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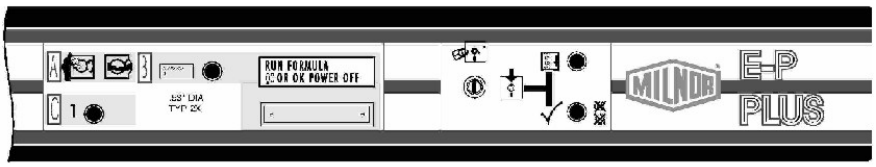
# Technical Reference—

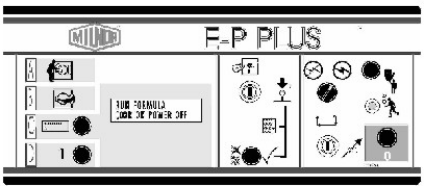
# E-P Plus Microprocessor Washer-Extractor Controller

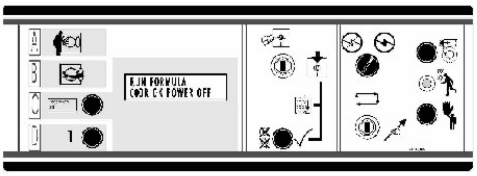
H7J

MxJ




QxJ




FxJ

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# Table of Contents
# for MATEPPLSDE/9910FV
# E-P Plus Microprocessor Washer-Extractor Controller

# ABOUT THIS MANUAL

**Scope**—This instruction manual is intended to provide commissioning, programming, operating, and troubleshooting instructions for washer-extractors equipped with the E-P Plus® microprocessor control. See the installation manual for information on machine installation procedures and mechanical requirements. See the service manual for preventive maintenance, service procedures, and mechanical parts identification. See the schematic manual for electrical parts identification and electrical troubleshooting.

**Quick Reference Tabs**—The tabs along the right edge of the manual mark vital information.

**COMMISSIONING**—Commissioning instructions ensure proper start up.

**CONTENTS**—See Table of Contents for section/page numbers of cross references used herein.

**CHANGES/NEW MATERIALS**—These, if any, will be found behind the "Changes . . ." divider.

**The Normal Display Sequence at Each Power Up**—On E-P Plus® models *with* a *Master switch,* the sequence of displays shown in "RUNNING A FORMULA IN AUTOMATIC . . ." appears every time the *Master switch* is turned on. On models *without* a *Master switch,* this sequence appears when the machine is connected to power.

**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 section MSOP0599AE/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— E-P PLUS WASHER-EXTRACTORS

Take the following steps before placing this machine in operation:

1. Ensure safety of laundry personnel.
2. Customize data (configure, formula, and productivity/accumulator data).

## Ensure Safety of Laundry Personnel

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

## Customize Data

### When To Customize Data

- When commissioning the machine
- When required by error message
- After replacing the CPU board
- After upgrading software (replacing EPROMs)
- After adding or removing optional equipment

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

**Data Accessibility**—Configure and formula data can only be altered while the keyswitch is in the program position (data is keyswitch-protected). Productivity 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:

| Type of Data | Ways Data Can Be Used and Altered |
|---|---|
| Configure Data | Data can be read and over-written |
| Formula Data | Data can be read, over-written (added/changed), and cleared |
| Productivity Data | Data can be read and cleared |

**If Data Becomes Corrupted**—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.

# ABOUT THE USER CONTROLS— E-P PLUS WASHER-EXTRACTORS

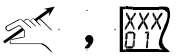
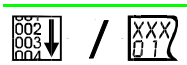
User controls are of two types—electro-mechanical controls (switches, buttons, and status lights) and microprocessor interface controls (display and keyswitch). Controls are mounted on one or more nameplates on the machine or a separate electric box.

**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 manual 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.

Throughout the manual, commands for operating controls will be portrayed as shown below:

| Symbol | What It Means |
|---|---|
|  | Turn the *Run/Program keyswitch c*lockwise to program. |
|  | Turn the *Run/Program keyswitch* counterclockwise to run (and remove the key). |
|  | Turn the *Auto/Test keyswitch* clockwise to the test position |
|  | Turn the *Auto/Test keyswitch* counterclockwise to the auto position (and remove key). |
|  | Press and release the *Stop button*. |
|  | Press (turn) buttons (keyswitches) sequentially. |
|  | Press (turn) buttons (keyswitches) simultaneously. |
|  | Press (turn) either button (keyswitch). |

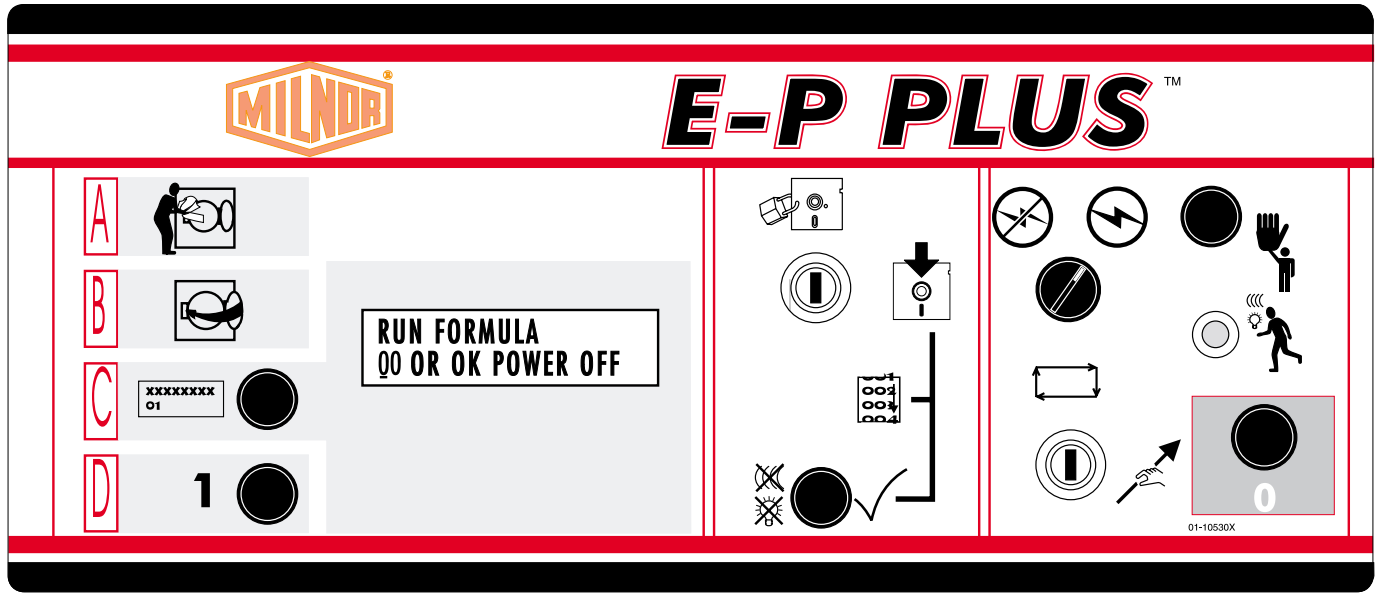



**FIGURE 2** (MSOP0271AE)
**Control Panel for Q-style and F-style Machine Models**

# Microprocessor Interface Controls

These controls, shown in FIGURE 1, include *Run/Program keyswitch* and *display*, located on the main nameplate (position may vary). 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.

**Run/Program 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-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.**

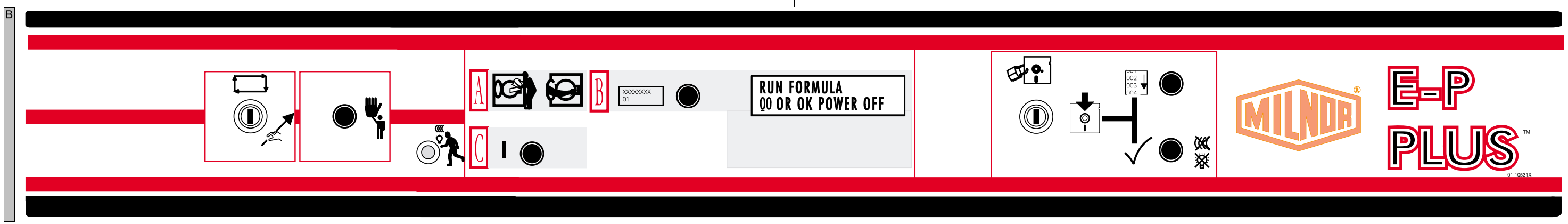



**FIGURE 1** (MSOP0271AE)
**Control Panel for M-style Machine Models**

Section 2

# Programming

# PROGRAMMING THE E-P PLUS® MICROPROCESSOR WASHER-EXTRACTOR CONTROL

## The Program Menu and How To Access It

### The Available Modes in the Program Menu

**0 = OK TURN KEY TO RUN (permits safe return to *run mode*)**
**1 = ADD/CHANGE FORMULA (adds/deletes steps or deletes formulas)**
**2 = CONFIGURE (tells controller which options are included)**
**3 = STANDARD FORMULAS**—deletes all field modifications to the first 10 formulas and reloads the 10 standard formulas for the selected industry set. Also optionally deletes any previously created formulas 11-30.

### To Access the Program Menu

**When the display=**

| RUN FORMULA<br>00 OK TO POWER OFF |
|---|

This is the *run mode* explained in "OPERATING" (see Table of Contents).

**Accesses the *Program Menu.***

**Display=**

| PROGRAM 0 MENU<br>OK TURN KEY TO RUN |
|---|

*Program Menu.* Underline indicates cursor position. Black character indicates current parameter. **Always return to 0 before turning the *Run/Program keyswitch* to *run.***

 /  or  /  **Scrolls forward/backward through the available program modes.**

### For Safe Return to Run Mode From Program Mode

Scroll to program mode 0

| PROGRAM 0 MENU<br>OK TURN KEY TO RUN |
|---|

 or  Returns to run display

| RUN FORMULA<br>00 OK TO POWER OFF |
|---|

# How To Avoid Data Loss!

Do not turn *Run/Program keyswitch* to *run* unless the display says *OK Turn Key To Run*; otherwise any formula modifications entered during this programming session (since last turning the keyswitch to *program)* will be lost, but any formula not modified during this programming session will be unaffected.

**Never turn power off while in *program mode*.** Otherwise, the control requires deleting the entire memory.

If the control requires reprogramming configure and formulas:

| CHECKSUM ERROR, |
|---|
| TURN KEY TO PROGRAM |

**Control starts at configure**

| TEMP CONTROL? |
|---|
| 0=NO 1=YES 0 |

# 1 = ADD/CHANGE FORMULA

**When the display=**

| PROGRAM 1 MENU |
|---|
| ADD/CHANGE FORMULA |

✓ =

| ADD/CHANGE FORMULA |
|---|
| 00 RETURN TO MENU |

**If selected formula doesn't yet exist, *Add* blinks; if it does exist, *Change* blinks.**

## To Select a Formula

002 003 004 / XXX 01 or ▼/▲

**To select a formula.** Indexes forward/backward through the formula numbers (01-30). There are always 30 programmable formulas even if some are blank.

Example:

| ADD/CHANGE FORMULA |
|---|
| 03 FORMULA NUMBER 03 |

**(example: formula 03 now available for *Change*)**

## To Access a Formula

✓ or ☑

**Accesses selected formula for programming**

| 03 TMMQFFFHC3LSCWSS* |
|---|
| 01 2050125232200— |

**(example: formula 03, step 01)**

## To Delete an Existing Formula

**Enter T=0 (type of step=end) in step 01**

## How the Formula Programming Help Screens Work

**Each decision has a help screen.**

| 03 TMMQFFFHC3LSCWSS* |
|---|
| 01 0000——— |

appears in four seconds (if no valid entry)

| 03 T TYPE OF STEP |
|---|
| 01 0 END FORMULA |

**Page A.** ✓ **or** ☑ **advances the cursor to the next decision.** When the cursor advances past the last decision on this display, a new display (Page B) appears for the remaining decisions in this step. Decisions required on both pages will vary depending on machine model and options.

① or 1 ***with Page A or B present, displays this formula and step name.***

**Help screen for *Type Of Step.*** When any help screen is present, 002 003 004 or XXX 01 scrolls the choices. When the help screen is displayed, ✓ is required to accept the displayed choice and advance the cursor to the next decision.

## How To Quickly Return to the Run Mode

✓, ✋, ☑, or ✋

**Returns to the *Formula Menu,* as explained in "To Move Cursor Backward/Forward in Formula Programming," in this section**

```
ADD/CHANGE FORMULA
00 RETURN TO MENU
```

✓ or ☑ **Returns to the *Program Menu***

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

, ✓ or , ☑ **Returns to the *run mode***

```
RUN FORMULA
00 OK TO POWER OFF
```

## To Move Forward/Backward Through the Step Numbers and Decisions

**Each step has two successive displays–pages A and B.**

**PAGE A**

Formula Number

Step Number

```
03 TMMQFFFHC3SCWSS*
01
```

These decisions repeat for each chemical programmed.

**PAGE B**

```
03 DRE
01
```

**OR**

```
03 SPD DRE
01
```

For single motor inverter driven machines only

**With the cursor at the step number:**

/ or ▼ / ▲ **Indexes forward/backward through the step numbers for this formula.**

✓ or ☑ Accesses the selected step (cursor moves to decision "T") or exits this formula, ***saving any changes if this is the last step of an existing formula.***

✋ or ✋ **Exits this formula, *clearing this formula if it was just created or losing any changes to an existing formula.***

**With the cursor at a decision within a step:**

✓ or ☑ **Moves the cursor forward among pages A and B through each valid decision in a specific step. This accepts the standard or default decision if another choice was not previously made.**

✋ or ✋ Moves the cursor backward among the two pages, through each valid decision within a specific step, except—

- If the cursor is at decision **T** on page A, it will move to the step number.
- If the cursor is at the first decision on page B, it will back up to the *first decision (C) for the first chemical* commanded in this bath (if any).

① or 1 **Displays the name of the formula and step you are modifying.**

## How To Insert or Delete a Step

**Only when the cursor is blinking at the step number:**

① or 1 — **Instructs the user** which key strokes insert or delete a step

```
START+NEXT/TERM TO
INS/DELETE THIS STEP
```

① + ✓ or 1 + ☑ — **Inserts a duplicate of this step**. If this is step 01, the duplicated step becomes the new step 01 and all the following steps move one number higher. The control prevents duplicating an *End Formula* or an extract step.

**Display=**

```
03 TMMQFFFHC3LSCWSS*
01 NEW STEP01 DUPPED
```

**Insert a new step** by duplicating a step and modifying the decision values as shown in "The Decisions When Programming a Step."

① + ✋ or 1 + ✋ — **Deletes this step.** The next higher step becomes the current step, and all following steps move one number lower.

**The control prevents deleting an *End Formula* or a bath between two extracts.**

**Display=**

```
03 TMMQFFFHC3LSCWSS*
01 STEP DELETED
```

✓ or ☑ — **Advances cursor** (without deleting or duplicating this step), accesses the next step, and allows modification of values.

002 003 004 or ▼ — **Scrolls through value choices** for decision selected by cursor.

### To Save Changes

Use the above procedures to quickly move around in a formula and make changes. After all changes are made, save the changes by moving the cursor to the step number and pressing ✓ or ☑ one or more times to exit the formula. **Do not exit with ✋ or ✋ or all changes will be lost.**

## The Decisions When Programming a Step

03 TMMQFFFHC3LSCWSS*
01

A total of 30 formulas with a total of 225 steps may be programmed.

**T=Type of step for SxJ, MxJ, and QxJ machines only.**

**0=End Formula** —The last step must be 0=*End Formula* and is automatically added as a last step if 5 or 6 *(Final Extract*) is selected. The formula can be ended without a final extract (if this is not the last available step, the display shows *End Formula #xx?*; see explanation under *Decision D* in this section) by making T=0 in the last step. An existing formula will be deleted if T=0 in step 01; step 01 may not=4, 5, or 6.

**1=1-Way Wash** —Increases mechanical action. Use for small pieces which cannot tangle.

**2=2-Way Wash** —Use for sheets or other large pieces which tangle unless reversed.

**3=Soak Wash** —**Cylinder does not turn.** Use for delicate fabrics.

**4=Int**ermediate **Extract**—For extracts between baths or for final extract at low (E1) speed if machine has two-speed extract.

**5=Final Extract** —Low (E1) speed duration is dictated by machine style (SxJ=no delay; MxJ=100 second duration, QxJ=60 second duration if Dip Switch 5 is set *off*, but no delay if switch 5 is set *on* (see "HOW TO SELECT AN E-P PLUS® INDUSTRY FORMULA SET"), then high (E2) speed duration lasts for remainder of commanded extract time. When the commanded extract time ends, the cylinder stops and the formula ends.

**T=Type of step for single motor inverter-driven machines only (FxJ, VxJ).**

**0-3 Same as above**

**4=Int**ermediate **Extract 1**—Lowest extract speed (Extract 1)

**5=Int**ermediate **Extract 2**—Middle extract speed (Extract 2)

**6=Final Extract** —Intermediate extract 1 (E1) duration is 100 seconds. Then, the high (E3) speed duration lasts for remainder of commanded extract time. When the commanded extract time ends, the cylinder stops and the formula ends (Extract 3).

03 TMMQFFFHC3LSCWSS*

**MMQ =Duration of step in minutes, minutes, and quarter minutes.**

**000**=Invalid. Control defaults to 001=15 seconds.
**001**=00.25 minutes (i.e., 0 minutes and 15 seconds—minimum)
**113**=11.75 minutes (i.e., 11 minutes and 45 seconds)
**633**=63.75 minutes (i.e., 63 minutes and 45 seconds—maximum)

### Factors Affecting Total Formula Time

Drain and distribution cycle times are standard for each machine. These times are a follows:

| **Machine(s)** | **Distribution** | Standard drains | **2-way wash drain** |
|---|---|---|---|
| MxJ/FxJ | 1:00 minute | 1:00 minute | 1:20 minutes |
| SxJ | begins when bath time expires and lasts until five seconds after the high level input is lost (if machine running at high level) or two seconds after the low level input is lost (if machine running at low level) | 1:00 minute | 1:20 minutes |
| QxJ | 1:08 minutes | 1:08 minutes | 1:08 minutes |

03 TMMQFFFHC3LSCWSS*

**Only appears if machine supplied with and configured for temperature control (Temp Control=yes).**

**FFF=°F commanded in this bath if configured for °F.**
**CCC=°C commanded in this bath if configured for °C.**
**000**=No temperature commanded in this bath.
**- - -**=Display if no temperature commanded.
**050**=MIN °F (010 = MIN °C)
**205**=MAX °F (095 = MAX °C)

03 TMMQFFFHC3LSCWSS*
01

03 TMMQFFFHC3LSCWSS*
01

03 TMMQFFFHC3LSCWSS*
01

**Only appears if machine supplied with and configured for this option.**

**H=Hot water valve**
**0**=Off
**1**=On
***2**=Raises temperature of filling water
**3**=Not allowed

**C=Cold water valve**
**0=Off**
**1=On**
**2=Not allowed**
***3=Lowers temperature of filling water**

**3=3rd water valve**
**0=Off**
**1=On**
***2=Raises temperature of filling water if connected to a hot water valve.**
***3=Lowers temperature of filling water if connected to a cold water valve.**

If a temperature is programmed in a step, the control requires either modulated water (H=2 and C=1 or 3, or C=3 and H=1 or 2) or steam injection, otherwise the cursor returns to the temperature decision for correction.

## How To Modulate Water Valves To Regulate the Temperature of Incoming Water

*When the thermo-modulated temperature of the incoming water is commanded having both hot and cold water valves, a faster, more accurate fill with fewer temperature swings will occur with H=1 (ON) and C=3 (Cold lowers fill temperature) when the commanded temperature is hotter than *split* or with use H=2 (Hot raises fill temperature) and C=1 (ON). Use H=2 (Hot raises fill temperature) and C=3 (Cold lowers fill temperature) when temperature is near *split* or when in doubt. H=2 (raises fill temperature) or 3=2 is not allowed for cold water and C=3 (lowers fill temperature) is not allowed for hot water.

03 TMMQFFFHC3LSCWSS*
01

**L=Liquor level**
**1**=Level 1 (low)
**2**=Level 2 (high)

## How To Cooldown

A Cooldown is programmed as a separate bath step following the bath in which the Cooldown is desired. In this cooldown step, command a cooldown temperature, plus **0** in each water valve. The control will automatically insert a "no drain" in the previous bath and *010* in *MMQ* (a Cooldown cannot be commanded following an extract). The commanded cooldown temperature must always be about 15-20°F (8-11°C) higher than the hottest ambient temperature *or* the hottest cold water temperature that will be encountered, or it may take a long time or even be impossible to achieve the commanded cooldown temperature. Cooldown will proceed for one minute after temperature is achieved (must be achieved for 15 seconds), whereupon the machine will drain (unless *no drain* is commanded to prolong this cooldown bath when desired, as to add chemicals after achieving the cooldown temperature). If 0 (zero) is commanded for each water valve in a bath following an extract:

Display=
```
Fxx COOLDOWN ILLEGAL
Sxx PRESS NEXT
```
① or 1

—If Cooldown configured, returns the cursor to the time field (MMQ).
—If Cooldown not configured, but *temperature control* configured, returns the cursor to the temperature field (FFF or CCC).
—If temperature control not configured, returns the cursor to the first water valve field.

```
03 TMMQFFFHC3LSCWSS*
01
```

**Only appears if machine supplied with and configured for temperature control (*temp control*=yes) and steam (*steam error* greater than zero).**

**S=Steam in this bath**
**0**=**No steam**

| | EARLY | AFTER | TIMER |
|---|---|---|---|
| **1** = | No | Yes | Runs |
| **2** = | No | No | Stops |
| **3** = | No | Yes | Stops |
| **4** = | Yes | Yes | Runs |
| **5** = | Yes | No | Stops |
| **6** = | Yes | Yes | Stops |

**See "How To Select the Steam Code" in this section.**

## How To Select the Steam Code

**EARLY =** *Yes* starts steaming at lowest safe level. Use *Yes* when machine has only a 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 after temperature is achieved. Use *No* if chemicals or goods may be damaged by steam after chemical injection (as in bleach baths), otherwise use *Yes.*

**TIMER RUNS =** runs while steaming. *Stops* = stops until commanded temperature is 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.

03 TMMQFFFHC3LSCWSS
01

Chemicals can be added to any bath (except cooldown bath). A standard chemi cal injection can be prevented by commanding C=0 (no chemical in this bath) or by commanding SS=00 (zero seconds of chemical injection). **No more than two chemicals can be programmed per bath.**

**C=Chemical number**
**0**=No chemical in this bath.
**2**=Chemical 2 (example)
**5**=Chemical 5 (maximum)

03 TMMQFFFHC3LSCWSS*
01

**W=When to inject chemical**
**0**=With fill
**1**=At level satisfied
**2**=At level and temperature satisfied (only if steam codes 2, 3, 5, or 6 to a specified temperature with *Timer Stops While Steaming* is commanded).

03 TMMQFFFHC3LSCWSS*
01

**SS= Seconds of chemical injection**
**00**=Zero seconds prohibits this chemical injection.
**40**=40 seconds. If no specific inject time is entered, the control will automatically insert 40. Any other value between 00=zero seconds (no chemical injection) and Q5=255 seconds may be specified and will override the 40-second default value.
**B9**=119 seconds (example)
**Q5**=255 seconds (maximum)

## How To Command Inject Times Between 100 and 255 Seconds

Enter the appropriate letters A-Q (excluding the letter O) for the first character and the desired number 0-9 for the second character. Examples: A0=100 seconds, E7=147 seconds, Q5=255 seconds (maximum).

| | | | |
|---|---|---|---|
| A=100 | E=140 | I=180 | M=220 |
| B=110 | F=150 | J=190 | N=230 |
| C=120 | G=160 | K=200 | P=240 |
| D=130 | H=170 | L=210 | Q=250 |

## ⚠ CAUTION ⚠

**RISK OF POOR OR INCONSISTENT WASH QUALITY—Short injections (less than 10 seconds) do not work fo the following reasons: 1)Fine adjustments are not possible (e.g., a 1 second change to a 3 second injection is +\- one third). 2) Eratic response time (due to pump mechanical lag, draining of the delivery tubes, etc.) is more detrimental (e.g., a 1/2 second delay in a 3 second injection yields 17% less than expected, versus only 5% less for a 10 second injection).**

- ☞ **Size pumps or valves small enough for adequate control (i.e., for longer injection times).**
- ☞ **Use two pumps or valves for one chemical (one small and one large) if quantity needs vary greatly.**

```
03 TMMQFFFHC3LSCWSS*
01
```

**✱ =Signal with chemical?** The signal will not occur until the when to start chemical injection decision has been satisfied. The commanded chemical injection will not start until the signal is cancelled (press ✓ or ☑ to cancel signal).
**0=No**
**1=Yes**

```
03 TMMQFFFHC3LSCWSS*
01
```

After the first chemical has been programmed, the controller will come back to ask for a second (final) chemical.

**C=Chemical number of additional chemical**
**0**=No additional chemical in this bath. Cursor advances to next decision.
**3**=Chemical 3 (or any valid chemical number). Cursor "returns" to decision W.

```
03 SPD DRE
00
```

Selects the wash speed for this step (for single motor inverter-driven machines only). Defaults to Wash 1 when default formulas or a new bath step is entered.

**SPD=Basket speed**
**0=Wash 2 : High speed (for use with polycotton)**
**1=Wash 1: Normal speed**

**⚠ 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.**

```
03 DRE
01
```

or

```
03 SPD DRE
01
```

**D=Drain Type**
**0=Standard drain speed** —Basket turns clockwise at drain (distribution) speed.
**1=Two-way wash speed** —Wash speed reversing; more mechanical action while draining.
**2=Do not drain** —Use for functions later in this bath, such as to inject chemicals, raise temperature, or raise level without draining.
**3=Stop with fill** —Basket stationary during *previous* fill; drain speed while draining.
**4=Stop with drain** —Basket stationary; no mechanical action while draining.
**5=Stop fill and drain** —Basket stationary during *previous* fill and drain.

```
03 DRE
01
```

or

```
03 SPD DRE
01
```

**If machine is configured for reuse drain** *(reuse drain=yes).*

**R=Drain destination**
**0**=Drain to sewer
**1**=Drain to reuse

| 03 TMMQFFFHC3LSCWSS*<br>02 |
|---|

The cursor returns here to program the next step unless the step just programmed is the last step of the formula (T=0;T=5 if SxJ, MxJ, or QxJ; or T=6 if FxJ or VxJ) or if the number of steps exceeds 50 where cursor will advance to "E."

| END FORMULA #xx ?<br>0 NO |
|---|

This display appears if T=0 in previous display and this is not the last available step in this formula.

**0=No.** Aborts the previous T=0 selection. Display returns to the T (type of step) decision.
**1=Yes.** Accepts that the formula should end here.

| 03 DRE<br>01 |
|---|

or

| 03 SPD DRE<br>01 |
|---|

**E=How to end?**
**0=Stopped** —Operator must press or to silence the signal.
**1=Reversing** —(at wash speed) Operator must press or to end.
**2=Drain Speed** —Operator must press to end.
**3=Tumble** —(at wash speed) Signal occurs two minutes later. Operator must press or to end.

| ADD/CHANGE FORMULA<br>00 RETURN TO MENU |
|---|

This display reappears if the step just programmed is the last step of the formula.

✓ or ☑ **Returns to the *Program Menu***

| PROGRAM 0 MENU<br>OK TURN KEY TO RUN |
|---|

, ✓ or , ☑ **Returns to the *run mode*** Display=

| RUN FORMULA<br>00 OK TO POWER OFF |
|---|

# 2 = CONFIGURE (and Why It Is Necessary)

Because the microprocessor can control several different models, it is necessary to *configure* each unit to match its specific model and type washer-extractor, including optional features like the number of water valves, whether or not the machine has thermostatically controlled water and/or steam temperatures, Cooldown, etc. Such decisions are discrete to the specific machine and must never be changed unless options are later added or removed. However, certain other configure decisions, such as whether to display metric units, may be subsequently changed if desired.

**⚠ CAUTION ⚠**

**CONFIGURE DATA MAY BE LOST if control is powered OFF while in configure mode. Reconfigure at installation and any time a memory error is detected. Although certain codes are discretionary and are so marked below, most configure codes must match those shown on the metal configure nameplate, unless optional equipment has been added to or removed from the machine.**

When the display= | PROGRAM 2 MENU<br>CONFIGURE | ✓ or ☑ = | TEMP CONTROL?<br>0=NO 1=YES 0 | First configure decision—Is machine equipped with temperature control option?

**0**=NO
**1**=YES

 , **Indexes between 0 and 1.** ✓ or ☑ **Accepts the displayed choice.**

## To Move Backward/Forward in Configure

✋ or ☑ **Moves backward through each configure display, retaining each previously entered value.**

✓ or ☑ **Moves forward through each configure display, retaining each previously entered value.** The control will not automatically advance when a value is entered.

TEMP UNITS ?
0=°F 1=°C 0

**Only appears if machine supplied with and configured for temperature control (temp control=yes).**

**0**=°F (Fahrenheit)
**1**=°C (Celsius)

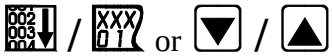
 **Indexes between 0 and 1.**

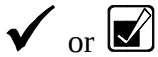
✓ or ☑ **Accepts the displayed choice.**

| |
|---|
| STEAM ERROR<br>0=NO STEAM 0 |

**Only appears if machine supplied with and configured for temperature control and requires option board (temp control=yes).** Permits steaming for time indicated before *Steam Error* (too long to steam) is displayed. Choose 0 if machine has no steaming function.

**0**=No steam
**1**=5 minutes
**2**=10 minutes
**3**=20 minutes

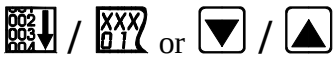
 **Indexes forward/backward through the available choices.**

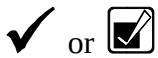
 **Accepts the displayed choice.**

| |
|---|
| COOLDOWN ERROR<br>0=NO COOLDOWN 0 |

**Only appears if machine supplied with and configured for temperature control and requires option board (temp control=yes).** Permits Cooldown for time indicated before *Cooldown Error* (too long to Cooldown) is displayed. Choose 0 if machine has no Cooldown function.

**0**=No cooldown
**1**=5 minutes
**2**=10 minutes
**3**=20 minutes

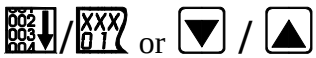
 **Indexes forward/backward through the available choices.**

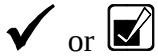
 **Accepts the displayed choice.**

| |
|---|
| EXTRA WATER<br>0=NO 1=YES 0 |

Is machine equipped with extra (third) water? Requires option board.

**0**=No
**1**=Yes

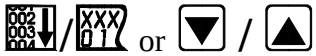
 **Indexes forward/backward through the available choices.**

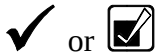
 **Accepts the displayed choice.**

| |
|---|
| REUSE DRAIN?<br>0=NO 1=YES 0 |

Is machine equipped with reuse drain? Requires option board.

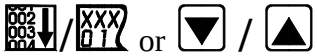
**0**=No
**1**=Yes

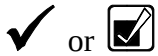
 **Indexes forward/backward through the available choices.**

 **Accepts the displayed choice.**

| AMPSAVER<br>0=NO 1=YES 0 | Is machine equipped with Ampsaver®? Requires option board. |
|---|---|

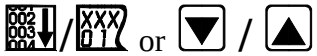
**0**=No
**1**=Yes

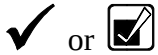
 **Indexes forward/backward through the available choices.**

 **Accepts the displayed choice.**

| LANGUAGE?<br>0=ENGLISH, 1=FORGN |
|---|

**0**=English
**1**=Foreign

 **Indexes forward/backward through the available choices.**

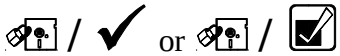
 **Accepts the displayed choice.**

| 42032 MACHINE?<br>0=NO, 1=YES 0 |
|---|

**0**=No
**1**=Yes

**Configuration is completed.** Display=

| PROGRAM 0 MENU<br>OK TURN KEY TO RUN |
|---|

 **Returns to the *run mode*.** Display=

| RUN FORMULA<br>00 OK TO POWER OFF |
|---|

# 3 = STANDARD FORMULAS

**AVOID DATA LOSS!**

**Other than the two courses of action described, it is not possible to selectively delete field-modified or field-programmed formulas within this mode. This mode erases all field programming formulas 01-10 or 01-30 as specified. For selective changes, use Program Mode 1=ADD/CHANGE FORMULA.**

1. **Delete all 30 formulas**, replace formulas 01-10 with the 10 standard formulas for the selected industry and replace formulas 11-30 with 20 blank formulas *(0 Default 30 Formulas).*
2. **Delete only formulas 01 through 10** and replace them with the 10 standard formulas for the selected industry, retaining any previously programmed formulas 11-30 *(1 Default 10 Formulas).*

When the display=

```
PROGRAM 3 MENU
STANDARD FORMULAS
```

✓ or ☑

```
ATHLETIC LAUNDRY
0 DEFAULT 30 FORMULAS
```

**or similar display with the appropriate industry formula set named on the top line.**

 , , ▼ or ▲ toggles between

```
ATHLETIC LAUNDRY
0 DEFAULT 30 FORMULAS
```

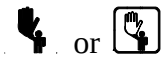
and

```
ATHLETIC LAUNDRY
1 DEFAULT 10 FORMULAS
```

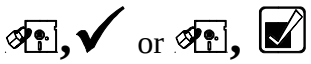
✓ or ☑ if ***0*** *Default 30 Formulas* is displayed, deletes all 30 formulas, replaces formulas 01-10 with the 10 standard formulas for the selected industry and replaces formulas 11-30 with blank formulas.

if ***1*** *Default 10 Formulas* is displayed, deletes only formulas 01-10 and replaces them with the 10 standard formulas for the selected industry, retaining any previously programmed formulas 11-30.

**or**

 **Cancels this procedure.** Display returns to the *Program Menu*

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

 **Returns to the *Formula Menu***

```
RUN FORMULA
00 OK TO POWER OFF
```

Section 3

# Operating

# DETERMINING LOAD SIZE

Putting *too much* linen into a properly designed laundry washer-extractor will not *overload* the machine to its mechanical or electrical detriment, provided these conditions exist:

1. The goods consist of typical cotton and/or synthetic fabrics normally encountered in commercial laundering operations
2. The load is not so bulky as to prevent a reasonably balanced distribution prior to the onset of extraction
3. The extract speed has not been increased above the designed maximum
4. The total number of intermediate and final extractions do not exceed the designed maximum for the extract motor

**Thus, the *maximum soiled linen capacity* for any properly designed washer-extractor is essentially limited by the amount of soiled goods that can be actually placed into the cylinder.**

The maximum weight of soiled goods that a washer-extractor cylinder will accept depends on 1) the internal volume of the cylinder (the space into which the goods can be placed), plus 2) the density (weight and bulkiness) of the specific goods. For example, many polyester-cotton fabrics have relatively low weights for their bulk so one should rarely expect to be able to put in a published maximum capacity load of such fabrics. In fact, published maximum capacities of machines based on the now generally accepted industry standards will usually be achieved only with the highest density, closely woven fabrics having a reasonable soil content as well.

The best load size depends on the size of the machine—plus the type of goods, soil content, and wash quality desired. Since the latter factors vary considerably, prior experience and/or experimentation generally yield the best results. Use these guidelines:

1. Overloading a washer-extractor will not increase production because longer wash formulas and more rewash will be required.
2. Avoid underloads because the inevitable greater extraction imbalance will cause more extract re-cycles and may stress the machine unnecessarily.
3. Load divided cylinder machines so that the *weight in each compartment is approximately equal at the onset of extraction*. Do not put goods with grossly dissimilar water absorption characteristics in the different compartments. Do not attempt to balance loads of wet goods in one compartment against dry goods in the other.

# RUNNING A FORMULA IN AUTOMATIC WITH THE E-P PLUS® MICROPROCESSOR CONTROL AND VIEWING AND CLEARING ACCUMULATED FORMULA COUNTS

## Power Up

Never power up unless / is set to , / is set to , and the keys are removed. Unlike the QxJ, other models (MxJ, SxJ, FxJ, and VxJ) do not contain a brake or speed sensing device, thus the control requires 80 seconds (120 seconds for 42032 F8J machine) after power up before any operation can be performed.

Upon power up, the display will show the software copyright information, machine name, and the checksum number. The checksum varies with any programming change. Record the checksum after each programming session, so unauthorized programming can be detected.

**⚠ DANGER ⚠**

**ENTANGLEMENT HAZARD—The linen inside or hanging partially outside a turning cylinder can suddenly wrap around your hand, arm, or body, twisting off/severing it. You can be killed or seriously injured.**

☞ **Never put any part of your body in this machine or touch the linen while it is turning.**

## Selecting the Formula

1. **Load machine and close door.** See "DETERMINING LOAD SIZE" (see Table of Contents).
2. **When the display =**

| |
|---|
| RUN FORMULA |
| 00 OK TO POWER OFF |

XXX 01 or ▲ **Indexes *forward* through the 30 formulas,** or

001 002 003 004 or ▼ **Indexes *backward* through the 30 formulas.**

**3. When the display =**

| RUN FORMULA<br>xx FORMULA NUMBER xx |
|---|

xx=number from 01 to 30.

① or 1 **Starts the machine and the selected formula.**
If a blank (non-existent) formula is selected, display =

| RUN FORMULA<br>DOES NOT EXIST |
|---|

for 3 seconds.

## The Display During Automatic

| 23:04 F02S01 02:37<br>dF=A168/D170 LEV 2 |
|---|

ALTERNATES WITH

| 23:04 STEP 01 02:37<br>dF=A168/D170 LEV 2 |
|---|

| DATA | WHAT IT MEANS |
|---|---|
| 23:04 | Time remaining in formula (i.e., 23 minutes, 4 seconds) |
| F02S01 | Formula 02, Step 01 |
| STEP01 | the current step |
| EXTRACT | an extract step |
| TIMEHALT | Timer is stopped for chemical injection (chemical supplier must wire for this option) |
| 02:37 | Time remaining in this step (i.e., 2 minutes, 37 seconds) |
| dF=A168/D170 LEV2<br>Bath Level (1 or 2) | Bath temperature dF(degrees Fahrenheit) or dC (degrees Celsius)<br>A168(Achieved=168°)/D170(Desired = 170°). Does not display unless machine has temperature control (alternates with SPD 0 (bath speed 0 or 1) on FxJ and VxJ models. |
| WAIT FOR LEVEL 2 H | Timer is stopped, waiting for the commanded level 2 to be achieved.<br>H=hot water valve open (C=cold water valve open, 3=Extra water valve open). |
| INJECT CHEM 03 | Chemical 3 is being injected. |
| FINAL EXTRACT | This is the final extract step. |

## How To Restart After Power Loss

The E-P Plus® control remembers the step it was in if power fails or the wall disconnect or *Master switch* is set to *off* while the machine is operating in *automatic*. When power is restored, the controller on MxJ, SxJ, VxJ, and FxJ machines displays

| PRESS START TO RUN<br>STEP xx - FORMULA xx |
|---|

The controller on the QxJ machine displays

| ENABLE 3-WIRE TO RUN<br>STEP xx - FORMULA xx |
|---|

① or 1 **Resumes the formula at the displayed formula and step.** If the outage occur level and temperature (if commanded) must again be satisfied, even if these were already satisfied before power loss. Any commanded chemicals will be injected again, even if these were previously injected. If the outage occurs during a drain, that step will be repeated and then followed by the next commanded step. If the outage occurs during an extract, the previous bath will run before extract begins.

or **Terminates the formula in progress.**

## To Shorten, Terminate, or Suspend a Formula in Progress

✓ + ① or ☑ + 1 **Zeros the step timer for a bath, a drain (unless the next step is an extract), or an extract in progress and proceeds to the next step (only if DIP switch 6 on the processor board was previously set *on*). See "HOW TO SELECT AN E-P PLUS® INDUSTRY FORMULA SET."**

### For QxJ Models Only

0 **Suspends a formula in progress. The drain opens, the machine stops, and the operator alarm sounds. To resume formula, press ① or 1.**

or Cancels the formula, and returns to *Run Formula.* Display =


**See "To Unload the Machine" in this section for how the door interlocks work for SxJ, MxJ, FxJ, and QxJ machines.**

## How Flush Valve Works

The E-P Plus® controller includes an output that turns on the flush valve for 30 seconds after all the chemicals have been injected for that bath. **If a bath is shortened or terminated before or while this valve is energized, the flush valve will be turned off.** Therefore, shortening or terminating a bath may prevent the flush valve from activating.

# How Cooldown Works

Goods must be cool enough to handle when a goods cycle has finished. However, a drastic temperature change will often set wrinkles in certain goods. Therefore, Milnor® uses a feature called *cooldown* to gradually lower the water temperature used during the goods cycle to provide cool goods for handling without setting wrinkles.

**SxJ, MxJ Machines**—Cooldown valve is enabled and stays on until the cooldown step is complete (temperature is reached), regardless of level.

**FxJ, VxJ Machines**—Cooldown valve is enabled and stays on until high level is reached, at which time the drain valve opens and cooldown valve closes until water falls below low level. When water level is below low level, the drain valve closes and the cooldown valve turns back on. This process continues until the cooldown step is complete (temperature is reached).

**QxJ Machines**—Cooldown valve is enabled and stays on until high or cooldown level is reached. This causes the drain to open and cooldown valve to close until high level is lost. When high level is lost, the drain valve closes and the cooldown valve turns back on. This process continues until the cooldown step is complete (temperature is reached).

# To Unload the Machine

The actions the machine takes when the formula ends depends on the type of machine, the type of ending step (bath, intermediate extract, or final extract), and whether the formula runs to completion or is terminated manually.

**⚠ DANGER ⚠**

**ENTANGLEMENT HAZARD—The linen inside or hanging partially outside a turning cylinder can suddenly wrap around your hand, arm, or body, twisting off/severing it. You can be killed or seriously injured.**

☞ **Never put any part of your body in this machine or touch the linen while it is turning.**

## To Unload MxJ, SxJ, FxJ, and VxJ Models

**1.** When the formula ends or is terminated, the cylinder coasts for 15 seconds if in a bath, xx seconds (45 seconds if MxJ; 60 seconds if VxJ or standard FxJ; 114 seconds if 42032 F8J; or 65 seconds if SxJ) if in low speed extract, or 95 seconds (135 seconds for 42032 F8J) if in high speed extract before the door unlocks, to be certain the cylinder has stopped.

**a.** If the formula runs to completion, all coast time is included in the overall formula time. Thus during coast, the normal automatic display (shown on the previous page) continues.
**NOTE:** Depending on the *How To End* code, the controller will explain how the cycle is ending and instruct you to press *To Terminate Program* if you want to escape this step in the cycle.

**b.** The display during the last 15 seconds of coast (or during the entire coast if the formula was manually terminated)=


**2.** At the end of coast, the operator alarm sounds, the door unlocks, and the machine may be unloaded.


## To Unload QxJ Models

**NOTE:** Depending on the *How To End* code, the controller will explain how the cycle is ending and instruct you to press *To Terminate Program* if you want to escape this step in the cycle.

**1.** When the formula ends or is terminated, the brake is applied to stop the basket. The control monitors the liquor level to ensure the water level is below low level (beneath door opening during wash step) and basket speed is slow enough for the door to be opened.


**2.** If the formula ends or is terminated in a bath, or when the speed switch closes following an extract,


0 **Will now unlock the door,** and the machine may be unloaded.

0 + 1 or 0 + 1 **Jogs the cylinder clockwise.** Use *jog* to loosen the goods after an extract.

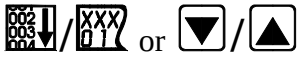
# Viewing and Clearing Accumulated Formula Count

The control individually stores how many times each formula was run since the last time the count for that formula was cleared. The maximum number of formula counts is 999, after which the count will remain at 999 until cleared. The count for each formula can only be viewed and/or cleared while the machine is in the *run mode*, but idle (not running a formula).

**AVOID BAD FORMULA COUNT DATA**

1. **On MxJ, SxJ, FxJ, and VxJ models, the disconnect switch (or on QxJ models, the Master switch) must be turned on for at least 15 seconds every 48 hours to retain the formula count. See "WHAT TO DO FIRST."**
2. **Each accumulator must be cleared when or before it reaches 999 to display an accurate count.**
3. **If "Accumulator Error" appears, the count for all formulas must be cleared. See "E-P PLUS® ERROR MESSAGES."**

Display= RUN FORMULA
05 OK TO POWER OFF

 To select a formula. Indexes forward/backward through the formula numbers (01-30).

example: display = RUN FORMULA
05 FORMULA NUMBER 05

With any formula selected,

✓ or ☑ **Displays the count in the upper right corner of the display.**

example shows 38 loads of formula 05 were processed RUN FORMULA 038
05 FORMULA NUMBER 05

✓ + or ☑ + **Clears the count for that formula.**

Section 4

# Troubleshooting

# VERIFYING SOFTWARE INFORMATION, VIEWING INPUTS, AND ACTUATING OUTPUTS ON THE E-P PLUS® CONTROLLER

## The Manual Menu and How To Access It

### The Available Modes in the Manual Menu

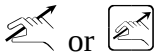
**1=SOFTWARE DATE CODE** (displays the software type, date code, and industry type)
**2=TEST INPUTS** (views inputs for testing while the E-P Plus® is *not* running a formula)
**3=TEST OUTPUTS** (actuates any output for testing while the E-P Plus® is *not* running a formula)

### To Access the Manual Menu

Display =

```
RUN FORMULA
00 OK TO POWER OFF
```

The machine must be idle (not running a formula), the *Run/Program keyswitch* at *run.*

 or 

Accesses the manual menu. Display =

```
MANUAL MENU
1 SOFTWARE DATE CODE
```

Underline indicates blinking cursor. Select one of three manual modes or return to *run mode* as explained below.

 or  **Indexes forward/backward through the available modes in the manual menu.**

or **<x>** Selects *manual mode* x where <x> is mode number.

```
MANUAL MENU
1 SOFTWARE DATE CODE
```

Example: Manual Menu 1 selected.

 **Returns to the *run mode.***
Display =

```
RUN FORMULA
00 OK TO POWER OFF
```

## 1=SOFTWARE DATE CODE

**Accesses the manual menu.**
Display =

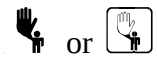
```
MANUAL MENU
1 SOFTWARE DATE CODE
```

 or  **Displays the software date code and the industry selected.**

```
EP-PLUS/M 8A008
CORRECTIONAL LAUNDRY
```

See "HOW TO SELECT AN E-P PLUS® INDUSTRY . . ." (see Table of Contents).

### For Return to Run Mode From Manual Mode

 **Returns to the manual menu.** Display =

```
MANUAL MENU
1 SOFTWARE DATE CODE
```

 **Returns to the *run mode.*** Display =

```
RUN FORMULA
00 OK TO POWER OFF
```

# 2=TEST INPUTS

The *on/off* state of each input to the microprocessor can be displayed via the manual menu while the machine is not running a formula.

When the display =

```
MANUAL MENU
2 TEST INPUTS
```

① or 1 **Accesses this *test mode.*** Display =

```
ABCDEFGHIJKLMNOP (-)
+-+-+-+-+-+-+-+- OFF
```

Input display code shown on top line (see "Table of Standard INPUTS for the E-P Plus® Controller") and the status of the input is shown below its code ("+"=input energized or "-"=input not energized).

or **Returns to the manual menu.** **Display =**

```
MANUAL MENU
2 TEST INPUTS
```

**Returns to the *run mode.*** **Display =**

```
RUN FORMULA
00 OK TO POWER OFF
```

## Table of Standard INPUTS for the E-P Plus® Controller

| Display Code | Input Name | Machine Model | Connector/Pin |
|---|---|---|---|
| A | Program Select button | all | MTA4-6 |
| B | Door is closed | all | MTA4-5 |
| C | Next/Signal Cancel button | all | MTA4-4 |
| D | Terminate button | all | MTA4-3 |
| E | Low Level switch | all | MTA4-2 |
| F | Start button | all | MTA4-1 |
| G | Auto/Manual switch | all | MTA5-6 |
| H* | Scroll button | all | MTA5-5 |
| | Cooldown Level (if so equipped) | QxJ | |
| I | Three-Wire Input | QxJ | MTA5-4 |
| | Vibration switch | SxJ, FxJ, VxJ | |
| J | Speed switch | QxJ | MTA5-3 |
| | Inverter Fault | FxJ, VxJ | |
| K | High Level switch | all | MTA5-2 |
| L | Run/Program keyswitch | all | MTA5-1 |
| M | Not Used | all | MTA8-4 |
| N | Ampsaver Acknowledge | all | MTA8-3 |
| O | External Fault | all | MTA8-2 |
| P | Halt Bath Time | all | MTA8-1 |

* This input is shared by and cooldown level for QxJ only.

# 3=TEST OUTPUTS

**Any machine function may be individually actuated for testing via manual menu while the machine is *not* running, by turning on its output.**

**⚠ DANGER ⚠**

**CRUSHING AND ENTANGLEMENT HAZARD—Bare Manual outputs actuate washer-extractor mechanisms. Make sure all personnel are well clear.**

Display =
MANUAL MENU
3 TEST OUTPUTS

① or 1 **Accesses the output menu.** Display =
TEST OUTPUTS
01 WASH CLUTCH

XXX 01 / 002 003 004 or ▼ / ▲ **Indexes forward/backward through the output names shown in the "Table of OUTPUTS for the E-P Plus® Controller," in this section.**

With an output name selected **example**
TEST OUTPUTS
02 COLD WATER VALVE

① or 1 **Accesses that output. example:**
COLD WATER VALVE
0=OFF 1=ON 0

① or 1 **Turns the output *on.* example:**
COLD WATER VALVE
0=OFF 1=ON 1

① or 1 **Turns the output *off.* example:**
COLD WATER VALVE
0=OFF 1=ON 0

XXX 01 or ▲ **Turns off the output if it was on, and advances to the next output when returning to the output menu.** **Display =**
HOT WATER VALVE
0=OFF 1-ON 0

or **Turns off the output if it was on, and returns to the manual menu.** **Display =**
MANUAL MENU
3 TEST OUTPUTS

**Turns off the output if it was on, and returns to the *run mode.*** **Display =**
RUN FORMULA
00 OK TO POWER OFF

# Table of OUTPUTS for the E-P Plus® Controller

| Output Number | Machine Models | Output Description | Output Device | Consequences of Actuating Output |
|---|---|---|---|---|
| 01 | MxJ and Q4J models | Wash Clutch | K0 | 0=extract clutch energized<br>1=wash clutch energized |
| | all others | Logic output | | Operates logic output. |
| 02 | all | Cold water valve | K1 | Opens valve. |
| 03 | all | Hot water valve | K2 | Opens valve. |
| 04 | all | Inject Chemical 5 | K3 | Operates chemical 5 inject device. |
| 05 | all | Inject Chemical 1 | K4 | Operates chemical 1 inject device. |
| 06 | all | Inject Chemical 4 | K5 | Operates chemical 4 inject device. |
| 07 | all | Inject Chemical 3 | K6 | Operates chemical 3 inject device. |
| 08 | all | Inject Chemical 2 | K7 | Operates chemical 2 inject device. |
| 09 | F, M, V, SxJs | Extract speed (Use only with empty cylinder) | K8 | Prevents door from being opened, releases brake (if any), and causes cylinder to turn at drain speed. |
| | QxJ models | Not used—See output 24 test | | |
| 10 | all | Distribution (drain speed)<br>(Door must be closed) | K9 | Prevents door from being opened, releases brake (if any), and causes cylinder to turn at drain speed. |
| 11 | all | Clockwise wash<br>(Door must be closed) | K10 | Prevents door from being opened, releases brake (if any), and causes cylinder to turn CW at wash speed. |
| 12 | all | Counterclockwise wash<br>(Door must be closed) | K11 | Prevents door from being opened, releases brake (if any), and causes cylinder to turn CCW at wash speed. |
| 13 | F, M, V, SxJs | Buzz signal | K12 | Sounds operator alarm. |
| | QxJ models | Brake | | Releases brake. |
| 14 | F, M, V, SxJs | Flush valve | K13 | Opens flush valve. |
| | QxJ models | Buzz signal | | Sounds operator alarm. |
| 15 | all | Drain solenoid | K14 | Closes drain. |
| 16 | F, M, V, SxJs | Door interlock | K15 | Energizes door lock. |
| | QxJ models | Flush valve | | Opens flush valve. |
| 17 | all | Reuse drain (if so equipped) | K16 | Operates reuse drain if supplied. |
| 18 | all | Extra water (if so equipped) | K17 | Operates extra water if supplied. |
| 19 | all | Cooldown (if so equipped) | K18 | Operates cooldown if supplied. |
| 20 | all | Steam (if so equipped) | K19 | Operates steam if supplied. |
| 21 | all | Ampsaver (if so equipped) | K20 | Operates ampsaver output. |
| 22 | all | Not used | K21 | Operates output. |
| 23 | all | Reversing wash speed<br>(Door must be closed) | § | Prevents door from being opened, releases brake (if any) and *causes cylinder to run at wash speed reversing.* |
| 24 | M, F, VxJs | High speed extract<br>(Use only with an empty cylinder)<br>(Door must be closed) | § | Prevents door from being opened, accelerates to high speed extract as follows: CW wash speed for 20 seconds, drain speed for 20 seconds, E1 for 60 seconds, then E2 (E3 if FxJ and VxJ). |
| | QxJs and SxJs | High speed extract<br>(Use only with an empty cylinder)<br>(Door must be closed) | § | Prevents door from being opened, accelerates to high extract speed as follows: CW wash speed for four seconds, drain for eight seconds (no drain for SxJ), then E2. |
| 25 | all | Fill to Level 1 (low)<br>(Door must be closed) | § | Prevents door from being opened, closes drain, opens cold water valve until level 1 (low) is achieved, whereupon cold water valve closes. |
| 26 | all | Fill to Level 2 (high)<br>(Door must be closed) | § | Prevents door from being opened, closes drain, opens cold water valve until level 2 (high) is achieved, whereupon cold water valve closes. |

**§** There is no output device devoted exclusively to this output test. Several output devices energize in a specific sequence to achieve the described action.

# E-P PLUS® ERROR MESSAGES

## Power Up Error Messages

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

**ACCUMULATOR ERROR TERMINATE TO CLEAR**

The microprocessor performs a memory check each time the machine is turned on. This error message appears if the microprocessor detects that the accumulator data is corrupt, in which case all accumulators must be reset to zero. Press TERMINATE to clear all accumulators and the error message. See "RUNNING A FORMULA IN AUTOMATIC . . . ," "Viewing and Clearing Accumulated Formula Count" (see Table of Contents).

**CHECKSUM ERROR, TURN KEY TO PROGRAM**

Appears if there is illegal data in Configure, Formulas, or Industry. Turn the *Run/Program keyswitch* to *program* and perform the following actions:

1. **Reconfigure** (see "PROGRAMMING THE E-P PLUS® . . . ," "2=CONFIGURE" (see Table of Contents).
2. **Reinstall the standard (default) formulas** (see "PROGRAMMING THE E-P PLUS® . . . ," "3=STANDARD FORMULAS").
3. **Reprogram the wash formulas** (see "PROGRAMMING THE E-P PLUS® . . . ," "1=ADD/CHANGE FORMULA").

**MEMORY: EEPROM IS NOT TALKING**

Appears when the microprocessor cannot read from or write to the EEPROM. Turn machine *off*. Replace EEPROM (consult factory). Turn machine *on*. All programmed formulas will be lost. Access *Program Menu, Mode 3* to reload the standard formulas.

1. **Reconfigure** (see "PROGRAMMING THE E-P PLUS® . . . ," "2=CONFIGURE").
2. **Reinstall the standard (default) formulas** (see "PROGRAMMING THE E-P PLUS® . . . ," "3=STANDARD FORMULAS").
3. **Reprogram the wash formulas** (see "PROGRAMMING THE E-P PLUS® . . . ," "1=ADD/CHANGE FORMULA").

**A/D BOARD IS NOT TALKING**

Appears when the A/D board is not responding to the microprocessor. Turn wall disconnect *off*. Check the connections on both ends of the ribbon cable connecting the processor board to the A/D board. Turn power *on*. If error persists, turn wall disconnect *off*, replace A/D board (consult factory). Turn power *on*.

# Run Error Messages

If an error message appears on the second line of the display while the machine is running, the timer shown on the first line of the display stops counting down. When the error is corrected, the timer resumes counting down. To troubleshoot most errors, suspend the formula and/or turn power *off*. **Do not press TERMINATE if the suspended formula should be resumed once the error is corrected.** See "RUNNING A FORMULA IN AUTOMATIC . . .," "To Shorten, Terminate, or Suspend a Formula in Progress" for more information.

| | |
|---|---|
| **XX:XX FXXSXX XX:XX DOOR NOT CLOSED** | Appears when the door input is not made while the machine is running. Verify that the door is closed, then check door switch and its connection to the microprocessor. Press ① if necessary to resume operation. **Do not operate the machine while this message appears.** |
| **XX:XX FXXSXX XX:XX CHECK LEVEL SWITCH** | Appears when the level switch is faulty (e.g., level 2 made before level 1). Check the level switch and its input connection to the microprocessor. |
| **XX:XX FXXSXX XX:XX LEVELS STILL MADE** | Appears if a level is still made before or during an extract. |
| **XX:XX FXXSXX XX:XX TOO LONG TO FILL** | Appears when the fill time exceeds 10 minutes. Check water valves, strainers, supply lines, and water pressure. The machine will continue to fill until level is reached, whereupon the error will clear automatically, and operation will resume. |
| **XX:XX FXXSXX XX:XX TOO LONG TO STEAM** | Appears if the time allowed to steam up to desired temperature (as commanded in configure) has been exceeded. Check steam valves, strainer, steam main header, and steam pressure, etc. The machine will continue to steam until temperature is achieved, whereupon the error will clear automatically, and operation will resume. |
| **XX:XX FXXSXX XX:XX TOO LONG TO COOL** | Appears if the time allowed for Cooldown (as commanded in configure) has been exceeded. Check cooldown valve and/or strainer (if any), cold water pressure, and position of vernier valve on cooldown inlet. |
| **XX:XX FXXSXX XX:XX TOO LONG TO DRAIN** | Appears when the machine did not drain properly in the *allotted* drain time. The machine continues to drain until the water level is low enough to begin next operation. |
| **XX:XX FXXSXX XX:XX CHECK PROBE** | Appears when the resistance of temperature probe is outside a certain range. Disconnect temperature probe leads from the processor board, and check the resistance across the leads with an accurate digital ohmmeter as follows: resistances between the leads must be between 2K and 35K Ohms. Resistance between each lead and ground must be infinite. |
| **XX:XX FXXSXX XX:XX EXTERNAL FAULT** | Appears when the chemical injection is unsuccessful (usually out of chemicals). Add chemicals. The error will clear automatically, and operation will resume. |
| **XX:XX FXXSXX XX:XX THREE WIRE DISABLED** | (QxJ models only)—The three wire relay became de-energized. This relay provides control circuit power to the machine. Once energized by momentarily depressing ①, it is held energized by its own normally open contact along with motor overloads, door interlocks, etc. Should any of these contacts open, even momentarily, the machine stops and displays *Three Wire Disabled.* This message can only be cleared by pushing ①, and then only if the fault is cleared. |

**XX:XX FXXSXX XX:XX INVERTER FAULT**

(FxJ and VxJ models only)—Appears if the processor does not see the inverter input after formula has run 14 seconds. After these 14 seconds, the timer stops, the basket is stationary, and the drain opens. To recover, press NEXT to instruct the machine to recover from this error. If the machine does not go into recovery sequence, see the installation and service manual.

**VIBRATION SW TRIPPED RECOVERY SEQUENCE**

(SxJ and 42032 F8J models only) When the vibration switch makes, the timer stops. After 80 seconds (120 seconds for 42032 F8J machine), the machine fills with water while the cylinder is reversing. When low level is made, the cylinder reverses for one minute then goes into extract.

Section 5

# Supplemental Information

# THE E-P PLUS® HARDWARE

## General

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

## The Microprocessor Components

**1. Keyswitches**—The *Run/Program keyswitch* and the *Automatic/Test keyswitch* allow access to the *program* and *test modes*. The *Run/Program key* may be removed only in *run*, and the *Automatic/Test key* may be removed only in *automatic*. **Never leave the keys accessible to unauthorized personnel.**

**2. Display**—The display on QxJ, MxJ, VxJ, and SxJ is liquid crystal (LCD) and contains two lines of 20 characters each. The display on FxJ machines is vaccuum flourescent (VFD) and contains two lines of 20 characters each. B

**3. Power Supply**—The power supply converts control circuit AC voltage to +12VDC, -12VDC, and +5VDC for the CPU board. The power supply is auto switchable between 120VAC and 240VAC input voltage.

Although the +12VDC and -12VDC are not adjustable, **the +5VDC is rather sensitive and the power supply must be adjusted most accurately so the actual voltage *at the power supply , and at the CPU board* is between 5.04 VDC and 5.06VDC as measured by an accurate digital voltmeter; otherwise the machine will likely malfunction.**

**4. CPU Processor Board**—The central processing unit (CPU) processes data received from the various inputs, stores information, and responds to each pushbutton entry with the appropriate action. Data is stored in three microprocessor chips, which reside on the CPU board.

**EPROM**—contains fixed instructions programmed by Milnor® (software) that determine how the machine functions. Also contains the standard formulas for all industries.

**EEPROM**—stores all protected memory (30 formulas and configure data) for the machine. This chip does not require battery backup.

**SRAM**—stores the accumulator (formula count) data so long as the machine has power, or via a capacitor for approximately 48 hours with power *off*. Also stores last formula and step in progress when power is turned *off* at machine.

**5. Output Board**—The 16 output relays are socket-mounted SPDT electromechanical relays with contacts capable of faithfully conducting a *maximum* of 25VA (0.1 ampere (100 milliamperes) at 220/240VAC, or 0.2 amperes (200 milliamperes) at a maximum of 110/120VAC). The output will be either 220/240VAC 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.**

**6. A/D Board (Analog to Digital Convertor)**—This board converts analog voltage signals, such as temperature, to a digital signal that can be utilized by the CPU. Up to a maximum of two A/D channels may be B provided on a single board.

**7. Temperature Probe**—A thermistor temperature probe is supplied on machines with optional temperature control. The thermistor is a temperature–sensitive resistor whose resistance changes with respect to temperature.

**8. Option Output Board**—The six output relays are socket-mounted SPDT electromechanical relays with contacts capable of faithfully conducting a *maximum* of 25VA (0.1 ampere (100 milliamperes) at 220/240VAC, or 0.2 amperes (200 milliamperes) at a maximum of 110/120VAC). The output will be either 220/240VAC or 110/120VAC depending on the machine model/type.

# HOW TO SET WATER LEVELS IN WASHER-EXTRACTORS WITH E-P PLUS® CONTROLS

These washer-extractors have the following adjustable water levels:

### Adjustable Water Levels

| Level | Use for |
|---|---|
| Level 1 (low) | Wash, distribution, wetdown |
| Level 2 (high) | Wash, distribution, wetdown |
| Level 3 (optional) | Cooldown |

It is recommended that the levels not be altered. If absolutely necessary, however, Levels 1 and 2 may be reliably adjusted up or down about two inches, as explained herein. The Level 3 switch is supplied with optional Cooldown and is normally set three inches above Level 2. On machines manufactured after April 1, 1990, an additional level switch (SPLLS) is provided to keep the door locked until the bath drops to a certain level. **This switch (SPLLS) must remain at the factory setting.**

## Factory Settings

Factory settings shown below specify the depth of the bath *inside an empty, stationary cylinder.* The levels in open-pocket cylinders (which slope down to the rear) are *at the rear* (deepest part) of the cylinder. **The goods in a loaded, rotating cylinder both absorb water and occupy space. Thus, depending on load size, type of goods, etc., it is likely that either more or less water will be needed to achieve any level compared to filling an empty, stationary cylinder.**

### AVOID INADEQUATE WETTING OF THE GOODS

**Do not set Level 1 lower than the factory setting. Inadequate wetting of goods can result in poor wash quality and improper distribution during extract.**

### Factory Set Water Levels (Levels are in inches and (millimeters) and measured at rear of cylinder)

| Model | L1 | L2 | L3 (optional) |
|---|---|---|---|
| 30015 | 7 (178) | 9 (229) | 14 (356) |
| 30020 | 7 (178) | 9 (229) | 14 (356) |
| 36021 | 8 (203) | 13 (330) | 15 (381) |
| 36026 | 8 (203) | 13 (330) | 15 (381) |
| 42026 | 10(254) | 13 (330) | 15 (381) |

B

# How the Pressure Switch Works

Much as the pressure rises in an inverted glass as it is pressed into a container of water, as the water level in the washer shell rises, the pressure switch detects the increasing pressure of entrapped air inside a chamber that is connected to the shell. A plastic tube connects the air chamber with the pressure switch, which is located in the washer's electric box.

The function of any pressure switch(es) used in your machine may be identified by the item number as follows:

SPLL = Level 1
SPLH = Level 2
SPCD =Cooldown
SPLLS = OK to Open Door

The part numbers can be found in the components list on the machine's electrical schematic.

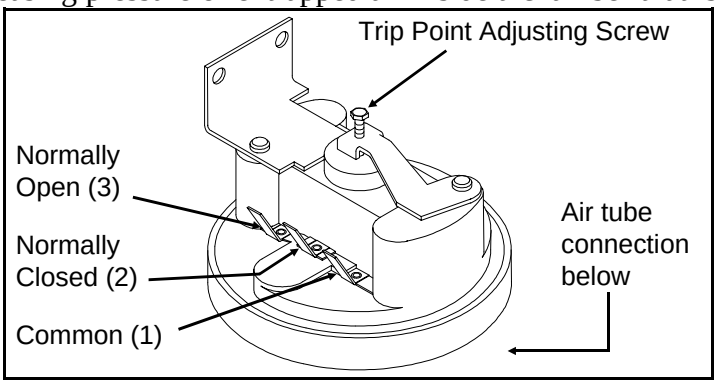



**FIGURE 1** (MSSM0240BE)
**Pressure Switch**

Each pressure switch has one trip point adjusting screw as shown in FIGURE 1. The switch manufacturer calibrates these switches to achieve the specified level. When the switch is installed, the washer is tested for proper water levels and when these are verified, the trip point adjusting screw on each pressure switch is painted with wax, to hold its adjustment.

## GUARD AGAINST OVERFLOWS–INSPECT AIR TUBES

**A crimp, cut, or loose connection in the plastic air tube will prevent the pressure switch from functioning. This will cause the machine to overflow.**

# Adjusting Water Levels

**It is normally not necessary to adjust water levels. However, if this is desired, always measure the level with the cylinder at rest and without goods. It is not possible to determine a water level by observing the level while the machine is rotating or with a load of goods in the cylinder.**

**1.** With the cylinder empty, measure from the bottom inside of the cylinder, and place clearly visible marks on the rear wall at each of the desired levels.

## ⚠ WARNING ⚠

**The adjusting screw may become electrically energized when power is *on.* Use only an insulated screwdriver to make adjustments.**

**2.** Fill the machine to each level, adjust the level setting if necessary, then drain and refill. Repeat this process until the desired level is achieved. If manual outputs 19 and 20 exist in your software, use these to fill to level 1 (low) and level 2 (high). If manual outputs 19 and 20 are not available, temporarily modify a formula to fill each level with the basket stationary. To move the level, turn the trip point adjusting screw *with an insulated screwdriver* about one-half turn each time. Turn clockwise to raise the level or counter-clockwise to lower the level.

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 SYSTEM 7 AND E-P PLUS WASHER-EXTRACTORS

Various methods are available on System 7 and E-P Plus washer-extractors to accommodate 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 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**

## ⚠ CAUTION ⚠

**RISK OF POOR OR INCONSISTENT WASH QUALITY—Short injections (less than 10 seconds) do not work for the following reasons: 1) Fine adjustments are not possible (e.g., a 1 second change to a 3 second injection is +\- one third). 2) Eratic response time (due to pump mechanical lag, draining of the delivery tubes, etc.) is more detrimental (e.g., a 1/2 second delay in a 3 second injection yields 17% less than expected, versus only 5% less for a 10 second injection).**

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

# Chemical Injection Methods Available

**Inject signals**—An inject signal is an electric potential that occurs in response to programmed chemical injections. Five discrete signals (chemicals 1 through 5) are always furnished. These signals are available at terminal strip TBS on System 7 and E-P Plus machines.

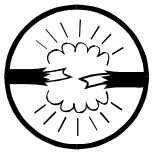
**Optional Flushing Type Automatic Supply Injector**—If a supply injector is furnished, the five electrically operated flush valves are wired to terminal strip TBS.

**Pumped Chemical Inlets (barbed connectors)**—A five-port inlet is standard 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.

# Connecting Apparatuses to Inject Signals

**Electrical Specifications**—Inject signals provide a 110VAC, 50 Hz or 120VAC, 60Hz potential. Each signal can accommodate one apparatus not exceeding 37 milliamperes. Inject signals cannot be made potential-free.

**⚠ CAUTION ⚠**



**COMPONENTS 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).**

**30" M-Style Models**—Acquire signals at terminal strip TBS in the incoming power box cover (see FIGURE 1). Pins 1 through 5 are for chemicals 1 through 5 respectively and pin 8 is common. The specified voltage is enabled between the appropriate pin and common whenever an injection is called for.

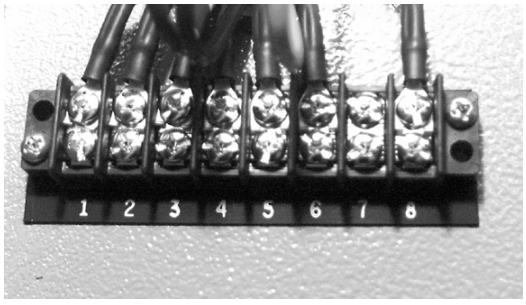



**FIGURE 1** (MSSM0270AE)
**30" M-Style Model TBS Strip**

**36" Q-Style Models**—Acquire signals at Molex connector WCS in the high voltage control box (see FIGURE 2). Pins 1 through 5 are for chemicals 1 through 5 respectively, pin 6 is for flush and pin 8 is common. The specified voltage is enabled between the appropriate pin and common whenever an injection is called for.

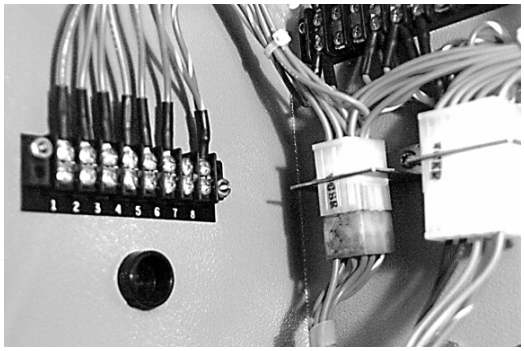



**FIGURE 3** (MSSM0270AE)
**36" Q-Style Model TBS Strip and WCS Molex Connection**

**30022F8J Models**—Acquire signals at terminal strip TBS in the high voltage control box (see FIGURE 3). Pins 1 through 5 are for chemicals 1 through 5 respectively. Pins 5 and 6 at terminal strip TBB represent flush and pin 6 is common. The specified voltage is enabled between the appropriate pin and common whenever an injection is called for.

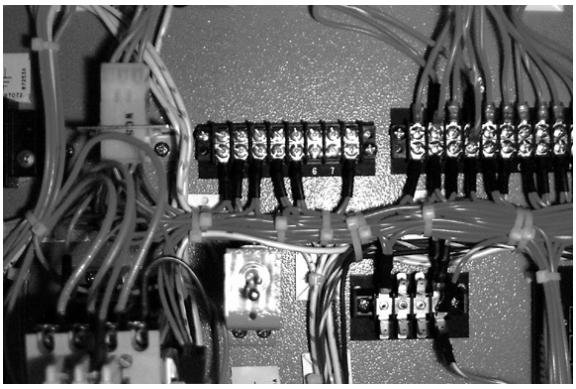


**FIGURE 2** (MSSM0270AE)
**30022F8J Model TBS Strip**

# Pumped Chemical Systems

These systems deliver chemicals to the machine intermittently usually via peristaltic pumps. Inlets on the machine much be unrestricted at all times (valveless). The five 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 CHEMICAL SYSTEMS TO SYSTEM 7 AND E-P PLUS WASHER-EXTRACTORS WITH EUROPEAN WIRING

Various methods are available on System 7 and E-P Plus washer-extractors to accommodate 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 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**

## ⚠ CAUTION ⚠

**RISK OF POOR OR INCONSISTENT WASH QUALITY—Short injections (less than 10 seconds) do not work for the following reasons: 1) Fine adjustments are not possible (e.g., a 1 second change to a 3 second injection is +\- one third). 2) Eratic response time (due to pump mechanical lag, draining of the delivery tubes, etc.) is more detrimental (e.g., a 1/2 second delay in a 3 second injection yields 17% less than expected, versus only 5% less for a 10 second injection).**

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

# Chemical Injection Methods Available

**Chemical Injection Output Signals**—Five discrete signals (for chemicals 1 through 5) are furnished standard on all washer extractors. These signals are available at terminal strip TBS on System 7 and E-P Plus machines.

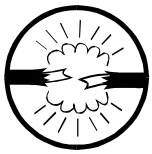
**Optional Five Compartment Flushing Chemical Injector**—A five-compartment dry supply injector mounted externally on the washer-extractors is offered optionally. The five electrically operated flush valves are wired to chemical injection output signals at terminal strip TBA.

**Liquid Chemical Tube Barbed Connectors**—A six-port inlet is standard on all models. Use these valveless inlets to connect tubes from remote chemical supply injection systems that are not continuously pressurized and that deliver chemicals only when an injection is commanded.

# 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 ⚠**



**COMPONENTS 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).**

**F8J Models—**Acquire signals at terminal strip TBA in the high voltage control box (see Figure 1). Chemicals 1 through 5 are represented by points 95, 85, 75, 91, and 93 respectively, point 97 is flush, and point 6 is common. The specified voltage is enabled between the appropriate point and common when an injection is called for.

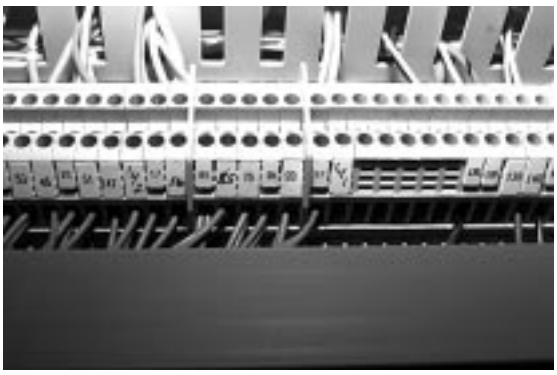


**FIGURE 1** (MSSM0270BE)
**Terminal Blocks on F8J Models**

**36" Q6J Models—**Acquire signals at Molex connector WCS in the high voltage control box (see Figure 2). Chemicals 1 through 5 are represented by points 40 through 44, point 38 is flush, and point 6 is common. The specified voltage is enabled between the appropriate point and common whenever an injection is called for.

**FIGURE 2** (MSSM0270BE)
**Terminal Blocks for Q6J Models**

# Pumped Chemical Systems

These systems deliver chemicals to the machine intermittently usually via peristaltic pumps. Inlets on the machine much be unrestricted at all times (valveless). The five 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.

# HOW TO SELECT AN E-P PLUS® INDUSTRY FORMULA SET

## General

The Milnor® factory configures each E-P Plus® washer-extractor controller for the industry specified by the purchaser. This consists of setting the DIP switches on the processor board and installing the appropriate industry nameplate. The DIP switch industry settings may be changed in the field, and new industry nameplates may be obtained from your dealer or the Milnor® Parts Department.

**DIP Switch Settings for the 9 Industry Formula Sets** are shown in the following table:

### DIP Switch Settings for the 9 Industry Formula Sets (must be set with the power *off*)

| Industry configuration | Switch Settings | | | | | |
|---|---|---|---|---|---|---|
| | S1 | S2 | S3 | S4 | S5 | S6 |
| CORRECTIONS | OFF | OFF | OFF | OFF | Depends on model* | OFF prevents/ ONpermits skipping steps.** |
| HOTEL/MOTEL | ON | OFF | OFF | OFF | | |
| ATHLETIC | OFF | ON | OFF | OFF | | |
| HEALTHCARE | ON | ON | OFF | OFF | | |
| RESTAURANTS | OFF | OFF | ON | OFF | | |
| COMMERCIAL | ON | OFF | ON | OFF | | |
| SHIRT LAUNDRY | OFF | ON | ON | OFF | | |
| OFFSHORE | ON | ON | ON | OFF | | |
| FIRE-FIGHTER | OFF | OFF | OFF | ON | | |

***** Set switch S5 to *on* in 36021/36026Q6J, and 42026QxJ models, otherwise these models will skip drain speed and try to enter extract from wash speed. This will overload or perhaps stall the extract motor and likely cause it to fail.
Set switch S5 to *off* in 36021/36026Q4J models, otherwise these models will skip E1 (extract speed) and try to enter E2 (high speed extract) from the distribution speed. This will overload or perhaps stall the extract motor and likely cause it to fail.
**NOTE**: Switch S5 setting has no effect on MxJ, SxJ, FxJ, and VxJ models.

****** Setting switch S6 *on* enables the operator to cancel any step in progress, including drain, except before an extract.

## DIP Switch Settings for Industry Formula Sets With Foreign Language Software

| Industry Configuration | Switch Settings | | | | | |
|---|---|---|---|---|---|---|
| | S1 | S2 | S3 | S4 | S5 | S6 |
| CORRECTIONS | OFF | OFF | OFF | OFF | Depends on model* | OFF prevents/ ON permits skipping steps. |
| HOTEL/MOTEL | ON | OFF | OFF | OFF | | |
| HEALTHCARE | OFF | ON | OFF | OFF | | |
| RESTAURANTS | ON | ON | OFF | OFF | | |
| COMMERCIAL | ON | ON | OFF | OFF | | |
| SHIRT LAUNDRY | ON | OFF | ON | OFF | | |

# How To Set DIP Switches

To change industries, turn the machine *off* and access the microprocessor board. On QxJ models, the board is in the control panel electric box. On MxJ models, it is just inside the top panel.

**⚠ DANGER ⚠**

**Do not open the door to any electric box without first turning the power *off*. These controls use 120VAC power or higher, which is extremely dangerous.**

The DIP switches on the microprocessor board are shown in FIGURE 1. The *on/off* positions are shown in FIGURE 2. Set the switches to the desired configuration according to the table on page 1. Turn the machine *on.* The display will show the current configuration chosen during power up.

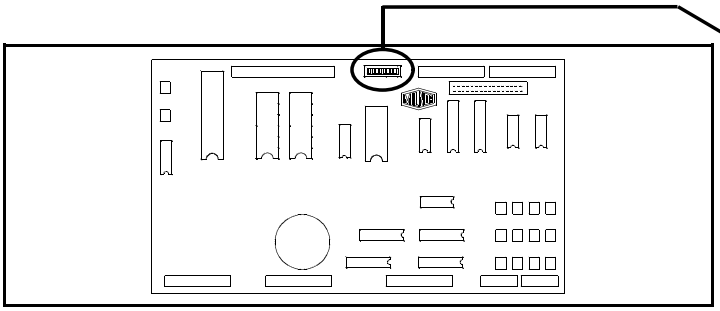


**FIGURE 1** (MSOP0244BE)
**DIP Switch Location on Processor Board**

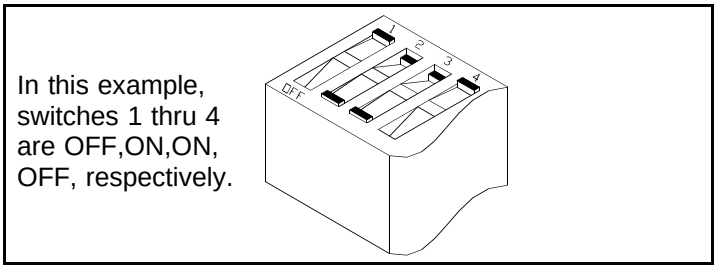



**FIGURE 2** (MSOP0244BE)
**DIP Switch on/off positions**

# HOW TO CHANGE EPROMS IN MICROPROCESSORS AND WHERE TO CHECK THE DC VOLTAGES

Occasionally, software enhancements become available. Depending upon the software change, the new software EPROMs (Erasable, Programmable, Read-Only Memory) may be offered for sale or for no charge to the customer. When a set of EPROMs is changed in the field, ensure that the software version being installed matches the machine hardware and that EPROMs are installed in the proper socket positions and orientation.

## How To Change EPROMs

**⚠ WARNING ⚠**

**SHOCK HAZARD—Electrical components on the machine conduct high voltage that will kill or seriously injure you on contact.**

☞ **Lock OFF and tag out electrical power at the main (wall) disconnect before beginning this procedure.**

1. Make sure all power to the machine is *off*.
2. Locate the EPROMs as described in "Location of EPROMs on Processor Board" in this section. Note the orientation of the EPROMs as shown in FIGURES 3, 5, 7, and 9.
3. Slip a small flat tool underneath the EPROM, and carefully remove each old EPROM from its base, taking note of their numerical order (see FIGURES 3 and 7) and orientation to the key notch on the socket.
4. Install new EPROMs, making sure the key notch on the EPROM is properly oriented and that all pins enter the proper holes in the socket (FIGURE 1). If necessary, slightly bend the pins on the EPROMs to align them in the socket. After inserting each EPROM, verify that all pins are seated in the socket.

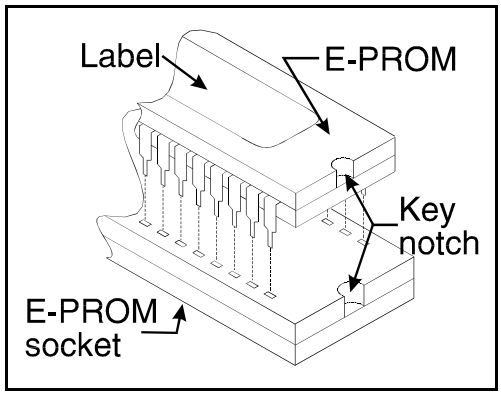
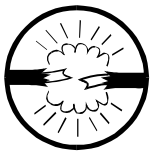



**FIGURE 1** (MSSM0217AE)
**Properly Seating the EPROM**

**⚠ CAUTION ⚠**



**COMPONENT DAMAGE HAZARD—Incorrectly installing any EPROM may cause EPROM burn out, machine failure, or display error.**

☞ **Match each EPROM with its corresponding socket. Each EPROM will *work* in only one socket, although it may physically *fit* in others.**

☞ **Align EPROM so every pin mates with the correct hole in the socket.**

**Verifying Proper EPROM Installation**—After installing new EPROMs, apply power to the machine and turn the machine *on*. If the EPROMs 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 check the orientation of the EPROMs.

B
C

# Location of EPROMs on Processor Board

Depending on machine model and type, the CPU chip can be an Intel 8085 or an Intel 8088. Each microprocessor board requires at least one EPROM for proper operation, but the EPROMs are located differently, depending upon the type of board. This information describes the location and arrangement of the EPROM chips on each type of board. It also describes where to check the voltages required by the processor board.

**8085 Processor Boards, *NOT Coin Machine*—**See FIGURE 3. Install EPROM #1 at the end of the row, then #2, #3, and #4. Chip #4 goes next to the two soldered chips on the board. See FIGURE 2 for where to check voltages.

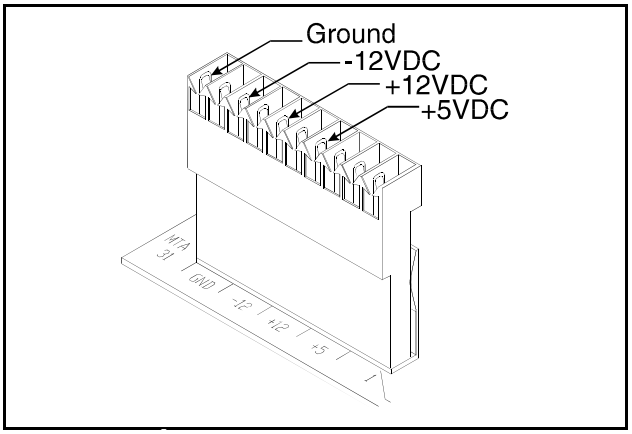



**FIGURE 2** (MSSM0217AE)
**MTA-31 on 8085 Processor Board**
(wires not shown for clarity)

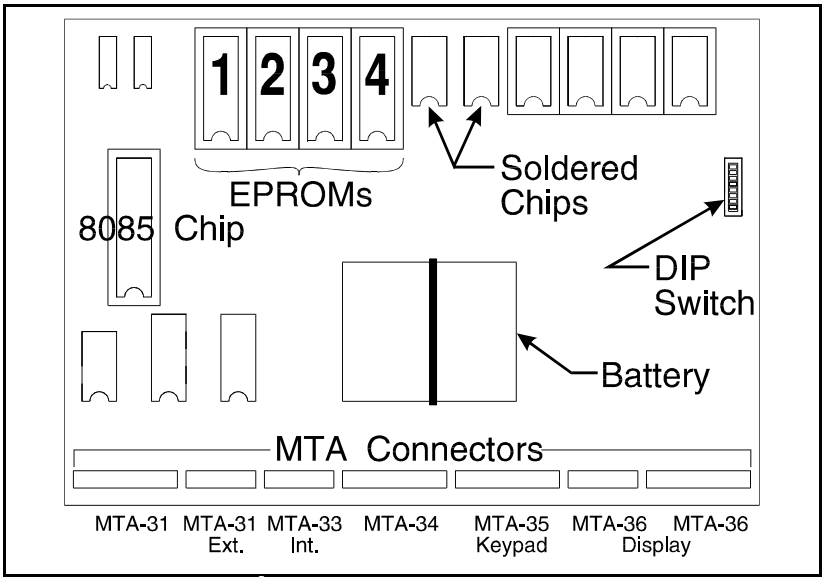



**FIGURE 3** (MSSM0217AE)
**8085 Processor Board (NOT Coin Machine)**

**8085 *Coin Machine* Processor Boards**—See FIGURE 5. Install the single EPROM in socket IC7 below connector W34. These boards have no battery.

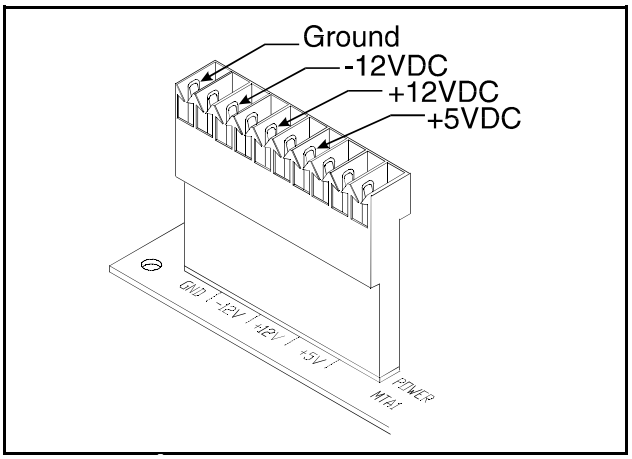



**FIGURE 4** (MSSM0217AE)
**MTA-1 in 8085 Coin Machine**
(wires not shown for clarity)

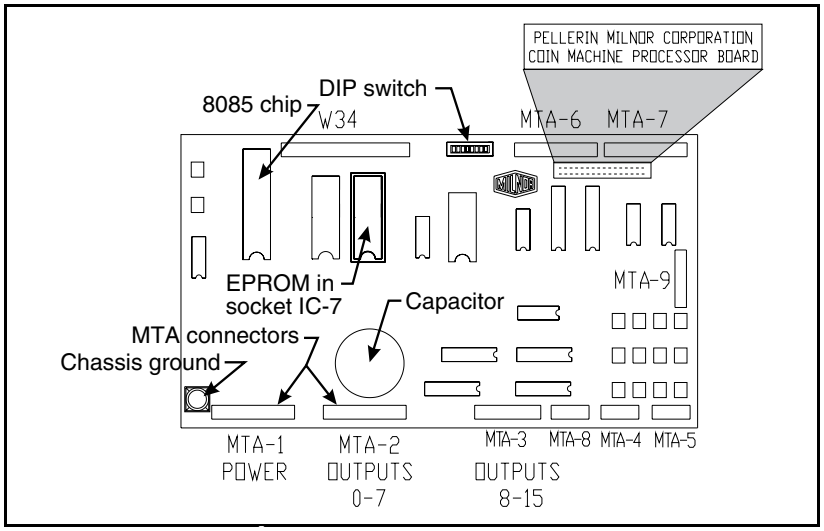



**FIGURE 5** (MSSM0217AE)
**8085 Coin Machine Processor Board**

B
C

**8088 Processor Boards *Without Memory Expansion Board***—See the table of EPROM locations (below) and FIGURE 7. If the set consists of only one EPROM, install it in socket A of FIGURE 7. If two EPROMs comprise the set, install EPROM #2 in socket A and EPROM #1 in socket B. **Always install 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.

**8088 Processor Boards *With Memory Expansion Board***—See the table of EPROM locations below and FIGURE 7. If the EPROM set consists of three or more EPROMs, install the two highest numbered EPROMs (e.g., EPROMs #3 and #4 of a four-chip set) *on the processor board*, with the highest numbered E-PROM (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.

| EPROM Locations on 8088 Processor Board and Memory Expansion Board | | | | |
|---|---|---|---|---|
| | E-PROM Location by Socket (see FIGURE 4) | | | |
| EPROMS in Set | A | B | IC-1 | IC-2 |
| 4-chip set | 4 | 3 | 2 | 1 |
| 3-chip set | 3 | 2 | 1 | — |
| 2-chip set | 2 | 1 | — | — |
| 1-chip set | 1 | — | — | — |

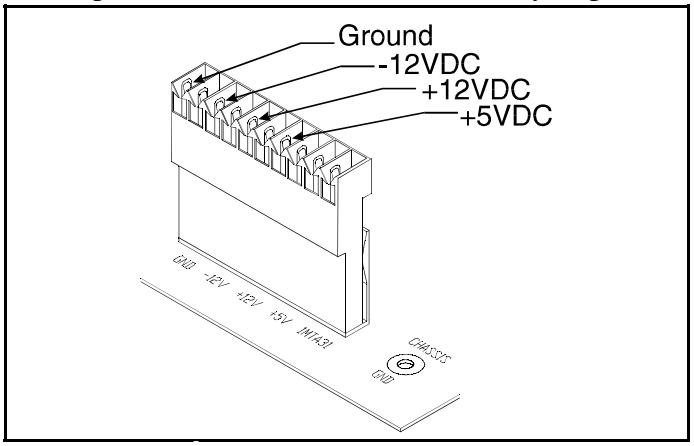



**FIGURE 6** (MSSM0217AE)
**1MTA-31 on 8088 Board** (wires not shown for clarity)

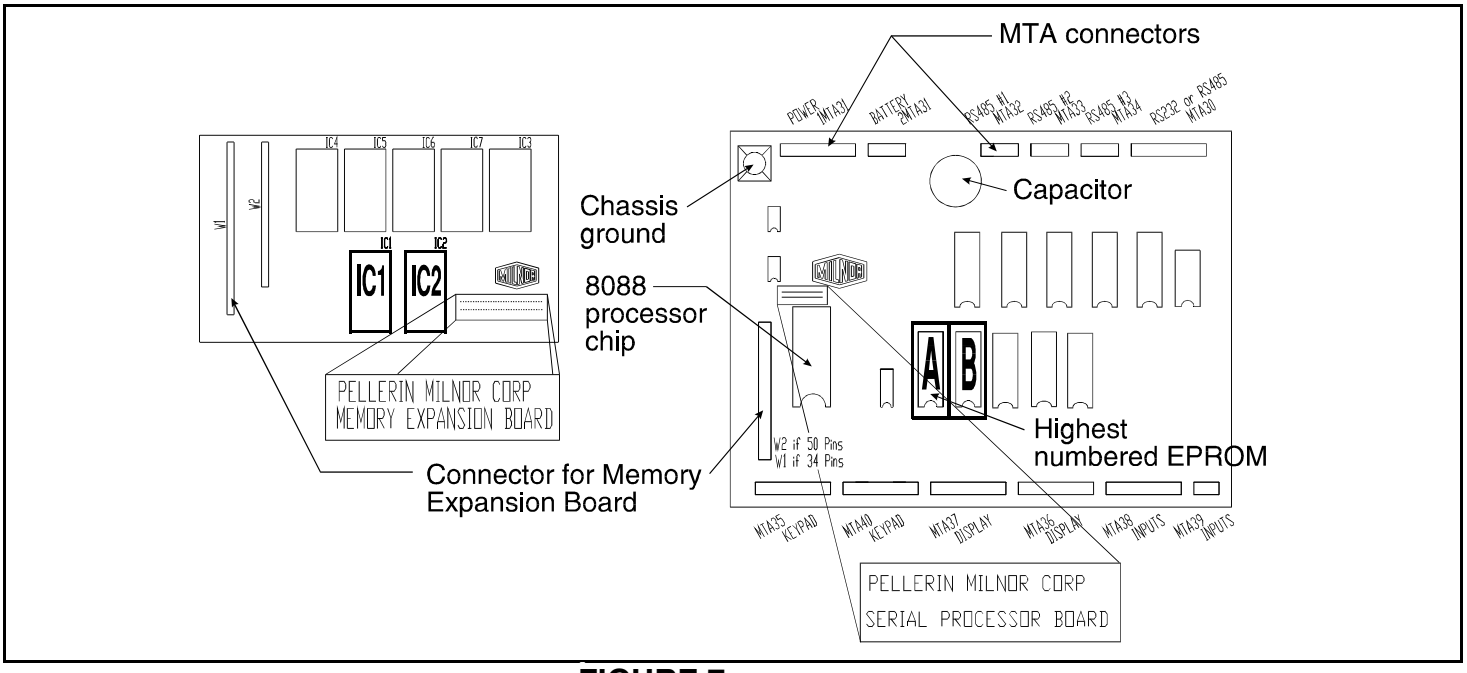



**FIGURE 7** (MSSM0217AE)
**8088 Processor Board and Optional Memory Expansion Board**

**80186 Processor Boards**—This processor board is used on all Milnor system controllers (Miltron, Mildata, etc.) equipped with a color monitor, and on textile processing machines with software versions 95000 and later. The single EPROM on this board is located in socket IC-2.

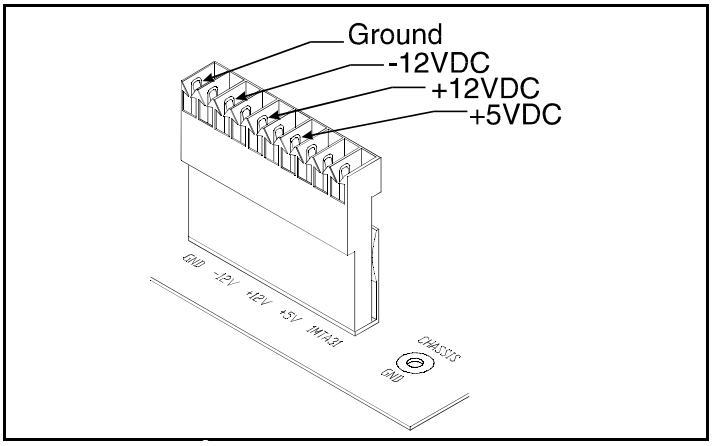



**FIGURE 8** (MSSM0217AE)
**1MTA-31 on 80186 Board** (wires not shown for clarity)

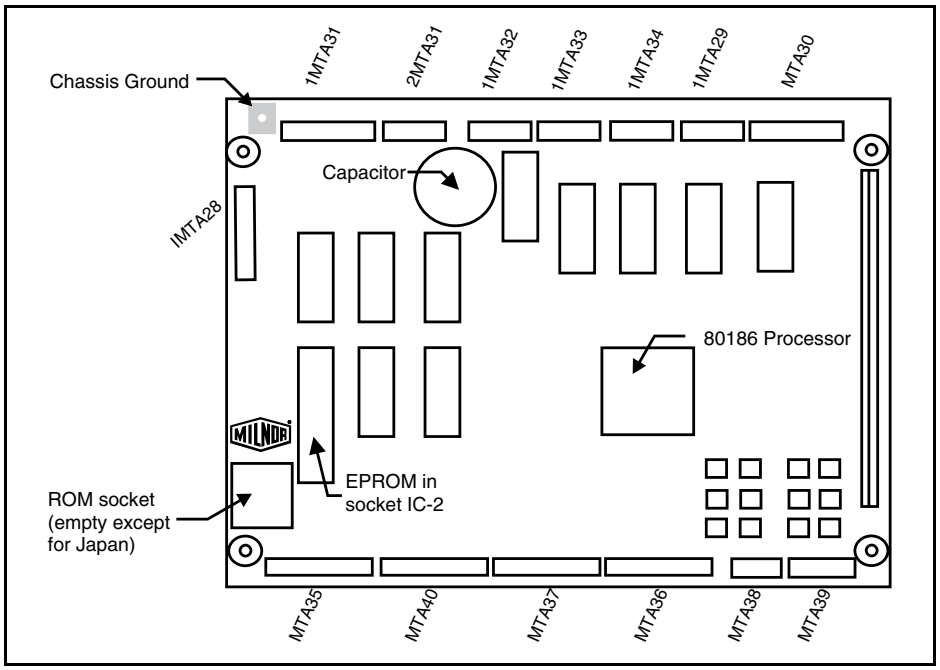



**FIGURE 9** (MSSM0217AE)
**80186 Processor Board**