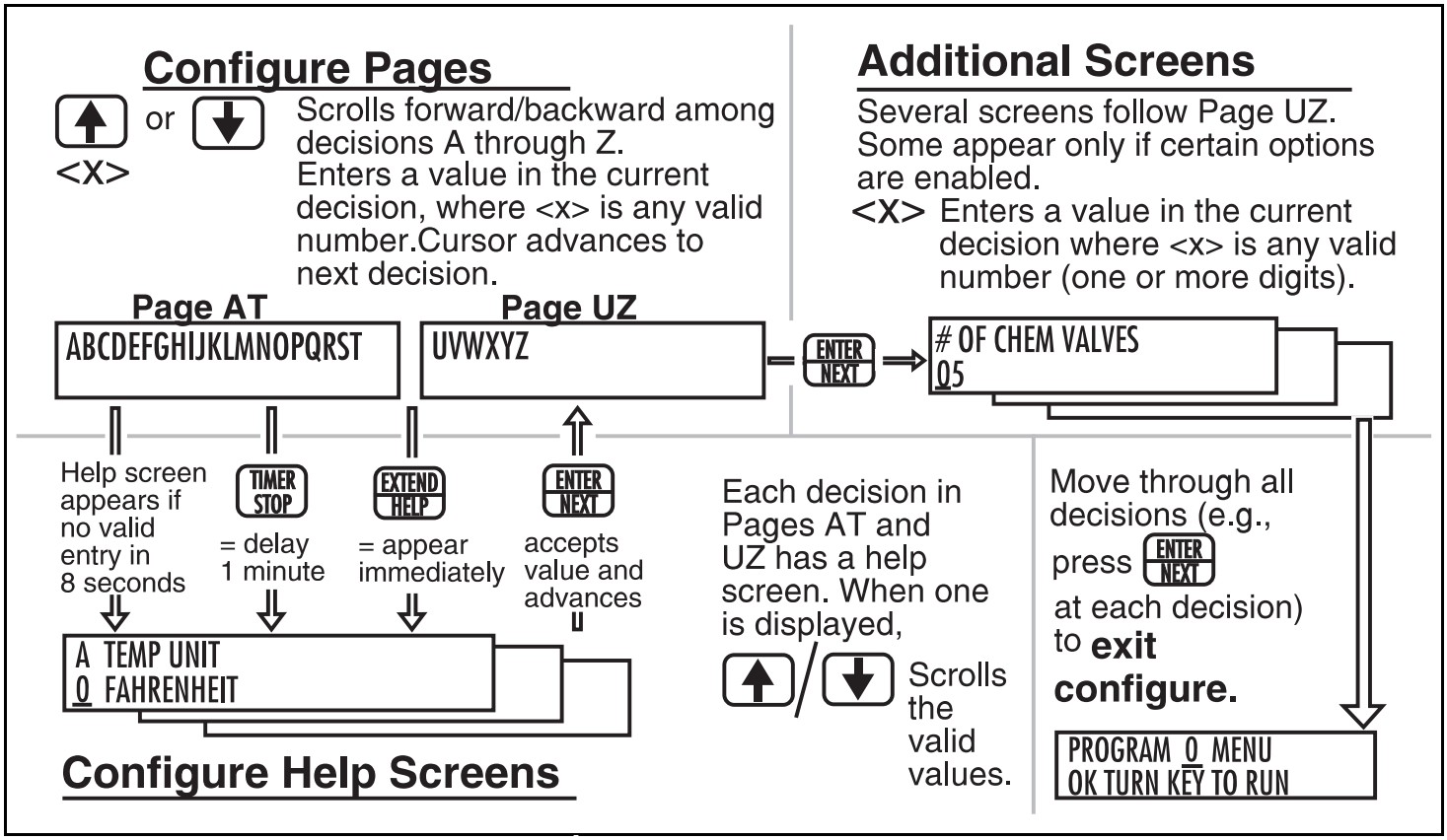


FIGURE 3 (MSOP0234BE)
How To Move Around in *Configure* and Using the Help Screens

The Configure Decisions

A few configure decisions on *page AT* influence subsequent configure decisions on *page AT* and *page UZ*. For example, *decision H (steam error)*=1 mandates *decision T (temp probes)*=1 or 2. Although the control does not prevent the user from incorrectly entering T=0 in this instance, it will subsequently insert the value *one*. If the user commands T=2, the control will retain this value. Other similar lockouts are built into the configure decisions.

Several of the *additional screens* that follow *page UZ*, will only appear if certain values are entered for certain previous decisions. All possible screens are shown and explained here.

Configure Decisions for Pages AT and UZ

Configure Decision (Page and Help Screen)	D=Discretionary H=Must Accommodate Hardware	Selections	Explanation
Page AT			
ABCDEFGHIJKLMNOPQRST A TEMP UNIT 1 CENTIGRADE	D	0=Fahrenheit, inches, and month/day/year 1=Celsius, centimeters, and day/month/year	Determines temperature units, length units, and date format for display and hard copy.
A**B**CDEFGHIJKLMNOPQRST B LANGUAGES 0 ENGLISH	D	0=English 1=Foreign	Specifies whether to display prompts, messages, step names and chemical names in English or the customer-specified non-English language. **⚠ CAUTION ⚠** **DATA LOSS HAZARD—If step or chemical names were field programmed, these can be lost if the language choice is changed now. See modes 3 and 4.**
ABCDEFGHIJKLMNOPQRST **C MACHINE TYPE** **0 30022F8W**	H	0=30022F8W 1=42032F7P 2=3630 STAPHGUARD	C F
Configure decisions D and E are not currently used.			
ABCDE**F**GHIJKLMNOPQRST F ANTI-PLUG 0 1.7 SECS	H	Decision appears, but needn't be configured as *Decision YYY* will override any value entered here.	This is the *dwell time* between when the wash motor turns off and restarts in the reverse direction. **⚠ CAUTION ⚠** **MACHINE DAMAGE HAZARD—A shorter dwell time than the factory selection can damage wash motor or belt/gear train. Longer dwell times are acceptable.**

Configure Decisions for Pages AT and UZ, continued

Configure Decision (Page and Help Screen)	D=Discretionary H=Must Accommodate Hardware	Selections	Explanation
ABCDEF**G**HIJKLMNOPQRST DRAIN G BATH EXTRACT (SEC) **0** 30 30	H	**BATH EXTR E1-2** 0= 30 30 45 1= 45 45 60 2= 60 60 90 3= 75 75 105 4= 90 90 90 5= 90 120 120 6= 30 60 90	This is *drain time* in seconds after each bath or before each extract, and also the *delay time* from E1 to E2 (low to high speed extract) if machine has *two speed extract* (see *configure decision D, page AT*). **⚠ CAUTION ⚠** **MACHINE MALFUNCTION AND DAMAGE HAZARDS— Shorter drain times than the factory selection may not permit a full drain before extract, resulting in possible damage to either or both extract motors. Longer drain times are acceptable.**
ABCDEFG**H**IJKLMNOPQRST H STEAM ERROR **1** 5 MIN	H D	0=no steam 1=5 minutes 2=10 minutes 3=50 minutes	*Steam injection* is standard on certain machines and optional on others. It permits steaming for time indicated before the *too long to steam* error appears.
ABCD**EFGH**I**JKL**MNOPQRST I FILL ERROR **0** 3 MIN	D	0=3 minutes 1=5 minutes 2=10 minutes 3=15 minutes	Permits filling for the time indicated before the *too long to fill* error appears.
ABCDEF**GHIJKLM**NOPQRST COOLDOWN J ERROR **1** 5 MIN	H D	0=no cooldown 1=5 minutes 2=10 minutes 3=50 minutes	*Cooldown* is standard on certain machines and optional on others. It permits cooling down for time indicated before the *too long to cool* error appears.
ABCDEFGHIJK**LMNOPQRST** **WATER OPT K** **H+C 0**	H	0=*hot + cold* water valves (standard in America) 1=*cold + 2nd* water valves (standard in Europe and other areas) 2=*hot + cold + 3rd* water valves (optional) 3=*cold + 2nd + 3rd* water valves (optional)	
ABCDEFHIJK**L**MNPOPQRST REUSE OPT. L NO [1=YES] **0**	H	0=no 1=yes	Optional reuse tank permits draining to sewer or reuse (as commanded in formula programming).
ABCDEFGHIJKL**M**NOPQRST O/H TANK M NO [1=YES] **0**	H	0=no 1=yes	Optional *overhead tank* allows collection of bath liquor for future use.
ABCDEFGHIJKLM**N**OPQRST METERED WATER N NO [1=YES] **0**	H	0=no 1=yes	Optional *metered water* feature provides for commanding a metered quantity of water for each bath of a formula.
Configure decision O is not currently used.			

Configure Decisions for Pages AT and UZ, continued

Configure Decision (Page and Help Screen)	D=Discretionary H=Must Accommodate Hardware	Selections	Explanation
ABCDEFGHIJKLM**NO**P**Q**R**S**T BALANCING OPT P NO [1=YES] 0	H	0=no 1=yes	*Hydraulic (water) balancing* feature is standard on certain machines. It is not an option. Answer 1(yes) if speed sensing and automatic RPM adjusting is desired.
ABCDEFGHIJKLMNOP**Q**RST RECIRC. Q NO[1=YES] 0	H	0=no 1=yes	Optional recirculation permits water spray through the load door.
Configure decision R is not currently used.			
ABCDEF**GHIJKLMNOPQRS**T **AMPSAVER OPT S** **NO [1=YES] 0**	H	0=no 1=yes	Optional *ampsaver* feature reduces maximum amperes required by a group of machines.
ABCDEFGHIJKLMNOPQ**RS**T **TEMP PRO**BES T 1 TEMP PROBE 1	H	0=no temperature probes 1=one probe 2=two probes	Number of temperature probes depends on model and method of filling with water.
Page UZ			
UVWXYZ U ELEC. LEVEL 0 NO [1=YES]	H	0=no 1=yes	As of this writing, *electronic level sensing* is standard on machines with the nameplate model designation xxxxxExN (e.g., 64046E6N) only. It is not an option.
Configure decision V is not currently used.			
UV**W**XYZ W VARIABLE SPD OPT 1 VARIABLE SPEED	H	0=no 1=yes	As of this writing, *variable speed* is standard on some machines, optional on some machines, and not available on some machines. Variable speed applies to wash speed only on some machines and to both wash and extract speeds on other machines. Answer 1(yes) if speed sensing and automatic RPM adjusting desired. **⚠ CAUTION ⚠** **MACHINE MALFUNCTION AND DAMAGE HAZARDS—The variable speed inverter was programmed at the factory. The constants are written inside the electrical box housing the inverter. Changing these constants may result in damage to goods or the machine.**

E

Configure Decisions for Pages AT and UZ, continued

Configure Decision (Page and Help Screen)	D=Discretionary H=Must Accommodate Hardware	Selections	Explanation
UV**W**X**Y**Z X MANUAL PASSWORD **1** YES [0=NO]	D	0=no—Password (numerical pass code) not required for manual modifications to a running formula. 1=yes—Password reqd..	

Configure decisions Y and Z are not currently used.

Additional Configure Screens

Configure Decision (Screen)	D=Discretionary H=Must Accommodate Hardware	Selections/Range	Explanation
Password (numeric pass code) Screen (only appears if *decision X, page UZ* = 1)			
PASSWORD: **1**234	D	0000-9999	The four digit pass code configured here must be entered by the operator before making manual formula modifications.
Electronic Level Sensing Screens (only appear if *decision U, page UZ* = 1)			
NOTE: *Low, med,* and *high* levels shown below only provide safety lockouts. They do not set the levels for the machine; thus, they do not coincide with the traditional levels *one* (low), *two* (wash), and *three* (rinse). See "ADJUSTING LEVEL SENSING APPARATUS . . . " for more information.			
LOW LEVEL **0**6	D	Inches (Centimeters) 4-6 (14-15)	Minimum level that can be commanded for any bath and thus, the minimum level required for steaming.
MED LEVEL **1**0	D	6-10 (15-25)	Minimum level required in a bath preceeding an extract. If a lower level is commanded, the control will insert the value configured here when the wash formula is saved.
HIGH LEVEL **1**6	D	10-16 (25-40)	Maximum level that can be commanded for any bath.
TAP OFFSET COUNTS **0**000	H	0000-9999 counts	This value adjusts the transducer output to compensate for offsetting conditions (such as location of level sensor) specific to each machine. It is determined for each machine at the factory (see configure nameplate), but may be re-calibrated in the field.

To Calibrate Tap Offset Counts—Measure and mark a level in the basket (e.g., 10 inches (25 centimeters)) then command this level. If the level achieved is *lower* than marked, *increase tap offset counts*. If the level achieved is *higher* than marked, *decrease tap offset counts*, or if *tap offset counts* = 0000, consult the Milnor® factory.

⚠ WARNING ⚠

ENTRAPMENT HAZARD—You can be injured or killed if you become trapped in the washer cylinder.

+ **Procedure must be done only by trained personnel.**
+ **Lock off and tag out power at the external disconnect before entering washer cylinder.**

Additional Configure Screens, continued

Configure Decision (Screen)	D=Discretionary H=Must Accommodate Hardware	Selections/Range	Explanation
Screens that Always Appear (not dependent on prior configure decisions)			
# OF CHEM VALVES 05	H	00-15 valves	This is the number of valves or pumps used to inject chemicals, whether flush valves on an optional *flushing supply injector*, peristaltic pumps (supplied by others) or optional *liquid supply valves*. Do not count the *manifold flush valve*, if any.
DRAIN WASH OUT SS 00	D	00-45 seconds	If a *no-water bath* is commanded (to shake out loose, dry soil) and *do not drain* is ***not*** commanded for a bath's drain, when the drain valve opens at the end of the bath, the cold water valve also opens for the shorter of the time stipulated here or the drain time stipulated in *configure decision G*.
AUTOSPOT RPM: 02	D	1-40	Enter the speed the cylinder turns during Autospot.
MACHINE NAME 30022F8W MACHINE 07	D	Any name (up to 20 characters) to identify this machine. Name appears on hard copy when *mode 8, Print Data* on the *Program Menu* is used.	

Machine name field (20 characters)

Moves the cursor right/left within the *machine name field.*

<x>

Enters a character in the current cursor position, where <x> is any keypad character.

ENTER NEXT

Accepts the displayed machine name and advances to the next decision.

SIMULATOR VERSION? 0 NO [1=YES]	H	0 = no 1 = yes	Select 1 = *yes* only if this is a simulator. If *yes*, board will not operate a washer-extractor or any outputs, but the simulator can send data to a printer or download to a machine or tape.
MILDATA 1 YES [0=NO]	H	0 = no—Machine does not communicate with a Mildata® computer 1 = yes —Machine communicates with a Mildata® computer	
Mildata Screens (only appear if *Mildata?* above = 1)			
MILDATA ADDRESS? 005	H	000-255	This value must match the *address* (discrete indentification code) assigned to this machine in the Mildata® computer. See Mildata® manual.

Configure Decision (Screen)	D=Discretionary H=Must Accommodate Hardware	Selections/Range	Explanation
DATA FWGCEWPL ENTRY **1**0000000	D	For each of the following, 0=*no* and 1=*yes*	Permits Mildata® accounting by the code categories enabled here.
Formula **F**			0 or 1, but 1 inserts 0 in next two decisions and skips them.
Work Order **W**			0 or 1 if *formula* above = 0, otherwise must be 0 and cursor skips over.
Goods Code **G**			0 or 1 if *formula* ***and*** *work order* above are both = 0. Otherwise must be 0.
Customer Code **C**			0 or 1 if *work order* above = 0. Otherwise must be 0.
Employee Code **E**			0 or 1
Weight **W**			0 or 1
Pieces **P**			0 or 1
Lot Number **L**			0 or 1

For each of the above,

<x> **Enters *no* or *yes***, where <x> is 0 or 1. Cannot scroll decisions or values. **Do not use** ⬆ / ⬇ .

Accepts the selected choice and advances to the next decision. Cursor moves forward only.

Metered Water Screens (only appear if *decision N, page AT* = 1)

COUNTS PER 100 **1**483	D	0000-9999	Establishes the units measured by the electronic flowmeter. Enter the number of flowmeter counts resulting from flowing 100 gallons, 100 liters, etc., whichever is the unit of choice. The same unit must be used when programming formulas. See flowmeter calibration procedures.
OFFSET VALVE TIME **0**48	H	000-255 tenths of seconds	Reduces, by the value entered here, the time the water valve will open to admit the metered quantity commanded. This compensates for the tendancy of the valve/flowmeter to *overshoot* the commanded quantity. See flowmeter calibration procedures.

NOTE: Discharge time, discharge dwell time, and number of discharge sequences, below, control basket rotation and duration of discharge. Use these configure decisions to ensure all goods are discharged.

6 = DOWN LOAD

What Downloading Does—Downloading transfers *all* formulas, step names, chemical names, and configure codes (if specified) from one machine to another via a *serial communication cable*. This eliminates the need to enter the same data repeatedly. It can also transfer this data between a machine and a Milnor® *serial downloader (Milnor® part number KXMIC00508)* for convenient data retrieval in the event of computer memory loss.

Downloading completely replaces all of the above mentioned data (configure codes are downloaded only if specifically commanded). Selective downloading (e.g., transferring only certain wash formulas) is not possible.

When and When Not To Download—The reliability and usefulness of downloaded data depends on the similarity between the sending machine and any receiving machines. Abide by the following table.

Similarity between sending and receiving machines			Should you download?	Actions required after downloading
Software	Basic model	Options		
Identical	Identical	Identical	**Yes –include configure.**	none
Identical	Identical	Different	**Ok–probably exclude configure.**	Check configure (see caution).
Identical	Different	Different	**Probably not.**	Reconfigure then revise formulas.
Different	doesn't matter	doesn't matter	**No**—will result in scrambled, unusable data.	

⚠ CAUTION ⚠

MACHINE MALFUNCTION HAZARD—Machine may malfunction, possibly causing unsafe operation, damage to machine and/or damage to goods if not properly configured.

+ **After downloading, reconfigure in accordance with each receiving machine's configure nameplate. This may be omitted only where all machines have *identical* configurations.**

The General Procedure—Downloading is done in the following stages:

1. *Connect* all participating devices via a temporary serial cable (if a permanent cable is not already installed).
2. *Set up* each machine (not the *serial downloader*), using *mode 6, Download.*
3. *Initiate and monitor* the downloading.

Making Connections

Machine To Machine—If a serial cable is not permanently installed (in conduit) between participating machines, install a temporary cable. See "THE EXTERNAL SERIAL LINK CABLES . . ." (see Table of Contents).

⚠ CAUTION ⚠

MACHINE MALFUNCTION HAZARD—Temporary cables (not enclosed in conduit) are susceptable to electromagnetic interference (EMI) which can disrupt machine operation.

+ **Remove temporary cable as soon as downloading is completed.**

Machine To/From Serial Downloader—Two sets of instructions appear on the downloader: ***To Download*—copying data *from a machine to the downloader* and *To Upload*—copying data *from the downloader to one or more machines.*** Connect the lead from the downloader box to the *Printer/Download socket* on the machine (*step 1* on the downloader instructions for *both downloading and uploading*). Ready light should be *on*.

Setting Up Participating Machines (not the *serial downloader*)

Depending on the type of downloading, there will be none, one, or several slave (receiving machines), and none or one master (sending) machine. **Designate *all* slave machines first.**

For each participating machine, access *mode 6, Download*. You will be prompted for the following information: *type of download* to be performed, whether this machine is a *slave (sending)* or *master (receiving)* machine, and for slave (receiving) machines, whether to *receive configure data*.

```
PROGRAM  6  MENU
    DOWN LOAD
```

When the *Program Menu* and *mode 6, Down Load* is displayed,

ENTER/NEXT **Accesses the *Down Load Devices menu* and displays the first selection.**

For a Quick Return to the Program Menu

CANCEL/ESCAPE **Aborts *mode 6* prior to designating slave/master and returns to the *Program Menu.* After designating slave/master, see "Aborting Downloading In Progress" in this section.**

For each of the decisions explained below,

↑ / ↓ **Scrolls the menu selections,**

or <x> **Specifies a menu selection**, where <x> is the menu item number.

ENTER/NEXT **Accepts the displayed selection** and advances to the next decision.

Specify the Type of Download

```
DOWN LOAD DEVICES
0  MACHINE<==>MACHINE.
```

Make the *same* selection for *all* participating devices.

This is the correct choice for all types of downloading covered by this instruction.

`1 MACHINE<==>TAPE....` No longer used. See manual MATM2MICxE for instructions on retrieving data previously stored on cassette tape.

`2 MILDATA=>MACHINE...` Data will transfer from a Mildata® PC to machine(s). See Mildata® manual for procedure.

Specify Slave (Receiving) or Master (Sending)

```
DOWN LOAD STATUS
0  SLAVE.............
```

Make the appropriate selection for each participating machine.

This machine will *receive* data (default). **All receiving machines must be designated *first.***

`1 MASTER.............` This machine will *send* data. **Must be designated last** (see next page before accepting).

Specify Whether To Download Configure Data (if this is a receiving machine)

```
RECEIVE CONFIG ?
0 NO [1=YES].........
```

Make the selection likely to most closely match this machine's *configure nameplate.*

Configure data will *not* be downloaded. This machine will retain its current configuration.

`1 YES [0=NO]..........` Configure data *will* be downloaded. Configuration will match the sending machine.

```
(S)  xxxx BAUD  0000
WAITING FOR MASTER
```

When the display at left appears, this receiving machine is ready to accept download data. *xxxx*=9600 (fast data transfer rate) for all types of downloading covered by this instruction. If *xxxx*=0300 (slow data transfer rate), this indicates that *1=Machine<==>Tape* was incorrectly specified above.

Initiating, Monitoring, and Aborting a Download

Once any receiving machine is set-up and awaiting data, downloading may be *initiated*. Displays are provided for *monitoring* the progress of downloading. You may *abort the download process* at any time. **However, if a download in progress is halted, all receiving devices will contain a mixture of old and new data, and will not operate properly until program memory is successfully downloaded or reprogrammed.**

Initiating Downloading

Between Machines	Machine to Serial Downloader (see *To Upload* on downloader box)	Serial Downloader to Machine (see *To Download* on downloader box)
1. **Designate master.** Downloading begins immediately.	1. **Clear memory in the serial downloader** as explained in the *To Upload* instructions on the serial downloader. 2. **Designate master.** Uploading begins immediately.	1. **Command *Transmit*,** as explained in the *To Download* instructions on the serial downloader.

Monitoring Downloading in Progress

Normal Displays During Downloading:

`(M) 9600 BAUD xxxx` `RECEIVING DATA`	`(S) 9600 BAUD xxxx` `TRANSFERRING DATA`
Slave (receiving) machines	Master (sending) machine

Display indicating successful completion (appears on all machines):

```
PROCESS COMPLETED
 NEXT TO PROCEED
```

The displays at left appear during downloading, where *xxxx* is a scrolling hexadecimal number, indicating byte location currently downloading. At 9600 baud, downloading takes about one minute. While downloading to/from the serial downloader, the *Transmit light* or *Receive light* (as appropriate) should be *on*. When downloading is successfully completed,

ENTER NEXT **On each machine, returns to *Program Menu*.**

NOTE: After downloading to the serial downloader, label the downloader with the *machine model and software version*.

Error Displays During Downloading:

`(S) 9600 BAUD 000` `WAITING FOR MASTER`	`ERROR IN CHECK SUM` `NEXT TO PROCEED`

If, during downloading, either display shown at left appears on a receiving machine, data transfer to that machine was unsuccessful. If the *Receive light* fails to illuminate when downloading from a machine to the serial downloader, data transfer was unsuccessful. Check the serial cable connections and repeat the download process.

Aborting Downloading In Progress

CANCEL ESCAPE **Aborts the download process** for any receiving machine on which it is commanded, or for all machines if commanded on the sending machine. The machine receiving the abort command displays the following:

```
DOWN LOAD ABORTED
  NEXT TO PROCEED
```

Repeat the download process for any receiving machine on which downloading was aborted; otherwise, the machine will contain a mixture of old and new data.

7 = CLEAR ALL MEMORY (VOLUNTARILY)

This mode clears all user-programmed formulas, step names, and chemical names on command. The step names and chemical names originally supplied with the machine will reappear. Configure codes are unaffected when memory is cleared voluntarily, but the control must be reconfigured after first commissioning the machine or after the display says *Clear Memory Now.* See "IMPORTANT OWNER/USER INFORMATION . . ." (see Table of Contents).

PROGRAM 7 MENU CLEAR ALL MEMORY

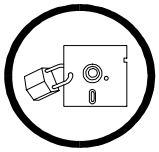
When the *Program Menu* and *mode 7, Clear All Memory*, is displayed,

ENTER NEXT **Accesses *mode 7*** and prompts the user to clear memory or cancel.

For a Quick Return to the Program Menu

CANCEL ESCAPE **Aborts *mode 7* without clearing memory and returns to the *Program Menu.***

⚠ CAUTION ⚠



DATA LOSS HAZARD—The following key strokes will delete all user programmed data.

+ **If this mode was entered accidently, press CANCEL ESCAPE to cancel this procedure.**

4+5+6=CLEAR MEMORY CANCEL = ESCAPE

When this display appears (no cursor),

4 JKL + 5 MNO + 6 PQR **Clears all user-programmed formulas, step names, and chemical names.**

CLEARING MEMORY **PLEASE WAIT**

This display appears while the controller is clearing memory. When memory is cleared, the display returns to the *Program Menu*.

or CANCEL ESCAPE **Aborts mode 7 without clearing memory.**
Display returns to the *Program Menu.*

8 = PRINT DATA

This mode permits printing the current formulas, configure codes, chemical names, and step names (see FIGURE 4) on a printer that meets the requirements explained in "REQUIREMENTS AND SETTINGS FOR THE EPSON LX300 PRINTER" (see Table of Contents). The printer is connected to the machine through the Printer/Download socket. A mating plug is provided with the machine for wiring the printer interface cable. See "THE EXTERNAL SERIAL LINK CABLES. . .".

```
PROGRAM 8 MENU
  PRINT DATA
```

When the *Program Menu* and *mode 8, Print Data* is displayed,

ENTER/NEXT **Accesses *mode 8*** and prompts for the type of data to print.

For a Quick Return to the Program Menu

CANCEL/ESCAPE **Aborts *mode 8* any time prior to the start of printing and returns to the *Program Menu*.**

```
PRINT DATA
0 FORMULAS.....
1 CONFIGURATION.....
2 CHEMICAL NAMES.....
3 STEP NAMES.....
```

When this display appears, select the type of data to print from the choices shown.

0 FORMULAS..... Prints formulas 00, 99, and the range of formulas specified below.

1 CONFIGURATION..... Prints the configure codes.

2 CHEMICAL NAMES..... Prints the 64 field-programmable chemical names.

3 STEP NAMES..... Prints the 15 field-programmable step names.

↑ or ↓ **Scrolls the choices**

ENTER/NEXT **Accepts the selected choice and prompts for today's date.**

```
DATE:  MM - DD - YYYY
       mm - dd - yyyy
```

When configure decision A=0

When configure decision A=1

```
DATE:  DD - MM - YYYY
       dd - mm - yyyy
```

This display permits entering today's date, which will appear on the printout. *mm*, *dd*, and *yyyy* are numbers representing month, day, and year, respectively. Note that month/day or day/month order depends on *configure decision A*. The date is retained (in unprotected memory) for about 48 hours with power *off*.

<mm> or <dd> or <yyyy> enters a value at the indicated cursor location, where <mm> is a number from 01 to 12, representing the month, <dd> is a number from 01 to 31 representing the day, and <yyyy> is a number representing the year (e.g., 1993).

ENTER/NEXT **Accepts the displayed value and advances to next field or decision.**

```
START          STOP
  xx            yy
```

This display only appears if *Formulas* was selected above. Formulas 00 and 99 are always printed. Enter the range of additional formulas to be printed, where *xx* is the starting formula and *yy* is the ending formula, inclusive.

<xx>, ENTER/NEXT **Enters the lowest formula number**, where <xx> is greater than 00 and less than or equal to <yy>.

<yy>, ENTER/NEXT **Enters the highest formula number**, where <yy> is greater than or equal to <xx> and less than 99. Printing begins.

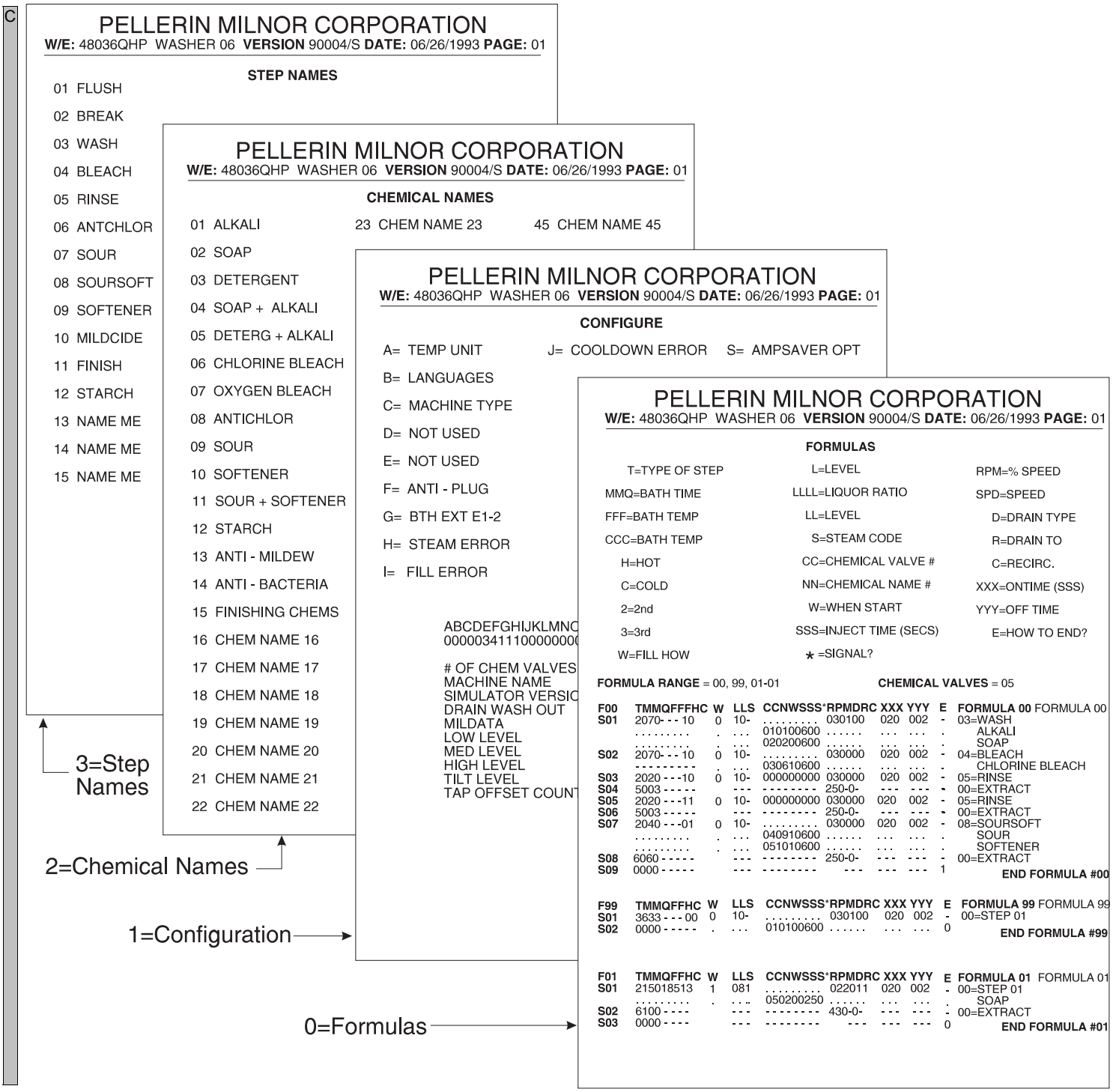


FIGURE 4 (MSOP0234BE)
Example Printouts Using *Mode 8, Print Data*

```
PRINTING . . . .
**  PLEASE WAIT  **
```

During printing, this display appears. When printing is concluded, the display returns to the *Program Menu.*

Section 3

Operating

OPERATING MARK II, III, IV, AND V 100 FORMULA, SINGLE MOTOR WASHER-EXTRACTORS

B C

This section provides information about 100 formula, single motor washer-extractors to assist management personnel in establishing procedures and training operators.

Procedures Used in Normal Operation

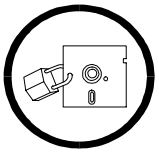
Fold out the "Summary of Operation" at the end of this section and use the "OPR" numbers to cross-reference the operating steps *for your machine* with the procedures explained below.

Fold out FIGURE 1 in "ABOUT THE USER CONTROLS . . ." (see Table of Contents) for the meaning of display and key symbols used in this section.

See the "Description of Controls . . ." in the operator manual for the nameplate symbols used to identify the controls (switches, buttons, status lights) mentioned in these explanations.

OPR 1: Verify Switch Positions—The machine must be in the *run mode* for operation. Verify that the *Run/Program keyswitch* is set to run and if not, consult management.

⚠ CAUTION ⚠



DATA LOSS HAZARD—Improper use of the *Program/Run keyswitch* may corrupt program data.

- **Return to the run mode only when the display says *OK Turn Key To Run.***
- **Only power off or on with the Program/Run keyswitch at *run*.**
- **Do not leave key accessible to unauthorized personnel.**

C

Mildata—100 formula, single motor machines may link to a *Mildata computer* which permits a bank of machines to download formulas from and provide accounting and other data to the Mildata computer. Set the *Remote/Local switch* to *remote* to place a washer-extractor on-line. When on-line, each time the operator selects a formula, the controller requests the selected formula from Mildata. For example, if the operator selects *formula 0005*, the machine receives and runs whatever formula is currently associated with that formula number in the Mildata computer. When operating on line, the machine displays the message *Please Wait*, while it is requesting and downloading the formula from the Mildata computer. To take the machine off-line, set the *Remote/Local switch* to *local*. The machine will then run the selected formula stored in the machine's formula memory.

OPR 2: Energize the Microprocessor Controller—The external disconnect switch (furnished by the owner/user) provides/removes *all* power to/from the machine (but not necessarily to/from non-Milnor electrical devices mounted to the machine). The *Master switch* provides/removes power to/from the controller.

⚠ DANGER ⚠

ELECTROCUTION AND ELECTRICAL BURN HAZARDS—Contact with high voltage will electrocute or burn you. Power switches on the machine and the control box do not eliminate these hazards. High voltage is present at the machine unless the external disconnect switch is off.

- ☞ **Do not unlock or open electric box doors.**
- ☞ **Do not remove guards, covers or panels.**
- ☞ **Do not reach into the machine housing or frame.**
- ☞ **Keep yourself and others off of machine.**
- ☞ **Know the location of the external disconnect switch and use it in an emergency to remove all electric power from the machine.**

To power-up the machine, verify that all utilities (electricity, water, air, and steam) and chemicals are on, set the *Master switch* to *on*, and view the start-up displays, as follows:

`COPYRIGHT PELLERIN MILNOR 1994`	Copyright statement (may repeat).
`ALL RIGHTS RESERVED 'OUTERWEAR '94003/S`	Example software date code/language version (/S indicates English/Spanish version).
`FORMULA CHECK SUM 02C8`	The checksum changes with any programming changes. Record the check-sum after each programming session, to protect against unauthorized programming.

C
D

On Staph-Guard type machines, the Soil Side light ( ) illuminates at this time.

OPR 4A: Open/Close Soil Door—Hold the Autospot button (+) and Unlock Door button ( ) simultaneously until the display says *Autospotting Is Completed* and the operator signal sounds. The soil cylinder door will be aligned with the soil shell door. Release the buttons. Hold the Unlock door button ( ) until the locks release (7 second delay) and open the outer door.

Open the cylinder door as follows:

1. Push the uppermost latches toward the door with your thumbs while holding the handle (see Figure 3). The latches will release the door and cause it to drop down.

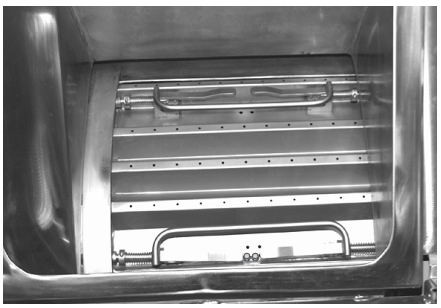


FIGURE 1 (MSOP0268AE)
View of Cylinder Door from Side of Machine

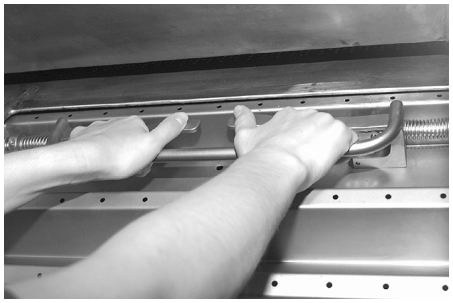


FIGURE 2 (MSOP0268AE)
Correct Hand Position for Releasing Top Door Locks

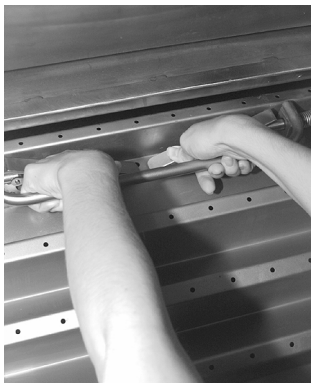


FIGURE 3 (MSOP0268AE)
Releasing Top Door Locks

2. Push the lowermost latches toward the door and release once the handles have been secured behind the retainer bolts (see FIGURE 4).

3. When both upper and lower door locks are unlocked, close the outer door. Hold the Autospot button (+)and Unlock door button ( ) simultaneously. Do not be startled by the loud "bang" that occurs during Autospot. When the display says *Autospotting Is Completed* and the operator signal sounds, release the buttons. The inner door will be open. Hold the Unlock door button ( ) until the locks release (7 second delay) and open the outer door.

FIGURE 4 (MSOP0268AE)
Release the Bottom Door Locks

4. Open the outer door and ensure the inner door is locked in the open position by pulling the exposed handle.

⚠ WARNING ⚠

CRUSH HAZARD—Falling door can crush hands or arms.

☞ **Do not place hands or arms into door opening before ensuring the door is locked in the open position.**

FIGURE 5 (MSOP0268AE)
Partially Open Door

FIGURE 6 (MSOP0268AE)
Pull Top Handle Up

To close the door after loading:

1. Push the revealed latches toward the door while holding the handle to unlock the door (see FIGURE 5).
2. Using the handle, pull the door downward until the lowermost handle is in the original position and the door is closed.
3. Pull the uppermost handle up and away from the machine (toward yourself) until it latches into place (see FIGURE 6).
4. Close the outer door. Resume operation.

C **OPR 4B: Open/Close Shell Door**—Machine power must be on to open the door. Safeguards prevent the door from being opened during, and immediately after, manually terminating a cycle. These safeguards are for the operator's protection. Never attempt to bypass them, nor operate the machine if there is any evidence of malfunctioning safeguards.

⚠ DANGER ⚠

CRUSH, ENTANGLE AND SEVER HAZARDS—Contact with the turning cylinder can crush your limbs. Contact with the goods being processed can cause the goods to wrap around your body or limbs and dismember you. The turning cylinder and goods are normally isolated by the locked cylinder door.

- ☞ **Do not attempt to open the door or reach into the cylinder until the cylinder is stopped.**
- ☞ **Do not operate the machine with a malfunctioning door interlock.**
- ☞ **Do not touch goods inside or hanging partially outside the turning cylinder.**

C On Staph-Guard style machines, return control to the clean side by pressing after unloading the machine and closing the door.

C **OPR 5: Compose the Load and Load the Machine**—The operator is responsible for maintaining proper *load size*, as explained in "DETERMINING LOAD SIZE" (see Table of Contents).

Effective centrifugal extraction (drawing the water from the goods by spinning the cylinder) depends on proper distribution in the cylinder. If the machine cannot adequately distribute the goods, it will be out of balance and its vibration safety devices will prevent it from achieving normal extract speed. The knowledgeable operator can minimize severe imbalances and intervene to correct those that occur.

Open pocket models distribute the load by turning the cylinder at drain (distribution) speed, just prior to extract. Drain speed is just fast enough to hold the goods against the cylinder, but slow enough to permit the goods to spread out as they pass through the draining bath.

If goods do not spread out sufficiently and a severe imbalance occurs, the machine will return to wash speed and attempt to redistribute the goods (extract recycle). Persistent recycles waste time and energy, and usually indicate a need for operator intervention. If goods are netted or tangled, distribution may not be possible. Observe the machine during extract and if necessary, stop the machine and untangle the goods.

C **OPR 6: Add Chemicals**—A washer-extractor may be equipped with a five-compartment supply injector, a pumped chemical system by others, or a central liquid supply system (chemical inlet valve supplied by Milnor®, chemical storage and delivery system by others). If the machine has a supply injector, the operator adds measured quantities of chemicals to the appropriate compartments as required for each load. This is normally done before starting the cycle, but may also be done during the cycle (see OPR 8C), if required by the formula. Management personnel who determine the formulas, must instruct the operator as to chemical type, quantity, and location (supply injector pocket to load) for each formula. See "USING THE FLUSHING TYPE AUTOMATIC SUPPLY INJECTOR" for more information. If a pumped chemical or central liquid supply system is used, observe this system periodically to ensure that chemicals are automatically delivered to the machine when called for.

OPR 7: Select a Formula—The machine can contain up to 98 field-programmed (local) wash formulas. The machine also contains two permanent formulas: *formula 00*, used to commission a new machine (explained below) and *formula 99*, used to develop new formulas (explained in "MODIFYING FORMULAS . . ."). The machine may also be connected to a Mildata computer providing access to up to 1000 (remote) formulas. With Mildata, the operator selects either a formula, a work order, or a goods code (as configured), then enters cake data. Cake data is the set of batch codes assigned to each load to identify it. It is preferable to select the formula just before starting the cycle.

Select a *local* formula when the machine *is not* on-line to Mildata as follows:

```
RUN FORMULA
00 OR OK POWER OFF
```

When the *Run Formula menu* is displayed as shown at left,

<xx> **selects formula,** where <xx> is a two digit number from 01 to 98. The formula name and number appear if a valid formula was selected. *Does Not Exist* appears for a non-existent formula. A valid formula sounds the operator signal, if the shell door is closed.

or ⬆ / ⬇ **Scrolls the available formula numbers.**

Select a *remote* formula, work order, or goods code and enter cake data when on-line to Mildata as follows:

```
REMOTE FORMULA 000
W/ORDER 0000000000
GOODS CODE 0000
```

When one of the prompts shown at left appears,

<response> **Selects formula, work order, or goods code**, where <response> is a four, ten, or five digit number, respectively. Cannot scroll.

ENTER NEXT **Accepts the value entered above.**

```
CUSTOMER CODE
_ - - - - - - - - - - -
```

Maximum Number of Characters
Alphanumeric or Numeric

Batch Code	↓	↓
Customer Code	A	10
Employee Number	A	5
Weight	N	3
Pieces	N	4
Lot Number	A	10

When each prompt shown at left appears,

<response> **Enters the requested batch code** where <response> is the number or alpha characters described at left. Codes are determined locally.

ENTER NEXT

- **After each code, accepts entered value and prompts for next code.**
- **After the last batch code, downloads the formula from Mildata®.** Formula name and number appear if valid data was entered. "INVALID FORM DATA" (or similar) appears for any invalid data.
- **After formula is downloaded, displays and permits changing each code previously entered.**

Select Formula 00 to commission a new machine.—*Formula 00* (see FIGURE 1) is similar to a medium soil formula. Because it may not take advantage of supplied options, it is only intended to help commission a new machine. It will run on any machine with two water valves to test the following:

- Filling to levels 2 and 3.
- Hot, cold, and split water (or cold, 2nd, and cold+2nd, if cold only). No temperatures are commanded.
- 60 second chemical injections from valves 01 through 05.
- Wash reversing, intermediate extract, and final extract.
- Draining to sewer. The first drain is at wash speed and all others are at distribution speed.

NOTE 1: *Formula 00* is available provided the machine is *not* on-line to Mildata.

NOTE 2: Even if the password is enabled, the controller permits modifying *formula 00* (see "MANUAL FORMULA MODIFICATIONS...") without the password. However, *formula 00* cannot be copied, deleted, or *permanently* changed.

F00	TMMQFFFHC	LLLLS	CCNWSSS*	D	E	**FORMULA 00** FORMULA 00
S01	2070- - - 10	2 -	. . . . .	1	-	03=WASH
	. . . . .	. . . . .	010100600	.	.	ALKALI
	. . . . .	. . . . .	020200600	.	.	SOAP
S02	2070- - - 10	2 -	. . . . .	0	-	04=BLEACH
	- - - - - - - - -	. . . . .	030610600	.	.	CHLORINE BLEACH
S03	2020 - - -10	3 -	000000000	0	-	05=RINSE
S04	5003 - - - - -	- -	- - - - - - - - -	-	-	00=EXTRACT
S05	2020 - - -11	3 -	000000000	0	-	05=RINSE
S06	5003 - - - - -	- -	- - - - - - - - -	-	-	00=EXTRACT
S07	2040 - - -01	3 -	. . . . .	0	-	08=SOURSOFT
	. . . . .	. . . . .	040910600	.	.	SOUR
	. . . . .	. . . . .	051010600	.	.	SOFTENER
S08	6060 - - - - -	- -	- - - - - - - - -	-	-	00=EXTRACT
S09	0000 - - - - -	- -	- - - - - - - - -	-	1	**END FORMULA #00**

FIGURE 7 (MSOP0268AE)
Printout of Formula 00 (used to commission a machine)

RUN FORMULA 00 OR OK POWER OFF
RUN FORMULA 00 FORMULA 00

When the *Run Formula menu* and selection *00* is displayed as shown at left,

ENTER/NEXT — **Accesses *formula 00*.**

① — **Silences the operator signal and starts the process** (see OPR 7).

or CANCEL/ESCAPE — **Cancels *formula 00* access.**

OPR 8: Start/Stop the Cycle—The *Start button* (①) starts processing and the *Stop button* (⓪) stops processing, as further explained below.

Spring-Mounted Models—On these models, the shell is permitted to vibrate within the frame during the entire cycle.

⚠ WARNING ⚠

CRUSH HAZARD—Machine can crush body parts caught in gaps around shell front and at rear of machine that close due to vibration and tilting.

☞ **Keep clear of moving parts.**

When the machine loaded, the door is closed, and the supply injector (if any) is charged with chemicals, start processing as follows:

RUN FORMULA 08 SHEETS

With a valid wash formula displayed as in the example at left,

① — **Starts the cycle and silences the operator signal.** Various displays appear so operator can monitor the formula in progress (FIGURE 4).

A wash cycle can be stopped then either resumed or cancelled (OPR 8A). The cycle can also be resumed after a power interruption (OPR 8B), because the controller remembers the step it was in. If a supply injector is used and the formula in progress requires additional chemicals, the operator signal sounds, the timer stops, and the display shows which chemical(s) to add (OPR 8C). When the cycle ends, a signal and display message alert the operator (OPR 9).

OPR 8A—If necessary, stop, then either resume or cancel the wash formula in progress as follows:

⓪ **Disables the three-wire circuit,** immediately stopping all machine functions and displaying an error message. If this is a bath, water, chemical, and steam valves close and the drain opens, draining the machine. (See "MANUAL FORMULA MODIFICATIONS . . ." for how to stop the formula timer without draining the machine.)

```
3 WIRE DISABLED
FAULT: SEE MANUAL
```

CANCEL ESCAPE **Cancels the formula.** Display returns to the *Run Formula menu.*

or ① **Resumes the formula *where the count left off* in the interrupted step**, as stipulated in the note below.

NOTE: How the machine recovers depends on whether the interruption occurred during a *bath, drain,* or *extract*.

- Bath—machine achieves level and temperature again, even if these were already achieved before the interruption. (If the machine is configured for *metered water*, the control prompts "REFILL WITH WATER?" Answer *yes* to inject the commanded quantity or *no* for no water.)
- Drain—the drain duration will be repeated.
- Extract—the machine will perform an extract recycle.

OPR 8B—When power is restored after a power loss, resume or cancel the interrupted formula as follows:

```
NEXT TO RESTART AT
Fxxxx Syy
```

When the display at left appears, where *xxxx* and *yy* are the interrupted formula/step,

ENTER NEXT **Confirms that the formula will be resumed,**

or CANCEL ESCAPE **Cancels the formula** and returns to *Run Formula menu*. Enter the password if requested (otherwise, resume the formula).

```
PRESS START
```

When the display at left appears,

① **Resumes the formula *at the beginning* of the interrupted step**, as stipulated ① in the note in OPR8A.

OPR 8C—Respond to the operator signal to add supplies as follows:

1. Read the display to determine chemical(s) to be added.
2. Load the supply compartment(s), add through soap chute, or flush manually as instructed locally. To flush supplies manually, load *compartment one* and hold the *Flush/Spray switch* to *manual flush*.
3. Press the *Signal Cancel button*. If a *signal only* was commanded, processing resumes immediately. If a *signal with chemical* was commanded, the supply compartment is flushed for the commanded time.

OPR 9: Respond to the end-of-cycle signal

```
message
PLEASE UNLOAD ME
```

When the display at left appears, where *message* describes cylinder motion,

CANCEL ESCAPE **or** ⓪ **Silences the signal and completes the cycle, except as follows:**
If *message* = "break cake," cylinder motions continue until completed.
If *message* = "tumbling," the operator can open the door to pull down any plastered goods. After closing the door again,

① Resumes "tumbling" for two minutes.

OPR 10: Jog the Cylinder to loosen the goods—Jogging (briefly turning the cylinder with the door open) is controlled by the operator and should be performed to loosen the goods before unloading the machine.

⚠ DANGER ⚠

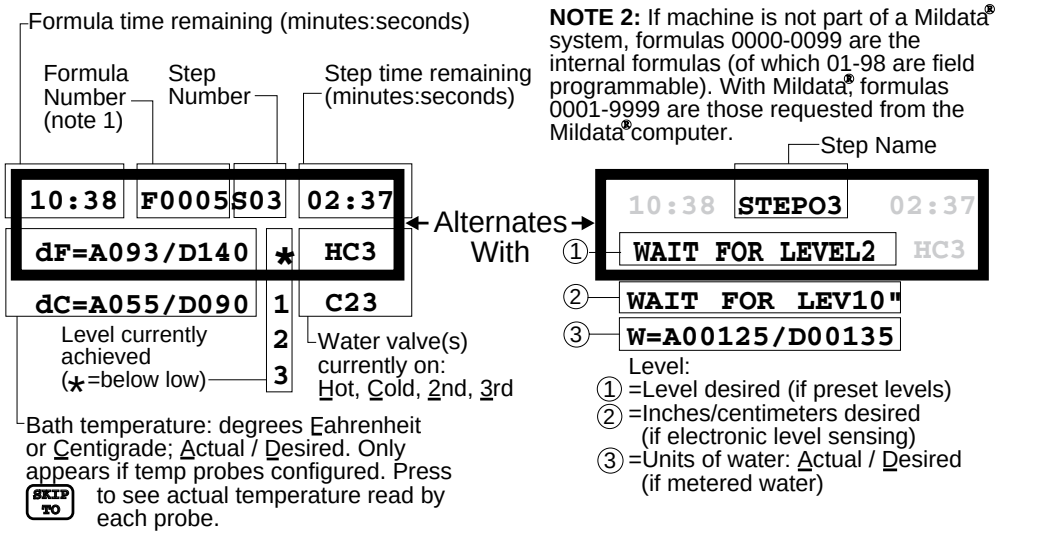
CRUSH HAZARDS—Contact with the turning cylinder can crush your limbs.

- ☞ **Keep yourself and others clear of cylinder and goods during jogging operation.**
- ☞ **Keep both hands on the controls while operating.**
- ☞ **Do not operate the machine with malfunctioning manual two-hand controls.**

To jog the cylinder, simultaneously hold the *Start button* (①) and hold the *Jog switch* to either position (clockwise (↻) or counter-clockwise (↺) as desired). The cylinder turns until buttons are released.

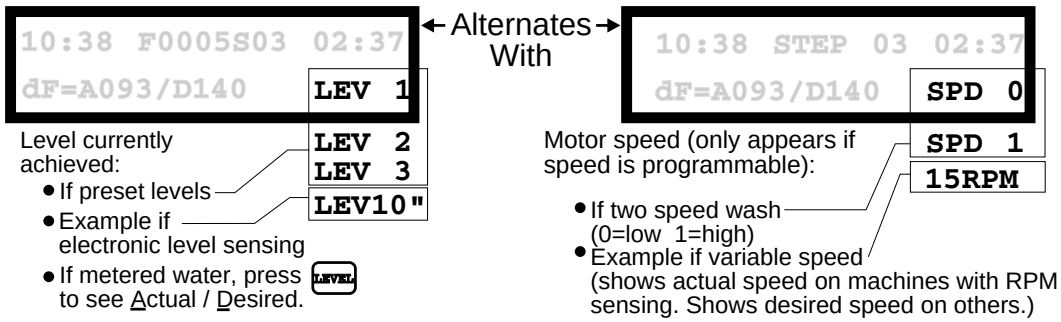
NOTE 1: Where data on the display is shown shaded, this information was explained on another display.

Bath Displays Before Level Satisfied—No Chemicals Actuated
(see NOTE 2)

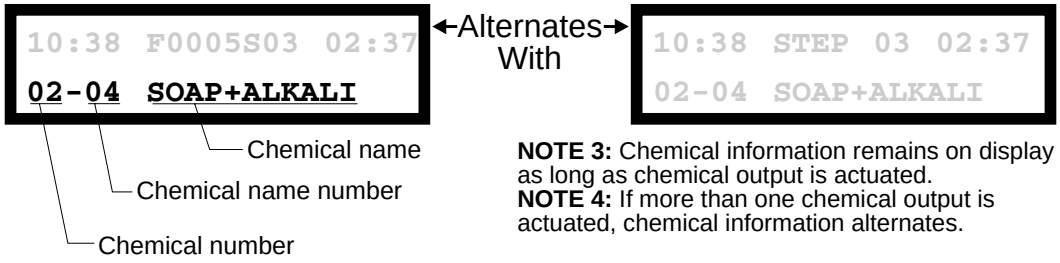


NOTE 2: If machine is not part of a Mildata® system, formulas 0000-0099 are the internal formulas (of which 01-98 are field programmable). With Mildata® formulas 0001-9999 are those requested from the Mildata® computer.

Bath Displays After Level Satisfied—No Chemicals Actuated

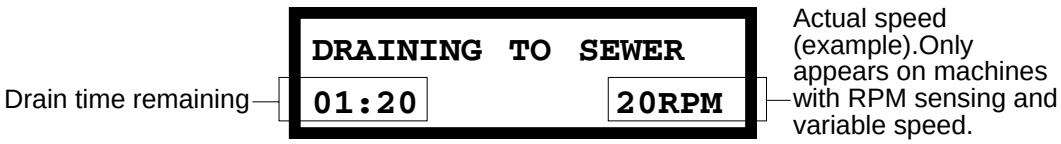


Bath Displays—Chemicals or Signal Actuated
(see NOTES 3 and 4)



NOTE 3: Chemical information remains on display as long as chemical output is actuated.
NOTE 4: If more than one chemical output is actuated, chemical information alternates.

Drain Display



Extract Displays

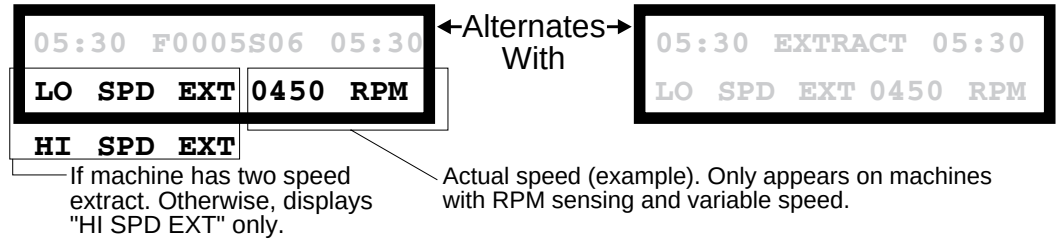


FIGURE 2 (MSOP0268AE)
Displays While Running a Wash Cycle

Summary of Operation

The operator actions listed here correspond to the headings in “Normal Operation . . .” in the operator manual.

Start the Operating Day

Be safe. Comply with all safety instructions.

Verify switch positions (OPR 1).

Energize microprocessor controller (OPR 2).

Run the Wash Cycle

Outerwear Models (FxW)	Staph-Guard Models (FxS)
Compose the load (OPR 5).	Compose the load. (OPR 5)
Load the machine (OPR 5).	Open the soil side doors. (OPR 4A)
Close the door (OPR 4B).	Load the machine. (OPR 5)
Add chemicals, if required (OPR 6).	Close the soil side doors. (OPR 4A)
Select a formula (OPR 7).	Add chemicals, if required. (OPR 6)
Start the cycle (OPR 8).	Select a formula. (OPR 7)
Respond to the end of cycle (OPR 9).	Start the cycle. (OPR 8)
Open the door (OPR 4B).	Respond to end of cycle. (OPR 9)
Jog to loosen the goods (OPR 10).	Open clean side door. (OPR 4B)
Unload the machine.	Unload the machine.
	Close the clean side door. (OPR 4B)
	Transfer control to the soil side. (OPR 4B)

Monitor Normal Operation—See FIGURE 4.

USING THE FIVE-COMPARTMENT FLUSHING SUPPLY INJECTOR

Five-compartment supply injectors are optional on most rigid washer-extractor models and standard on most suspended models. FIGURE 1 depicts the supply injector used on 75-135 lb. capacity models. Injectors on other models vary in appearance but not in function.

General Guidelines

Compartments 1 and 2 are intended for dry chemicals (e.g., soap, alkali) which may be placed directly into the compartment.

Compartments 3, 4, and 5 may be used for liquid or dry chemicals (e.g., bleach, sour, softener) and are furnished with plastic cups. Liquid chemicals are recommended because they are more easily measured and diluted. When dry chemicals are to be injected from cups, drill a 1/8" (3mm) diameter hole just above the base of the cup to allow it to drain automatically.

Restrict starch to compartment 5, if possible.

NOTE: All machines are furnished with a soap chute which may be used to manually inject chemicals directly into the cylinder at any time.

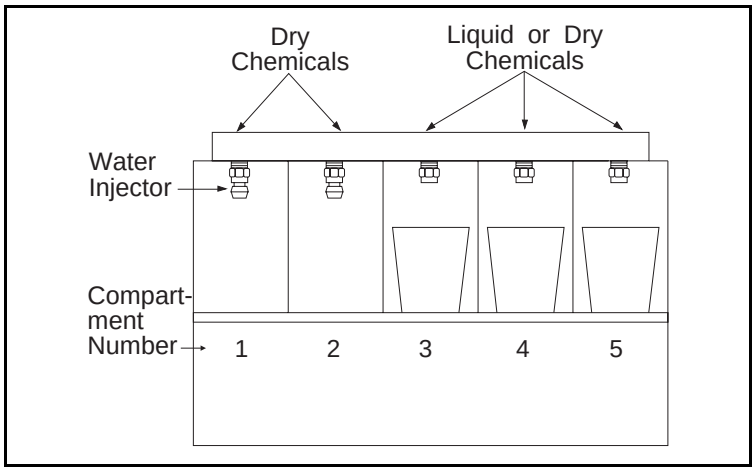
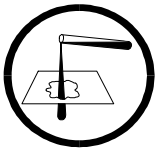


FIGURE 1 (MSOP0207AE)
Five-Compartment Flushing Supply Injector for 75-135 Pound Washer-Extractors (Injectors for Other Machines Similar)

⚠ CAUTION ⚠



MACHINE DAMAGE HAZARD—Stainless steel surfaces can corrode if chemicals (e.g., bleach) dry on them, leaving residue. Rubber and plastic components (other than plastic cups) can deteriorate from exposure to chemical concentrates.

☞ **Keep surfaces clean.**

Operator Guidelines

Load Chemicals According to Formula Instructions

For System 7 (non-programmable) controllers, refer to the wash formula descriptions for chemical loading instructions (which chemicals to preload into which pockets).

For E-P Plus or Mark II, III, IV, and V controllers, refer to the wash formula descriptions for any fixed (factory-supplied) formulas employed. For field-programmed formulas, refer to instructions prepared locally. B

Load the supply injector before starting a cycle. Each chemical is automatically *flushed* into the washer at the proper moment. If supply compartments need to be re-loaded during the cycle, the operator signal and a display message will alert you.

Protect Against Corrosion Damage

- When loading compartment 3, 4, or 5, place chemical into cup and direct flushing water into it. Do not place chemical directly into the compartment. This is especially true for dry bleach.
- Avoid spilling any chemically active concentrate directly onto machine surfaces.
- Spray all supply compartments with water at the end of each day's production.
- Carefully clean away any rust from the supply injector at least once a week.
- Notify management if injection water does not completely flush chemicals into the machine, or if machine components corrode.

Some washer-extractors are equipped with a *Manual Flush switch* and/or spray hose shown in FIGURE 2.

- Hold the switch at *Manual Flush*, to flush the contents of the first compartment into the basket.
- Hold the switch at *Spray* and use the hose to assist chemicals into the cylinder and to clean the supply injector at the end of the day.

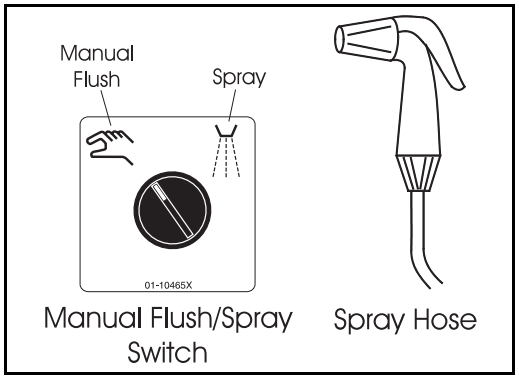


FIGURE 2 (MSOP0207AE)
Manual Flush/Spray Switch and Spray Hose

Formula Development Guidelines

Protect Against Corrosion Damage

- Verify that chemical injection durations ensure complete flushing. It is recommended to extend injections 30 seconds beyond the required time, for safety.
- If surface deterioration persists, check for intermittent low water pressure. If dry bleach is used, try changing the brand of bleach.

Determine Bleach Quantity and Concentration—The supply cups are large enough to contain all the chemicals required for a given bath. For bleaching, however, a concentration higher than 1% may be required. For the normal practice of 64 ounces (1893 ml) of 1% solution per 100 pounds (45 kg) of goods, use the quantities and concentrations shown in the table at right. These may be used with complete confidence since the diluting action of the supply injector will reduce the actual strength of the bleach to less than 1% prior to injection.

Washer Capacity pounds (kg)	Bleach Quantity and Concentration ounces (ml)
35 (15.9)	6 ounces (177) of 4%
50 (22.7)	8 ounces (237) of 4%
55 (24.9)	9 ounces (266) of 4%
60 (27.2)	10 ounces (296) of 4%
75 (34.0)	12 ounces (355) of 4%
90 (40.8)	14 ounces (414) of 4%
125 (56.7)	15 ounces (444) of 4%
135 (61.2)	16 ounces (473) of 4%
200 (90.7)	16 ounces (473) of 8%
250 (113.4)	20 ounces (591) of 8%
300 (136.1)	24 ounces (710) of 8%
450 (204.1)	36 ounces (1065) of 8%
700 (317.5)	56 ounces (1656) of 8%

Determine the Type of Starch—The supply injector is normally connected to a source of hot water. However, some types of dry starch may require cold water to prevent them from becoming too "gooey." If you have difficulty injecting dry starch automatically, the supply injector can be modified to flush one compartment with cold water. Consult the Milnor® factory for more information.

MODIFYING FORMULAS IN PROGRESS

The operator can manually override certain programmed values (e.g., commanded bath temperature) and invoke certain functions (e.g., chemical injection) on the Mark II, III, IV, and V microprocessor washer-extractor and FxW controllers, *while a formula is in progress.* This can be done either 1) one action at a time, with the formula running (*method A*), or 2) one *or more* actions simultaneously, with the formula temporarily suspended, using the *manual mode* (*method B*). *Method A* applies to baths, drains, and extracts. *Method B* only applies to baths. Certain actions are exclusive to each method. B

If a password is not enabled (*configure decision X*), both methods are available to anyone. If a password is enabled, both methods are password-protected.

Method A: Individual Modifications With the Formula Running

Method A: General Procedure

```
10:38 F0005S03 02:37
dF=A093/D140 LEV2
```

When a formula is running and a run display such as the example at left appears,

<command> **Either 1) causes the commanded action to occur or 2) prompts for the password**, where <command> is the key or key combination explained in "Method A: Actions Available. . ." below.

```
ENTER PASSWORD :
```

If the display shown at left appears,

<password> **Enters the password**, where <password> is the four digit numerical pass code configured. The initial command that prompted the password must be re-entered; however, the controller will permit several actions to be performed after entering <password>, provided the key strokes are no more than ten seconds apart.The *Start button* (①) and *Stop button* (⓪) are not password-protected.

```
INVALID PASSWORD :
```

If the display shown at left appears, an invalid or no password was entered. Repeat <command>, <password>, <command> with the valid password.

Method A: Actions Available During Wash, Drain, and Extract—The following actions (other than manually stopping and starting the timer) can be invoked with the formula timer stopped or running.

TIMER STOP **Stops the formula timer.** Any functions in progress continue.

CANCEL ESCAPE **Resumes timing if the timer is stopped.**

⓪ **Stops the formula in progress.** Any functions in progress, cease. ① resumes the formula.

⓪ , CANCEL ESCAPE **Cancels the formula in progress.** Formula cannot be resumed.

EXTEND HELP **Extends a bath or extract in progress one minute** (repeat for each additional minute).
Extends a drain in progress ten seconds (repeat for each additional ten seconds).

CANCEL ESCAPE **Cancels a bath, a drain proceeding a bath, or an extract in progress, and proceeds to the next step.** This action will not cancel a drain proceeding an extract.

Method A: Actions Available During Wash Only

(WASH MOTOR SPEED) + ↑ / ↓ — **Increases/decreases basket speed** (if so equipped). If machine has *two speed wash*, during a bath, this action moves the commanded speed between 0 (normal) and 1 (low). If the machine is equipped with *variable speed*, this action increases/decreases the RPMs (if speed is programmed in RPMs), or increases/decreases the percent of normal speed (if speed is programmed in percent). The display skews approximately two units per second.

(LEVEL) + ↑ / ↓ — **Raises/lowers the *commanded* level.** If the machine is configured for *preset levels*, this action moves *commanded* level between 1 (below low level), 2 (low level), and 3 (high level). If levels are programmed in inches/centimeters, this action increases/decreases the inches/centimeters *commanded*, within the allowable limits configured. This action is unavailable on machines with *metered water*.

If level was previously achieved, the display only shows *actual* level, not *commanded* level. When commanded level is raised, the controller injects water using the water valves/thermo-modulation commanded for this bath in the formula. Lowering the commanded level has the following limitations: 1) the controller will not permit lowering the *commanded level in a bath preceeding an extract and 2) the machine will not respond by draining, but it will remain at a lower level if the higher commanded level was not achieved.*

(ENTER NEXT) + ↑ / ↓ — **Raises/lowers *commanded* bath temperature** (if so equipped). A higher *commanded* temperature can be achieved by thermo-modulation or steaming if conditions permit. The machine can only achieve a lower commanded temperature by thermo-modulation and only if the commanded level is not yet achieved.

hold (CHEM) + <x> — **Injects a chemical** (from Chem 1 to Chem 8, if so equipped) any time during a bath (without consideration for level/temperature achieved), as long as keys are held depressed. <x> is the chemical number from 1 to 8. Injection continues for one second after keys are released.

hold (CHEM) + (0) + <y> — **Injects a chemical** (from chem 9 to chem 15, if so equipped) any time during a bath (without consideration for level/temperature achieved) as long as keys are held depressed. <y> is the number from 1 to 7, indicated by the table at right.

<y>	Chemical
1	9
2	10
3	11
4	12
5	13
6	14
7	15

hold (CHEM) + ↓ — **Flushes the supply injector manifold** (if so equipped) as long as keys are held depressed.

Method B: Multiple Modifications With the Formula Temporarily Suspended Using Manual Mode (accessible during baths only)

Method B: General Procedure

```
10:38 F0005S03 02:37
dF=A093/D140 LEV2
```

When a formula is running and a run display such as the example at left appears,

MANUAL — **Either 1) places the machine in *manual mode* or 2) prompts for the password.** In *manual mode*, the timer stops, all water/steam/chemical valves close, and the *manual mode* display appears.

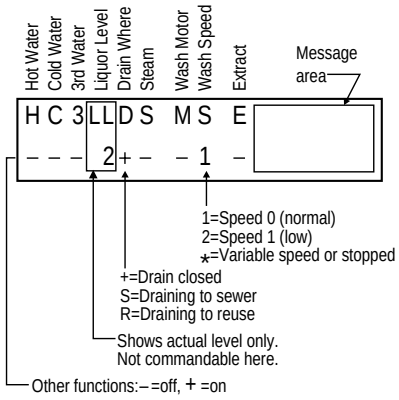
```
ENTER PASSWORD :
```

If the display shown at left appears,

<password> **Enters the password**, where <password> is the four digit numerical pass code configured. Press MANUAL within ten seconds after entering <password>.

```
INVALID PASSWORD :
```

If the display shown at left appears, an invalid or no password was entered. Repeat MANUAL, <password>, MANUAL with the valid password.



When the *manual mode* display appears, (alternating with the normal run displays) as shown at left,

<command> **Causes the commanded action to occur**, where <command> is the key or key combination explained in "Method B: Actions Available" below.

CANCEL ESCAPE — **Turns off any action currently invoked.**

CANCEL ESCAPE — **Exits *manual mode* (resumes timing and normal run displays) if all manual actions were cancelled**. Any chemical injections that were interrupted will not be resumed.

Method B: Actions Available—The following actions can be invoked in the *manual mode*. Any one *or more* actions invoked by the following commands, except for those that require holding the keys depressed, will be terminated with CANCEL ESCAPE.

HOT H_2O — **Injects hot water** (if so equipped). Water valve closes at level 3. Hold key depressed for more water.

COLD H_2O — **Injects cold water.** Water valve closes at level 3. Hold key depressed for more water.

THIRD H_2O — **Injects third water** (if so equipped). Water valve closes at level 3. Hold key depressed for more water.

COOL DOWN — **Closes steam/water valves, displays *cooldown* message, and injects cooldown water** (if so equipped).

STEAM — **Injects steam** (if so equipped and level 1 is satisfied). Steam valve closes once bath temperature reaches 270°F (27°C). Hold key depressed for more steam.

SEWER **Closes water/steam/chemical valves, disables reuse drain (if equipped), and drains bath to sewer.**

REUSE **Disables sewer drain, closes water/steam/chemical valves, and drains bath to reuse (if so equipped).**

WASH MOTOR ON/OFF **Turns the wash motor on.** Motor starts with a delay, but powers off instantly with brake not applied.

WASH MOTOR SPEED **Displays basket speed (if equipped with two-speed or variable speed wash).**

WASH MOTOR SPEED + ↑ / ↓ **Increases/decreases basket speed** as explained in *method A.*

EXTRACT + SEWER **If level 2 is satisfied, drains to sewer and either 1) accelerates to extract speed, or 2) prompts for an extract speed** (if two-speed extract).

EXTRACT + REUSE **If level 2 is satisfied, drains to reuse (if so equipped) and either 1) accelerates to extract speed, or 2) prompts for an extract speed** (if two-speed extract).

```
HC3LLDS MS E EXTRACT
---02*- -* - 0=L 1=H
```

If the extract speed prompt shown in the message area of the *manual mode display* at left appears,

<x> **Accelerates to the commanded extract speed if level 2 is satisfied,** where <x> is 0 (low extract) or 1 (high extract).

hold CHEM + **<x>** **Injects a chemical** (from chem 1 to chem 8, if so equipped) as long as keys are held depressed, where <x> is the chemical number.

hold CHEM + 0 + **<y>** **Injects a chemical** (from chem 9 through chem 15, if so equipped), where <y> is the number from 1 through 7 indicated by the table at right.

<y>	Chemical
1	9
2	10
3	11
4	12
5	13
6	14
7	15

hold CHEM + ↓ **Flushes the supply injector manifold** (if so equipped) as long as the keys are held depressed.

Using Formula 99 to Develop/Test a New Formula

Formula 99 is a 63.75 minute bath with no water or any other functions and with the cylinder stopped. To develop/test a process without programming a new formula, run *Formula 99* and use the "Method B" procedures described herein.

NOTE 1: *Formula 99* is available provided the machine is not on line to Mildata®.

NOTE 2: Even if the password is enabled, the controller permits modifying *Formula 99* without the password. However, *Formula 99* cannot be copied, deleted, or permanently changed.

Section 4

Troubleshooting

100 FORMULA, SINGLE MOTOR WASHER-EXTRACTOR ERROR MESSAGES

Errors at Power-Up (or Power Restoration)

Memory Errors—These errors occur when field data stored in the microprocessor's memory becomes unreliable as a result of: 1) a power loss while the controller is in a *program mode*, 2) improper use of the *Run/Program keyswitch*, 3) a loss of back-up power to microprocessor components, or 4) a power surge at power-up. The risk of these errors occurring is minimized and data restoration is simplified if the precautions in "IMPORTANT OWNER/USER INFORMATION . . ." (see Table of Contents) are followed.

ACCUM. DATA ERROR
NEXT TO CLEAR DATA

Accumulator data (e.g., count of loads processed) has become unreliable.

NEXT **Resets counters to zero** (the only action permitted).

CLEAR MEMORY NOW
PRESS 4 + 5 + 6

Formula data and possibly configure data have become unreliable.

4 JKL + 5 MNO + 6 PQR **Clears field-programmed formulas, and step/chemical names** (the only action permitted).

After clearing formula data, perform the following actions:

1. Step through all configure decisions and verify each value (*program mode 5, Configure*).
2. Rename steps and/or chemicals, if desired (*program modes 3, Change Step Names* and *4, Change Chem Names*)
3. Program the formulas (*program mode 1, Add/Change Formulas*)

CONFIG ERROR
TURN KEY TO PROG

Configure data has become unreliable.

Accesses *mode 5, Configure*, and displays *Page A-T* for reconfiguration
Step through all configure decisions and verify each value.

LOST WATER DATA
NEXT TO PROCEED

(Machines with *metered water* only) Water data for a formula which was resumed after a power loss has become unreliable. Controller cannot tell if machine has water.

NEXT **Clears the error message. The user is prompted whether or not to refill.**

Hardware Errors—These errors usually result from hardware failure. See precaution on next page.

***board name* FAILED**
CHECK THIS BOARD

These messages available in English only

The controller detects a failed *or missing* control circuit board. *board name* can be *16/8 BOARD, 16 OUT #1, 16 OUT #2, A/D BOARD,* or *D/A BOARD*. This error can also result from configuring the machine for an option not furnished, installing a new board, or installing software that was configured for an option not on this machine.

CANCEL ESCAPE **Clears the error message,** permitting access to the *Program Menu.* It also permits running a formula, if the cause of the error has been corrected.

--KEYPAD ERROR--
key name

The keypad key named on the second line shorted or failed to release, requiring keypad replacement. See also *display freezes* in "Errors While Programming."

Errors While Operating

PRECAUTION: Before troubleshooting operating errors, review safety instructions in all applicable manuals.

Errors That Disable the Three-Wire Circuit (Immediately Stops All Machine Functions)

—The *three-wire relay* provides control circuit power to the machine. Once energized by momentarily depressing the *Start button*, the *three-wire relay* is held energized by its own normally open contact, in series with numerous other safety devices (e.g., motor overloads, tilt limit switches, door interlock). Should any of these contacts open, even momentarily, all machine functions stop immediately, inlet valves close, the drain opens, the operator alarm sounds, and the appropriate *error* message appears.

3 WIRE DISABLED
FAULT : *message*

The *three-wire relay* became de-energized for the reason indicated by *message*.

① **Resumes the cycle (or enables the *three-wire circuit*), clears the error message, and silences the operator alarm, providing the cause of the error has been corrected.**

These messages available in English only

Message	Explanation
DOOR	*Door interlock relay* indicates door is or was open.
WASH OVERLOAD	*Wash motor overload* opened.
VARIABLE SPEED	*Variable speed drive unit* malfunctioned. Check the *variable speed drive unit display* for an error code and refer to the manual for this unit.
DRAIN OVERLOAD	*Drain motor overload* opened.
E1 OVERLOAD	*E1* (low-speed extract) *motor overload* opened.
E2 OVERLOAD	*E2* (high-speed extract) *motor overload* opened.
FRONT UP	Front of machine not full down, or *front down switch*, relay, or circuitry malfunctioned.
REAR UP	Rear of machine not full down, or *rear down switch*, relay, or circuitry malfunctioned.
SEE MANUAL	The controller cannot determine why the *three-wire relay* opened. Most often, this is the result of pressing a *Stop button*. Otherwise, see *three-wire circuit* in schematic manual.

BRAKE FAULT MUST BE CLEARED TO RESTART

Brake pressure switch detects insufficient air pressure in the *brake release air cylinder* to guarantee brake has released. Possible causes include low air pressure, a leaking *air cylinder piston cup*, pinched or leaking *air lines*, a leaking *quick-release air valve*, or a faulty *pressure switch* or *pilot air valve*. On Hydro-Cushion® models, low air pressure can result from an air line that is too small to handle the *pushdown* and the brake, which operate simultaneously.

***board name* FAILED**
CHECK THIS BOARD

The controller detects a failed *or missing* control circuit board. See "Hardware Errors" under "Errors At Power-Up . . ." in this section.

Errors That Interrupt the Cycle, Usually Requiring Corrective Action

—These errors stop the formula timer and sound the operator alarm, but they do not open the *three-wire circuit*. Except where noted otherwise, the operator alarm is silenced and operation resumes as soon as the error is rectified, without additional operator action.

normal run data **CHECK LEVEL SWITCH**	Controller detects an error in the *level switch* circuit (e.g., *high level* is *made* and *low level* is *not made*).
normal run data **CHECK *type* PROBE**	Controller detects a steam or water temperature probe malfunction (where *type* is *STEAM* or *WATER*). Check probe position and connections at resistor board. If OK, disconnect probe and verify that lead-to-lead resistance is 2K to 35K ohms and that lead-to-ground resistance is infinite. **Once the cause of the error is remedied, press the *Signal Cancel button* to clear the error message, silence the operator alarm, and resume operation.**
normal run data **TOO LONG TO COOL**	The allotted time to cool down to the commanded temperature was exceeded (*configure decision J*). Check *cooldown* procedures in "PROGRAMMING . . ." in this manual.
normal run data **TOO LONG TO FILL**	The allotted time to fill to the commanded liquor level (*configure decision I*) has been exceeded. Check for low water pressure.
normal run data **TOO LONG TO STEAM**	The allotted time to achieve the commanded temperature by steam injection (*configure decision H*) has been exceeded. Check for low steam pressure.

Conditions That Interrupt the Cycle, Usually Not Requiring Corrective Action

—These conditions are normally self-correcting.

AMPSAVER HALT	(Machines with Ampsaver® option) The machine desires to extract but the Ampmaster controller is delaying this action until the current drawn by other machines in the system falls below the specified level (an energy saving feature).
normal run data **RECYCLE FAILURE**	Machine recycled five times in a single extract step. The controller will now attempt to balance the load by repeating the previous step. If problem persists, check load balance and *excursion switch* adjustment.

Errors That Interrupt User Actions

—These error messages inform the user of proper procedure.

INVALID PASSWORD	An invalid password was entered or no password was entered within 10 seconds of the *ENTER PASSWORD* message, in response to a manual intervention command.
MANUAL EXTRACT : MUST HAVE LEVEL 2	An attempt was made to command an extract manually from a bath in which *level 2* (required prior to an extract) was not yet achieved. First, command *level 2*, then permit time to achieve this level before commanding an extract.

Additional Errors That Interrupt User Actions (Mildata® Option)

INVALID WORK ORDER	User entered a *work order number* that is not programmed in Mildata®. Enter a valid number.
INVALID GOODS CODE	User entered a *goods code* that is not programmed in Mildata®. Enter a valid number.
INVALID CUST CODE	User entered a *customer code* that is not programmed in Mildata®. Enter a valid number.
INVALID EMPLOYEE #	User entered an *employee number* that is not programmed in Mildata®. Enter a valid number.
INVALID FORM DATA	User entered an *formula number* that is not programmed in Mildata®. Enter a valid number.
DATA UNLOCATABLE	User entered a valid code which has invalid data associated with it (e.g., user entered a *goods code* that is programmed in Mildata®, but the *formula code* assigned to that *goods code* is not programmed).

Errors While Programming

Keypad Error That Occurs While Programming

display freezes	If the display stops responding to *valid* keypad commands, a keypad malfunction probably occurred. (The controller cannot detect and display a *Keypad Error* in any *program mode*.) If a replacement keypad is available, it is permissible for authorized service personnel, observing the hazard statement below, to replace the keypad with power on. This procedure will usually regain keypad function, thus avoiding data loss due to power loss while the machine is in the *program mode*.

⚠ DANGER ⚠

ELECTRIC SHOCK HAZARD—Although the keypad conductors on the Mark II washer-extractor controller are potential-free, accessing the keypad connections will expose other live conductors within the electric box/enclosure.

- ☞ **Keypad replacement must be done *only* by qualified service personnel.**
- ☞ **Ensure that body parts and metal tools do not come in contact with conductors.**

Errors While Programming Formulas—See "1=ADD/CHANGE FORMULA" under "PROGRAMMING . . ." for a complete explanation of the following errors and the *formula programming* procedure.

CCNN CHEM # AND NAME **0600 ILLEGAL CHEM**	An attempt was made to program a chemical injection using a chemical number for which the machine is not configured (e.g., *chemical 06* on a machine with only five chemicals).
ESCAPE? PUSH ENTER **TIL END OF FORMULA**	An attempt was made to exit formula programming by pressing CANCEL ESCAPE —an improper procedure. The user must first move to the end of the formula (*end formula* or *final extract*).

FORM *xx* INCOMPLETE TURN KEY TO PROG	An attempt was made to exit formula programming by turning the *keyswitch* to *Run* without first returning to the *Program Menu*. This is an improper procedure which causes the data for formula *xx* to become unreliable. *xx* is the formula number.  **Deletes the incomplete formula.** If no other memory errors are detected, the controller permits returning to the *run mode*.
Fxx TMMQCCCHC LS Syy ILLEGAL INSERT!	An attempt was made to duplicate this step when this would result in an *illegal* condition (e.g., adjacent extract steps or two *end formula* steps). *xx* and *yy* are the formula and step numbers, respectively.
Fxx TMMQCCCHC LS Syy ILLEGAL DELETE!	An attempt was made to delete this step when this would result in an *illegal* condition (e.g., adjacent extract steps).
Fxx COOLDOWN ILLEGAL Syy PRESS NEXT	An attempt was made to create a *cooldown* step when the prerequisites are not met. Prerequisites are: 1) *cooldown* is configured (*configure decision J*), 2) the *cooldown* is not the first step in a program, and 3) the preceding step is not an extract.
MEMORY IS FULL PRESS NEXT	Formula memory will be exceeded with the next step, so this formula must be deleted.  **Deletes this incomplete formula.**

Errors While Configuring—See "5=CONFIGURE" under "PROGRAMMING . . ." for a complete explanation of the *configuration* procedure.

ESCAPE? GO TO END OF CONFIGURATION	An attempt was made to exit the *configure mode* by pressing CANCEL ESCAPE —an improper procedure. Once in this mode the user must move through all decisions, whether or not they are to be changed.

Errors While Downloading—See "6=DOWNLOAD" under "PROGRAMMING . . ." for a complete explanation of the following errors and the *download* procedure.

DOWN LOAD ABORTED NEXT TO PROCEED	The user manually aborted the download on this machine, or on the sending machine, if this is a receiving machine.
ERROR IN CHECK SUM NEXT TO PROCEED	This receiving machine received unreliable data, possibly due to a bad connection in the serial link. Repeat the download once the problem is corrected.
[S] 9600 BAUD 000 WAITING FOR MASTER	If this display appears after downloading has begun, this receiving machine is not receiving data, possibly due to a bad connection in the serial link. Repeat the download once the problem is corrected.

MONITORING INPUTS AND OUTPUTS FOR MARK II AND III FxW WASHER-EXTRACTORS

D

C

This section identifies all inputs and outputs used in the Mark II and III FxW washer-extractor controller. It also demonstrates how to access RPM information during operation. The current state of all inputs (made or not made) and the current state of most outputs (energized or not energized) can be displayed *while a formula is running or stopped due to an error condition.* This is real-time information. Any change in the state of the input or output is displayed *as it occurs.*

NOTE: See "MANUAL MODE MENU FUNCTIONS . . ." (see Table of Contents) for instructions on testing outputs and viewing inputs *while the machine is idle*.

Inputs

```
10:38 F0005S03 02:37
dF=A093/D140 LEV2
```

```
3 WIRE DISABLED
FAULT : SEE MANUAL
```

0 = First 16 inputs (8/16 Board #1)
1 = Second 16 inputs (direct inputs-processor board)

```
(0) A B C D E F G H I J K L M N O P
    - - + + - - - + - - - + - - - -
```

Top line shows input letter (see "Table of Inputs"). Bottom line shows status: – = not made, + = made.

When a formula is running and a normal run display or error display similar to the displays at left appears,

hold 7 — **Displays the *first* 16 inputs: (0) A through P.**

hold 7 + 1 — **Displays the *second* 16 inputs: (1) A through P.**

When the *input status display* appears as in the example at left, see the "Table of Inputs" below, for input descriptions.

Table of Inputs

Display Code	(0) A through P (direct inputs -processor board)		(1) A through P (8/16 Board #1)	
	Input Name	Connector/Pin	Input Name	Connector/Pin
C **A**	—	—	Tank is Full (Drain to Sewer)	1MTA3-10
B	—	—	Door Closed	1MTA3-9
C	—	—	Inverter Tripped	1MTA3-8
D	—	—	—	—
E	—	—	—	—
F	—	—	—	—
G	—	—	Don't Allow Chems	1MTA3-2
H	—	—	—	—
I	Mildata	MTA38-8	Amp Saver	1MTA4-10
J	Program key	MTA38-3	—	—
K	Signal cancel	MTA38-2	—	—
L	Course Balance	MTA 38-5	—	—
M	Excursion	MTA38-6	—	—
N	Three wire	MTA38-7	—	—
O	—	—	—	—
P	—	—	—	—

B **NOTE:** Once the drain to sewer input (1MTA3-10) is made, the input is latched and the machine drains to the sewer until the drain cycle is over (even if the input is lost before then). The latch resets before the next drain cycle.

Outputs

```
10:38 F0005S03 02:37
dF=A093/D140 LEV2
```

```
3 WIRE DISABLED
FAULT : SEE MANUAL
```

When a formula is running and a normal run display or error display similar to the displays at left appears,

hold 8 — **Displays the *first* 16 outputs: (0) a through p.**

hold 8 + 1 — **Displays the *second* 16 outputs: (1) a through p.**

hold 8 + 2 — **Displays the *third* 16 outputs: (2) a through p.**

0 = First 16 outputs (on 8/16 Board #1 and 16 Out Board #1)
1 = Second 16 outputs (on 16 Out Board #2)

```
(0)   a b c d e f g h i j k l m n o p
      – – – – + – – – – – + – – – +
```

Top line shows output letter (see tables of outputs). Bottom line shows status: — = not energized, + = energized.

When the *output status display* appears as in the example at left, see the following tables of outputs for output descriptions.

Table of *First* 16 Outputs: (0) a through p

Display Code	Output Name	Connector/Pin		
		Common	Normally Open	
On 8/16 Board #1				
a	Recirculation Pump	1MTA5-9	1MTA5-8	1MTA5-10
b	Cooldown	1MTA5-6	1MTA5-5	1MTA5-7
c	Flush	1MTA5-4	1MTA5-3	1MTA5-1
d	Chem 4	1MTA5-2	1MTA6-10	1MTA6-3
e	Chem 1	1MTA6-1	1MTA6-2	N/A
f	Chem 3	1MTA6-4	1MTA6-5	N/A
g	Chem 2	1MTA6-6	1MTA6-7	N/A
h	Chem 5	1MTA6-8	1MTA6-9	N/A
On 16 Out Board #1				
i	Tank to Machine	1MTA13-9	1MTA13-8	1MTA13-10
j	Alternate Acelerate/Decelerate	1MTA13-6	1MTA13-5	1MTA13-7
k	Machine to Machine	1MTA13-3	1MTA13-4	1MTA14-10
l	CW Wash	1MTA13-1	1MTA13-2	1MTA15-10
m	CCW Wash	1MTA14-8	1MTA14-7	1MTA14-9
n	Steam Valve	1MTA14-5	1MTA14-6	N/A
o	Signal	1MTA14-3	1MTA14-4	N/A
p	Three Wire Relay	1MTA14-1	1MTA14-2	N/A

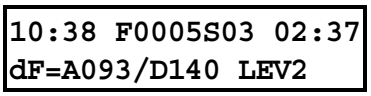
Table of *Second* 16 Outputs: (1) a through h

Dis-play Code	Output Name	Connector/Pin		
		Common	Normally Open	Normally Closed
On 16 Out Board#1				
a	—	—	—	—
b	Water Valve #1	1MTA15-5	1MTA15-6	N/A
c	Water Valve #2	1MTA15-3	1MTA15-4	N/A
d	Water Valve #3	1MTA15-1	1MTA15-2	N/A
e	Sewer Drain	1MTA16-7	1MTA16-8	N/A
f	Reuse Drain	1MTA16-5	1MTA16-6	N/A
g	Door Unlock	1MTA16-3	1MTA16-4	N/A
h	Machine to Tank	1MTA16-1	1MTA16-2	N/A
i-p	—	—	—	—

Table of *Third* 16 Outputs: (2) a through p

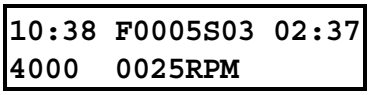
Dis-play Code	Output Name	Connector/Pin		
		Common	Normally Open	Normally Closed
On 16 Out Board #2				
a	Chem 14	2MTA13-1	2MTA13-11	2MTa13-10
b	Chem 9	2MTA13-2	2MTA13-12	2MTA13-7
c	Chem 13	2MTA13-3	2MTA13-13	2MTA14-10
d	Flush	2MTA13-4	2MTA13-14	2MTA15-10
e	Chem 15	2MTA13-5	2MTA13-15	2MTA14-9
f	Chem 11	2MTA13-6	2MTA13-16	N/A
g	Chem Save	2MTA13-7	2MTA13-17	N/A
h	Drain Save (Miltrench)	2MTA13-8	2MTA13-18	N/A
i	Chem 10	2MTA13-9	2MTA13-19	N/A
j	Amp Saver	2MTA13-10	2MTA14-1	N/A
k	Chem 6	2MTA14-11	2MTA14-2	N/A
l	Chem 7	2MTA14-12	2MTA14-3	N/A
m	Chem 8	2MTA14-4	2MTA14-13	N/A
n	Chem 12	2MTA14-4	2MTA14-14	N/A
o	—	—	—	—
p	—	—	—	—

RPM Display



When a bath, drain, or extract is running as shown at left,

Displays the speed value and machine RPM. The speed value is a numerical representation of of the analog voltage to the variable speed controller (i.e., 0000=0 volts and 4095=10 volts).



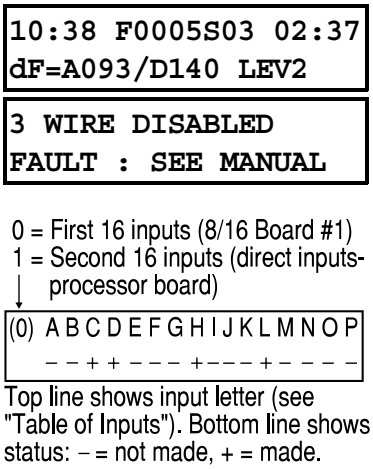
Returns to the run display.

MONITORING MICROPROCESSOR INPUTS AND OUTPUTS FOR THE MARK IV AND V 100 FORMULA, SINGLE MOTOR WASHER-EXTRACTORS

This section identifies all inputs and outputs used in the Mark IV and V microprocessor 100 formula, single motor washer-extractor controller. It also demonstrates how to access RPM information during operation. The current state of all inputs (made or not made) and the current state of most outputs (energized or not energized) can be displayed *while a formula is running or stopped due to an error condition.* This is real-time information. Any change in the state of the input or output is displayed *as it occurs.*

NOTE: See "MANUAL MODE MENU FUNCTIONS . . ." (see Table of Contents) for instructions on testing outputs and viewing inputs *while the machine is idle*.

Inputs



When a formula is running and a normal run display or error display similar to the displays at left appears,

hold 7 — **Displays the *first* 16 inputs: (0) A through P.**

hold 7 + 1 — **Displays the *second* 16 inputs: (1) A through P.**

When the *input status display* appears as in the example at left, see the "Table of Inputs" below, for input descriptions.

Table of Inputs

Display Code	(0) A through P (direct inputs -processor board)		(1) A through P (8/16 Board #1)	
	Input Name	Connector/Pin	Input Name	Connector/Pin
A	Mildata	MTA38-8	Tank is Full (Drain to Sewer)	1MTA4-1
B	Program Key	MTA38-3		1MTA4-2
C	Signal cancel	MTA38-2	Inverter Tripped	1MTA4-3
D	Course Balance	MTA38-5	—	—
E	Excursion	MTA38-6	—	—
F	Three wire	MTA38-7	—	—
G	—	—	Don't Allow Chems	1MTA4-7
H	—	—	—	—
I	—	—	Amp Saver	1MTA4-11
J	Drain Saver (Miltrench)	MTA39-6	—	—
K	—	—	—	—
L	—	—	I am spotted	1MTA39-4
M	—	—	—	—
N	—	—	—	—
O	—	—	—	—
P	—	—	—	—

NOTE: Once the drain to sewer input (1MTA3-10) is made, the input is latched and the machine drains to the sewer until the drain cycle is over (even if the input is lost before then). The latch resets before the next drain cycle.

Table of Inputs continued

(2) A through P (8/16 Board #2)—StaphGuard Only					
Display Code	**Input Name**	**Connector/Pin**	**Display Code**	**Input Name**	**Connector/Pin**
A	I Want Clean Control	2MTA4-1	**I**	—	—
B	Autospot Desired	2MTA4-2	**J**	—	—
C	—	—	**K**	—	—
D	—	—	**L**	—	—
E	—	—	**M**	—	—
F	—	—	**N**	—	—
G	—	—	**O**	—	—
H	—	—	**P**	—	—

NOTE: The #3 Input/output board is a special peripheral board dedicated to the autospot feature. Because it does not communicate with the machine's processor board, these inputs cannot be displayed. The inputs connectors are as follows: Autospot Desired: 3MTA4-12, I Am Spotted: 3MTA4-3.

B

Outputs

```
10:38 F0005S03 02:37
dF=A093/D140 LEV2
```

```
3 WIRE DISABLED
FAULT : SEE MANUAL
```

When a formula is running and a normal run display or error display similar to the displays at left appears,

hold 8 **Displays the *first* 16 outputs: (0) a through p.**

hold 8 + 1 **Displays the *second* 16 outputs: (1) a through p.**

hold 8 + 2 **Displays the *third* 16 outputs: (2) a through p.**

0 = First 16 outputs (on 8/16 Board #1 and 16 Out Board #1)
1 = Second 16 outputs (on 16 Out Board #2)

```
(0)   a b c d e f g h i j k l m n o p
      - - - - + - - - - - - + - - - +
```

Top line shows output letter (see tables of outputs). Bottom line shows status: — = not energized, + = energized.

When the *output status display* appears as in the example at left, see the following tables of outputs for output descriptions.

Table of *First* 16 Outputs: (0) a through p

Display Code	Output Name	Connector/Pin	
		Common	Normally Open
On 16 Out Board#1			
a	Recirculation Pump	1MTA5-10	1MTA5-19
b	Cooldown	1MTA5-9	1MTA5-18
c	Flush	1MTA5-8	1MTA5-17
d	Chem 4	1MTA5-7	1MTA5-16
e	Chem 1	1MTA5-4	1MTA5-14
f	Chem 3	1MTA5-3	1MTA5-13
g	Chem 2	1MTA5-2	1MTA5-12
h	Chem 5	1MTA5-1	1MTA5-11
On 24 Out Board #1			
i	Tank to Machine	1MTA13-1	1MTA13-11
j	Alternate Accelerate/Decelerate	1MTA13-2	1MTA13-12
k	Door Unlock	1MTA13-3	1MTA13-13
l	CW Wash	1MTA13-4	1MTA13-14
m	CWW Wash	1MTA13-5	1MTA13-15
n	Steam Valve	1MTA13-6	1MTA13-16
o	Signal	1MTA13-7	1MTA13-13
p	Three Wire Relay	1MTA13-8	1MTA13-18

Table of *Second* 16 Outputs: (1) a through h

Display Code	Output Name	Connector/Pin	
		Common	Normally Open
On 16 Out Board#1			
a	—	—	—
b	Water Valve #1	1MTA13-10	1MTA14-1
c	Water Valve #2	1MTA14-11	1MTA14-2
d	Water Valve #3	1MTA14-12	1MTA14-3
e	Sewer Drain	1MTA14-4	1MTA14-13
f	Reuse Drain	1MTA14-4	1MTA14-14
g	Machine to Machine	1MTA14-10	1MTA14-5
h	Machnine to Tank	1MTA14-10	1MTA14-15
i	Autospot Brake	1MTA14-10	1MTA14-6
j-p	—	—	—

Table of *First* 16 Outputs: (0) a through p

Display Code	Output Name	Connector/Pin	
		Common	Normally Open
On 8/16 Board #2—StaphGuard Only			
a	Transfer Control	2MTA5-10	2MTA5-19
b	Xfer Control Not	2MTA5-9	2MTA5-19
c	Transfer Control 1	2MTA5-8	2MTA5-18
d	Xfer Control Not 1	2MTA5-7	2MTA5-17
e	Clean Buzzer	2MTA5-4	2MTA5-14
f	Brake Release	2MTA5-3	2MTA5-13
g	Door Unlock	2MTA5-2	2MTA5-12
h	Spotting in Progress	2MTA5-1	2MTA5-11
24 Output Board #2			
i	Chem 14	2MTA13-1	2MTA13-11
j	Chem 9	2MTA13-2	2MTA13-12
k	Chem 13	2MTA13-3	2MTA13-13
l	Flush	2MTA13-4	2MTA13-14
m	Chem 15	2MTA13-5	2MTA13-15
n	Chem 11	2MTA13-6	2MTA13-16
o	Chem Save	2MTA13-7	2MTA13-17
p	Drain Save (Miltrench)	2MTA13-8	2MTA13-18

NOTE: The #3 Input/output board is a special peripheral board dedicated to the autospot feature. Because it does not communicate with the machine's processor board, these outputs cannot be displayed. The outputs connectors are as follows: Spotting in progress: 4MTA5-9 and 4MTA5-18, CW Wash: 4MTA5-8 and 4MTA5-17, Autospot Brake: 4MTA5-7 and 4MTA5-16, Signal: 4MTA5-3 and 4MTA5-13.

Table of *Fourth* 16 Outputs: (3) a through p

Display Code	Output Name	Connector/Pin	
		Common	Normally Open
24 Out Board #2 continued			
a	Chem 10	2MTA13-9	2MTA13-19
b	Amp Saver	2MTA13-10	2MTA14-1
c	Chem 6	2MTA14-11	2MTA14-2
d	Chem 7	2MTA14-12	2MTA14-3
e	Chem 8	2MTA14-4	2MTA14-13
f	Chem 12	2MTA14-4	2MTA14-14
g	—	—	—
h	—	—	—
i-p	—	—	—

RPM Display

```
10:38 F0005S03 02:37
dF=A093/D140 LEV2
```

When a bath, drain, or extract is running as shown at left,

```
10:38 F0005S03 02:37
4000  0025RPM
```

Displays the speed value and machine RPM. The speed value is a numerical representation of of the analog voltage to the variable speed controller (i.e., 0000=0 volts and 4095=10 volts).

Returns to the run display.

MANUAL MODE MENU FUNCTIONS ON MARK II, III, IV, AND V WASHER-EXTRACTORS

C

This section describes functions on the Mark II, III, IV, and V microprocessor washer-extractor controllers (including outerwear machines) that are available when the machine is *idle* (formula not running) and in the *run mode*. B

NOTE: See "MODIFYING FORMULAS IN PROGRESS" (see Table of Contents) for instructions on manually modifying a *running formula*. See "MONITORING MICROPROCESSOR INPUTS AND OUTPUTS . . ." for instructions on viewing inputs and outputs *while the machine is running*.

Selections (Modes) on the Manual Menu

0=Turn Output On—Actuate individual outputs for testing. This is called *bare manual*.
1=Look at Inputs—View the on/off status of each input *during idle conditions.*
2=Data Accumulation—View, print, and clear the accumulated counts of loads processed.

To Access the Manual Menu

```
RUN FORMULA
00 OR OK POWER OFF
```

When the *Run Formula menu* and *selection 00* is displayed as shown at left,

MANUAL — **Accesses the manual menu.**

```
TURN OUTPUT ON
0
```

When *selection 0, Turn Output On,* on the *manual menu* is displayed as shown,

▲ / ▼ — **Scrolls the available *manual* modes,**

or <x> — **Selects a *manual* mode,** where <x> is a number from 0 to 2. See the following information for how to access and utilize each manual mode.

or CANCEL ESCAPE — **Returns to the *Run Formula menu* (run mode).**

0=Turn Output On (Bare Manual)

How Bare Manual Works—Bare manual permits turning certain outputs *on* and *off*, one at a time, for testing, when the machine is idle. Note that outputs appear in a different order on the *bare manual menu* herein, than on the *output status displays* (see "MONITORING MICROPROCESSOR INPUTS AND OUTPUTS . . .").

To Actuate Outputs in Bare Manual

When *selection 0, Turn Output On* on the *manual menu* is displayed as shown,

ENTER NEXT — **Accesses mode 0 and displays *Press Start.***

1 — **Closes the *three-wire circuit* permitting output actuation and displays the *bare manual menu.***

When *selection 00* on the *bare manual menu* is displayed, as shown at left,

↑ / ↓ — **Scrolls the outputs.**

or <xx> — **Selects an output by number,** where <xx> is a menu item number on the "Table of Bare Manual Outputs."

or CANCEL ESCAPE — **Returns to the *Run Formula menu.***

When an output is selected as in the example *02, Counter Clockwise*, at left,

ENTER NEXT — **Turns the output *on*.** See table for consequences.

CANCEL ESCAPE — **Turns the output *off*** and permits selecting any other output for testing.

Table of Bare Manual Outputs
for 100-Formula, Multi-motor Washer-Extractor Controller

Menu Item	Output Name on Display	Applicable Machines	Standard or Option	Consequences of Actuating the Output
00	Abort Manual Oper	all	S	Return to *Run Formula menu.*
01	Clockwise	all	S	Turn basket clockwise at wash speed.
02	Counter Clockwise	all	S	Turn basket counterclockwise at wash speed.
03	Drain Speed	all	S	Turn basket at drain speed (clockwise).
04	Clutch 1	all	S	Clutch is normally engaged when *Master switch* is *on*. Clutch disengages when this output is turned on then off.
05	Water Valve #1	all	S	Opens valve.
06	Water Valve #2	all	S	Opens valve.
07	Water Valve #3	all	O	Opens valve.
08	Sewer Drain	all	S	Output *on* closes drain.
09	Reuse Drain	all	O	Output *on* opens drain.
10	Brake	all	S	Output *on* releases brake.
11–15	Chemical (1 thru 5)	all	S	Operates selected chemical inject device.
16–25	Chemical (6 thru 15)	all	O	Operates selected chemical inject device.
26	Steam	all	O	Opens steam valve.
27	Cooldown	all	O	Opens cooldown valve.

Menu Item	Output Name on Display	Applicable Machines	Standard or Option	Consequences of Actuating the Output
28	P-Dn (pushdown)	Hydro-cushion®	S	Actuates push-down devices, lowering shell onto pads. Output *off* de-actuates push-down *and releases clutch.*
	BotFil (bottom fill)	BWP	S	Closes diverter valve to door and opens valve to bottom.
	W-Tilt (wash tilt position)	spring-mount,tilt	S	Moves housing to the wash tilt position.
29	Signal	all	S	Sounds operator alarm.
30	Aux Bal	self-balance	S	Enables balancing circuit.
	Spray Down	Rapid Load	S	Opens spray down valve.
	(transfer clean/soil)	Staph Guard®	S	Transfers control to clean-side.
31	Manifold Flush	all	S	Operates manifold flush valve for supply injector.
32	Disch. Command	WTB+	S	Moves machine to full up and door full open if prerequisites met.
33	Load Command	WTB+	S	Moves machine to full down and door full open if prerequisites met.
34	Ld/Unld Terminate	WTB+	S	Closes door if all other prerequisites are met.
35	Disch. Terminated	WTB+	S	Signals allied receiving device that discharging is completed.
36	Disch. Desired	WTB+	S	Signals allied receiving device that discharging is completed.
37	Discharging	WTB+	S	Signals allied receive device that discharging is in progress.
38	Start Loading	WTB+	S	Signals allied loading device to start loading the machine.
39	Flag Down	WTB+	S	Signals shuttle to stop at the machine.
40	Load Desired	WTB+	S	Signals allied loading device that machine desires a load.
41	Dryell Up	WTB+	O	Moves dryell up if all prerequisites are met.
42	Dryell Down	WTB+	O	Moves dryell down if all prerequisites are met.
43	El Lock Release	WTB+	O	Releases the dryell up lock.
44	Flush Dryell	WTB+	O	Injects flushing water into the dryell.
45	Dryell Blow	WTB+	O	Turns on the valve that blows air into the dryell flush water line to purge it of water.
46	Seq Load Desired	WTB+	O	Signals the discharge sequencer this machine desires a load.
47	Seq Load Allowed	WTB+	O	Signals Milrail that a load is allowed.
48	Seq Flag Dn Disch	WTB+	O	Actuates the flag on the shuttle rail that stops the shuttle in front of this machine.
49	Seq Load/Unld Term	WTB+	O	Resets the discharge sequencer following loading or unloading.
50	Seq Disch. Desired	WTB+	O	Signals the discharge sequencer this machine desires to discharge.
51	Seq Disch. Allowed	WTB+	O	Signals the shuttle that discharge is allowed.

Table of Bare Manual Outputs for 100-Formula, Single Motor Washer-Extractor Controller

Menu Item	Output Name on Display	Standard or Option	Consequences of Actuating the Output
00	Abort Manual Oper	S	Returns to run formula menu.
01	Clockwise	S	Turns basket clockwise at wash speed.
02	Counter Clockwise	S	Turns basket counterclockwise at wash speed.
D **03**	Door Unlock	S	Unlocks door.
04	Water Valve #1	S	Opens valve.
05	Water Valve #2	S	Opens valve.
06	Water Valve #3	O	Opens valve.
07	Sewer Drain	S	Output *on* closes drain.
08	Reuse Drain	O	Output *on* opens drain.
09	Brake	S	Not Used
10-14	Chemical (1 thru 5)	S	Operates selected chemical inject device.
15-24	Chemical (6 thru 15)	O	Operates selected chemical inject device.
25	Steam	O	Opens steam valve.
26	Cooldown	O	Opens cooldown valve.
D **27**	Signal	S	Sounds operator alarm.
28	Alternate Accelerator/Decelerator	S	Signals inverter for use; alternates acceleration or deceleration constants.
29	Manifold Flush	S	Operates manifold flush valve for supply injector.
30	Recirc. Pump	O	Enables recirculation pump.
31	Machine to Machine	O	Enables valve from machine to machine.
32	Machine to Tank	O	Enables valve from machine to tank.
33	Tank to Machine	O	Enables valve from tank to machine.
D **34**	Transfer Control	S	Transfers machine control to clean side.
35	Brake Release	S	Releases autospot brake.
36	Clean Buzzer	S	Sounds the operator alarm on clean side.

1=Look at Inputs (While Idle)

The current state of all microprocessor inputs (made or not made) can be displayed while the machine is *idle*. This is real-time information. Any change in the state of the input is displayed *as it occurs.*

NOTE: This procedure accesses the same *input status displays* explained in "MONITORING MICRO-PROCESSOR INPUTS AND OUTPUTS . . ." (see Table of Contents), but permits viewing these displays *while the machine is idle*. See the referenced section for discriptions of the displays, input descriptions, and for instructions on viewing these displays *while a formula is running.*

When *selection 1, Look At Inputs,* on the *manual menu* is displayed as shown at left,

ENTER NEXT — **Displays the first 16 inputs.**

7 STU + 1 ABC — **Displays the second 16 inputs.**

7 STU + 2 DEF — **Displays the third 16 inputs.**

CANCEL ESCAPE — **Returns to the *Run Formula* menu.**

2=Data Accumulation

How Data Accumulation Works—The controller stores data pertaining to loads processed. This data can be used for both accounting purposes and to gauge efficiency of operation. The controller stores data for the last load processed and also accumulates totals per formula as well as for all formulas combined since the last time the data was cleared. This data can be viewed on the display or printed. The data includes:

- **Loads**—The number of loads processed (if applicable).
- **Formula Number**—(if applicable).
- **Run Time**—Total time to process a load including drain, distribution, coast and any *error time* (see below).
- **Wait Time**—The time span between when one formula ends and when the next one begins (with machine power on). Wait time is always applied to the formula that follows it. If the machine remains on and idle overnight, this entire time is applied to the wait time for the first load processed the following day. **Turn power *off* then back *on* before starting the first load to exclude idle time outside of normal operating hours.**
- **Error Time**—The time during which normal operation is suspended due to an error condition. This time is included in *run time* (see above).

NOTE: The accumulators will store data for formulas 00 through 99, whether these are internal or down-loaded from Mildata®. They do not store data on Mildata® formulas higher than 99. However, Mildata® itself provides this capability.

Selections (Modes) on the Data Accumulation Sub-Menu

0=Display Data—Display accumulated data on the microprocessor display.
1=Print—Print out hard copy of accumulated data on a serial printer.
2=Clear—Erase all accumulated data.

To Access the Data Accumulation Menu

```
DATA ACCUMULATION
2
```

When *selection 2, Data Accumulation,* on the *manual menu* is displayed as shown at left,

ENTER/NEXT **Accesses *Data Accumulation* and displays the choices.**

```
0  0=DISPLAY DATA
   1=PRINT 2=CLEAR
```

When the *Data Accumulation* choices are displayed as shown at left,

▲ / ▼ **Scrolls the choices.**
or <x> **Selects one of the displayed choices,** where <x> is a number from 0 to 2.
or CANCEL/ESCAPE **Returns to the *Run Formula menu* (run mode).**

0=Display Data—Accumulated data may be displayed in three ways, as shown in the "Table of Displayed Data" below.

```
0  0=DISPLAY DATA
   1=PRINT 2=CLEAR
```

When *0=Display Data* is chosen from the *Data Accumulation* choices, as shown at left,

ENTER/NEXT **Accesses *Display Data* and displays the choices.**

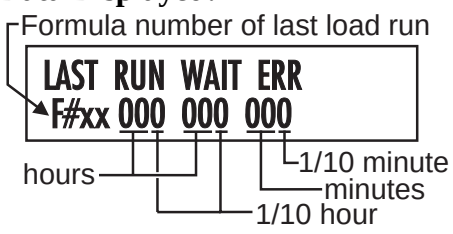
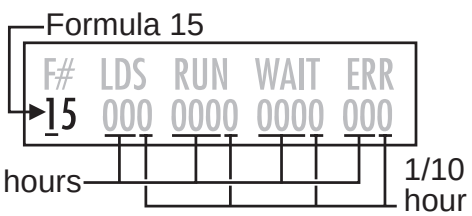
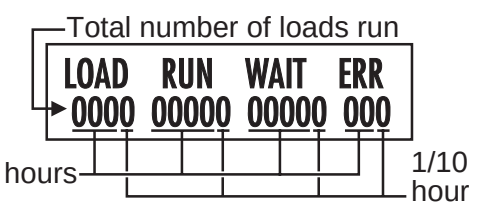
```
0  0=LAST LOAD
   1=FORMS 2=TOTAL
```

When the *Display Data* choices are displayed as shown at left,

<x> **Selects a type of data to display,** where <x> is a number from 0 to 2.
ENTER/NEXT **Displays the selected data,** as explained in the "Table of Displayed Data," below.
If *1=Forms* is accessed,
▲ / ▼ **Scrolls the formulas,**
or <xx> **Selects a formul**a, where <xx> is the two-digit formula number.
CANCEL/ESCAPE **Returns to the *Data Accumulation* choices.**

Table of Displayed Data

Data Type:

0=LAST LOAD	1=FORMS (formulas)	2=TOTAL
Data Displayed: 		

1=Print—Accumulated data may be printed on a serial printer that conforms to the "REQUIREMENTS AND SETTINGS FOR THE EPSON LX300 PRINTER" (see Table of Contents). FIGURE 1 is an example printout.

```
1  0=DISPLAY DATA
   1=PRINT 2=CLEAR
```

When *1=Print,* is chosen from the *Data Accumulation* choices, as shown at left,

ENTER NEXT **Accesses the print function** and prompts for the date.

```
DATE:MM-DD-YYYY
DATE: DD-MM-YYYY
      00
```

Month-day-year or day-month-year format, depending on the format configured.

When one of the *date entry displays* is displayed as shown at left,

<xx>, ENTER NEXT **Enters the first value,** where <xx> is the two-digit number for the month or day (depending on the format configured) and advances the cursor to the second field.

<xx>, ENTER NEXT **Enters the second value** and advances the cursor to the third value.

<yyyy>, ENTER NEXT **Enters the year,** where <yyyy> is the four digit number for the year and sends the data to the printer. When all data has been sent, the *Data Accumulation menu* reappears.

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W/E: 48036QHP WASHER 06 **VERSION** 91000/S **DATE:** 11/09/1993 **PAGE:** 01

DATA ACCUMULATION

0 = LAST FORMULA RUN

FORMULA #	RUN TIME HHT	WAIT TIME HHT	ERROR TIME MMT
05	003	001	000

1 = DATA PER FORMULA

FORMULA #	#OF LOADS #	RUN TIME HHHT	WAIT TIME HHHT	ERROR TIME HHT
05	042	0372	0038	002
09	027	0183	0014	000
11	008	0041	0026	000

2 = TOTAL ACCUMULATION DATA

TOTAL	# OF LOADS #	RUN TIME HHHHT	WAIT TIME HHHHT	ERROR TIME HHT
	0077	00596	00078	002

NOTES:

# = Number
HHT = Hours-Hours-Tenth of hour
HHHT = Hours-Hours-Hours-Tenth of hour
HHHHT = Hours-Hours-Hours-Hours-Tenth of hour
MMT = Minutes-Minutes-Tenth of minute
***** = Data has reached maximum stored value.

FIGURE 1 (MSOP0254BE)
Example Data Accumulation Printout

2=Clear—Accumulated data may be cleared whenever the machine is idle. All data is cleared simultaneously.

```
2 0=DISPLAY DATA
  1=PRINT 2=CLEAR
```

When *2=Clear* is chosen from the *Data Accumulation* choices as shown at left,

ENTER NEXT **Accesses the *clear* function** and prompts the user to continue or cancel.

```
NEXT TO CLEAR DATA
  CANCEL=ESCAPE
```

When the display shown at left appears,

ENTER NEXT **Clears all accumulated data from memory** and returns to the *Data Accumulation* choices.

or CANCEL ESCAPE **Exits the *clear* function without clearing the accumulators** and returns to the *Data Accumulation* choices.

Section 5

Supplemental Information

NOTICE

As this manual was being printed, Pellerin Milnor Corporation began a manufacturing change which may affect how this manual applies to your machine. The six-position DIP switch on each printed circuit board is being replaced with two sixteen-position rotary switches. The switches (DIP and rotary) are used to set the logical address for each board that communicates with the microprocessor in the machine, or with a higher-level control system (e.g., a Mildata network).

Because the change to rotary switches corresponds so closely to the release of this manual, we are supplying you with documentation on how to set both types of switches.

If your machine uses printed circuit boards containing one DIP switch, refer to MSFDA401**D**E to set the address on replacement boards. If your machine uses printed circuit boards containing rotary switches, refer to MSFDA401**E**E.

BMP970004/97071

Hardware Components of Serial Microprocessor Controllers

1. General

Milnor® serial microprocessor controls are designed specifically for Milnor® machines and systems. Along with certain external electromechanical relay logic and sensing devices, they control all machine and system functions. **Not every microprocessor controller includes all the components described in this section.**

2. Microprocessor Components

Note 1: This is a list of all components for Milnor® microprocessor controllers. Not every Milnor® microprocessor controller includes all of the following components.

2.1. Keypad or Keyboard—Depending upon the model and type of machine, the keypad may have 12, 30, or 58 buttons. The different keypads are not interchangeable.

2.2. Keyswitch—Selects run/program modes. The key may be removed only when the switch is set to the *Run* position.

CAUTION 1: Prevent Unauthorized Programming—To prevent unauthorized programming, store the programming key so that it is not available to unauthorized personnel. Improper programming can damage equipment and goods.

2.3. Display—Depending upon the type and model of machine, the display may be either liquid crystal, vacuum fluorescent, or cathode ray tube (CRT), which is a typical computer monitor. Different types of displays are not interchangeable.

Liquid crystal graphic display—This display is identified by colored characters and graphics, usually on a black or white background. It's currently used only on certain washer-extractor models with the Milnor Mark VI control system.

Liquid crystal text display—This type of display is identified by dark gray characters on a lighter gray background, or by green characters on a dark gray background.

Vacuum fluorescent display—The bright green characters on a black background make this display highly visible. This is the most common display for Milnor® washer-extractors, textile machines, and dryers.

Cathode ray tube (CRT)—The CRT display resembles a television screen in appearance and function. This type of display is most commonly used in Miltrac™ and Mildata® systems, which require the display of graphics such as boxes and lines. It is also used on Milnor CBW® tunnel washers.

2.4. Power Supply—The power supply converts the alternating current at the control circuit voltage to direct current voltages of 12 volts positive and negative, and 5 volts positive. One or more of these values are adjustable, depending on the specific power supply used in each application.

The Milnor™ CBW® system employs two different power supplies to convert alternating current from the control circuit to direct current for the microprocessor and peripheral boards.

2.4.1. Control Console Power Supply—The power supply referenced as ESPS in the schematic

diagrams is a 40-watt power supply located in the Miltron™ or Mentor™ cabinet. It powers the peripheral boards located within this cabinet, including the optional load cell interface board and the analog to digital board for a weighing conveyor, as well as the microprocessor board and the memory expansion board.

Tip: For maximum reliability and to minimize the chances of the processor board resetting due to low voltage, adjust the power supply voltage for 80186 processors to 5.10 VDC at the processor board.

In systems operated via the Miltron™ controller, this power supply also provides electricity to the monitor interface board. In Mentor™-controlled tunnel systems, the monitor interface board is contained within the Mentor™ computer enclosure and powered by the computer power supply.

2.4.2. Tunnel Power Supply—The power supply referenced as PSO in the schematic diagrams is a 120-watt unit which powers the peripheral boards located on the tunnel washer. All three voltages output by this device are adjustable.

If adjustment is necessary, set the 5 volts output to provide at least positive 4.8VDC at the electric box on the module farthest from the power supply. This measurement must be made with an accurate digital voltmeter. Verify that the positive and negative 12 volts outputs are set at positive and negative 12.00VDC, respectively.

If the 5 volts reading at the peripheral board nearest the PSO power supply is at least positive 5.25VDC, and the voltage at the peripheral board farthest from PSO is positive 4.8VDC or less, suspect one or more loose connections or inadequate wiring somewhere between the two peripheral boards.

2.5. Power Supply —The power supply converts the alternating current at the control circuit voltage to direct current voltages of 12 volts positive and negative, and 5 volts positive. One or more of these values are adjustable, depending on the specific power supply used in each application.

- The 12 volts positive is used to power all boards other than the microprocessor board. This value is not adjustable.
- The 12 volts negative is used by the analog to digital (A/D) board. This value is not adjustable.
- The 5 volts output powers the microprocessor. This value is adjustable and very sensitive. For devices using microprocessors other than the 80186, the power supply must be adjusted to provide actual voltage of 4.95VDC to 5.10VDC at the microprocessor board. Use an accurate digital voltmeter to measure this value. For devices with 80186 microprocessors, the power supply voltage should be 5.10VDC at the processor board.

A wire of at least 14AWG (2.5 sq mm) must be connected between the ground points on the microprocessor and the peripheral boards. This ground wire is installed at the factory if both enclosures are mounted on the same machine (e.g., washer-extractors). The ground wire must be provided during installation if the microprocessor enclosure and its associated peripheral board enclosures are remote from one another (e.g., dryers).

Some machines, including Milnor® dryers, employ a second identical power supply to provide power for the peripheral boards, which are mounted in an enclosure separate from the microprocessor enclosure.

2.6. Central Processing Unit (CPU) Board—Also referred to as the microprocessor, the central processing unit processes data received from the various inputs, stores information, and responds to each keypad entry with the appropriate action. It may be mounted in an enclosure separate from its peripheral boards. The CPU board contains EPROMs programmed by the Milnor® factory with fixed instructions (software) that determine how the machine functions. Depending upon machine model/type, the processor chip may one of three Intel models: the 8085, the 8088, or the 80186.

Although the EPROMs do not require battery backup, the CPU board utilizes a battery which normally provides power to retain the user-programmable memory for two to three months without external power.

2.7. Memory Expansion Board—Increases memory space available to the processor. This board is used with 8088 CPU boards in some applications.

2.8. Battery—Provides memory retention backup when power is off. The battery is mounted directly on 8085 CPU boards, and mounted separately for 8088 and 80186 CPU boards. A capacitor on the 8088 and 80186 CPU boards provides enough power to retain memory for several hours after the battery has been disconnected. Once fully charged, the battery backup is reliable for two to three months with no power applied.

2.9. Opto-Isolator Board—Optically isolates inputs to the microprocessor for electronic noise immunity. Opto-isolators are incorporated into the 8088 and 80186 CPU board; thus this separate board is only required for machines employing Intel 8085 CPUs.

2.10. Input/Output Board—The 16/8 input-output board contains 16 solid-state signal input devices and eight output relays. The input devices are capable of faithfully conducting a low VA 12VDC ground signal to the microprocessor. The output relays are socket-mounted SPDT, 12VDC electromechanical relays with contacts capable of faithfully conducting a maximum of 25VA at 110/120VAC (0.2 ampere or 200 milliamperes at 110/120VAC) or 12.5 VA at 24VAC (0.5 ampere or 500 milliamperes at 24VAC). The output will be either 24VAC or 110/120VAC, depending on the machine model/type.

These outputs and their power source are intended only to drive another relay with higher contact ratings, that in turn may drive a pump, valve, solenoid, etc., from a separate power source. Never use these outputs to directly drive a pump, valve, or solenoid unless the maximum current required never exceeds the above values. Higher ampere or VA loads will burn out traces on the printed circuit board or possibly overload and damage the control circuit transformer.

This board has 25 status lights. The amber light flashes when the board is communicating. Each of the 24 remaining lights represent an input (green lights) or output (red lights) on that board, and illuminates when the corresponding input or output is made. This board has two rotary dials which must be adjusted to set the board's address (see Section 4 “Assigning Board Addresses” in this document). This board also has convenient test points that can be used to test voltage to the board.

Standard input/output board—used in all devices requiring input/output boards, except those listed below.

High-speed input/output board—used only in the following devices and configurations: E6N, J6N, and T6N washer-extractors equipped with and configured for both variable basket speed and electronic balancing; Milrail configured for high-speed boards, and all configurations of the M7E centrifugal extractor.

2.11. Output Board—A 24-output board contains 24 output relays identical to those described in Section 2.10 "Input/Output Board".

2.12. Analog to Digital Convertor Board—Converts analog voltage signals, such as temperature, to a digital signal that can be utilized by the CPU. Up to a maximum of eight channels may be provided on a single board. Although seemingly identical, the analog to digital boards used to sense air temperature in the dryer, water temperature in washer-extractors and textile machines, water temperature in the tunnel, and weight for a weighing conveyor are all different. The different types are clearly marked with different part numbers, which are mentioned in the wiring diagram set and are not interchangeable.

All analog to digital boards have one status light which flashes when the board is communicating. The board has two rotary dials which must be adjusted to set the board's address (see Section 4 "Assigning Board Addresses"). This board also has convenient test points that can be used to test voltage to the board.

2.13. Digital to Analog Convertor Board—Converts digital signals from the processor to analog signals with voltages between 0 and 5VDC (e.g., provides the analog signal to the dryer gas valve position actuator and dye machine steam position actuator).

This board has one status light which flashes when the board is communicating. The two rotary dials must be adjusted to set the board's address (see Section 4). This board also has convenient test points that can be used to test voltage to the board.

2.14. CRT (Video Display) Board—Receives display instructions from the processor and generates the signals to the video monitor to create the desired displays; used in controllers such as the Miltron™ and Miltrac™ controllers and Device Master™ systems.

CAUTION 2: Avoid Component Damage—The CRT board can be installed backwards, even though the cabinet and bracketry makes this difficult, and labelling on the parent board states the proper orientation. Use care to orient the board correctly, otherwise microprocessor components may be damaged.

CBW® systems with the Mentor™ controller use a standard computer video display adapter, housed within the Mentor™ computer, to transmit signals from the Mentor™ computer to the video monitor. Thus, Mentor™ systems do not have a separate video display board as described here.

2.15. Resistor Boards—Although visually similar, resistor boards vary according to the application. The different types are clearly marked with part numbers, which are mentioned in the electrical schematic diagrams and are not interchangeable.

For temperature-sensing systems—used with analog to digital boards in washer-extractors and dye-extractors as part of temperature-sensing system; not required on tunnel systems because the necessary circuitry is included on other standard CBW® circuit boards.

For modulating gas valves—used with digital to analog boards in the temperature control circuit of gas dryers; converts 0-5VDC to 4-20 milliamperes for controlling the modulating gas valve.

For modulating steam valves—used with digital to analog boards in temperature control circuit of older steam dryers; converts 0-5VDC to 4-20 milliamperes for modulating steam valve. See Section 2.20 "4-20mA Output Board" in this document.

2.16. Signal Conditioner for Thermocouple—Amplifies and filters the output from a thermocouple so an analog to digital board can convert the signal to digital values for the microprocessor.

2.17. Rotation Safety Board—Used in dryers. Reads rotational safety proximity switch to confirm that the basket is turning.

2.18. Temperature Probe—Two types of temperature probes are used, depending on equipment type:

Thermistor temperature probe—a temperature-sensitive resistor whose resistance value changes with respect to temperature; uses include washer-extractors, textile machines, and tunnel systems.

Thermocouple temperature probe—a closed loop of two dissimilar metals which produces a voltage with respect to the change in temperature between the two junctions. Thermocouples are used in dryers.

2.19. Weigh Scale Interface Board—In the electrical circuit, this device is between the weighing conveyor (CONWA) load cell and the weighing conveyor analog to digital board. It filters and interprets the signals from the conveyor load cell to the analog to digital board.

2.20. 4-20mA Output Board—Used on newer textile machines and steam dryers with temperature control. See Section 2.15 "Resistor Boards" in this document.

2.21. 8 Output/16 Input Chemical Flow Meter Board—This board is used with the metered chemical injection option on textile machines. Eight outputs and eight counters respectively are assigned to chemical valves and chemical flow meters. Two of the counters are non-isolated direct inputs to the microprocessor on this board and are capable of counting pulses of 0 to 5VDC at a frequency of up to 10kHz. The remaining six counters are optically isolated from the peripheral board microprocessor and are capable of counting pulses from 0 to 12VDC at a frequency up to 150 Hz.

3. Serial Communications Port

All Milnor® serial microprocessors have a serial port with a nine-pin receptacle and plug to communicate with other devices via one of several special serial cables. If supported by the software, downloading and printing of data is accomplished through this port. These actions are described in the programming section of this manual.

For more information on the various separate serial cables required for these functions, see the related section in document BICWUC01, if applicable.

Table 1: Board Application by Device (Part A)

Device		Board Name													
		CPU	Input/Output	Output	Analog to Digital	Digital to Analog	CRT	Opto-isolator	Temperature Sensing Resistor	Gas Valve Resistor	Steam Valve (4-20mA)	Thermocouple Signal Conditioner	Chemical Flow Meter	Rotation Safety	Weight Scale Interface
CBW System*	Number	1	2		1		1								1
	Note(s)		+	1	9										5
Device Master*	Number	1	2				1								
	Note(s)		1	1											
Miltrac*	Number	1					1								
	Note(s)														
VERTSTO	Number	1	2				1								
	Note(s)														
Linear COSTA	Number	1	1												
	Note(s)		1												
Link Master	Number	1													
	Note(s)														
Textile*	Number	1	1	2	1	1			1		1				
	Note(s)				4								1		

Notes:

*	Intel 80186 central processing unit
1	Boards can be added for options
2	Used on steam dryers with temperature control, and all gas dryers
3	Used on washer-extractors with temperature option
4	Analog to digital boards vary according to application. See the descriptions of these boards elsewhere in this section.
5	Required for weighing conveyors on tunnel washing systems
6	Required for reuse/cooldown and/or overhead fill tanks on tunnel washing systems
7	Mark I washer-extractor control used Intel 8085 central processing unit
8	Notes 3 and 4 apply
9	One board required per each 8 modules (see also Notes 1, 4, 5, and 6)
10	Two boards required, plus one additional board per module

Table 2: Board Application by Device (Part B)

Device		CPU	Input/Output	Output	Analog to Digital	Digital to Analog	CRT	Opto-isolator	Temperature Sensing Resistor	Gas Valve Resistor	Steam Valve (4-20mA)	Thermocouple Signal Conditioner	Chemical Flow Meter	Rotation Safety	Weight Scale Interface
COBUC	Number	1	2												
	Note(s)		1	1											
COSHA	Number	1	2												
	Note(s)		1												
Dryer	Number	1	2	1	1	1				1		1		1	
	Note(s)				4	2				2	2				
Extractor	Number	1	2	1											
	Note(s)		1	1											
Press	Number	1	2	1	1										
	Note(s)		1	1											
W/E (Mark I)	Number	1	1	1	1			1	1						
	Note(s)	7	1	1	8	1									
W/E (Mark II-VI)	Number	1	1	1	1	1								1	
	Note(s)		1	1	8	1			1						

Notes:

*	Intel 80186 central processing unit
1	Boards can be added for options
2	Used on steam dryers with temperature control, and all gas dryers
3	Used on washer-extractors with temperature option
4	Analog to digital boards vary according to application. See the descriptions of these boards elsewhere in this section.
5	Required for weighing conveyors on tunnel washing systems
6	Required for reuse/cooldown and/or overhead fill tanks on tunnel washing systems
7	Mark I washer-extractor control used Intel 8085 central processing unit
8	Notes 3 and 4 apply
9	One board required per each 8 modules (see also Notes 1, 4, 5, and 6)
10	Two boards required, plus one additional board per module

4. Assigning Board Addresses

The input/output board, output board, analog to digital board, and digital to analog board each have two rotary switches which establish the address for each board. This allows each board to communicate serially with the microprocessor in its device while sending and receiving its own messages. In a battery of machines, the rotary switches are identical for each identical peripheral board in each identical machine (e.g., the first input/output board (I/O-1) in each washer-extractor has identical rotary switch settings). When a microprocessor must communicate with a higher level control (e.g., when all dryers communicate with the MilData® system), the higher level control must know the address of each microprocessor. For 8088 microprocessors, the high level control knows the address of each device because that information was established during configuration (e.g., see *Miltrac Address* configure decision in the programming manual for any device that communicates with Miltrac).

Table 3: Rotary Switch Settings

Board		Washer-Extractor	VERTSTO	Extractor	Two-Stage Press	One-Stage Press	Linear COSTO	Textile	Dryer	Device Master	COBUC	COSHA
Analog to Digital	SW2	2*			2	2		2	2			
	SW1	1*			1	1		1	1			
Digital to Analog	SW2	3*				3		3	3			
	SW1	1*				1		1	1			
Input/Output #1	SW2	0	0	0	0	0	0	0	0	0		
	SW1	1	1	1	1	1	1	1	1	1		
Input/Output #2	SW2	0*	0	0*	0	0	0*	0*	0	0	0	0
	SW1	2*	2	2*	2	2	2*	2*	2	2	2	2
Input/Output #3	SW2			0*	0*	0*				0*	0*	0*
	SW1			3*	3*	3*				3*	3*	3*
Input/Output #4	SW2			0	0*					0*	0*	0*
	SW1			4	4*					4*	4*	4*
Output #1	SW2	1		1	1	1		1	1	1*		
	SW1	1		1	1	1		1	1	1*		
Output #2	SW2	1*		1*	1*			1		1*		
	SW1	2*		2*	2*			2		2*		
Output #3	SW2	1						1*		1*		
	SW1	3						3*		3*		

Notes:

* Optional boards

1 See schematics for rotary switch positions on tunnel washer system devices.

— End of BICMDF01 —

BICMUM01 (Published) Book specs- Dates: 20040817 / 20040817 / 20040817 Lang: ENG01 Applic: CWW

How to Upgrade Microprocessor EPROM Chips

Milnor® microprocessor software is continually upgraded to improve performance and maximize efficiency. Depending on the software change, the new software EPROM (Erasable, Programmable Read-Only Memory) chips may be offered for sale or for no charge to the customer. When a set of these chips is changed in the field, ensure that the software version being installed matches the machine hardware, and that the chips are installed in the proper socket positions and orientation.

1. How to Change EPROMs

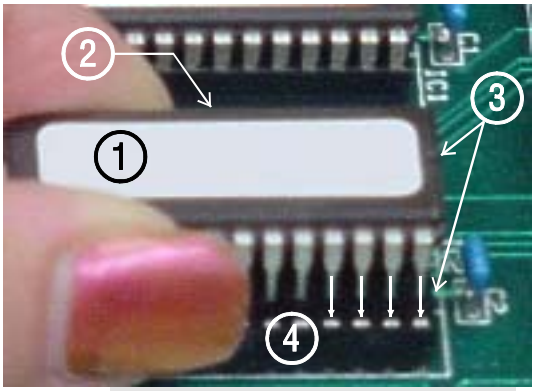
WARNING 1: Electrocution and Electrical Burn Hazards—Contact with high voltage will electrocute or burn you. Power switches on the machine and the control box do not eliminate these hazards. High voltage is present at the machine unless the main machine power disconnect is off.

- Do not attempt unauthorized servicing, repairs, or modification.
- Lock out and tag out power at the main machine disconnect before servicing, or in accordance with factory service procedures.

1.1. Remove and Replace EPROM Chips

1. Make sure all power to the machine is off.
2. Locate the chips as described in Section 2 "Location of EPROM Chips". Note the orientation of the chips as shown in the figure(s) below.
3. Use a chip removal tool or another small flat tool to carefully remove each EPROM chip from its base. Be sure to note the numerical order of each chip and the orientation to the key notch on the socket.
4. Install new chips, making sure the key notch on each chip is properly oriented and that all pins enter the proper holes in the socket, as shown in Figure 1. If necessary, slightly bend the pins on the EPROM chip to align the pins with the holes in the socket. After inserting each chip, verify that all pins are seated in the socket.

Figure 1: EPROM Chip Identification and Installation

EPROM Chip and Socket	Legend
	**1.** Label **2.** EPROM chip **3.** Key notch **4.** EPROM socket

CAUTION 2: Machine Damage Hazards—Incorrectly installing any EPROM chip may destroy or damage the chip or cause the machine or the display to operate erratically.

- Match each chip with its corresponding socket. Each EPROM chip will operate in only one socket, although it may physically fit into others.
- Align each chip so every pin mates with the correct hole in the socket.

1.2. **Verify Proper EPROM Chip Installation**—After installing new EPROM chips, apply power to the machine and turn the machine on. If the chips are properly installed, the display will continue with the normal display sequence when powering up. If the display is blank or appears unusual, turn the machine off at once and verify that the chips are correctly oriented in the sockets.

2. Location of EPROM Chips

Depending on machine model and type, the microprocessor may be an Intel 8085, Intel 8088, or Intel 80186. Each microprocessor board requires at least one EPROM chip for proper operation, but these chips may be located differently on each type of processor board. The following information describes the location and arrangement of the EPROM chips on each type of board, as well as the favored location for checking the voltages required by each type of board.

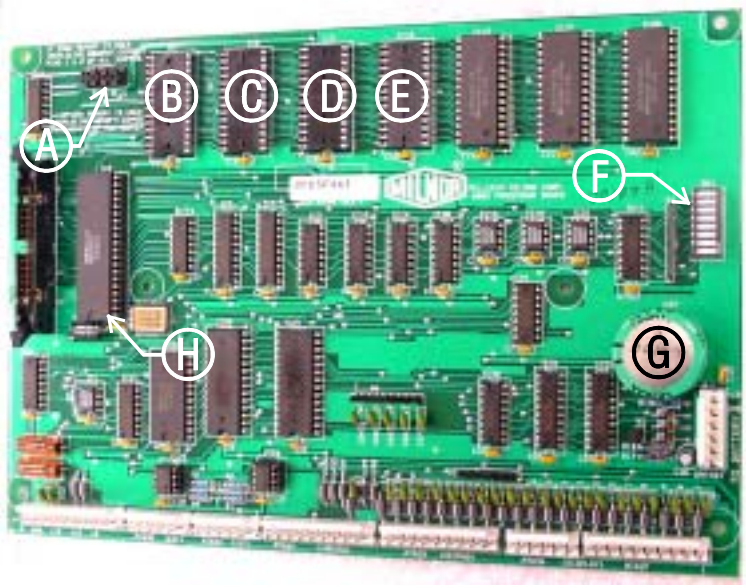
Table 1: Processor Boards and Applications

Processor Part Number	Typical Machine Applications	Comments
08BNCMPAD_	System 7 (e.g., 30015M5G)	
08BN785A_	30-inch E-P Plus	
08BN788A_	---see above---	
08BH18EP_	36- and 42-inch E-P Plus	20 MHz; brown output and chemical connectors
08BH18EPA_	---see above---	15 MHz; brown output and chemical connectors
08BH18EPB_	---see above---	15 MHz; white output and chemical connectors
08BH18EPC_	---see above---	11 MHz
08BH18EPD_		20 MHz; white output and chemical connectors
		8085 non-serial
08BSP___	Mark 2 washer-extractors, etc.	8085 serial with 4 EPROMs
08BSPA___	Mark 2 textile machines	8085 serial with 2 EPROMs
08BSPAA_	replacement for 08BSP_ and 08BSPA_	uses jumpers on processor board to match EPROM type
08BSPC_		Revisions A through D use same software; revision E software is different
08BSPD_	tunnel washers (with expanded memory board)	8088 serial with 2 EPROMs; same as Rev. E of 08BSPC_
08BSPDA_		8088 serial with 4 EPROMs; expanded memory added to processor board
08BSPE_		80186 serial with 1 EPROM and 4 UART chips
08BSPE1_		80186 serial with 1 EPROM and 1 quad-UART chip
08BSPE2_	Mark 6 devices (with graphic display)	
08BT168A_	E-P OneTouch (e.g., 30015T5E)	

2.1. **8085 Processor Boards (except Coin Machines)**—See Figure 4. Install EPROM #1 at the end of the row nearest the corner of the board, then #2, #3, and #4. Chip #4 goes next to the two chips soldered to the board. See Figure 3 for where to check for proper voltages.

Figure 2: Replacement Processor Board

08BSPAA_

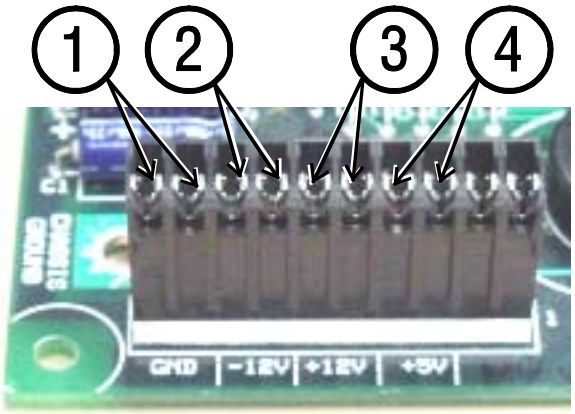


Legend

A. Jumpers for setting EPROM capacity
B. EPROM socket 1
C. EPROM socket 2
D. EPROM socket 3
E. EPROM socket 4
F. DIP switch
G. Capacitor
H. Microprocessor

Figure 3: Where to Check Processor Board Voltages

Typical MTA-31

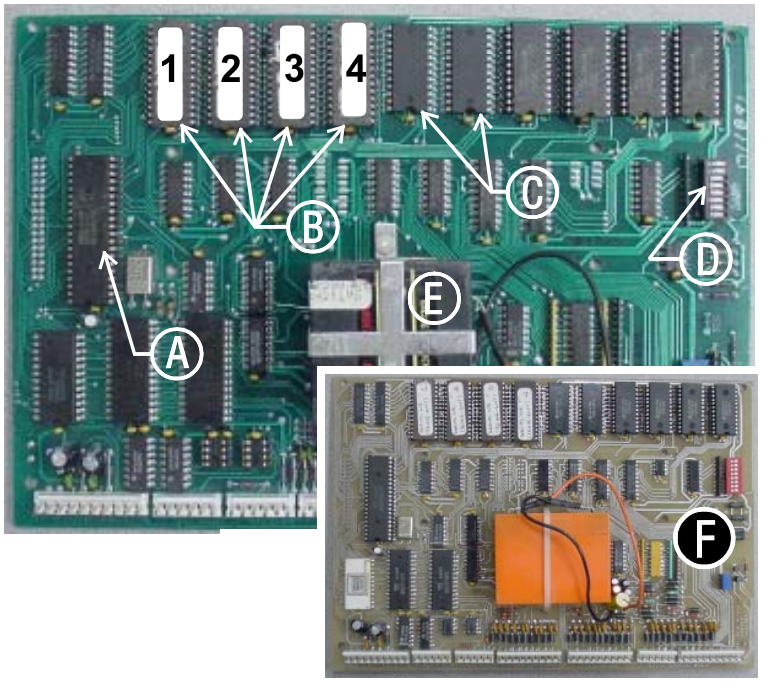


Legend

1. Ground (Earth)
2. Negative 12VDC
3. Positive 12VDC
4. Positive 5VDC

Figure 4: 8085 Processor Boards (Except Coin Machine)

Typical 08BSP_ and 08BSPx_ Processor Boards



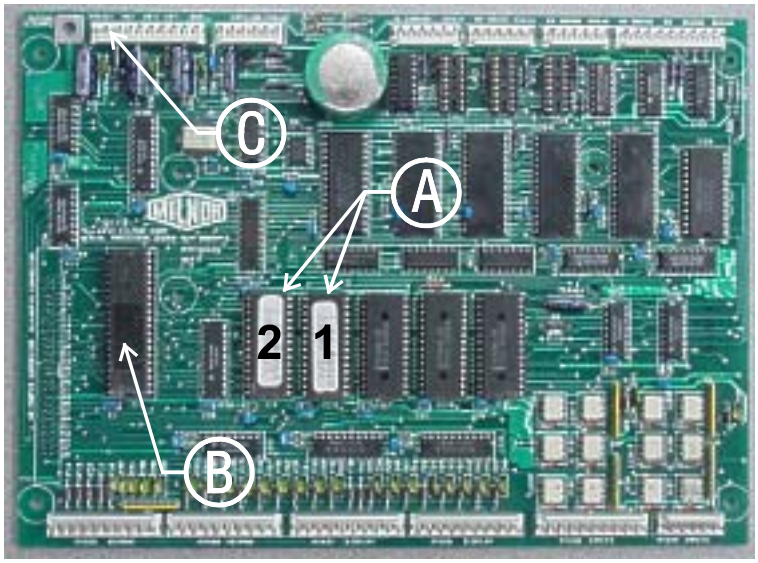
Legend

A. 8085 microprocessor chip
B. EPROMs
C. Soldered chips
D. DIP switch
E. Battery
F. 08BSPB_ processor board

2.2. 8088 Processor Boards without Memory Expansion Board—See Table 2 "EPROM Locations for 8088 Processor Applications" and Figure 6. If the set consists of only one EPROM, install it in socket A of Figure 6 . If two EPROMs comprise the set, install EPROM #2 in socket A and EPROM #1 in socket B. Always install the highest numbered EPROM in socket A. If the set consists of more than two EPROMs, a memory expansion board must be present in the machine along with the processor board.

Figure 5: Typical 8088 Processor Board without Memory Expansion Board

08BSPC_ Processor Board



Legend

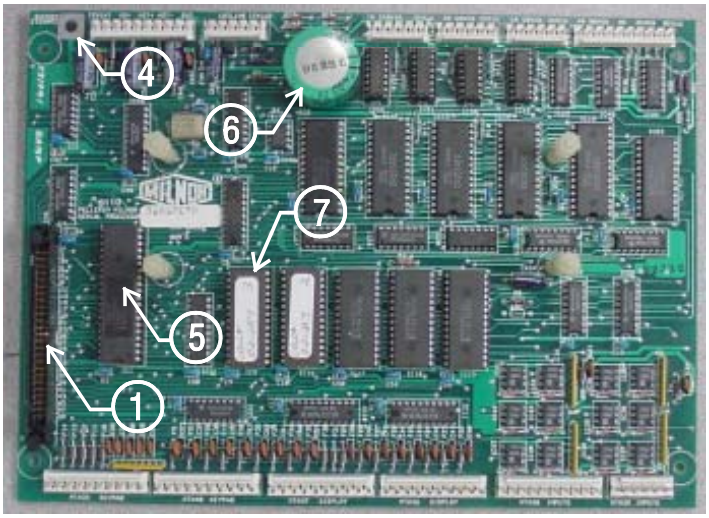
A. EPROMs
B. 8088 processor chip
C. MTA31 for voltage verification

Table 2: EPROM Locations for 8088 Processor Applications

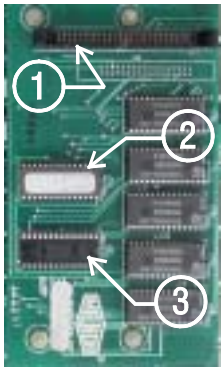
	EPROM Location by Socket			
EPROMS in Set	**A**	**B**	**IC-1**	**IC-2**
4 chips	4	3	2	1
3 chips	3	2	1	—
2 chips	2	1	—	—
1 chip	1	—	—	—

Figure 6: 8088 Processor Board and Optional Memory Expansion Board

8088 Processor Board



Memory Expansion Board



Legend

1. Connector, memory board to processor board
2. Socket IC1
3. Socket IC2
4. Chassis ground
5. 8088 microprocessor chip
6. Capacitor
7. Highest numbered EPROM

2.3. 8088 Processor Boards with Memory Expansion Board—See Table 2 and Figure 6. If the EPROM set consists of three or more EPROMs, install the two highest numbered EPROMs (e.g., #3 and #4 of a four-chip set) on the processor board, with the highest numbered EPROM (EPROM #4 of a four-chip set) in socket A, and the EPROM with the second highest number (EPROM #3 of a four-chip set) in socket B. Install the remaining EPROM(s) on the memory expansion board with the highest numbered of the remaining EPROMs (e.g., EPROM #2 of a four-chip set) in socket IC-1 on the memory expansion board and EPROM #1 in socket IC-2.

2.4. 80186 Processor Boards—This processor board (see Figure 7) is used on all Milnor® system controllers (Miltron™, Mildata®, etc.) equipped with a color monitor. It is also used on fully-programmable washer-extractors, textile processing machines with software version 95000 and later, and other models. The single EPROM on this board is located in socket IC-2.

Tip: For maximum reliability and to minimize the chances of the processor board resetting due to low voltage, adjust the power supply voltage for 80186 processors to 5.10 VDC at the processor

board.

There are three major revisions of this board, both of which have Milnor part numbers starting with “08BSPE”. If the seventh character is a number “1,” the board is a later version with a single four-channel communications chip. If the seventh character of the part number is a letter, the board is an earlier version with four one-channel communications chips.

The third version of 80186 processor board—with part number “08BSPE2_”—can be configured via a jumper on the board to operate either a vacuum fluorescent **text** display, or a flat panel **color graphic** LCD display. The jumper controls the serial communications port on MTA30.

Supplement 1

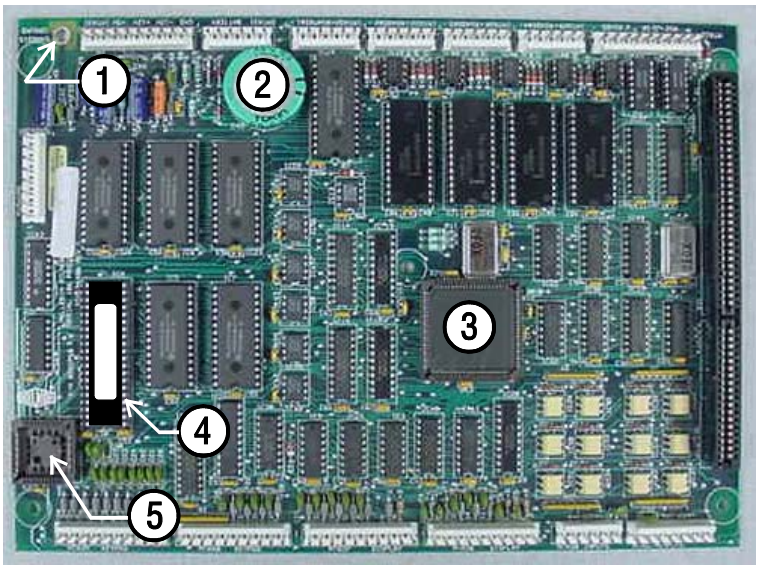
Rules for Replacing 80186 Processor Boards

Processor board “08BSPET” is obsolete. Depending on machine model and build date, this board can be replaced by either “08BSPE1T” or “08BSPE2T”, but new software is required. Contact Milnor's service engineering department to determine the appropriate replacement board and software.

Processor board “08BSPE1T” has been superseded by board “08BSPE2T”(see Figure 9). If your machine uses a two-line or four-line vacuum fluorescent text display, either “...E1T” or “...E2T” will work with your existing software. The most important difference between these two boards is jumper *J1* on the “...E2T” board for selecting the flat panel **color graphic** LCD display. This jumper must be set to the *TXT* or *NO* position for machines with a vacuum fluorescent display, or in the *GPX* (graphics) position for machines with a color LCD display.

Figure 7: Obsolete 80186 Processor Board

08BSPE_ Processor Board

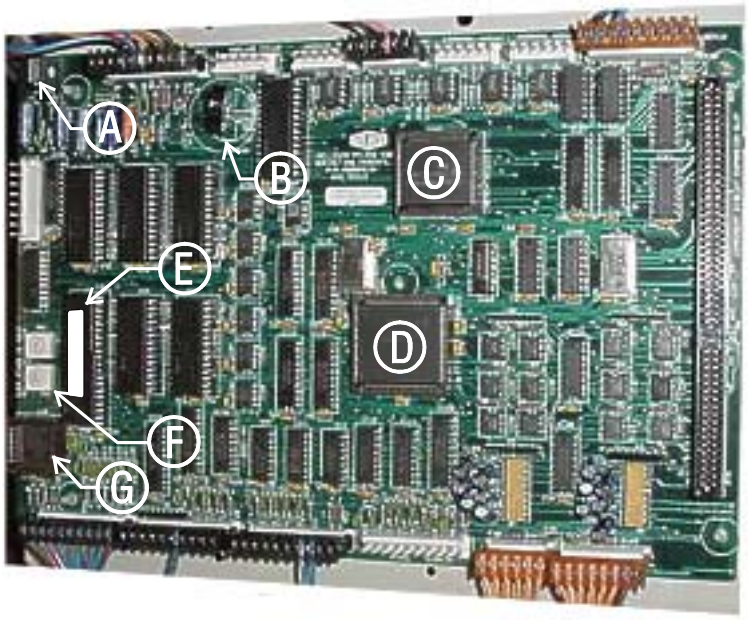


Legend

1. Chassis ground
2. Capacitor
3. 80186 microprocessor chip
4. EPROM in socket IC-2
5. ROM socket (empty except in Japan)

Figure 8: 80186 Processor Board

08BSPE1_ Processor Board

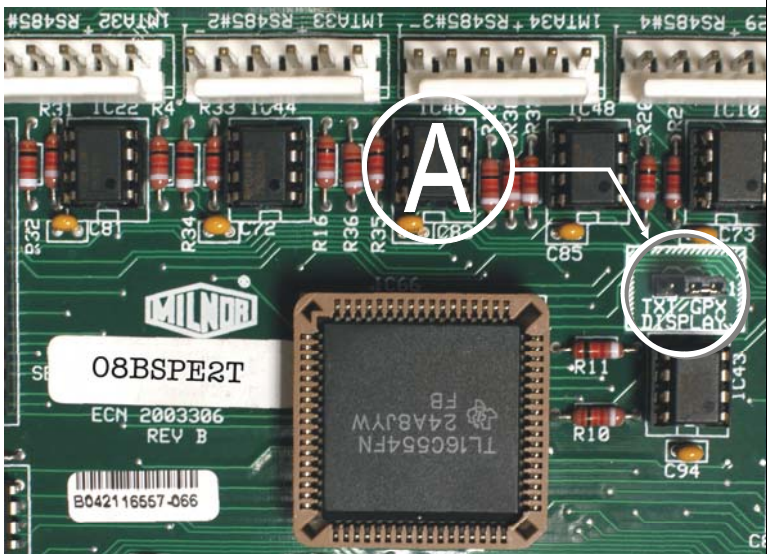


Legend

A. Chassis ground
B. Capacitor
C. Quad-UART chip
D. 80186 microprocessor
E. EPROM
F. Rotary DIP switches for keypad
G. ROM socket (empty except in Japan)

Figure 9: 08BSPE2_ 80186 Processor Board

Detail



Legend

A. Jumper for selecting display type

— End of BICMUM01 —

Memory Download Box Applications

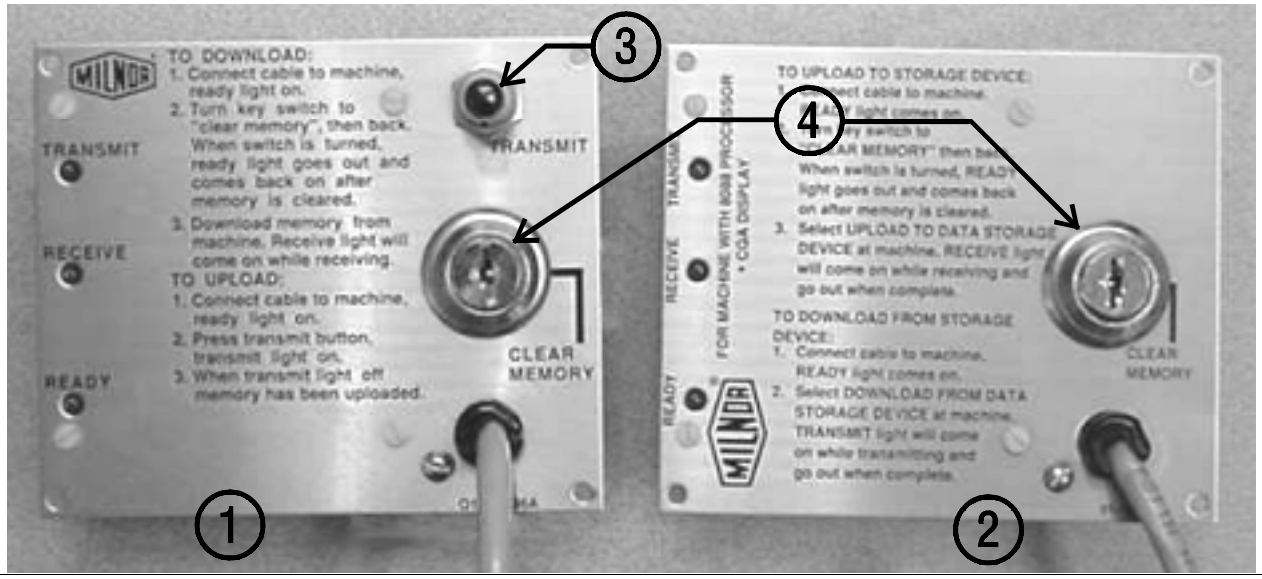
Document..... BICUDC01
Specified Date..... 20010807
As-of Date..... 20010807
Access Date..... 20010807

Applicability..... YUD CUD
Language Code..... ENG01

The memory download box is used to store configuration and formula data for most current models of Milnor® machines. Two types of download boxes (Figure 1) are available: one with a *Transmit* button on the front panel, and one without the button. The *Transmit* button is not required for machines—usually CBW® controllers and similar devices—which are capable of initiating the data transfer.

Figure 1: Download Box Identification

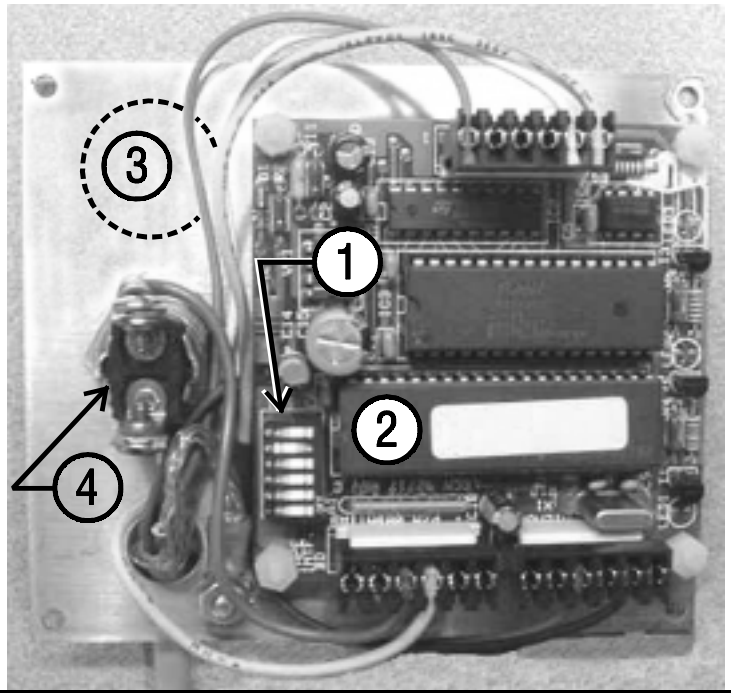
Faceplate Comparison



Legend

1. Download box **with** *Transmit button*
2. Download box **without** *Transmit button*
3. *Transmit button*
4. Key switch

Figure 2: Rear View of Circuit Board

View	Legend
	**1.** DIP switch **2.** Software chip **3.** Location of *Transmit button*, if equipped **4.** Key switch

Supplement 1

Interpreting the DIP Switch Settings

Use the following codes and their definitions to set the DIP switch positions for the equipment, as shown in Table 1.

A. All switch positions are OFF.

B. Switch position 4 is ON; all other switch positions are OFF.

C. Switch position 5 is ON; all other switch positions are OFF.

D. Switch positions 1 and 5 are ON; all other switch positions are OFF.

Note 1: If necessary, a memory download box with the *Transmit* button may be used to store configuration and formula data from any machine that's capable of downloading. When using a button-equipped download box to store data from one of the devices listed in Table 1 as requiring the *Transmit* button, ignore the button. The download will begin when commanded from the device control panel.

Table 1: DIP Switch Positions

Processor Board	Software Version	DIP Switch Setting
Uses Memory Download Box WITH Transmit Button		
Washer-extractor Models		
8088	All	C
80186	98000-98003	C
	98004-99004	not supported
	99005-9900B	D
	20000-20003	D
FxW, FxP, and FxS Washer-extractor models		
8088	All	C
80186	98000-98003	C
	98004-98009	not supported
	9800A-9800H	D
	20000-2000B	D
Textile and Dye Machine Models		
8088	All	C
80186	95000-95305M	C
	95305N-95306	D
	20000-20004	D
Dryer Models		
8088	All	C
80186	All	C
Centrifugal Extractor Models		
8088	All	C
80186	All	C
Single-station Press Models		
8088	All	C

Processor Board	Software Version	DIP Switch Setting
Uses Memory Download Box WITHOUT Transmit Button		
Miltron Controller for CBW System		
8088	All	A
80186	All	B
Miltrac		
8088	All	A
80186	All	B
Milrail Rail Controller		
8088	All	A
80186	All	B
Device Master		
8085	All	not supported
8088	All	not supported
80186	94000-94017	not supported
	94018	B
	20000-present	B
Linear Costo Master		
8085	All	not supported
8088	All	not supported
80186	94000-94011	not supported
	20000-present	B
Key:		
A	All switch positions OFF	
B	Position 4 ON; all others OFF	
C	Position 5 ON; all others OFF	
D	Positions 1 and 5 ON; all others OFF	

— End of BICUDC01 —

BICWUC01 (Published) Book specs- Dates: 20050112 / 20050112 / 20050118 Lang: ENG01 Applic: CWU CDU

Construction of External Serial Link Cables

This document provides information for on-site fabrication of certain types of serial communication cables. An individual machine can be connected to certain makes and models of serial printer (see Note 1) using the printer cable described in Section 2.2. Programmable data can be transferred between compatible machines or between a machine and a Milnor serial memory storage device (see Note 2), using the download cables described in Section 2.3 and Section 2.4 respectively. These cable(s) connect to the cabinet-mounted 9-pin DIN type receptacle shown in Figure 1 and may be installed temporarily or permanently, as appropriate.

If the machine is connected to a Mildata® or Drynet (dryer/shuttle controller) network (see Note 3), downloading is more likely to be handled by these products. Another Milnor document—the related section in document BICCUC01—describes the permanent cables needed to communicate across a Mildata, Drynet, or Miltrac™, network. In the unlikely event that personnel will want to download data via the download cables described herein, rather than via Mildata, all energized machines on the Mildata network will receive the downloaded data. **Turn off power to any machines to which you do not wish to download.**

Note 1: The currently approved printers and printer configuration settings are provided in the related section in document BICWUI01. A pre-assembled machine-to-printer cable similar to the cable described here, is available from Milnor (P/N 10YMK2PNTR).

Note 2: The Milnor serial memory storage device (also known as a download box) contains nonvolatile memory to hold a back-up copy of the programming and configuration data for **one machine**. This data is transferred between the machine and the memory storage device via the DIN receptacle on the machine. Two models are currently available: KXMIC00507 and KXMIC00508. The already wired cable and DIN connector are included as part of the memory storage device. Consult the Milnor Service department to determine the correct device for a particular application.

Note 3: Mildata is Milnor's PC-based product for centralized data collection, productivity analysis, report generation, formula development and data downloading. Drynet permits supervisory and manual functions for a group of dryers and the shuttle that serves them to be performed from a central PC.

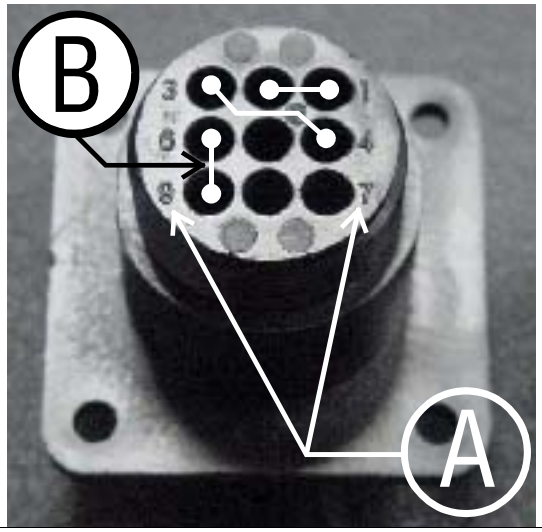
Applicable machines are provided with a single DIN receptacle for both downloading and printing. Only one function at a time (downloading or printing) can be performed using this connection.

1. Pin Identification

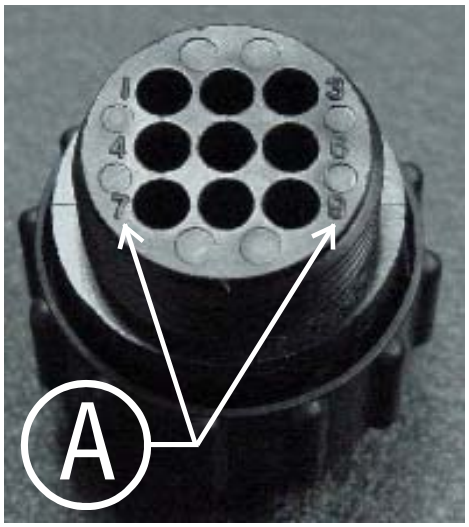
The download and printing functions use different data communication lines, but the DIN receptacle on the machine contains all of the pins used for either function. Figure 1 illustrates the DIN receptacle (which uses male pins) and the mating plug (which uses female pin sockets), each viewed from the **wire entry** side. The receptacle is normally installed and wired at the Milnor factory. The plug and female pin sockets for customer use are provided in a bag inside the electric box. Table 1 shows the function of each pin.

Figure 1: 9-Pin DIN Connector Pin Identification (from wire entry side of connectors)

Receptacle (uses male pins)



Plug (uses female pin sockets)



Legend

A. Pin numbers molded into parts

B. Heavy white lines terminated with dots indicate pins normally connected together at the Milnor factory

Table 1: External Serial Link Pin Assignments

Pin Number	Function	Receptacle Wiring (inside electrical enclosure)	
		Wire Number	Color Code
1	Serial low	DLL	Blue and black
2			
3	Serial high	DLH	Blue and red
4			
5	Clear to send (used for printing only)	CTS	Blue and orange
6	Electronic ground	2G	Blue and white
9			
7	Transmit data (used for printing only)	TXD	Blue and orange
8	+5 volts DC (used for serial memory storage device only)	V1	Blue

CAUTION 1: Risk of damage to electronic components—Pin 8 is only used to supply +5VDC power to the download box and, if improperly connected, will damage components in both devices.

- Never connect pin 8 to any other pin in the connector, a printer, or another machine.

2. How to Wire the Cables

Because the DIN receptacle is wired to support different functions and because the data transferred across these cables can be corrupted by electrical noise, follow these instructions carefully.

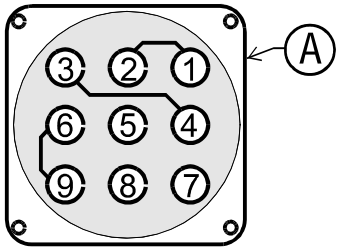
2.1. Cable Specifications—Multi-conductor shielded cable that meets the following minimum requirements must be used in the applications covered herein. Conforming cable may be purchased from Milnor (P/N 09V300A04S) or purchased from another source:

- Jacket: 600VAC insulation
- Shielding: braided, tinned copper, minimum 85% coverage
- Four conductors with these specifications:
  - » Conductive material: Tinned copper, 20 AWG
  - » Insulation: 300VAC, color coded
  - » Preferred colors: red, black, green and white

2.2. Connecting a Machine to a Printer for "Print Data"—Many Milnor microprocessor-controlled machines allow permanent or temporary connection of a serial printer for generating printed copies of formulas or status reports during operation. Figure 2 shows how to wire the machine-to-printer cable. Milnor has tested and approved certain printers for this application (see Note 1).

Figure 2: Wiring Diagram for Cable to Connect a Machine to a Printer

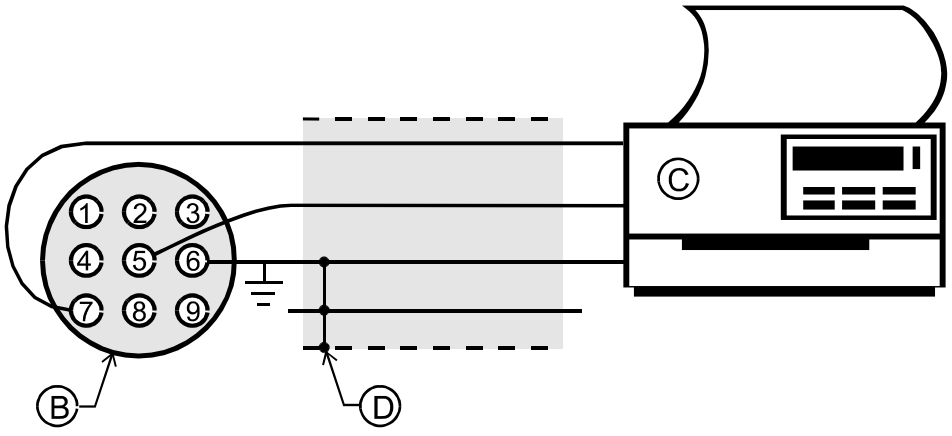
Receptacle



Legend

A. Receptacle (with male pins). Pin functions are as follows:
5. Clear to send (CTS).
7. Transmit data (TXD)
6&9. Ground. This application only uses Pin 6.
1&2. Not used in this application
3&4. Not used in this application
8. Not used in this application. See caution statement **1** .
B. Plug (with female pin sockets)
C. Approved serial printer (see Note 1)
D. Tie shield and spare conductor(s) on this end of cable to ground. Leave unconnected on other end.

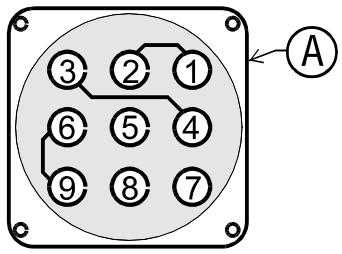
Cable Wiring



2.3. Connecting Two or More Machines for Machine-to-machine Transfer—Figure 3 shows how to wire a cable to connect a bank of identical machines (the Figure 3 example shows connections for four machines) so that data programmed on one machine in the group can be downloaded to all other machines simultaneously. This cable is referred to as a daisy chain because it runs in segments from machine to machine, connecting all machines in the group.

Figure 3: Wiring Diagram for Cable to Connect Two or More Machines

Receptacle On Each Machine



Legend

A. Receptacle on machine (with male pins). Pin functions are as follows:
- **1&2.** Serial low
- **3&4.** Serial high
- **6&9.** Ground
- **5&7.** Not used in this application
- **8.** Not used in this application. See caution statement **1** .

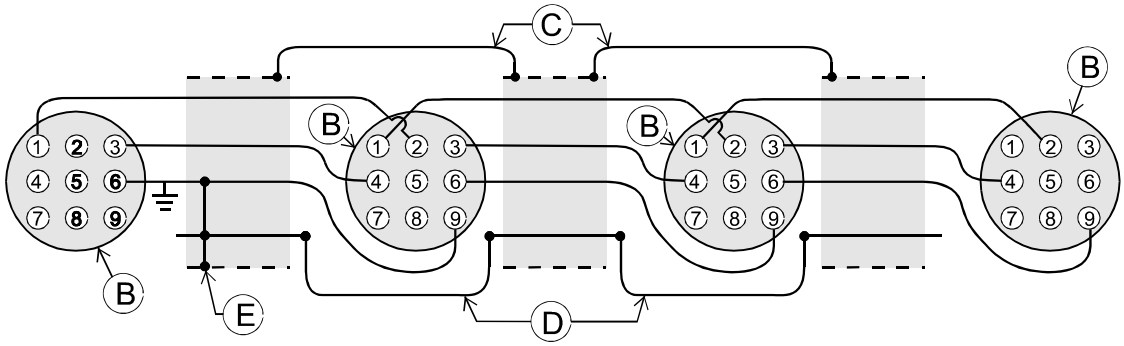
B. Plug on cable (with female pin sockets)

C. Connect together each segment of shield so that it has continuity across entire daisy chain.

D. Connect together each segment of an unused conductor so that it has continuity across entire daisy chain.

E. Tie shield and spare conductor(s) on one end of daisy chain to ground. Leave unconnected on other end of daisy chain.

Cable Wiring



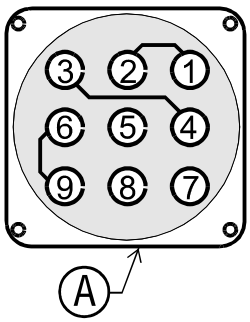
The internal connections on each receptacle (machine) between pins 1 and 2, 3 and 4, and 6 and 9 make it easier to wire the cable because it is not necessary to jumper these pins together on the cable. However, this also means that every plug on the daisy chain must be plugged into a receptacle. Otherwise, the serial low, serial high, and ground conductors will not have continuity across the entire daisy chain and some machines will not receive data.

Rules and details about downloading among machines are fully described in the programming section of the reference manual.

2.4. Connecting a Machine to a Serial Memory Storage Device—The cable used with the serial memory storage device (download box) available from Milnor, see Note 2, is permanently attached to the storage device. Cable fabrication, as shown in Figure 4, is not required except for replacing a damaged cable. The memory storage device is the only application in which the power conductor (Pin 8) is used.

Figure 4: Wiring Diagram for Cable to Connect a Machine to a Serial Memory Storage Device

Receptacle



Legend

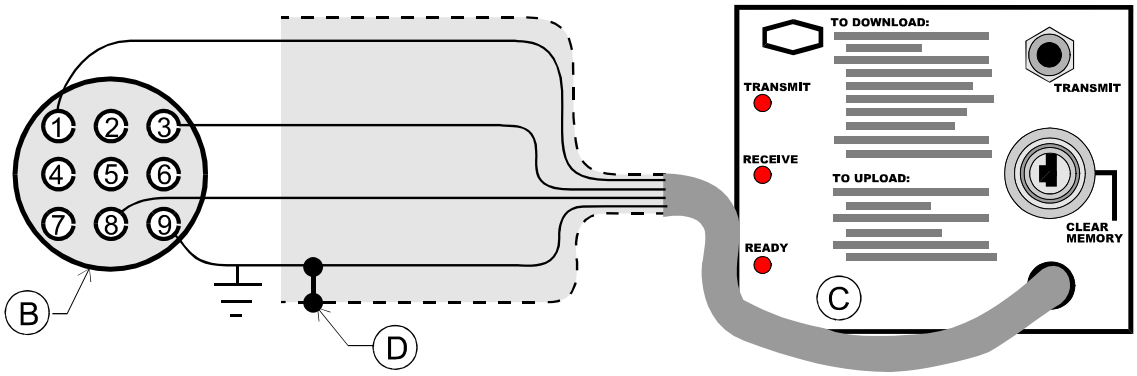
A. Receptacle on machine (with male pins). Pin functions are as follows:
- **1&2.** Serial low. This application only uses Pin 1.
- **3&4.** Serial high. This application only uses Pin 3.
- **6&9.** Ground. This application only uses Pin 9.
- **5&7.** Not used in this application.
- **8.** +5VDC. Provides power to memory storage device.

B. Plug on cable (with female pin sockets)

C. Memory storage device (front panel may be different)

D. Tie shield on this end of cable to ground. Leave unconnected on other end.

Plug and Storage Device



— End of BICWUC01 —

BICWUI01 (Published) Book specs- Dates: 20071113 / 20071113 / 20071113 Lang: ENG01 Applic: CDU

Printer Requirements and Settings

Notice 1: Because of the many differences among printer makes and models, Milnor® cannot ensure suitability or troubleshoot printers other than those described in this document (or certain older approved models), with the required interface cable.

1. Cable Requirements

The printer must be connected to the printer port on the machine using the appropriate one of the following Milnor® interface cables:

Table 1: Milnor® Printer Cables

Printer Cable Part Number	Description
10YMK2PNTR	100-formula washer-extractor, dryer, extractor, and Miltron (CBW) controllers
10YCBWPNTR	Non-serial Miltron (CBW) controller
08MPSERCBL	Mentor (CBW) and Mildata controllers

2. Configuring the Citizen GSX-190 Printer

Table 2 lists the required settings for this printer model to work properly with Milnor® equipment. To print the current settings stored in your printer, move the *Menu* slide switch on the printer to the *VuePrint* position, then hold the *Print* button for three seconds. Hold the *Menu* button for three seconds to enter the *VuePrint* menu system to make changes.

Table 2: Required Settings for Citizen GSX-190 Printer

Menu	Data Field	Value	Menu	Data Field	Value
Install 1	Ribbon	Normal	Character	Slash zero	Off
	A.S.F.	Off		Character set	Graphics
	Emulation	Epson		Intl character set	U.S.A.
Print Style	Font	Draft		Code page	U.S.A.
	Emphasized	Off	Install 2	Tear off	Off
	Pitch	10 characters per inch		Paper out	Enable
	Font lock	Off		Auto linefeed	Off
Page Layout	Line spacing	6 lines per inch		Copy mode	Off
	Form length	Letter		Envelope	Off
	Page skip	Off	Serial I/F	Baud rate	9600
Print Mode	NLQ Dir	Uni-directional		Parity	Even
	Graphic Dir	Uni-directional		Data bits	8 bits
				Stop bits	1 bit
				Protocol	DTR

3. Configuring the Epson LX300 Printer

The Epson model LX300 printer was supplied by Milnor® prior to March 2001 to print data from microprocessor controllers with printing functions. When shipped from Milnor®, this printer was configured to operate correctly with Milnor® equipment. If the printer is replaced or must be reconfigured for any reason, refer to the user's guide and the following table.

Table 3: Required Settings for Epson LX300 Printer

Data Field	Value	Data Field	Value
Character spacing	10 characters per inch	Tractor	Single
Shape of zero	0	Interface	Serial
Skip over perforation	Off	Bit rate	9600 bps
Character table	PC 437	Parity	Even
Auto line feed	Off	Data length	8 bits
Page length	11 inches	ETX/ACT	On
Auto tear off	Off		

4. Previous Printer Models

The Epson LX300 printer replaced the Epson LX-810, which replaced the Epson LX-800. For information on these older printer models, request document MSSM0251AE from the Milnor factory.

— End of BICWUI01 —

HOW "CHEMWAIT" WORKS IN MILNOR MARK I, II, III, IV, AND V MICROPROCESSOR WASHER-EXTRACTOR CONTROLLERS

B

"CHEMWAIT" is a feature in the Milnor washer-extractor controller whereby a central chemical injection system can service several washer-extractors. When the chemical injection system is serving another machine, each washer-extractor controller can accept a command from the injection system to "stop the timer and do not start the injection signal."

An independent output from Milnor to the chemical system declares: **"THIS MACHINE DESIRES TO INJECT ONE OR MORE UNNAMED CHEMICAL(S)."** (The same independent output is used regardless of the chemical(s) that will be subsequently requested.) To cause the Milnor timer to stop and delay the **"COMMENCE CHEMICAL INJECTION"** signals, an independent input from the chemical system to Milnor must respond, **"WAIT"** (within two seconds).

In the *absence* of a **"WAIT"** response, the Milnor signal(s) start two seconds after the inject request, or two seconds after the **"WAIT"** response is extinguished. The duration of the inject signals will be whatever is commanded in the washing program.

"WAIT" commands will be ignored unless the machine has desired to inject less than two seconds before.

When several washer-extractors desire chemicals simultaneously, it is the central chemical injection systems' responsibility to decide which machine will receive chemicals first. It is also the central chemical injection systems' responsibility to cope with the situation when one or more washer-extractors simultaneously desire more than one chemical, although the latter case may be avoided by only commanding one chemical injection at a time—using Milnor's exclusive "do not drain" feature to subsequently inject more than one chemical in the same bath.

The **"DESIRES TO INJECT"** and **"WAIT"** signals must be via potential-free contacts capable of faithfully handling 10 MA (.01 amperes) at 5 VDC. The specific **"COMMENCE CHEMICAL INJECTON"** signals will be either 120 VAC or 240 VAC, depending on the specific MILNOR model, and via relay contacts capable of conducting a maximum of 9 VA (i.e., a maximum of either 80 MA (.08 amperes) at 120 VAC or 40 MA (.04 amperes) at 240 VAC).

"CHEMWAIT" is presently available in all Mark I, II, III, IV, and V controllers, but does require the optional #2 output board. Ask factory for more information. B

ADJUSTING LEVEL SENSING APPARATUSES AND SETTING LEVELS ON 100-FORMULA WASHER-EXTRACTORS AND TEXTILE MACHINES

How Level Control Works

Types of Level Sensing Apparatuses—Three types of apparatuses are used on these machines: *float chamber assemblies, pressure switches,* and *pressure transducers*.

A *float chamber assembly* (FIGURE 1) is an open-top, metal tube connected to the shell below the water line. The height of water in the tube is the same as in the cylinder. Changes in the level cause a float, rod, and actuating arm to move, which in turn, actuate either of two switches. Each switch actuates at one pre-set level.

A *pressure switch* (FIGURE 2) actuates when the air inside an airtight chamber connected to the washer shell below the water line reaches a certain pressure. As the liquor level changes, the air pressure in the chamber changes. Each pressure switch actuates at one pre-set level.

A *pressure transducer* (electronic level control) works similar to a pressure switch, except that it produces a voltage which varies with changes in pressure. The varying voltage is converted into digital data which the microprocessor controller can interpret and display as inches or centimeters of water.

Which Apparatuses and Methods of Level Control Are Used—Table A, below, shows which apparatuses are used on various machine types. These apparatuses permit controlling the liquor level using the methods listed in the table, unless the machine is equipped and configured for *metered water* (specifying a quantity of water). In the latter case, the level sensing apparatuses are not used to control levels, but they are used by the microprocessor controller for certain internal lockouts (e.g., permit steaming only after low level is achieved).

Table A: Apparatuses and Methods for Each Machine Type

Machine Type	Level	Level Sensing Apparatus	How level is specified in wash formula (no *metered water*)
Divided cylinder models	Level 3=high (rinse)	pressure switch SPLL3	Select one of the four pre-set levels
	Level 2=low (wash)	pressure switch SPLL1	
	Level 1=below low (starch)	pressure switch SPLLL	
	Level 0=no water (shake out)	N. A.	
36021xxx and 36026xxx open pocket models	Level 3=high (rinse)	float chamber/switch SLLL3	Select one of the four pre-set levels
	Level 2=low (wash)	float chamber/switch SLLLL	
	Level 1=below low (starch)	pressure switch SPLL1	
	Level 0=no water (shake out)	N. A.	
	OK to open door	pressure switch SPLLS	N. A.
42026xxx and larger open pocket models	Processing levels	pressure transducer	Specify inches or centimeters within a pre-set range
	OK to open door		N. A.
	Fill while tilted		N. A.

NOTE: There is no separate *cooldown* level. Cooldown occurs at the commanded level in the bath in which cooldown is commenced.

Determining Levels

Washer-Extractors—Ultimately, the local situation dictates the best processing levels to use. However, the factory levels shown in Table B, below, reflect "typical" processing conditions, and the user should carefully consider the consequences before changing these settings. For example, given normal load size and common fabric type, the factory settings for *level 2* and *medium* shown in the table below are the minimum required for a first bath. At lower levels the goods may not be fully wetted, resulting in poor washing and unbalanced extractions.

Textile Machines—Because textile processes vary greatly, the configure lockouts for textile machines are set initially to provide the widest range for commanding levels in the formula.

Table B: Factory Levels (in inches and ( ) centimeters)

Actual levels set on apparatus (machines with a float chamber assembly and/or pressure switches)			
Cylinder Designation	Level 1 (starch)	**Level 2 (wash)**	**Level 3 (rinse)**
Divided Cylinder Washer-Extractors			
42044	4 (10)	7 (19)	12 (31)
60036	4 (10)	9 (23)	14 (36)
60044	4 (10)	9 (23)	14 (36)
72044	4 (10)	9 (23)	14 (36)
36021xxx and 36026xxx Washer-Extractors			
36021	3 (8)	8 (20)	13 (33)
36026	3 (8)	8 (20)	13 (33)
NOTE: *Ok to open door* level = 7 (18) This setting must not be changed.			

Configure values entered in microprocessor (machines with a pressure transducer)				
Cylinder Designation	Low (minium)	**Medium (min. prior to extract)**	**High (maximum)**	Tilt
F8W Outerwear Washer-Extractor				
30022	4 (10)	7 (19)	10 (25)	—
Open Pocket Washer Extractors—42026 and Larger				
42026	8 (20)	10 (25)	16 (41)	—
42032	8 (20)	10 (25)	16 (41)	—
48032	9 (23)	11 (28)	16 (41)	*
48036	9 (23)	11 (28)	16 (41)	*
52038	8 (20)	10 (25)	16 (41)	*
64046	10 (25)	12 (31)	16 (41)	16 (41)*
72046	10 (25)	14 (36)	18 (46)	18 (46)*
72058	10 (25)	14 (36)	18 (46)	18 (46)*
* On non-tilting models, the *tilt level* must be set to 00. On tilting models, the factory settingis the same as high level.				
Textile Machines				
64046	4 (10)	15 (38)	38 (97)	6 (15)
72058	4 (10)	15 (38)	38 (97)	6 (15)

Precautions When Changing Factory Levels

1. *Pressure switch SPLLS*, used on 36021xxx and 36026xxx models to unlock the door at a safe level, must remain at the factory setting. (In other models, this level is specified in the software and cannot be changed.)
2. Never set the level for a first bath lower than needed to thoroughly wet the goods. Normally this will be the factory setting shown in the table for *level 2* or *medium* .
3. Never change float or pressure switch hierarchy. All lower level switches must make (i.e., L1 and L2 must both make for *level 2*; L1, L2, and L3 must all make for *level 3*.)
4. *Pressure switch* settings that vary more than one inch (2.5 cm) from the factory settings are not recommended.

About Level Adjustments

⚠ CAUTION ⚠

INJURY AND MACHINE DAMAGE HAZARDS—A knowledge of machine programming, operating, and mechanical/electrical servicing is needed when making level adjustments. These adjustments must be performed only by qualified personnel, in strict compliance with published safety precautions.

When Adjustments Are Needed—If the mounted position of a *float chamber assembly* or part of it changes (which can occur when components are replaced), the switches will no longer actuate at the same levels. Similarly, a *pressure switch* may not actuate at the original level setting as a result of prolonged wear or replacement. In these situations, the pre-set levels must be re-established.

On machines with *pressure transducers,* the microprocessor may not properly interpret the transducer output as a result of prolonged wear or replacement of the transducer. In this situation, the transducer must be re-calibrated.

Apparatuses Used To Make Level Adjustments—*Level float*-controlled levels are adjusted by moving the clips on the float rod. *Pressure switch*-controlled levels are adjusted with the *trip point adjusting screw* on the switch. On machines with *pressure transducers,* actual processing levels are not pre-set (levels are specified in the formula), but ranges and tilt level are pre-set with the *low, medium, high,* and *tilt level* configure decisions. The transducer is calibrated with the *tap offset counts* configure decision.

Measuring Levels Accurately—The adjustment procedures require filling the machine to a level mark of known height. The amount of water needed to achieve a level will vary unpredictably if goods (which both absorb water and occupy space) are present or if the cylinder is rotating. **Always set levels/calibrate with the cylinder at rest and without goods.**

On divided cylinder machines (which hang level, front to back), use the graduated sight glass on the shell front to measure levels. The graduations are in inches or centimeters, depending on the machine's destination country.

The levels in open pocket cylinders (which slope down to the rear) are measured at the rear (deepest part) of the cylinder. Temporary marks must be placed on the cylinder rear wall, as explained below.

Marking Levels on an Open Pocket Machine

⚠ DANGER ⚠

CONFINED SPACE HAZARDS—Confinement in the cylinder can kill or injure you. Hazards include, but are not limited to panic, burns, poisioning, suffocation, heat prostration, biological contamination, and crushing.

☞ **Do not enter the cylinder until it has been thoroughly purged, flushed, drained, cooled, and immobilized.**

1. Prepare the machine for safe entry and in accordance with all applicable codes (e.g., OSHA permit-required confined space entry requirements). Lock power off at the external disconnect switch.
2. On the inside of the cylinder, measure from the bottom rear and place clearly visible marks on the rear wall. If the machine has a *level float* and/or *pressure switches,* mark a line at each level to be set. If the machine has a *pressure transducer,* mark a line at *high* level. The cylinder will be stationary while filling, so the marks will not move.
3. When all personnel are clear, restore machine power.

Level Setting Procedures

(Machines With a *Float Chamber Assembly* and/or *Pressure Switches*)

General Procedure—Perform the following for each level to be set:

1. Close the door and run Formula 99. (The cylinder will be stationary and without water.)
2. Use the procedures described in "MODIFYING FORMULAS IN PROGRESS," "Method B . . ." (see Table of Contents) to fill with cold water just to the mark for the level to be set.
3. Adjust the appropriate apparatus (*float chamber assembly* or *pressure switch*) as explained below, just enough to actuate (as indicated by the proper level number appearing on the display).

Accessing and Adjusting the Float Chamber Assembly

⚠ DANGER ⚠

ENTANGLE AND SEVER HAZARDS—Contact with moving components normally isolated by guards, covers, and panels can entangle you and crush your limbs. These components move automatically.

☞ **Do not service machine unless qualified and authorized.**

The machine must remain powered on while adjusting the float rod clips. **Use extreme caution not to reach into the path of any apparatuses which could move, such as pulleys or belts.** On rigid models, the float chamber assembly (FIGURE 1) is located behind the shell. The float rod clips are accessible from the top of the machine. On suspended models, the level float is located within the frame. Remove the appropriate panel(s) for access.

Move clips as shown in FIGURE 1. Note that top and bottom clips must not be placed closer together than one inch (25 mm), otherwise the float rod can bind in the actuator arm.

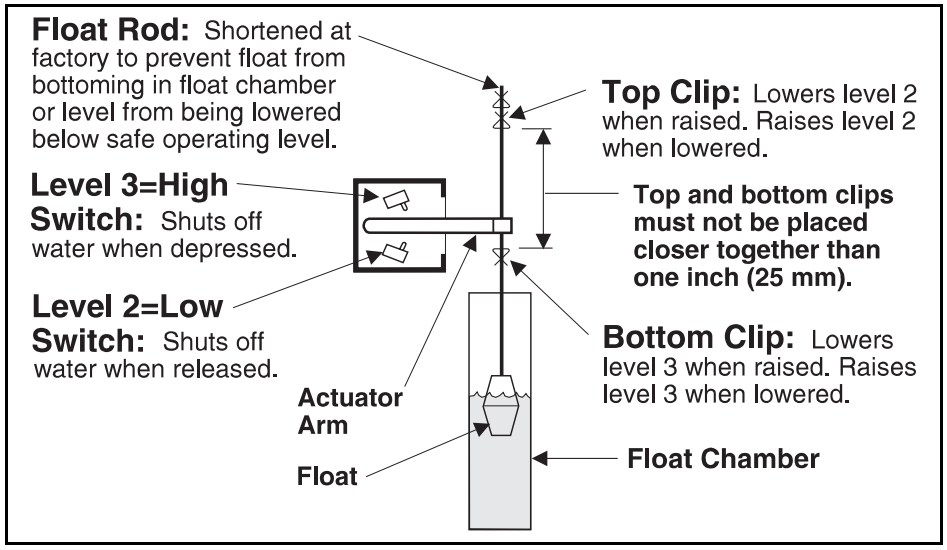


FIGURE 1 (MSSM0238BE)
Float Chamber Assembly—Clip Adjustment

Accessing, Identifying, and Adjusting Pressure Switches

⚠ DANGER ⚠

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

☞ **Do not service machine unless qualified and authorized.**

The machine must remain powered on when adjusting pressure switches. **Use extreme caution not to touch any electrical conductors on the switch or in the electric box. The trip point adjusting screw may become electrically energized when power is on. Use only an insulated screwdriver to make adjustments.**

Pressure switches (FIGURE 2) are located in the *low voltage control box*. A sticker on the switch and/or a tag in the control box identify the switches by the functional names given in Table A (e.g., SPLL3).

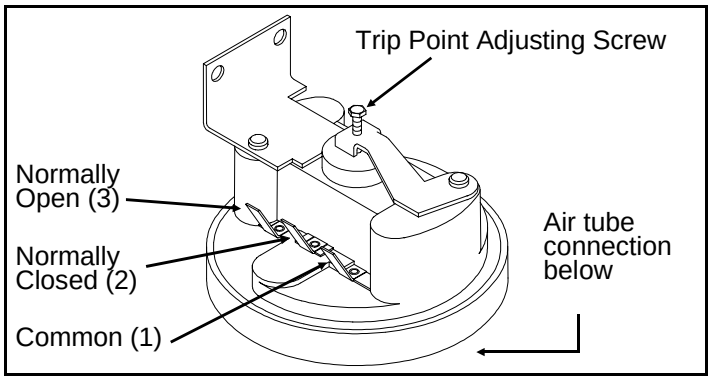


FIGURE 2 (MSSM0240AE)
Pressure Switch

The switch manufacturer calibrates these switches to actuate at a set pressure. When proper levels are verified at the Milnor factory, the *trip point adjusting screw* is painted with wax to hold its adjustment. **With an insulated screwdriver**, turn the *trip point adjusting screw* slowly. Turning clockwise causes the switch to actuate at a higher level; turning counter-clockwise actuates it at a lower level.

NOTE: A crimp, cut, or loose connection in the plastic air tube will prevent the pressure switch from functioning, causing the machine to overflow. Inspect air tubes periodically.

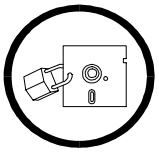
Range Setting, Calibrating, and Testing Procedures

(Machines With a *Pressure Transducer*)

Disabling *Metered Water* if the Machine Also Has a Flow Meter—If the machine has a flow meter and is configured for *metered water* (configure decision N), then the pressure transducer is only used for internal lockouts. Never-the-less, the transducer must be properly calibrated. The procedures described herein for range setting and calibrating may be used in this instance provided *metered water* is disabled, as follows:

1. Write down (or print out) all configure decisions. This is necessary because the next step will cause certain configure values to be lost. These must be re-entered later.
2. Set configure decision N (*metered water*)=0. Now a calibration formula can be programmed, specifying levels in inches (or centimeters) of water, as explained elsewhere herein.

⚠ CAUTION ⚠



DATA LOSS AND MALFUNCTION HAZARDS—Existing formulas contain water quantity data which only applies to *metered water*. While metered water is disabled:

- ☞ **Do not access existing formulas. The microprocessor will delete the water data.**
- ☞ **Do not run existing formulas. The water data will cause the machine to malfunction.**

Setting the Level Ranges and Tilt Level—The *low*, *medium*, and *high level* configure decisions determine the ranges within which levels may be specified in the wash formula. See "PROGRAMMING . . . ," "5=CONFIGURE . . ." for how these values affect the ranges. Set these values as desired. The *tilt level* configure decision specifies the level a tilting machine will fill to while tilted. On non-tilting machines this level must be set to *00*.

Creating a Calibration Formula—A one-step calibration formula is needed for calibrating and testing. Command a soak wash (cylinder does not turn), no temperature, cold water only, a level height (inches or centimeters) equal to high level (the height of the level mark), no steam, and no chemicals.

Calibrating Tap Offset Counts—Set the *tap offset counts* configure decision to 0000. Run the calibration formula and observe the water level. If the machine does not fill precisely to *high* level, adjust the *tap offset counts* configure value and run the formula again, repeating as required. Initially, change this value in fifty unit increments.

If the level is too low—enter 0050. *Increasing* the value in the range 0000 to 4095 *increases* the level achieved.

If the level is too high—enter 5050. *Increasing* the value in the range 5000 to 9095 *decreases* the level achieved.

Enabling *Metered Water* if the Machine Also Has a Flow Meter—If *metered water* was previously disabled, re-enable it as follows (if the transducer must be tested, do this after testing):

1. Set configure decision N (*metered water*)=1
2. Step through all configure decisions, comparing them with the recorded values. **Do not change the *low level, medium level, high level, tilt level,* and *tap offset counts* values, which were just established.** Verify that all other values are as previously recorded. The *counts per 100* and *offset valve time* values for *metered water* will probably need to be re-entered.

Testing the Transducer—If problems with the transducer are encountered (e.g., eratic levels), a qualified service technician can troubleshoot this condition as follows:

1. **Test for a faulty transducer:**
   a. Disconnect the pressure transducer output wire (2MTA3-4).
   b. Measure the voltages on the transducer. There should be +12VDC on the input pin and approx. 1 VDC on the output pin with no water in the cylinder.
2. **Test for an air leak:**

⚠ CAUTION ⚠

The following step requires injecting water with the transducer output disconnected. The water supply must be shut off manually otherwise the machine will overflow.

   a. With the output wire still disconnected, have an assistant run the calibration formula and manually shut off the cold water supply externally when high level is achieved.
   b. While the machine is filling, measure the voltage on the output pin of the transducer. It should rise from 1.0VDC to some voltage less then 6.0VDC. It rises approximately 1VDC per 11inches (28 cm) of water.
   c. With the machine at high level, monitor the transducer output voltage. It should remain stable.
3. **Test for effective shielding of the transducer box-to-low voltage control box cable.** The shield on this four conductor cable must be grounded to the copper bus bar in the low voltage control box and disconnected in the transducer box. Verify proper shielding as follows:
   a. Re-connect the wire to the output pin on the transducer.
   b. Change the calibration formula *type of step* to a *two-way bath* and run this formula.
   c. While the machine is filling with the cylinder rotating, hold 9 YZ- on the keypad.

```
05:38 STEP 01   05:00
2461/056/056
```

The display will appear similar to the example at left. Monitor the middle numeric value on the bottom line of the display which is the actual level in centimeters. If this value goes to zero while the basket is turning and returns to the correct level during dwell, then the shield is not properly grounded.

Troubleshooting Basket Speed Errors on Single-motor Washer-extractors

This document describes the proper procedure for troubleshooting errors related to basket motor speed on machines equipped with a single motor, an inverter, and a digital-to-analog (D-to-A) board.

All or part of this document does not apply to washer-extractors in the following categories:

- Models equipped with the Milnor E-P Plus controller. The E-P Plus controller commands the inverter to drive the motor at one of the speeds pre-programmed at the Milnor factory. These machine models do not use a D-to-A board for speed control.
- Single-motor washer-extractors in the Milnor "E _ _" model line, and divided-cylinder washer-extractors. These models—which use software WUWESME—allow configuring of the counts per RPM and of the D-to-A offset counts. This makes the data in Table 1 "Model-Specific Data" invalid.

1. As the basket rotates, a photoeye sees each spoke of the main drive pulley. The photoeye sends a pulse representing each pulley spoke to an input/output board (I/O #1).
2. I/O #1 determines the time between pulses and communicates this to the machine processor board.
3. The processor board calculates the RPM and compares this value to the digital value corresponding to the programmed basket speed. If the speed is incorrect, the processor board signals the digital-to-analog (D-to-A) board to slightly increase or decrease the basket speed.
4. The D-to-A board converts the digital signal from the processor board to an analog voltage of 0 to 10 volts and sends it to the inverter. The speed at which the inverter drives the motor is directly related to the voltage output of the D-to-A board.
5. The inverter interprets the voltage from the D-to-A board and adjusts the voltage and frequency of the motor supply to drive the motor at a different speed.
6. The motor speed changes, causing the spokes on the main pulley to pass the photoeye at a different rate, and the speed control circuit is complete.

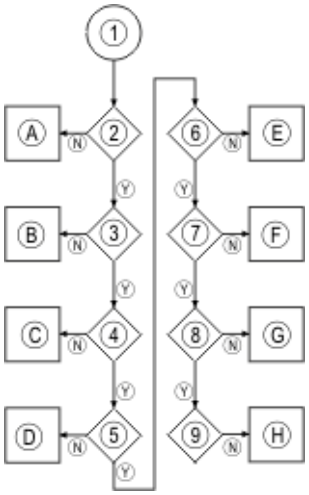
The most common indicator of a problem somewhere in the speed control circuit is that the basket does not turn at the desired speed, or does not turn at all. The chart in Figure 1 describes the overview of the troubleshooting process.

WARNING 1: Electrocution and Electrical Burn Hazards—Hazardous voltages can cause sever injury or death.

- Whenever possible, lock all power sources feeding the inverter in the "OFF" position.
- The status indicator LEDs and the inverter display will be extinguished when the DC voltage inside the inverter is below 50VDC. Wait at least one additional minute for voltages to further dissipate.

Figure 1: Troubleshooting Speed Errors

Process Chart



Legend

Y. Yes
N. No
1. Machine does not run at desired speed.
2. Section 1: Is desired speed programmed in wash formula?
A. Edit wash formula.
3. Section 2: Are inverter parameters correct for this machine model?
B. Contact Milnor, and correct inverter parameters.
4. Section 3: Does digital counts value match desired speed?
C. Contact Milnor for updated software.
5. Section 4: Does D-to-A output voltage at **D-to-A board** match desired speed?
D. Replace D-to-A board.
6. Section 4: Does D-to-A voltage **at inverter** match desired speed?
E. Check wiring from D-to-A board to inverter.
7. Section 5.1: Does inverter output frequency match input voltage?
F. Review inverter parameters, and contact Milnor Customer Service.
8. Section 5.2: Is inverter output amperage within normal limits?
G. Contact Milnor Customer Service before repairing or replacing inverter.
9. Section 6: Does motor test within normal limits?
H. Contact Milnor Customer Service before repairing or replacing motor.

1. Verify Programmed Speed

Verify that the machine is programmed correctly. The desired basket speed is programmed on the second page of each wash formula step.

Display or Action	Explanation
	Insert the programming key into the *Run/Program* keyswitch and turn the key 1/4 turn to the right. This accesses the *Program Menu*.
PROGRAM 0 MENU OK TURN KEY TO RUN	*Program Menu* item *0* indicates that it is safe to turn the key to the *Run* position. If you make any changes to a wash formula or machine configuration, do not turn the key to the *Run* position unless this menu item is displayed.
	Press the up and down arrow keys to select other items from the *Program Menu*.

Display or Action	Explanation
PROGRAM 1 MENU ADD/CHANGE FORMULA	Select *Program Menu* item *1* to view the programmed steps in the wash formula.
	Press *Enter/Next* to confirm your selection and prompt for the desired wash formula number,
or	
	press *Cancel/Escape* to return to *Program Menu* item *0*.

Display or Action	Explanation
ADD/CHANGE FORMULA 00	This display prompts for the number of the formula in which the error occurs. If the error appears in several formulas, only one needs to be verified.
	Enter the formula number. An incorrect formula number can be changed at the next display.
ADD/CHANGE FORMULA 01 FORMULA 01	The cursor flashes on "CHANGE" and the first digit of the number for any existing formula. "ADD" flashes if the formula does not exist, prompting you to program a new formula. If the selected formula is not correct, enter another formula number at this display.
	Confirms the selected formula and advances to the next display.
F01 FORMULA 01 S01 00 STEP 01	The cursor flashes on the first character of the name for step 01.
	Accepts the formula name and advances to the overview display for step 01.
F01 TMMQFFFHC3WLL S S01 2050150133110 0	The overview display for step 01. Notice that there is no cursor flashing.
	Advances to the step decisions for step 01.

Display or Action	Explanation
F01 TMMQFFFHC3WLL S S01 2050150133110 0	The first page of step decisions includes the type and duration of the step, the desired temperature, water valves, fill action, bath level, and steam code.
ENTER	Press ENTER several times to advance to the second page of decisions.
F01 CCNNWSSS*RPMDRC S01 000000000-30000	The second page of step decisions includes the prompt for the desired basket speed. If the value shown here is not the desired value, change it. The complete procedure for programming a wash formula is described in the reference manual for your machine.

2. Verify Inverter Parameters

The machine processor board adjusts the speed of the motor by communicating with the inverter. The inverter contains several values, called *constants* or *parameters*, that control how the inverter interprets signals from the machine processor. These parameters were programmed into original equipment inverters at the Milnor factory before the machine was shipped, but replacement inverters must be programmed with the correct constants for machine type, inverter type, and voltage. If these parameters are incorrect, the inverter will not work as expected.

The procedure for verifying the inverter parameters varies among inverters, but is described in detail in the documentation provided by the inverter manufacturer. Replacement manuals for several inverter models are available at `http://www.drives.com`.

Inverter constants for specific inverters and Milnor machine models are available in the *Customer Service* area of `http://www.milnor.com`.

3. Verify Digital Value of Programmed Speed

If the desired value is correctly programmed, view the speed diagnostics to verify that the machine controller is commanding the programmed speed. The machine must be running a step in which the speed is wrong.

Supplement 1

Creating a Test Formula

When a wash step begins, the beginning value sent to the inverter is calculated according to this equation:

$$V_0 = [RPM_d * (C/RPM)] + D$$

Where:
V_0 = beginning value sent to inverter
RPM_d = Desired basket speed in RPMs
C/RPM = Counts per RPM
D = Offset

If all motors, inverters, and digital-to-analog boards could be manufactured to exactly the same specifications, adjustment of the basket speed would not be necessary. However, manufacturing tolerances allow minor variances in these components, so a feedback system is used to monitor the basket speed and make adjustments to achieve the desired value.

If a speed adjustment is required during a wash step, the machine controller signals the inverter

to increase the basket speed by two RPMs or decrease the speed by one RPM at each adjustment. These adjustments are made three seconds before the end of the programmed *basket On time* (programming decision *XXX*). Because the speed is adjusted only one time per *On time* period, formulas programmed with *On times* near the maximum may require several minutes to achieve the programmed speed.

To give the machine sufficient time to achieve a steady speed state and to maintain that speed during troubleshooting, it is often a good idea to program a special test formula. To troubleshoot a speed error in a bath step, the test formula should contain a bath of moderate to long duration with relatively brief *basket On* and *Off times*.

1. For step 01, set the *Type of Step* to a *Wash* with basket rotation (*T = 1* or *2*).
2. Set the *Step Time* to about 10 minutes (*MMQ = 100*).
3. Do not set a temperature (*FFF* or *CCC = 000*).
4. Program the machine to fill with cold water (*C = 1*) to a low level (*LL = 04*).
5. Program no chemical injection (*CC = 00*).
6. Program the speed in RPMs (e.g., *RPM = 018*) that is used in the erroneous production formula.
7. Program the basket *On time* to 20 seconds (*XXX = 020*) and the basket *Off time* to 3 seconds (*YYY = 003*).
8. End the formula (*E = 0*).

Use the formula created in Supplement 1 or a similar formula to evaluate other possible sources of the problem.

Display or Action	Explanation
6	With a step running in which the problem occurs, press this key to view the speed diagnostics data. Press this key a second time to close the speed diagnostics and display the normal run data.
10:38 F0005S03 02:37 **0195** RPM=A029/D030	The top line of the speed diagnostics display is the same as when the formula is running normally. All speed diagnostics are contained on the second line. The leftmost number is the calculated digital **counts** value. You can determine the initial digital count for the programmed basket speed from Table 1 and the equation below:

$$C_d = [RPM_d * (C/RPM)] + D$$

Where:
C_d = Desired digital counts value
RPM_d = Desired basket speed in revolutions per minute
C/RPM = Counts per RPM
D = Offset value

Table 1: Model-Specific Data

Machine Model	Maximum Frequency	Maximum Wash RPM	Counts per RPM (C/RPM)	Offset (D)
30022F_W	155	40	5	15
30022X_W				
36030F_S	186	43		
36030F_W	205			
42026V_W	155	40		
42032F_S	178			
42032F_W	195			
48040F_W	170	38	6	
68036F_N		32	7	
Important: Values shown are subject to change without notice. Contact Milnor Customer Service for verification.				

Note 1: The counts and offset values are configurable in controller software WUWESME, used in single-motor E-style and divided cylinder washer-extractors. Contact your dealer or the Milnor service department for assistance with these machines.

Display or Action	Explanation
10:38 F0005S03 02:37 0195 RPM=A029/**D030**	The rightmost number of the bottom line indicates the desired (programmed) basket speed for this step. This value matches the value programmed in the wash formula.
10:38 F0005S03 02:37 0195 RPM=**A029**/D030	The middle number of the bottom line indicates the current calculated basket speed. Input/output board #1 determines the time between each main pulley spoke passing the photoeye and reports this data to the processor board at each communication cycle, which is usually more often than once per second. The processor board filters the raw data from the input/output board and displays the most recent valid value.

Tip: Large variations in the achieved RPM value are possible early in extract steps because the valid range includes values from 0 RPMs to the maximum extract RPM of the machine. These variations have no effect on how the machine operates because of the frequency with which new data is reported.

4. Verify Output Voltage of D-to-A Board

If the microprocessor is displaying the correct calculated digital value, the next step is to verify that the digital-to-analog board is putting out the appropriate signal voltage.

1. Calculate the voltage of the signal that the D-to-A board should deliver to the inverter:

$$V_d = C_d / 409.5$$

Where:
V_d = Desired voltage
C_d = Desired counts per RPM

For example, assume the machine is configured as a 48040F_W and the desired wash speed is 24 RPMs.

a. From Table 1, we see that this machine model makes six counts per revolution and has an offset of 15.

b. Calculate the desired counts for a basket speed of 24 RPMs:

$$C_d = [RPM_d * (C/RPM)] + D$$

$$C_d = [24\ RPMs * (6\ counts\ per\ RPM)] + 15$$

$$\mathbf{159} = 144 + 15$$

c. Calculate the desired voltage:

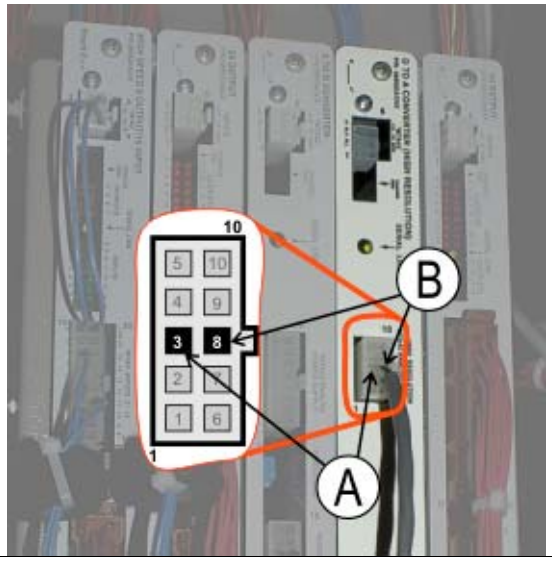
$$V_d = C_d / 409.5$$

$$0.3883 = 159 / 409.5$$

2. The DC voltage measured at the output terminals of the D-to-A board and at the analog voltage input terminals (FV and FC on GPD 506 model inverters, or A1 and AC on F7 model inverters) (shown in Figure 2) should match this number. You may see a small voltage drop from the D-to-A board to the inverter.

Figure 2: Measuring Control Voltage at D-to-A Board and Inverter

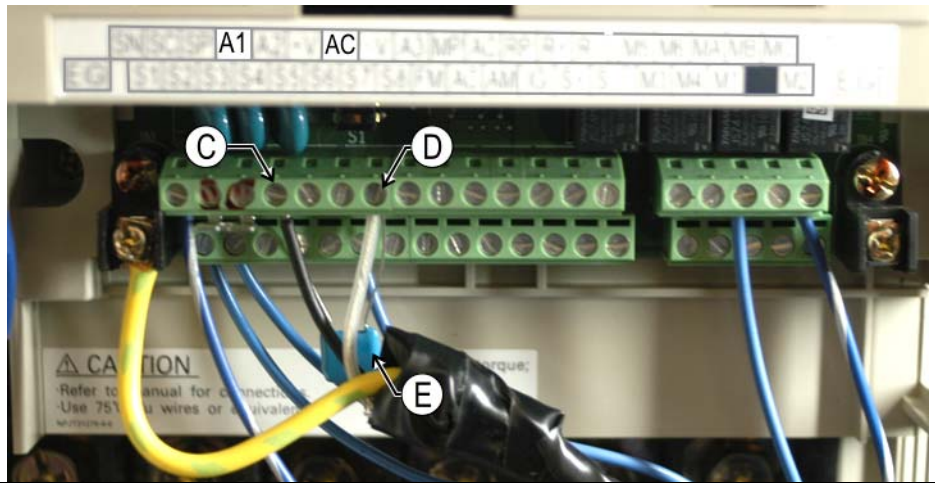
Digital-to-Analog Board



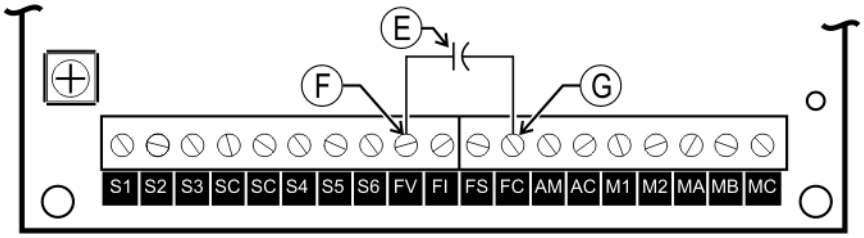
Legend

A. MTA-43 Pin 3
B. MTA-43 Pin 8
C. Inverter terminal A1
D. Inverter terminal AC
E. 2.2 microfarad capacitor
F. Inverter terminal FV
G. Inverter terminal FC

Inverter Analog Terminals for Yaskawa F7



Inverter Analog Terminals for Yaskawa GPD 506



Tip: The 2.2 microfarad capacitor between the analog input terminals (*FV-FC* on GPD 506; *A1-AC* on F7) filters noise from the input signal to the inverter. The machine may not operate as expected if this capacitor is not present. When installing a replacement inverter, transfer the capacitor as part of the procedure.

3. If this value is wrong at the D-to-A board, replace the board.

4. If the value is correct at the D-to-A board but wrong at the inverter, check the wiring between the board and the inverter.
5. If the value is correct at both sets of terminals, troubleshoot the inverter.

5. Troubleshooting the Inverter

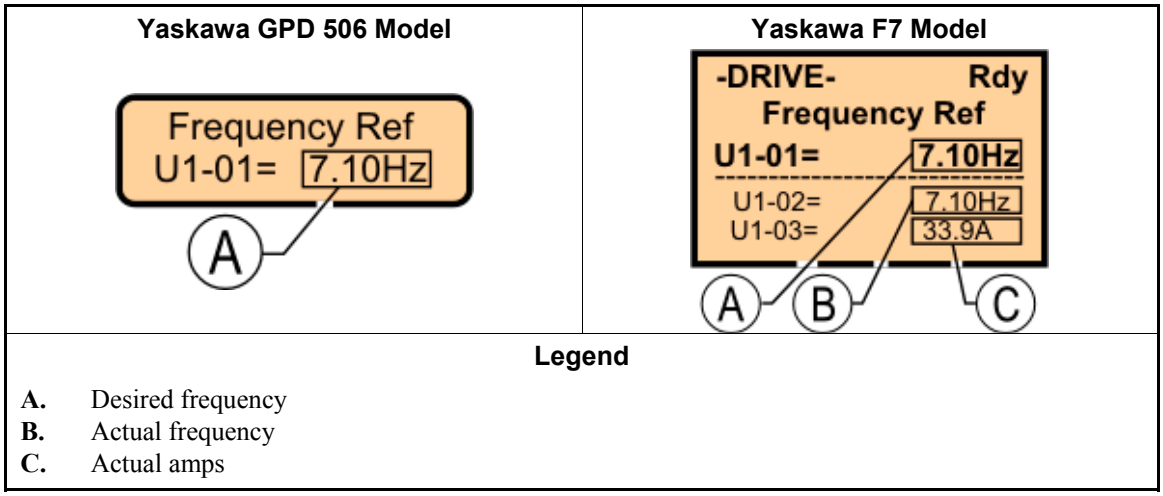
5.1. Verify Inverter Output Frequency—Use the inverter keypad to display the current desired frequency. This frequency should correspond to the input voltage according to this equation:

$$F_d = (V_{out} / 10) * F_{max}$$

Where:
F_d = Desired frequency
V_{out} = DC voltage output from D-to-A board
F_{max} = Maximum inverter frequency (see Table 1)

When the machine is running normally, the inverter display appears similar to one of the illustrations in Figure 3.

Figure 3: Typical Inverter Run Displays



The specific procedure for viewing the inverter operating parameters varies among inverter models.

- For Yaskawa F7 models, the actual and desired frequencies and the actual amperage are visible on the normal operating display.
- For Yaskawa GPD 505 and 506 models, press the *DSPL* button on the inverter once to advance from the *Desired Frequency* display to the *Actual Frequency* display.

5.2. Verify Inverter Output Amperage—Verify the current being delivered to the motor. Contact the Milnor® Customer Service department for guidelines on the acceptable amperage for the conditions.

For Yaskawa GPD 505 and 506 models, press the *DSPL* button on the inverter once to advance from the *Actual Frequency* display to the *Actual Amperage* display.

6. Testing the Motor

If the procedures described earlier in this document do not eliminate the error, have the motor tested by a reputable facility.

— End of BICWUT01 —

Speed Limiting System on 42032 F7S and 36030 F8S Open-pocket Staph-Guard® Models

Notice 1: This document applies only to the specific models and software versions listed in Table 1 below.

Table 1: Models and Software Versions Covered by this Document

Machine Model Number	Controller Software and Version	Balancing Software and Version
36030F8S	WUF8WE/2000D and later	WUBAL7/20002 and later
36030F8R		
42032F7S		WUBAL6/20001 and later
42032F7R		

1. General Information

For the referenced models, the speed limiting system provides an extra measure of protection from premature wear to the components of the machine during extract, especially the side-loading door. When a load is properly balanced and all components of this system are functioning, the machine runs at the programmed extract speed. However, if the system detects that the load is severly imbalanced, it caps the extract speed at a speed that is slow enough to safely handle the imbalanced load.

This document describes the operation of the speed limiting system which minimizes the possibility of vibration-induced machine damage. This information can also be used to determine if this system is in good working order.

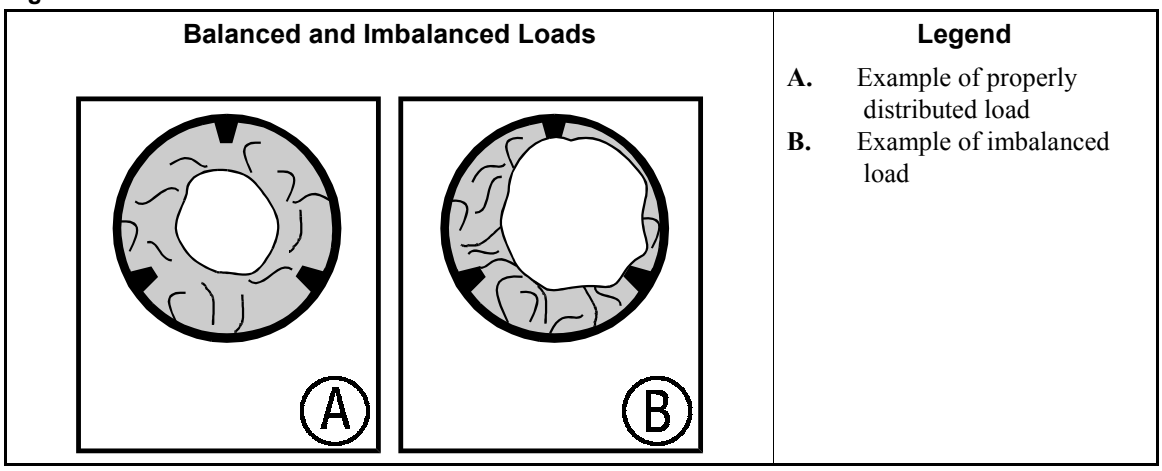
Tip: If a machine model specified in Table 1 regularly extracts at a speed slower than the programmed speed, the information in this document allows a qualified technician to determine if the speed limiting system is functioning.

The software and devices described in this document work together to prevent premature machine wear while allowing the maximum safe extract speed for any reasonable degree of imbalance in the cylinder.

- The software monitors the horizontal acceleration of the shell (detected by the accelerometer) while the cylinder speed approaches extract speed. If the horizontal acceleration exceeds a predetermined value, the controller software prevents the machine from accelerating to a faster extract speed.
- An accelerometer and a photo-eye provide information used by the controller software.
  - » The photo-eye measures the rotational speed of the cylinder. If the photo-eye reports a speed within the expected range when the extract sequence begins, the speed limiting system monitors the accelerometer and controls the maximum extract speed according to the accelerometer output voltage. If the speed reported by the photo-eye is outside the expected limits, the machine control software assumes the photo-eye is not working and applies a pre-determined maximum output speed for the current extract sequence.
  - » The accelerometer produces a voltage that increases in proportion to machine shell acceleration; i.e., the accelerometer puts out a lower voltage during small excursions at slow speeds than it does if the machine is shaking violently.

To ensure the highest safe extract speeds, load the machine at or near its rated capacity whenever practicable. At the beginning of the extract sequence, the goods will distribute around the cylinder as illustrated in Figure 1. See "Determining Load Size" (BIWUUO01) for a complete explanation of how to achieve even distibution for maximum extract speed.

Figure 1: Load Distribution



2. Mode 1: Photo-eye not Functioning Properly

The software on these machines allows the controller to determine if the load is sufficiently balanced to run at the maximum programmed extract speed. This determination is based on a **timing** input from a photo-eye and an **amplitude** input from an accelerometer. See Note 1 and Note 2 for the locations of these components on the machine. The controller software verifies that the photo-eye is present and working by monitoring the photo-eye input during each drain sequence. If the pulse rate received from the photo-eye indicates that the basket is turning less than 40 RPMs or more than 100 RPMs for 10 seconds or more, the software determines that the photo-eye is disabled.

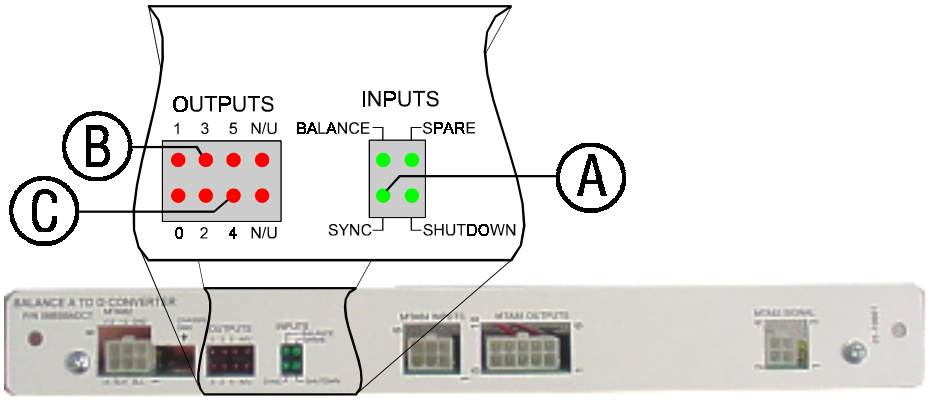
> **Note 1:** The accelerometer on 36-inch machines is located behind the right front frame member, accessible by removing the right side access panel. The accelerometer on 42-inch machines is inside the stationary part of the door latch mechanism (NOT on the door).

> **Note 2:** The photoeye is mounted on a bracket inside the main drive pulley.

The photo-eye output goes to the balance board and the microprocessor. To verify the circuit between the photo-eye and the balance board, observe the *SYNC* light on the balance board (see Figure 2). This light flashes with each pulse from the photo-eye to the balance board.

Figure 2: Balance Board Detail

Input and Output Indicator Lights



Legend

A. Sync light (flashes with input from photo-eye)

B. Output 3 light (on when accelerometer threshold is exceeded)

C. Output 4 light (on when machine has power)

Verify the circuit between the photo-eye and the microprocessor with the display. Access the diagnostic display from the normal operating display as described below:

Display or Action	Explanation
`05:30 EXTRACT 05:30` `EXTRACT 0700 RPM`	Typical operating display during extract.
6	Toggles the diagnostic display on and off. Press 6 again to return to the normal operating display.
`05:30 EXTRACT 05:30` `3885 RPM=A502/D700`	Typical diagnostic display during extract.

- 3885 = typical digital output value. This value is generated by the processor board and sent to the digital-to-analog board, where it is converted to an analog voltage for the inverter. The inverter drives the motor at the desired speed. The processor pauses the digital output value at 3535 for 30 seconds to prevent motor saturation, then resumes acceleration. The processor stops accelerating the motor if the output voltage from the accelerometer exceeds the preset threshold.
- A502 = actual basket speed
- D700 = desired basket speed

The controller requires an input from the photo-eye to determine the basket speed. Without a photo-eye input, the controller automatically restricts the basket speed to approximately 70 percent of nominal maximum speed. For the machines and software versions listed in Table 1, the maximum speed attainable without the photo-eye input is **approximately** 490 RPMs.

Figure 3: Processor Board

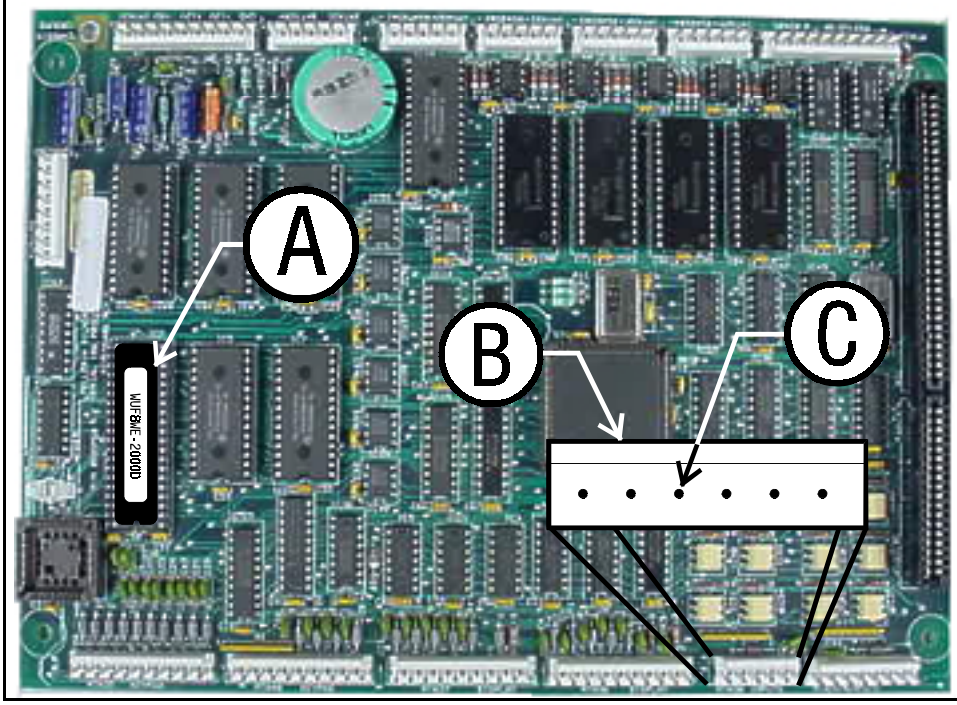
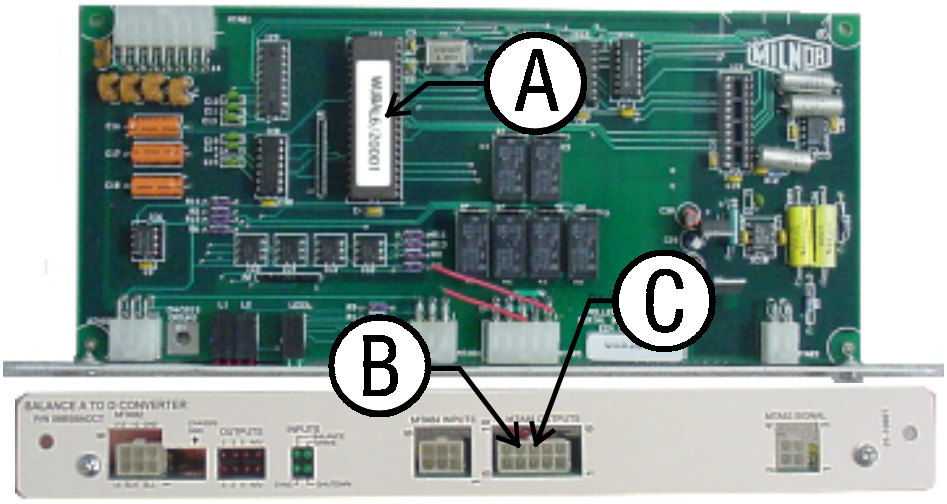
Illustration	Legend
	**A.** Software chip with version number sticker **B.** Detail of MTA38 **C.** Location of Pin 4

Figure 4: Balance Analog to Digital Board

Illustration	Legend
	**A.** Software chip with version number sticker **B.** Pin 9 of MTA85 **C.** Pin 8 of MTA85

3. Mode 2: Photo-eye Present and Functioning

If the photo-eye is functioning properly, the system (shown in Figure 5) functions as described here.

1. The balance board monitors the output voltage of the accelerometer.

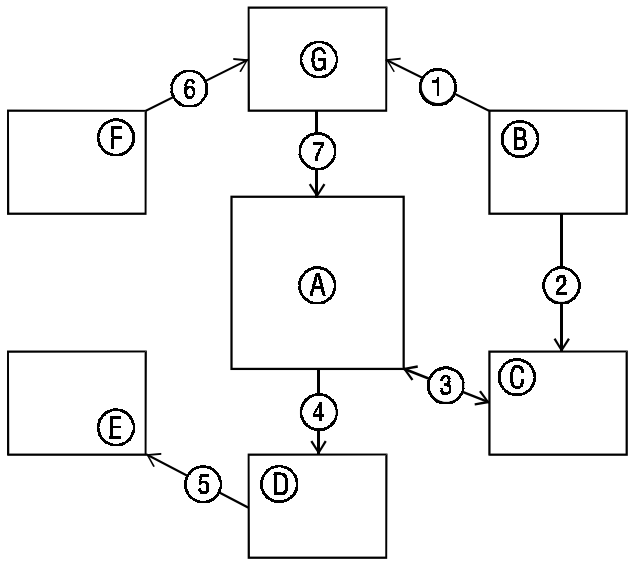
2. If the output voltage from the accelerometer exceeds the threshold value shown in Table 2, contact 4-7 on relay CRBLM on the balance board closes.
3. When relay CRBLM 4-7 closes, the microprocessor input at MTA38-4 (see Figure 6) is grounded.
4. The input on MTA38-4 signals the controller software to stop accelerating the motor.
5. The current extract step runs to completion at the speed achieved when acceleration was halted.

Table 2: Accelerometer Output Voltage Thresholds

Machine Model	Controller Software Version	Balance Software Version	Threshold Voltage
36030 F8S	WUF8WE/2000D and later	WUBAL7/20002 and later	3.7V
36030 F8R			
42032 F7S		WUBAL6/20001 and later	3.9V
42032 F7R			

Figure 5: Diagram of Speed Limiting Circuitry

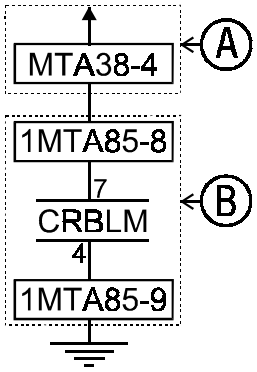
Block Diagram



Legend

A. Processor board
B. Photo-eye
C. Input/output board
D. Digital-to-analog board
E. Inverter
F. Accelerometer
G. Balance analog-to-digital converter board
1. Pulse signal for RPM
2. Pulse signal for RPM
3. Serial communications
4. Raw counts for RPM (digital signal)
5. Voltage for RPM (analog signal)
6. Out-of-balance voltage (analog signal)
7. Threshold signal (digital signal)

Figure 6: Partial Schematic Diagram

Diagram	Legend
	**A.** Physically located on processor board **B.** Physically located on balance analog to digital board

— End of BICWPF02 —

SETTING THE UNIT OF MEASURE AND CALIBRATING ELECTRONIC WATER FLOWMETERS USED ON WASHER-EXTRACTORS AND TEXTILE MACHINES

Metered water (formerly called *liquor ratio*) is a feature which permits the formula developer to specify a quantity of water (as opposed to a liquor level) for each wash step. On washer-extractors, the quantity injected when the formula is run is the quantity specified in the formula. On textile machines, the quantity of water injected is proportional to the ratio of actual load weight entered by the operator and nominal weight specified in the formula.

Washer-extractors and textile machines furnished with *metered water* are equipped with a flowmeter to measure the quantity of incoming water. The flowmeter is calibrated at the Milnor factory.

NOTE: Ensure that reuse water is free of lint and other solid contaminants which can become entangled in the flowmeter, causing it to malfunction.

About These Procedures

Why the Flowmeter Must be Calibrated—Flowmeters have a paddle wheel that rotates at a speed proportional to the *speed* of the passing water, sending pulses to an electronic counter. The number of pulses for a given *speed* of water will vary slightly from one flowmeter to another. The number of pulses for a given *quantity* of water depends on the size of the pipe the flowmeter is in. A 2" (51 mm) diameter pipe will have a much lower pulse count than a 1" (25 mm) diameter pipe, for the same quantity. Calibration determines the ratio of pulses to quantity of water for the specific flowmeter and pipe. Initially, some unit of measure (e.g., pounds, gallons, kilograms, liters) must be chosen for calibrating. The Milnor factory uses *pounds.*

What Calibration Values are Required—The calibration values required by the microprocessor controller are *counts per 100* and *offset valve time*. These values are entered in *mode 5, Configure* (see "PROGRAMMING . . ." see Table of Contents).

Counts per 100 is the number of flowmeter counts resulting from injecting 100 units of water (pounds, gallons, kilograms, liters). Once the *counts per 100* is established for a given unit of measure it may be converted to any other unit. The unit of measure that *counts per 100* is based on must also be used when programming formulas.

Offset Valve Time is the *reduction* in time that the water valve will remain open to admit the metered quantity commanded in the formula. This adjustment compensates for the tendancy to *overshoot* the commanded quantity because of the time taken for the valve to close. The value is in tenths of seconds.

NOTE: The *counts per 100* must be finalized before determining the *offset valve time.*

Setting the Unit of Measure

When Setting the Unit of Measure is Required—Every machine equipped with electronic flowmeters is calibrated at the Milnor factory and the *flowmeter calibration label* is marked with the *counts per 100* and *offset valve time* values. This label is located on the inside of the processor control board. A laundry desiring to program formulas in any unit other than pounds (the unit used by Milnor) must first convert the *counts per 100* shown on the calibration label to their preferred unit of measure and enter this value in the *counts per 100* configure decision. B

Conversion Procedure—Use the following formula to convert from pounds to another unit of measure:

Factory *counts per 100* pounds x Multiplier listed below = New *counts per 100*

Desired Unit	Multiplier
Gallons	8.33
Kilograms	2.2
Liters	2.2

Example: Factory *counts per 100* pounds = 0532
Desired units = Liters

New *counts per 100* liters = 0532 x 2.2 = 1170

NOTE: Contact the Milnor factory for any unit not listed if the conversion factor cannot be determined.

Calibrating

When Calibration is Required—If configuration label is lost, merely re-enter the values listed on the configuration plate (or convert to the desired units). Recalibration is only required for replacement flowmeters or if it is suspected that a flowmeter has lost its calibration as may eventually occur with use.

Preparations for Calibrating

⚠ CAUTION ⚠

INJURY AND MACHINE DAMAGE HAZARDS—Calibrating requires temporarily removing the cylinder water inlet hose. This procedure must be performed only by qualified maintenance personnel, in strict compliance with published safety precautions.

Obtain a container large enough to hold 460 pounds (208 kilograms, 55 gallons, 208 liters). Establish a means of accurately measuring the contents of the container (by weighing or determining volume).

Lock off machine power at the external disconnect switch, then remove the appropriate panels to gain access to the machine's water inlet piping. An internal hose connects the water inlet piping to the wash cylinder. Obtain eight feet (2.5 meters) of hose of the same diameter as the internal hose. Disconnect the internal hose and install the temporary hose such that incoming water will be injected into the measuring container. Make sure the hose is secured so it cannot jump out of the container.

Taking care to keep bystanders away from the machine, restore machine power. In *mode 5, Configure*, enter the initial *counts per 100* value from Table A and enter *000* for the *offset valve time*.

Create a calibration formula consisting of one bath step. For this step, command no steam, cold water only, no chemicals, and whichever of the following water quantities is in the same units as the *counts per 100* configure decision: 416 pounds, 189 kilograms, 50 gallons, or 189 liters.

Table A: Initial *Counts per 100*

Cylinder Size	Initial Value of *Counts per 100*			
	Pounds	Kilograms	Gallons	Liters
36021/36026	Consult Milnor factory			
42026				
42031/42044				
48032/48036	0540	1189	4498	1189
52038	0540	1189	4498	1189
60044	0225	0496	1874	0496
64046	0225	0496	1874	0496
72044/72058	0225	0496	1874	0496

Summary of Calibration Procedure—The calibration procedure is in two parts:

Part A. **Determine the actual *counts per 100* value.** This is done by running the calibration formula, measuring the actual quantity injected (disregarding commanded quantity), reading the total counts, calculating the actual *counts per 100* units, entering this value in configure, and repeating the procedure until consistent results are achieved.

Part B. **Determine the *offset valve time*.** This is done by running the calibration formula, measuring the actual quantity injected, determining any difference between actual and commanded quantity (because the water valves do not close instantaneously when commanded quantity is achieved) then adjusting the *offset valve time* to eliminate discrepancies. This procedure is repeated until actual and commanded quantities are equal.

Part A: Determining *Counts per 100*

⚠ CAUTION ⚠

When first running the calibration formula, the measuring container may overflow.

☞ **Increase the number of *counts per 100* to reduce the quantity of water injected.**

1. Run the calibration formula. When the water valve closes, hold 2 DEF on the keypad and read the display.

```
04:38 F0001S01 04:00
01784 01350
```

The number on the lower left of the display (01784 in this example) is the total counts for this injection. Record this number.

2. Accurately measure the quantity of water injected. Record this value then drain the container.

3. Calculate the *counts per 100* using the following formula:

$$\frac{\text{Total counts}}{\text{Actual quantity}} \times 100 = \textit{Counts per 100}$$

Example: Let's say the actual quantity is 395 pounds. Then,

$$\frac{1784}{395} \times 100 = 452 \textit{ counts per 100} \text{ pounds}$$

4. Enter the result in the *counts per 100* configure decision.

5. Repeat steps 1 through 4. The quantity injected should be slightly more than the commanded quantity and the new *counts per 100* should be close to the previously calculated value. Repeat, if necessary, until the *counts per 100* value is consistent.

Part B: Determining *Offset Valve Time*

1. Run the calibration formula.

2. Accurately measure the quantity of water injected, and compare this to the commanded quantity. Assuming actual is more than commanded, enter 010 (one second) into the *offset valve time* configure decision. (If actual is less than commanded, repeat Part A). Drain the container.

3. Repeat steps 1 and 2 as required, adjusting the offset valve time until actual and commanded quantities are equal. This is a trial and error process.

4. Once testing is completed, lock power off at the machine's external disconnect switch and restore the machine to its correct operational condition.

Pellerin Milnor has begun a manufacturing change which may affect how this manual applies to your machine. European-style wiring is replacing conventional wiring methods in electrical boxes. Because this change is being implemented one machine model at a time, not all models currently use European-style wiring.

Because this wirirng change affects the chemical connections made in the field, it is important to refer to the correct manual section when making these connections. If your machine uses conventional wiring methods, refer to MSSM0262BE. If your machine uses European-style wiring, refer to MSSM0262CE.

The following list includes all washer-extractor models currently being shipped with European-style wiring and the date code of the day the change was implemented on that machine.

36021BWP	--97146
36030F8P	--97173
36030F8S	--97362
36030F8W	--97113
36026Q6P	--97073
36021Q6P	--97073
42026Q6P	--97146
42032F7W	--98107
42032F7P	--98107
36030F8J	--98107
42032F8J	--98107
36030Q6J	--97146

BMP980025/98141

CONNECTING CHEMICAL SYSTEMS TO 100-FORMULA WASHER-EXTRACTORS AND TEXTILE MACHINES

Various methods, some standard and some optional, are available on all 100-formula washer-extractors and textile machines, to accommodate any of the commonly used allied (non-Milnor) chemical systems. Use this section to help determine the best method of chemical injection and how to connect the chemical system. Always consult the schematic manual before connecting chemical systems to the machine.

⚠ DANGER ⚠

ELECTRIC SHOCK HAZARD—Contact with high voltage electricity will kill or seriously injure you. Even with the Master Switch off and/or any emergency stop switches off, three-phase power and control circuit power are still present at several locations within electric boxes and electrical components.

INJURY AND DAMAGE HAZARDS—Improper wiring can cause 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 maintenance personnel.**
- ☞ **Lock off and tag out power at the external disconnect switches for the washer-extractor and for any chemical devices that provide power to the interpreter relay box (if furnished) 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.**

Chemical Injection Methods Available

(Item numbers correspond to those in FIGURE 1)

1. Inject Signals—An inject signal is an electric potential that occurs in response to a programmed chemical injection. Five discrete signals (chemicals 1 through 5) are always furnished. If *only these signals* are furnished, they are available at terminal strip *TBS* on BWP, QxP, and FxP models, and at Molex connector *WCS* on larger models.

Ten additional signals (chemicals 6 through 15) are optionally available. If these signals are furnished, then on BWP and QxP models, all 15 signals are available at terminal strips *TBS* and *TBT*. On BWP and QxP models furnished with interpret relays and on all other models (whether or not interpret relays are furnished) all 15 signals are available at terminal strip *TBA*.

Items 2 through 5 below operate off of inject signals. Disconnect the factory wired apparatus to use the inject signal for any other *low current* apparatus that meets the electrical specifications provided elsewhere herein.

2. Supply Injector—If a supply injector is furnished, the five electrically operated flush valves are wired to terminal strip *TBS, WCS,* or *TBA* (depending on model and options).

3. Optional Interpret Relays—Interpret relay contacts have a higher current carrying capacity than inject signals. The interpret relay coils are wired to *TBA* (see FIGURE 3). One set of contacts on each relay is wired to terminal strip *TBB* and connected to an internal power source. This power source may be replaced by an external, *separately fused* source, or merely disconnected, to provide potential-free ("dry") contacts. Use interpret relays to actuate electrically operated apparatuses (e.g., pumps, valves) or provide potential-free signals for other controllers.

4. Optional Pilot Air Valves—If these electrically operated valves are furnished, they are wired to terminal strip *TBS, WCS,* or *TBA,* (depending on model and options) at the factory. Use pilot air valves to actuate air-operated apparatuses (e.g., chemical valves).

5. Optional Liquid Supply Valves—If these air-operated valves are furnished, they are tubed to the pilot air valves. Use these valves with pressurized liquid chemical delivery systems (e.g., ring main).

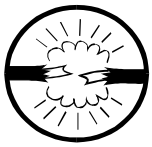
6. Pumped Chemical Inlets—A five-port inlet is standard on rigid models and a 15 port inlet is optional on all models. Use these valveless inlets only with systems that are not continuously pressurized and that deliver chemicals only when an injection is commanded (e.g., peristaltic pumps).

Sequenced Chemical Injection (Chemwait)—When coupled with an allied chemical controller of appropriate capability, the Chemwait feature permits a single chemical source to supply a bank of washer-extractors by delaying chemical injection into one machine whenever that chemical source is currently supplying another machine. See "HOW CHEMWAIT WORKS . . ." (see Table of Contents).

Connecting Apparatuses to Inject Signals

Electrical Specifications—Inject signals provide a 110VAC, 50Hz or 120VAC, 60Hz potential. Each signal can accommodate one apparatus not exceeding 37 milliamperes. Inject signals cannot be made potential-free.

⚠ CAUTION ⚠



COMPONENT DAMAGE HAZARD—Board components will burn out, requiring board replacement if devices driven by inject signals do not meet the electrical specifications. (Pumps generally draw a higher current and will burn out board components.)

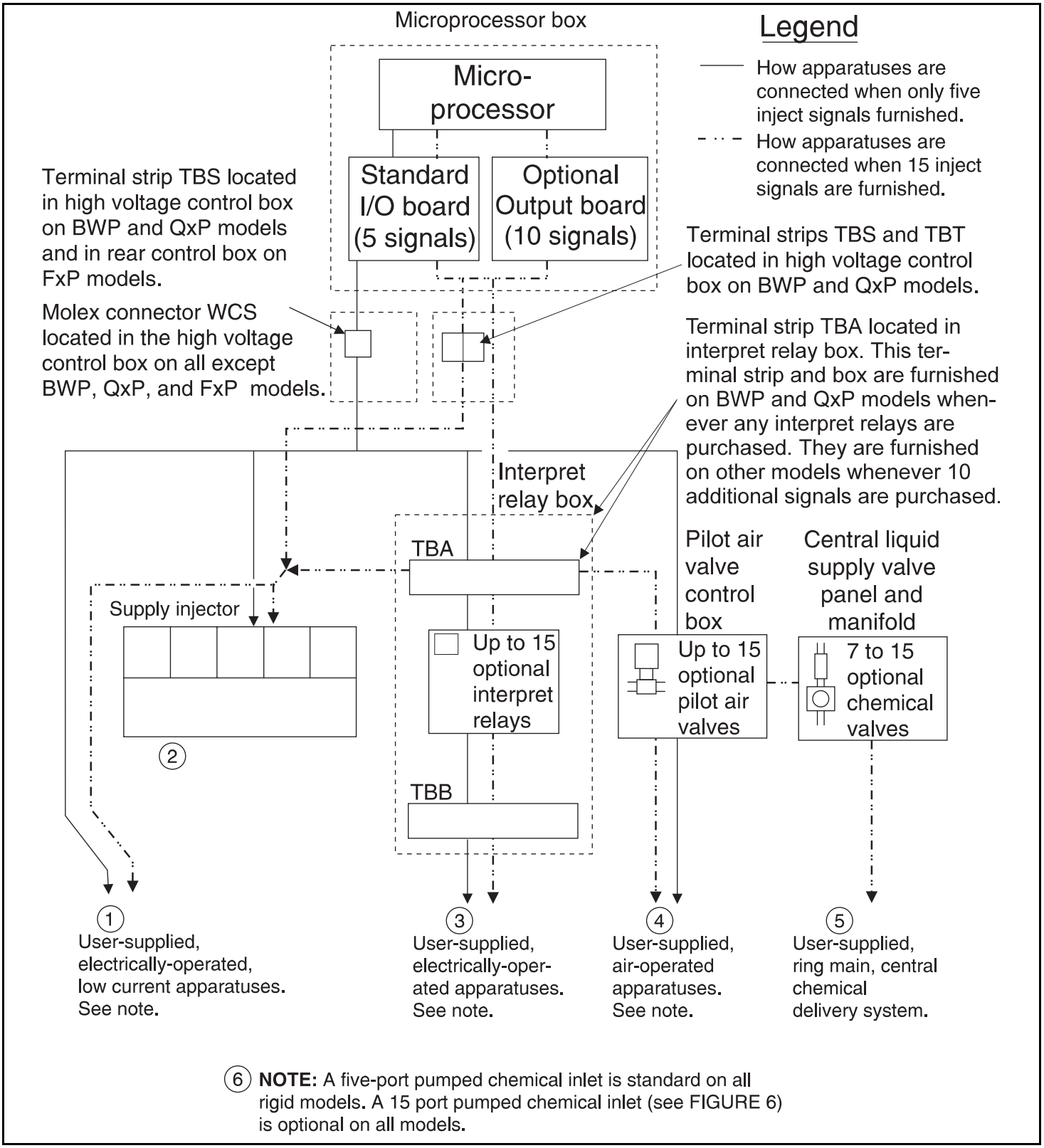


FIGURE 1 (MSSM0262BE)
Schematic Illustration of Available Chemical Injection Methods

BWP, QxP and FxP Models With Five Signals Only—Acquire signals at terminal strip *TBS*, located in the *high voltage control box* on BWP and QxP models and in the *rear control box* on FxP models. *Terminals 1* through *5* are *chemicals 1* through *5*, respectively and *terminal 8* is *common.* The specified voltage is enabled between the appropriate terminal and *common* whenever an injection is called for.

Other Models With Five Signals Only—Acquire signals at Molex connector *WCS* in the *high voltage control box* (see FIGURE 2). *Pins 1* through *5* are *chemicals 1* through *5* respectively and *pin 7* is *common*. The specified voltage is enabled between the appropriate pin and *common* whenever an injection is called for.

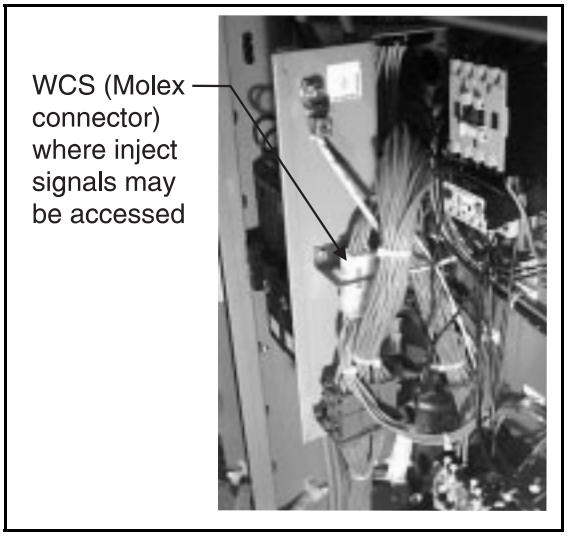


FIGURE 2 (MSSM0262BE)
Locating WCS in High Voltage

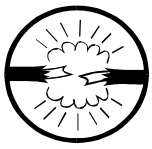
BWP and QxP Models With 15 Signals and No Interpret Relays—Acquire all 15 signals at *TBS* and *TBT* in the *high voltage control box*. *Terminals 1* through *7* on *TBS* and *1* through *8* on *TBT* are *chemicals 1* through *15* respectively. *Terminal 8* on *TBS* is *common*. The specified voltage is enabled between the appropriate terminal of *TBS* or *TBT* and *common*, whenever a chemical injection is called for.

Other Models With 15 Signals and No Interpret Relays—Acquire all 15 chemical signals and a *manifold flush* signal at *TBA* (see FIGURE 3). *Terminals A* through *Q* on this terminal strip are *chemicals 1* through *15* respectively and *Terminal R* is the *flush*. Terminal *TB1* provides a multi-pin *common*. The specified voltage is enabled between the appropriate terminal of *TBA* and *common* whenever a chemical injection or flush is called for.

Connecting Apparatuses to Interpret Relays

Electrical Specifications—The internal power source provides a 110VAC, 50Hz or 120VAC, 60Hz potential. Each interpret relay can accommodate one apparatus, not exceeding 0.6 amperes. The total current drawn by all apparatuses must not exceed 10 amperes. When apparatuses are driven by external power, do not exceed 1 ampere at 250VAC per relay contact.

⚠ CAUTION ⚠



COMPONENT DAMAGE HAZARD—Interpret relay contacts will fail, requiring relay replacement if devices exceed the specified current load.

Using Internal Power—When interpret relays (up to 15) are furnished, chemical signals are available at *TBB* in the *interpret relay box*. *Terminals A* through *Q* are *chemicals 1* through *15* respectively. Terminal *TB1* provides a multi-pin *common*. The specified voltage is enabled between the appropriate terminal of *TBB* and *common* whenever a chemical injection is called for. As shown in FIGURE 3, *terminal R* of *TBB* is used to supply power internally to one contact on each interpret relay.

Using External Power or Potential-Free Contacts—As shown in FIGURE 3, *TBB, terminal R*, which receives power via *WCL*, not only supplies power to the interpret relay contacts but also to the pumped chemical inlet manifold flush valve and/or supply injector flush valves, if furnished. To disconnect the internal power source, remove all of the wires from the left side of *terminal R, but maintain the connections between the removed wires.* **Make certain that any external power source connected to terminal R is separately fused.**

⚠ WARNING ⚠

Consider carefully the potential hazards of having more than one power source in a single enclosure.

If an external power source is wired to *TBB, terminal R*, then the voltage provided by this source is enabled between the appropriate terminal of *TBB* and the user-supplied *common* (not *TB1*) whenever a chemical injection is called for. If no power source is connected to *TBB, terminal R*, then a potential-free signal (contact closure) is enabled between the appropriate terminal (*A* through *Q*) of *TBB* and *TBB, Terminal R*, whenever an injection is called for.

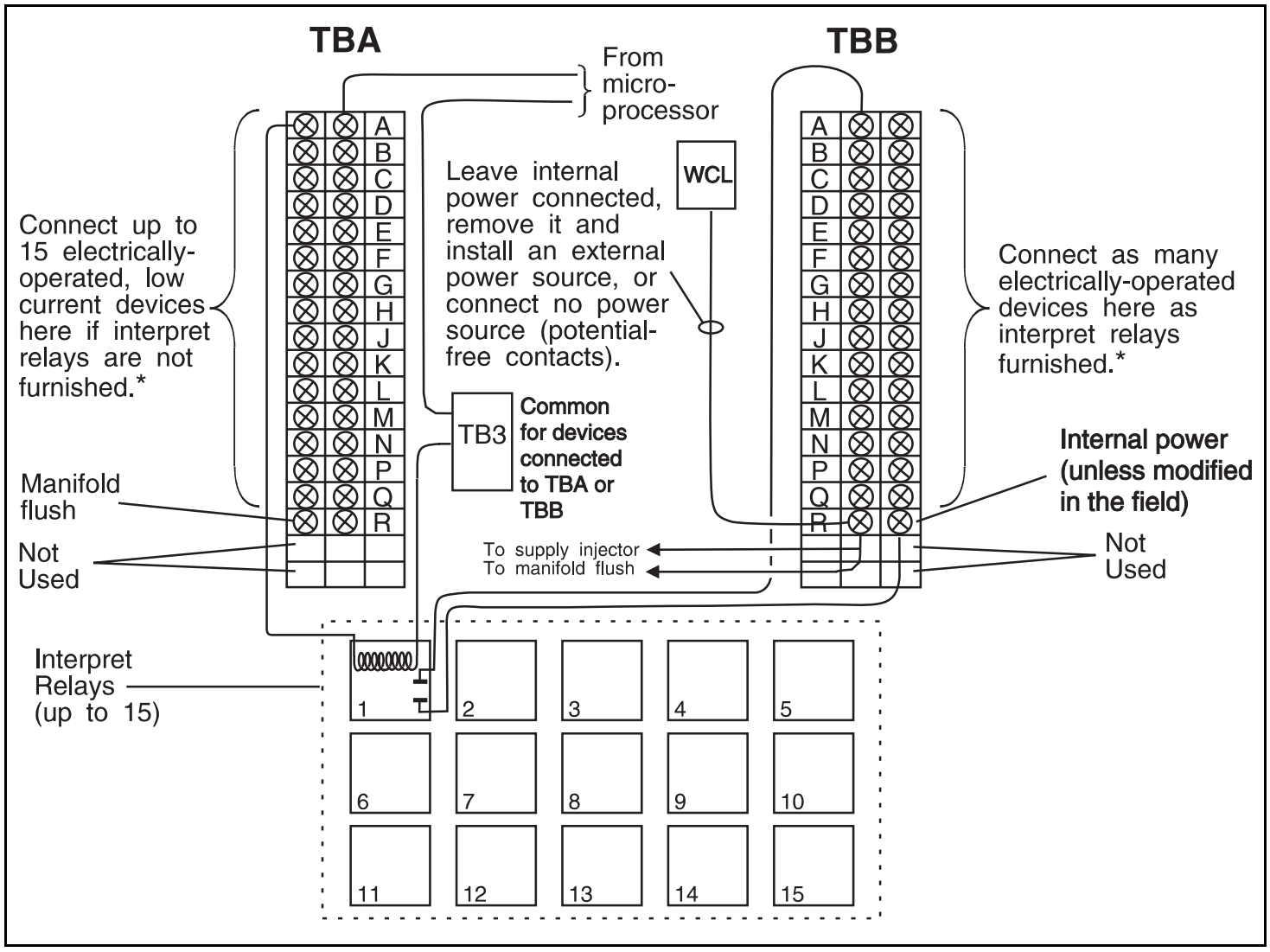


FIGURE 3 (MSSM0262BE)
Connections Inside the Interpret Relay Box

Pressurized Chemical Systems

These systems use chemical valves on the machine to admit chemicals from pressurized lines (e.g., ring main systems). The machine may be furnished with pilot air valves only, to which the customer may attach air-operated chemical valves, or with pilot valves and chemical valves.

Connecting Air-Operated Chemical Valves to Pilot Air Valves—When chemical injection pilot valves are furnished, they are located in an *air valve box* dedicated to this function. Connect incoming compressed air where indicated in FIGURE 4. See the installation manual for compressed air specifications. Pilot valves are arranged from left to right, beginning with *chemical 1*, when facing the connections, as shown in FIGURE 4 (however spacing varies with the number of valves furnished). Pilot valve connections accept 1/4" (6.3 mm) OD, 0.17" (4.3 mm) ID tubing. Tubing used by Milnor is rated for 310 psi (2.137 MPa) working pressure at 72°F (22°C) and 1250 psi (8.618 MPa) minimum burst pressure at 73°F (23°C). If air-operated, liquid chemical valves are also furnished, these will be pre-connected to the pilot valves; however, these may be disconnected and the pilot valves used to drive other devices, if desired.

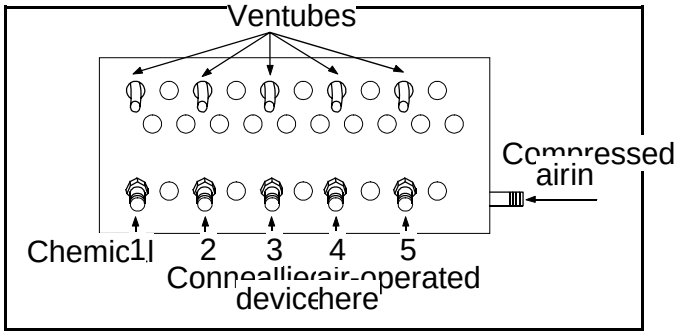


FIGURE 4 (MSSM0262BE)
Arrangement of Pilot Air Valves

Connecting Pressurized Liquid Chemical Lines to Air-Operated Valves

If air-operated chemical valves are furnished, between seven valves (two standard flow plus five high flow) and 15 valves will be supplied. Although each valve can be devoted to a separate chemical, the high flow valves are usually used to speed up injection when an extra large quantity of a chemical also injected via a standard flow valve is required (e.g., large doses of alkali in early heavy soil baths followed by smaller doses in later baths). Thus, the basic seven-valve set normally accommodates five chemicals as shown in FIGURE 5. When air-operated chemical valves are furnished by Milnor, corresponding pilot air valves and associated air connections between pilot and chemical valves are also furnished. All chemicals are injected into a manifold which is automatically flushed with water after every injection.

Standard flow valve connections (1, 2, 3, 4, 5, etc.) are 3/8" NPT. High flow valve connections (1L, 2L, etc.) are 1/2" NPT. Chemical piping should adhere to chemical system manufacturer specifications. The water inlet for flushing is internally connected to the main cold water inlet on some machines. An external, 1/2" NPT connection is required on other machines. Because the output relay-to-pilot valve wiring and the pilot valve to chemical valve air connections vary with the number and combination of valves furnished, its best to test each chemical output to determine which output (chemical 1, 2, 3, etc.) operates which valve (1, 1L, 2, 2L, etc.). See “MANUAL MODE MENU FUNCTIONS . . .”

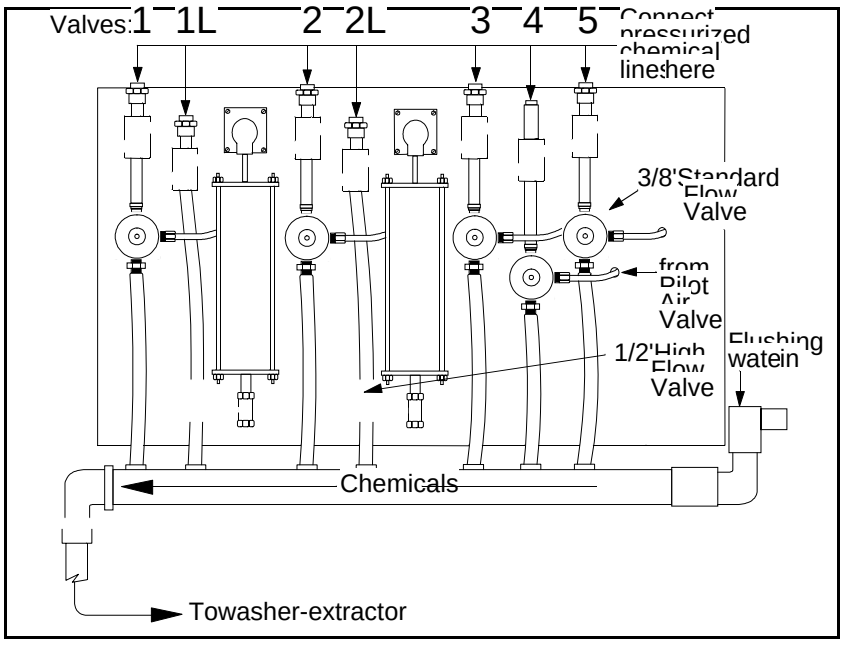


FIGURE 5 (MSSM0262BE)
Arrangement of Liquid Chemical Valves

Pumped Chemical Systems

These systems deliver chemicals to the machine intermittantly usually via peristaltic pumps. Inlets on the machine must be unrestricted at all times (valveless). The 5 and 15 port pumped chemical inlets meet this requirement.

Risk Associated With Pumped Chemical Systems—An inherent risk of this method of chemical injection is that concentrated chemicals can dribble into the machine after hours, when the machine is not in operation, causing machine and/or linen damage. Because Milnor has no control over the design or installation of pumped chemical systems, **Pellerin Milnor Corporation accepts absolutely no responsibility for damage to its equipment or textiles therein, caused in this way**. Much more information on this subject is provided in document B2TAG86033, "Pumped Chemical Installation and Precautions." Consult this document before connecting a pumped chemical system.

Connecting Flushing Water to 15-Port Inlets—Flushing water is required for 15-port inlets. It is internally piped to the incoming cold water inlet on some machines. When not internally piped, a 1/2" NPT external water line must be connected where indicated in FIGURE 6.

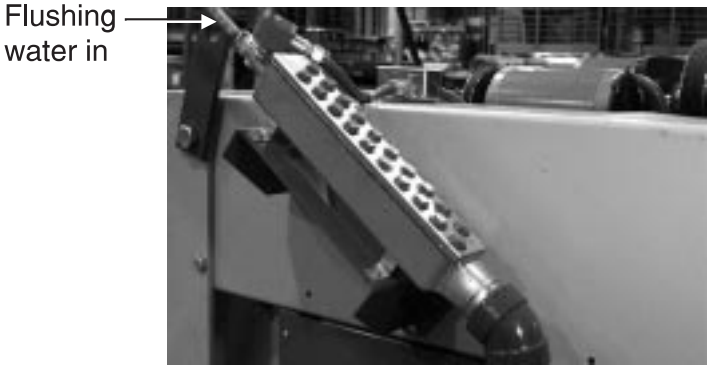


FIGURE 6 (MSSM0262BE)
15-Port Pumped Chemical Inlet

CONNECTING CHEMICAL SYSTEMS TO 100-FORMULA WASHER-EXTRACTORS AND TEXTILE MACHINES WITH EUROPEAN WIRING

Various standard and optional methods are available on all 100-formula washer-extractors and textile machines, to accommodate any of the commonly used allied (non-Milnor) chemical systems. Use this section to help determine the best method of chemical injection for your laundry and how to connect the chemical system. Always consult the machine schematic manuals before connecting chemical systems.

⚠ DANGER ⚠

ELECTRIC SHOCK HAZARD—Contact with high voltage electricity will kill or seriously injure you. Even with the Master Switch off and/or any emergency stop switches off, three-phase power and control circuit power are still present at several locations within electric boxes and electrical components.

INJURY AND DAMAGE HAZARDS—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 maintenance personnel.**
- ☞ **Lock off and tag out power at the external disconnect switches for the washer-extractor and for any chemical devices that provide power to the interpret relay box (if furnished) 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 described by this instruction.**
- ☞ **DO NOT connect a *common* wire to *ground*. Use the *common* terminal furnished.**

Chemical Injection Connection Methods Available

Chemical Injection Output Signals

Five discrete signals, released in response to programmed chemical injections for chemicals 1 through 5, are furnished standard on all washer-extractors. Ten additional signals (chemicals 6 through 15) are optionally available on most machines. Often these start signals are used to operate other electrically-operated, low-voltage chemical injection devices like interpreter relays and pilot valves. These devices, in turn, are used to operate a higher voltage chemical injection device.

These signals, each capable of a maximum electrical load of 9VA at 120VAC, can be accessed at terminal strip *TBA*. Disconnect the factory wired apparatus to use these start signals for any other low current apparatuses.

Liquid Chemical Tube Barbed Connectors

Barbed fittings, furnished standard on F-style machines, provide for the connection of tubes from remote chemical supply injection systems. The F8P and F7P are furnished with six barbed connectors, while outerwear machines are furnished with ten connectors.

One chemical injection output signal is required for each connector, and at least five are provided standard.

Five Compartment Flushing Chemical Injector

A five-compartment dry supply injector mounted externally on the washer-extractor is furnished standard on most washer-extractors in lieu of a pumped chemical style system. The flushing chemical injector is offered optionally on the Q style microprocessor machines and outerwear machines.

Each electrically operated flush valve located in a supply compartment is wired to terminal strip *TBA* and uses a chemical injection output signal.

Optional Interpret Relays

One or more interpreter relays (up to 15) mounted in a control box are optionally available and connected to the standard chemical injection outputs on washer-extractors. These relays can be used to operate other electrically-operated, high voltage chemical injection devices like pumps and valves.

These relays, each capable of a maximum electrical load of 1 ampere at 250VAC, have one set of contacts on each relay wired to terminal strip TBA and connected to an internal power source. The internal power source may be replaced by an external, separately fused source, or merely disconnected, to provide potential-free (“dry”) contacts.

Optional Pilot Air Valves

Pilot air valves are optionally available to actuate air-operated chemical injection valves or other similar air-operated devices supplied by others. A maximum of 15 of these normally-closed air valves are available and are connected to corresponding chemical injection output signals.

Each air-operated valve is wired to terminal strip *TBA* and uses a chemical injection output signal.

Optional Central Liquid Chemical Supply System/Valves

Seven air-operated chemical injection valves are optionally available for use with up to seven different chemicals on most models. The system includes two 1/2" high flow and five 3/8" standard flow air-operated valves. Individual standard flow central liquid chemical valves are also optionally available up to a maximum of 8 additional standard flow valves in the system for a maximum of 15 valves. Each individual valve includes the necessary interpreter relay and pilot valve.

Chemical injection valves are wired to terminal strip *TBA* and use a output signal, interpreter relay, and pilot valve for each optional chemical valve. These valves are used with pressurized liquid chemical delivery systems like a ring main.

Optional Peristaltic Pump Connections

Up to fifteen 1/2" barbed fittings for separate peristaltic hose connections are optionally available. Automatic flush can be added optionally with peristaltic pump connections.

The connections are provided standard with five chemical output signals, and additional signals must be added to operate more than five peristaltic hose connections. These valveless inlets are used only with systems that are not continuously pressurized and that deliver chemicals only when an injection is commanded.

Sequenced Chemical Injection (Chemwait)

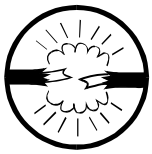
A chemical injection sequencer supplied by others interfaces with the machines to supply each machine with chemicals one at a time.

See “HOW CHEMWAIT WORKS . . .” (see Table of Contents).

Connecting Apparatuses to Chemical Injection Signals

Electrical Specifications—Inject signals provide a 110VAC, 50Hz or 120VAC, 60Hz potential. Each signal can accommodate one apparatus not exceeding 37 milliamperes. Inject signals cannot be made potential-free.

⚠ CAUTION ⚠



COMPONENT DAMAGE HAZARD—Devices driven by injection output signals which exceed electrical specifications will burn out board components, requiring board replacement. (Pumps generally draw a higher current and will burn out board components.)

BWP and QxP Models With Five Signals Only—Acquire signals at terminal strip *TBA*, located in the *high voltage control box . Points 86* through *90* are *chemicals 1* through *5*, respectively, *point 109* is flush, and *point 6* is *common.* The specified voltage is enabled between the appropriate terminal and *common* whenever an injection is called for.

FxP, FxS, and FxW Models With Five Signals Only—Acquire signals at terminal strip *TBA* in the *rear control box. Points 47* through *51* are *chemicals 1* through *5, point 62* is *flush, point 6* is *common*. In FxS models, *point 63* is the soap chute. The specified voltage is enabled between the appropriate terminal and *common* whenever an injection is called for.

BWP and QxP Models With 15 Signals and No Interpret Relays—Acquire all 15 signals at *TBA* in the *high voltage control box. Points 86* through *90* are *1* through *5* respectively and *points 94* through *102* are *6* through *14* respectively. *Point 108* is chemical 15. *Point 109 is flush*. The specified voltage is enabled between the appropriate terminal of *TBA* and *common*, whenever a chemical injection is called for.

FxP and FxW Models With 15 Signals and No Interpret Relays—Acquire all 15 signals at *TBA* in the *high voltage control box. Points 52* through *61* are chemicals *6* through *15* respectively. The specified voltage is enabled between the appropriate terminal of *TBA*, whenever a chemical injection is called for.

FxW Models With 15 Signals and Interpret Relays—Acquire all 15 signals at *TBA* in the high voltage control box. *Points 68* through *82* are *1* through *15* respectively. The specified voltage is enabled between the appropriate terminal of *TBA* and common, whenever a chemical injection is called for.

Connecting Apparatuses to Interpret Relays

Electrical Specifications—The internal power source provides a 110VAC, 50Hz or 120VAC, 60Hz potential. Each interpret relay can accomodate one apparatus, not exceeding 0.6 amperes. The total current drawn by all apparatuses must not exceed 10 amperes. When apparatuses are driven by external power, do not exceed 1 ampere at 250VAC per relay contact.

⚠ CAUTION ⚠

COMPONENT DAMAGE HAZARD—Connecting devices which exceed the electrical specifications can cause interpret relay contacts to fail, requiring relay replacement.

Using Internal Power

When interpret relays (up to 15) are furnished, chemical signals are available at *TBB* in the interpret relay box. Terminals *A* through *Q* are chemicals 1 through 15 respectively. Terminal *TB1* provides a multi-pin common. The specified voltage is enabled between the appropriate terminal of *TBB* and common whenever a chemical injection is called for. As shown in Figure 1, terminal *R* of *TBB* is used to supply power internally to one contact on each interpret relay.

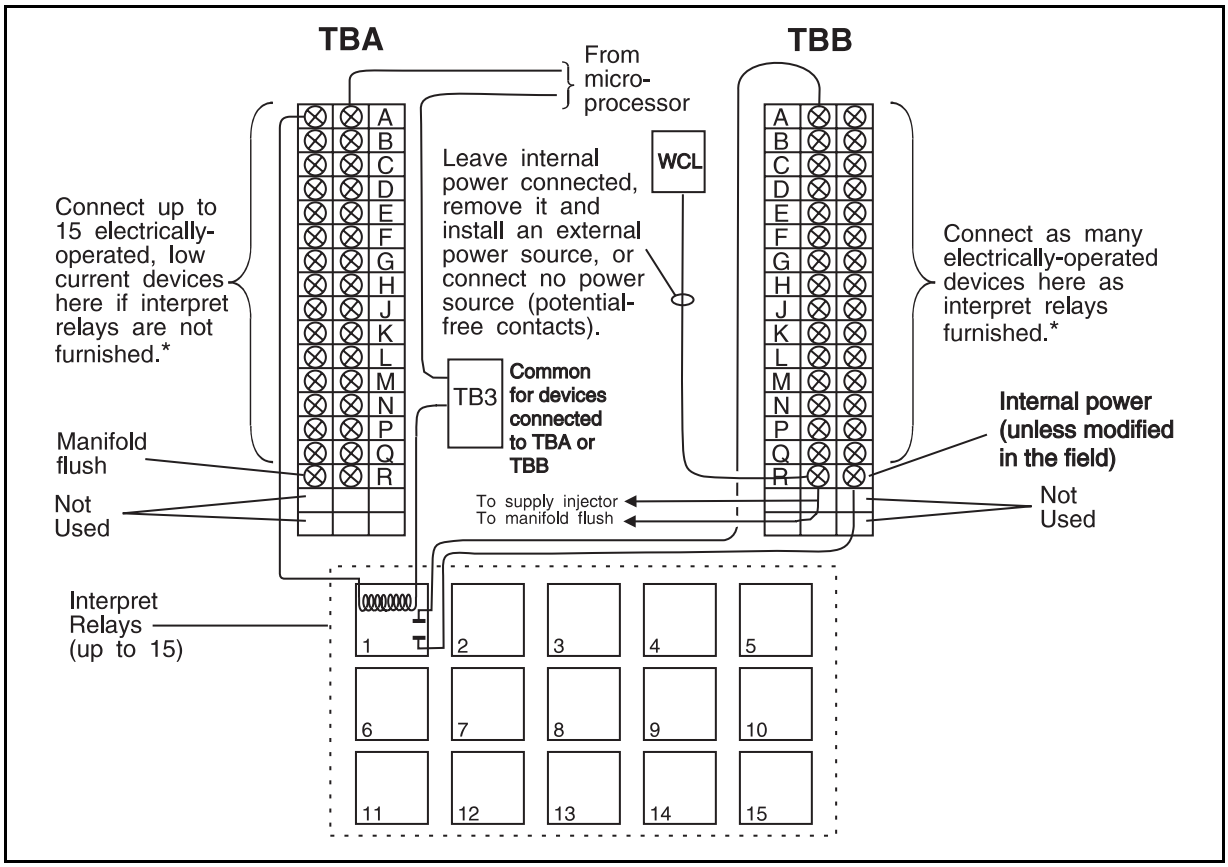


FIGURE 1 (MSSM0262CE)
Connections Inside the Interpret Relay Box

Using External Power or Potential-Free Contacts

As shown in Figure 1, *TBB*, terminal *R*, which receives power via *WCL*, not only supplies power to the interpret relay contacts but also to the pumped chemical inlet manifold flush valve and/or supply injector flush valves, if furnished. To disconnect the internal power source, remove all wires from the left side of terminal *R*, but maintain the connections between the removed wires. Make certain that any external power source connected to terminal *R* is separately fused.

⚠ WARNING ⚠

Consider carefully the potential hazards of having more than one power source in a single enclosure.

If an external power source is wired to *TBB*, terminal *R*, then the voltage provided by this source is enabled between the appropriate terminal of *TBB* and the user-supplied common (not *TB1*) whenever a chemical injection is called for. If no power source is connected to *TBB*, terminal *R*, then a potential-free signal (contact closure) is enabled between the appropriate terminal (*A* through *Q*) of *TBB* and *TBB*, Terminal *R*, whenever an injection is called for.

Pressurized Chemical Systems

These systems use chemical valves on the machine to admit chemicals from pressurized lines (e.g., ring main systems). The machine may be furnished with pilot air valves only, to which the customer may attach air-operated chemical valves, or with pilot valves and chemical valves.

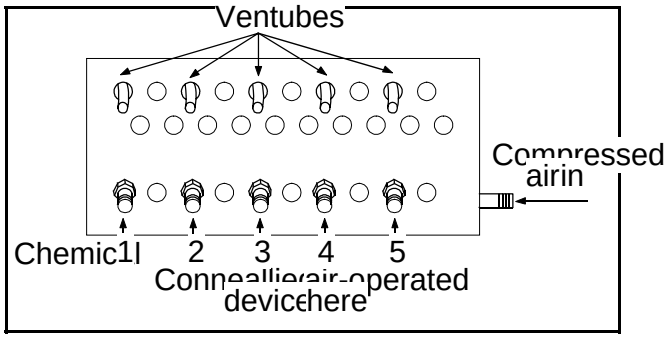


FIGURE 2 (MSSM0262CE)
Arrangement of Pilot Air Valves

Connecting Air-Operated Chemical Valves to Pilot Air Valves

—When chemical injection pilot valves are furnished, they are located in an *air valve box* dedicated to this function. Connect incoming compressed air where indicated in Figure 2. See the installation manual for compressed air specifications. Pilot valves are arranged from left to right, beginning with *chemical 1*, when facing the connections, as shown in Figure 4 (however spacing varies with the number of valves furnished). Pilot valve connections accept 1/4" (6.3 mm) OD, 0.17" (4.3 mm) ID tubing. Tubing used by Milnor is rated for 310 psi (2.137 MPa) working pressure at 72°F (22°C) and 1250 psi (8.618 MPa) minimum burst pressure at 73°F (23°C). If air-operated, liquid chemical valves are also furnished, these will be pre-connected to the pilot valves; however, these may be disconnected and the pilot valves used to drive other devices, if desired.

Connecting Pressurized Liquid Chemical Lines to Air-Operated Valves—If air-operated chemical valves are furnished, between seven valves (two standard flow plus five high flow) and 15 valves will be supplied. Although each valve can be devoted to a separate chemical, the high flow valves are usually used to speed up injection when an extra large quantity of a chemical also injected via a standard flow valve is required (e.g., large doses of alkali in early heavy soil baths followed by smaller doses in later baths). Thus, the basic seven-valve set normally accommodates five chemicals as shown in Figure 3. When air-operated chemical valves are furnished by Milnor, corresponding pilot air valves and associated air connections between pilot and chemical valves are also furnished. All chemicals are injected into a manifold which is automatically flushed with water after every injection.

Standard flow valve connections (1, 2, 3, 4, 5, etc.) are 3/8" NPT. High flow valve connections (1L, 2L, etc.) are 1/2" NPT. Chemical piping should adhere to chemical system manufacturer specifications. The water inlet for flushing is internally connected to the main cold water inlet on some machines. An external, 1/2" NPT connection is required on other machines. Because the output relay-to-pilot valve wiring and the pilot valve to chemical valve air connections vary with the number and combination of valves furnished, it is best to test each chemical output to determine which output (chemical 1, 2, 3, etc.) operates which valve (1, 1L, 2, 2L, etc.). See "MANUAL MODE MENU FUNCTIONS . . ."

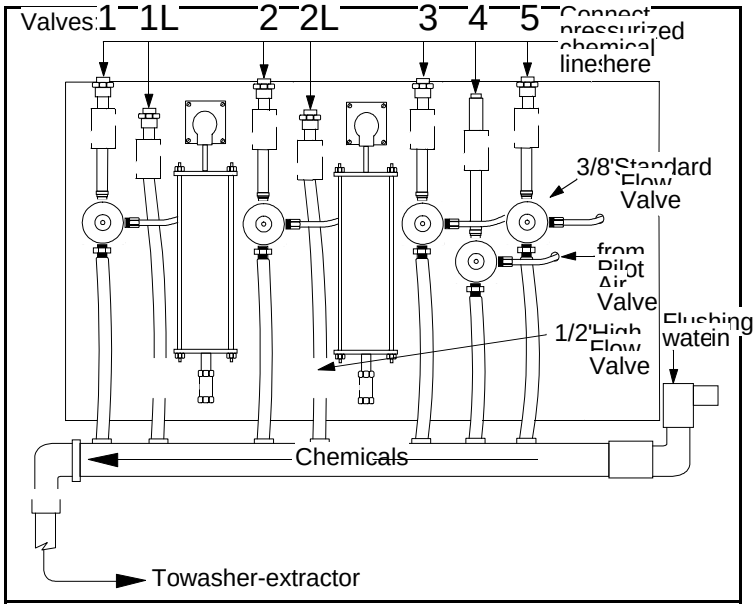


FIGURE 3 (MSSM0262CE)
Arrangement of Liquid Chemical Valves

Pumped Chemical Systems

These systems deliver chemicals to the machine intermittently usually via peristaltic pumps. Inlets on the machine must be unrestricted at all times (valveless). The 5 and 15 port pumped chemical inlets meet this requirement.

Connecting Flushing Water to 15-Port Inlets—Flushing water is required for 15-port inlets. It is internally piped to the incoming cold water inlet on some machines. When not internally piped, a 1/2" NPT external water line must be connected where indicated in FIGURE 6.

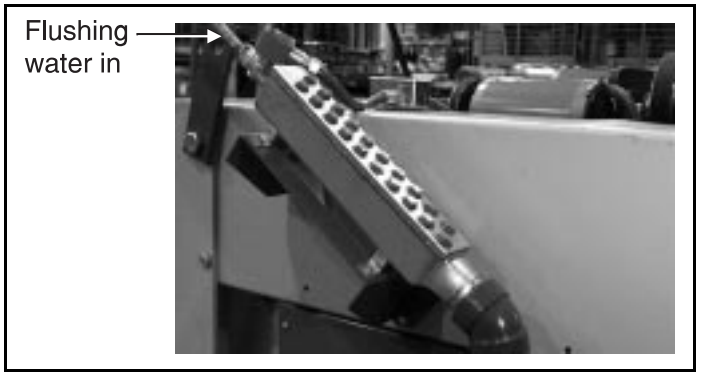


FIGURE 4 (MSSM0262CE)
15-Port Pumped Chemical Inlet

Risk Associated With Pumped Chemical Systems—An inherent risk of this method of chemical injection is that concentrated chemicals can dribble into the machine after hours, when the machine is not in operation, causing machine and/or linen damage. Because Milnor has no control over the design or installation of pumped chemical systems, **Pellerin Milnor Corporation accepts absolutely no responsibility for damage to its equipment or textiles therein, caused in this way**. Much more information on this subject is provided in document B2TAG86033, "Pumped Chemical Installation and Precautions." Consult this document before connecting a pumped chemical system.

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Definitions of Terms and Abbreviations

AutoSpot—a control mechanism with which the operator can automatically align one cylinder pocket of a divided cylinder machine with the loading doors

bath—a general term for any step of a wash formula during which the goods are exposed to water with or without chemicals.

CPU (central processing unit)—integrated circuit component, usually an Intel 8088 and its ancillary devices, that interprets programming instructions and inputs to the microprocessor and provides outputs to other devices

CCW—counterclockwise cylinder rotation, as viewed from the load end; see also CW

central liquid supply system—chemicals are constantly supplied to the machine under pressure; valves on the machine open and close to regulate the flow of chemicals into the machine

checksum—one of several numbers generated by the control that represents the amount of data in a specific memory area; any change in a checksum indicates that data has changed

clean side—the side of a pass-through machine from which clean goods are unloaded after processing

code, customer—the code that identifies the one of 1,000 possible owners of a batch

code, destination—the code that identifies the one of 64 (with the Miltrac™ controller) or one of eight (if allied data pass) desired post-dry or no-dry destination of a batch

code, dry—code that identifies the one of 16 full-dry and 16 partial-dry cycles for a batch

code, formula—code that identifies the one of 16 basic wash formulas used to process a batch

code, goods—code that identifies the one of 256 goods classifications that describe a batch and invoke any variations to the basic formula used

configure—microprocessor programming for various software and hardware options on the machine

control—an electrical enclosure, usually housing a keypad, at which the user commands actions and programs the machine; also includes all electromechanical devices on the machine involved with its operation; also referred to as “controller”

cooldown—used to gradually cool goods to prevent the setting of wrinkles. In a washer equipped with the cooldown option (an additional level switch, a manual throttling valve, and an on/off cooldown water valve), this is a method of reducing the temperature of the goods through repeated partial draining and refilling with cold water. The cooldown rate is controlled by the manual throttling valve.

CPU—central processing unit; the main computer chip in a microprocessor control system that processes data, as well as the board on which the CPU chip is mounted

customer code—see **Code, customer**

CW—clockwise cylinder rotation direction as viewed from the front of the machine

cycle—operations undertaken in a specific order to process goods; a cycle normally ends with the device ready to accept another load

cylinder—the perforated basket inside the machine shell which contains the goods and is rotated by the motors

cylinder pocket—one of the two or three divisions of a divided cylinder washer-extractor into which goods are loaded for processing

daisy chain—method of linking two or more serial type microprocessor controls with one four-conductor shielded cable. All data passes via this cable, regardless of which machines are communicating.

default password—see **Password, default**

default value—value used by the microprocessor control if no other value has been set by the programmer

destination—area or zone of a laundry facility to which goods will be routed after drying, or before pressing if the destination is a "no-dry" station

destination code—see **Code, destination**

DIP switches—dual in-line package switches; a row of (usually six or eight) miniature switches in a single housing used to permanently select or configure certain options on microprocessor boards; on Milnor® microprocessor controls these switches are used most often to specify the communications address for each machine in a system

discretionary data field—any field in the microprocessor control system that can be updated through the keyboard or keypad; also, a machine configuration field, such as temperature units, that is not limited by hardware or equipment in the machine

display—the component by which the machine provides data to the operator; the component may be one of several types, including vacuum fluorescent or liquid crystal (two lines of 20 alpha-numeric characters), color graphic liquid crystal (320 pixels by 240 pixels), or CRT monitor of various resolutions.

door, manual—machine door which is opened and closed by hand, without power assistance

door, power operated—machine door which is normally operated through electro-mechanical controls rather than manually; usually, the machine must be energized for the door to operate

download—process of transferring data, usually configuration and programming instructions, from a machine to another machine or to a memory storage device

drain speed—one of several ways to end a wash formula; goods are kept in motion at a speed approximating the force of gravity (1g) until the operator is ready to discharge them

dry code—see **Code, dry**

EPROM—erasable programmable read-only memory; the portion of some Milnor® microprocessor control systems used to store the fixed instructions (software) that determine how the machine functions

extraction—the removal of excess water from goods discharged from the tunnel washer

formula—instructions used by the machine control to operate motors, valves, and other components during a standard cycle

formula code—see **Code, formula**

goods—articles processed or conveyed by a machine

hardware—electronic boards that control the machine

hold code—function of a programmable output which answers the question, "If a hold condition is encountered while this function is actuated, should the function continue to operate even if its commanded parameters have not been achieved?"

inching—a control mechanism with which an operator can manually align one pocket of a divided cylinder machine with the loading doors

input, direct—signals that enter the processor board directly; direct inputs are provided by switches on the machine, including limit switches, the *Signal Cancel* button, and the *Run/Program* keyswitch

input, standard—signals to the microprocessor controller that certain standard conditions exist; these inputs enter the processor board through the standard input/output board(s); include *Bag Ready*, *Load Conveyor Ready*, and remote customer and goods codes, etc.

jogging—intermittent rotation of the cylinder on certain Milnor® machines can be used to dislodge goods from the cylinder wall after extraction, or to assist in discharging goods from the tilted cylinder, etc.

level switch—device that signals the controller when the bath liquor has reached a preset level

liquor—bath solution, usually consisting of water and chemicals at a specified temperature, for processing goods

load—the amount of goods, measured by weight or pieces, that a machine normally handles during a cycle

loading device—in a system, this is the device which loads another device; example: a shuttle may be the loading device for a dryer

loading direction—the direction the goods are loaded into or onto a device

MMQ—minutes, minutes, and quarter minutes (e.g., 043 = 4 minutes and 45 seconds); see also **SS** and **SSS**

model—designation of machine without regard to options; for most devices, the model includes some dimensional representation of the effective machine size

motor contactor box—enclosure containing the high voltage motor contactors

password—three-character code entered to access or change values in certain display pages, used to prevent unauthorized programming. The instructions for changing the password are contained in a separate document sent only to the owner of the machine. See also **Minipass**

password, default—password when shipped from the Milnor® factory that automatically replaces any field-programmed password after a failed Program Memory check, or if a new password has not been entered since the processor board memory was cleared or a new processor board was installed

permanent press—a fabric or finish which is heat-set after the article is manufactured to minimize wrinkling and to retain creases

program mode—mode which allows programming of wash formulas, dry cycles, and other discretionary data; see also **Run mode**

pumped chemical supply system—chemicals flow into the machine when the machine control or operator commands the pump to operate

reversing—one of several ways to end a wash formula; goods are kept in motion at wash speed by the rotating cylinder until the operator is ready to discharge them

run mode—mode of operation that allows devices to run automatically; see also **Program mode**

software—fixed information contained in EPROMs (programming by Milnor®) or on disk files that determines how a machine or computer operates

soil side—the side of a pass-through machine into which soiled goods are loaded for processing

spray-down—a feature which allows the operator to facilitate loading the machine by spraying the goods with water as they are loaded

SS (SSS)—seconds, i.e., "SS" means two digits (usually 00-99 seconds), "SSS" means three digits (usually 000-255 seconds); see also **MMQ**

step timer—counts time for each individual step in a formula or dry code

supply injector—compartmented hopper into which chemicals are loaded before beginning a wash cycle; the chemicals are flushed from the hopper compartments into the machine automatically when commanded by the control

thermistor—temperature sensing device that varies its resistance to an electrical current with regard to temperature; used frequently in CBW® washers, washer-extractors, and textile machines

three-wire circuit—circuit that provides control power for all machine functions; any of several safety devices in the three-wire circuit will open the circuit and stop machine operation if a malfunction is detected; once open, the three wire circuit can only be closed by manual intervention and then only if the condition that opened the circuit is rectified

Thermo-water—method of controlling incoming water temperature by modulating (alternately and oppositely opening and closing) the hot and cold water valves

toggle switch—one of several types of hand-operated switches with a single operating lever that can be moved to two or more positions (e.g., the *Master* switch)

trickle charge—process of slowly and continuously charging a microprocessor backup battery during machine operation to maintain a full charge

tumbling—goods are kept moving after the cycle is complete until the operator is ready to discharge them

washer-extractor—machine that both washes and extracts (spins the goods) to remove a large percentage of the absorbed water

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