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- **Language Code: ENG01, Purpose: publication, Format: 1colA**

Technical Reference—

Operating, Programming, and Troubleshooting the Mark VI WTB+ Controller

Read the **separate safety manual** before installing, operating, or servicing

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

Applicable Milnor® products by model number:

68036F5P

Preface

BICWFK01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

i. About the Mark VI WTB+ Washer-extractor Control Manual

i. 1. The Scope of this Manual

This manual provides commissioning, programming, operating, and troubleshooting instructions for Milnor® washer-extractors employing the Milnor® Mark VI WTB+ washer-extractor control. Refer to additional documentation provided with the machine for additional information. Replacement documentation is available from the Milnor® parts department.

i. 2. The Display at Start-up

The normal start-up display sequence for machines covered by this manual is described in Section 2.1.1.3 “The Normal Power-up Display Sequence”.

i. 3. How to Identify this Manual and its Included Documents [Document BIUUUD13]

This document uses Simplified Technical English.
Learn more at http://www.asd-ste100.org.

Use the specifications on the front cover of this manual to identify this manual or the included documents. This section tells about these specifications.

Published manual number—The primary identification number for the manual.

Specified date—The first assembly date for the machine or change about which this manual gives data.

As-of date—The company makes new manuals about items that are not new. These new manuals will include data started before this date.

Access date—The date Milnor prepared the manual for its publication.

Depth—“Detail” manuals show the maximum available data. “Synopsis” manuals show the minimum necessary data. A manual with more data goes with a synopsis manual.

Custom—A value of “n/a” here shows that this manual applies to all machines identified on the inner front cover of the manual. Other values show the laundry name and a code for the specified machine.

Applicability—Each value here shows the machines or model numbers that this manual applies to. The inner front cover shows the full list of the applicable models. If this value is “not used,” this manual has a different function.

Language Code—The value here shows the language and dialect of this manual. “Eng01” shows that the manual uses United States English.

Refer to a **document** in this manual with all of the specifications shown on the front cover. Replace the published manual number with the document number.

i. 4. Trademarks [Document BIUUUD14]

i. 4.1. Trademarks of Pellerin Milnor Corporation—These words are trademarks of Pellerin Milnor Corporation:

Table 1: Trademarks

CBW®	E-P OneTouch®	Gear Guardian®	Milnet®	RinSave™
E-P Express®	E-P Plus®	Mentor®	Milnor®	Staph-Guard®
	ExactXtract™	Mildata®	MultiTrac™	Visionex™

i. 4.2. Trademarks of Other Companies—These words are trademarks of other companies:

Table 2: Trademarks

Acronis®	IBM®	Microsoft Office XP®	Microsoft Access®	Siemens®
Atlas 2000®	Microsoft Windows 2000®	Microsoft Windows NT®	Microsoft Windows XP®	Seagate Crystal Reports®
		Yaskawa®		

— End of BICWFK01 —

BIUUUK06 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

ii. Contacting Milnor®

Your authorized Milnor dealer can assist you with any aspect of your Milnor machine and is familiar with local conditions that may be pertinent to its installation, use, or maintenance. Always contact your dealer first. Should you or your dealer need assistance from the Milnor factory, refer to Table 3 for contact information.

Table 3: Pellerin Milnor Corporation Contact Information

Purpose	Department	Telephone	FAX	E-mail/Website
Order, or enquire about replacement parts	Parts	504-467-2787	504-469-9777	parts@milnor.com
Obtain advice on installing, servicing, or using	Customer Service/ Technical Support	504-464-0163	504-469-9777	service@milnor.com www.milnor.com (Customer Service)
Learn about, request, or enroll in Milnor service seminars	Training	504-712-7725	504-469-9777	training@milnor.com
Determine warranty eligibility or claim status	Warranty Administration	504-712-7735	504-469-9777	service@milnor.com (Attention: Warranty)
Ask about, comment on, or report an error in equipment manuals	Technical Publications	504-712-7636	504-469-1849	techpub@milnor.com

Your first contact with any question should be your authorized Milnor dealer, but problems or special situations encountered in the field may require consultation with the Milnor factory. Written correspondence can be mailed to this address:

Pellerin Milnor Corporation
Post Office Box 400
Kenner, Louisiana 70063-0400

Telephone: 504-467-9591
http://www.milnor.com

— End of BIUUUK06 —

Table of Contents

Sections	Figures, Tables, and Supplements

Sections	Figures, Tables, and Supplements

Sections	Figures, Tables, and Supplements

Chapter 3. Programming

Chapter 1
Commissioning

BIWUUI02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

1.1. About the Forces Transmitted by Washer-extractors

During washing and extracting, all washer-extractors transmit both static and dynamic (cyclic) forces to the floor, foundation, or any other supporting structure. During washing, the impact of the goods as they drop imparts forces which are quite difficult to quantify. Size for size, both rigid and flexibly-mounted machines transmit approximately the same forces during washing. During extracting, rigid machines transmit forces up to 30 times greater than equivalent flexibly-mounted models. The actual magnitude of these forces vary according to several factors:

- machine size,
- final extraction speed,
- amount, condition, and type of goods being processed,
- the liquor level and chemical conditions in the bath preceding extraction, and
- other miscellaneous factors.

Estimates of the maximum force normally encountered are available for each model and size upon request. Floor or foundation sizes shown on any Milnor® document are only for on-grade situations based only on previous experience without implying any warranty, obligation, or responsibility on our part.

1.1.1. Foundation Considerations

1.1.2. How Strong and Rigid?

Many building codes in the U.S.A. specify that laundry floors must have a minimum live load capacity of 150 pounds per square foot (732 kilograms per square meter). However, even compliance with this or any other standard does not necessarily guarantee sufficient rigidity. In any event, it is the sole responsibility of the owner/user to assure that the floor and/or any other supporting structure exceeds not only all applicable building codes, but also that the floor and/or any other supporting structure for each washer-extractor or group of washer-extractors actually has sufficient strength and rigidity, plus a reasonable factor of safety for both, to support the weight of all the fully loaded machine(s) including the weight of the water and goods, and including the published 360-degree rotating sinusoidal RMS forces that are transmitted by the machine(s). Moreover, the floor, foundation, or other supporting structure must have sufficient rigidity (i.e., a natural or resonant frequency many times greater than the machine speed with a reasonable factor of safety); otherwise, the mentioned 360-degree rotating sinusoidal RMS forces can be multiplied and magnified many times. It is especially important to consider all potential vibration problems that might occur due to all possible combinations of forcing frequencies (rotating speeds) of the

machine(s) compared to the natural frequencies of the floor and/or any other supporting structure(s). A qualified soil and/or structural engineer must be engaged for this purpose.

The figure(s) above depict(s) both on-grade and above-grade installations as well as models installed directly on a floor slab or on a foundation poured integrally with the slab. Current machine data is available from Milnor® upon request. All data is subject to change without notice and may have changed since last printed. It is the sole responsibility of every potential owner to obtain written confirmation that any data furnished by Milnor® applies for the model(s) and serial number(s) of the specific machines.

— End of BIWUUI02 —

BICM3K02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

1.2. Important Owner/User Information—Machines with a Keypad

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

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

1.2.1. Ensure Safety of Laundry Personnel

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

1.2.2. Protect Against Data Loss

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

1. Keep the *Run/Program* keyswitch set to *run* ( ) and secure the keys. Users must understand proper use of this control. See Section 1.3.2.1 "Keyswitch".
2. Keep all electric box doors closed and locked. Secure the keys.
3. Leave machine power on for 48 hours before customizing data. This fully charges the microprocessor battery, which will then supply power to the RAM for 90 days even if machine power is off.
4. Replace the battery board every five years. A capacitor on the processor board can supply power to the RAM for several hours with the battery removed.
5. Keep electronic back-up data and/or a printed record of all field-programmed data (e.g., wash formulas, configure values, step names, chemical names) in case of data loss. See the instructions for downloading (Section 3.1.10 "6 = Memory Transfer") and printing (Section 3.1.12 "8 = Print Data") this data.
6. For machines that accumulate productivity data (e.g., count of loads or batches processed), transcribe any needed data frequently, as described in the instructions for data accumulation.

1.2.3. Customize Data

1.2.3.1. When to Customize Data

- When commissioning the machine

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

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

1.2.3.3. Data Accessibility—Configure and formula data are normally protected by the keyswitch and can be altered only when the keyswitch is in the *program* position. 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:

Table 4: Data Type and Accessibility

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

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

— End of BICM3K02 —

BICWFK02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

1.3. About the User Controls—Machines with a Keypad

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

Note 1: Do not attempt to use your machine merely by referring to the descriptions of controls. Read the operating, programming and troubleshooting instructions throughout this and the operator manual.

1.3.1. Electro-Mechanical Controls

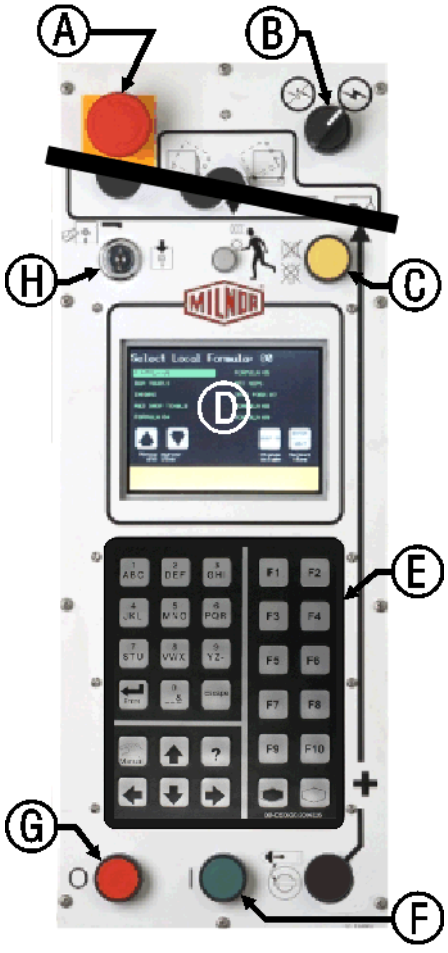
Electro-mechanical controls vary with machine model and are explained in this manual and other documentation furnished with the machine.

1.3.2. Microprocessor Interface Controls

These controls include the keyswitch, display and keypad located on the main nameplate, and the printer/download connection, located on its own nameplate. These controls permit the user to pass data to and from the microprocessor controller.

Figure 1: Microprocessor Interface Controls

1. Control Panel



2. Printer/Download Connection

Legend

1. Control Panel
A. *Emergency Stop* switch
B. *Master* switch
C. *Operator Signal* controls
D. Display
E. Keypad
F. *Start* switch
G. *Stop* switch
H. *Run/Program* switch
2. Printer/Download Connection

The keystrokes below are examples of the format used in this manual. When one or more keystrokes are required to perform an action, they will be shown and described like this.

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

1.3.2.1. 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 2: 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.

1.3.2.2. **Display**—This graphic device displays messages and data entry screens. Messages inform the user of the machine's operating status or alert the user to conditions that must be satisified before operation can continue.

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 usually indicates where the next character will be entered.

1.3.2.3. **Keypad**—The 30-key keypad is used for programming, making selections (e.g., selecting formulas in a washer-extractor), responding to display messages, certain normal operating procedures, and manual operation. Applicable procedures are explained in the remainder of this manual and depicted using symbols to indicate pressing keys on the keypad.

Note 2: Some keys on the 30-key keypad are not used on some machines.

1.3.2.4. **Printer/Download Connection (if so equipped)**—Connect a Milnor®-supplied printer here to print field-programmed data (e.g., formulas) and accumulated data (e.g., count of loads processed), if applicable. Connect a Milnor®-supplied serial downloader here or interconnect between machines to copy field-programmed data between devices. Printing and downloading, if applicable, are explained in Section 3.1.12 and Section 3.1.10, respectively.

— End of BICWFK02 —

BIUUUK05 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

1.4. Definitions of Terms and Abbreviations

AutoSpot—a control mechanism with which the operator can automatically align one cylinder pocket of a divided cylinder machine with the loading doors

bath—a general term for any step of a wash formula during which the goods are exposed to water with or without chemicals.

CPU (central processing unit)—integrated circuit component, usually an Intel 8088 and its ancillary devices, that interprets programming instructions and inputs to the microprocessor and provides outputs to other devices

CCW—counterclockwise cylinder rotation, as viewed from the load end; see also CW

central liquid supply system—chemicals are constantly supplied to the machine under pressure; valves on the machine open and close to regulate the flow of chemicals into the machine

checksum—one of several numbers generated by the control that represents the amount of data in a specific memory area; any change in a checksum indicates that data has changed

clean side—the side of a pass-through machine from which clean goods are unloaded after processing

code, customer—the code that identifies the one of 1,000 possible owners of a batch

code, destination—the code that identifies the one of 64 (with the Miltrac™ controller) or one of eight (if allied data pass) desired post-dry or no-dry destination of a batch

code, dry—code that identifies the one of 16 full-dry and 16 partial-dry cycles for a batch

code, formula—code that identifies the one of 16 basic wash formulas used to process a batch

code, goods—code that identifies the one of 256 goods classifications that describe a batch and invoke any variations to the basic formula used

configure—microprocessor programming for various software and hardware options on the machine

control—an electrical enclosure, usually housing a keypad, at which the user commands actions and programs the machine; also includes all electromechanical devices on the machine involved with its operation; also referred to as "controller"

cooldown—used to gradually cool goods to prevent the setting of wrinkles. In a washer equipped with the cooldown option (an additional level switch, a manual throttling valve, and an on/off cooldown water valve), this is a method of reducing the temperature of the goods through repeated partial draining and refilling with cold water. The cooldown rate is controlled by the manual throttling valve.

CPU—central processing unit; the main computer chip in a microprocessor control system that processes data, as well as the board on which the CPU chip is mounted

customer code—see **Code, customer**

CW—clockwise cylinder rotation direction as viewed from the front of the machine

cycle—operations undertaken in a specific order to process goods; a cycle normally ends with the device ready to accept another load

cylinder—the perforated basket inside the machine shell which contains the goods and is rotated by the motors

cylinder pocket—one of the two or three divisions of a divided cylinder washer-extractor into which goods are loaded for processing

daisy chain—method of linking two or more serial type microprocessor controls with one four-conductor shielded cable. All data passes via this cable, regardless of which machines are communicating.

default password—see **Password, default**

default value—value used by the microprocessor control if no other value has been set by the programmer

destination—area or zone of a laundry facility to which goods will be routed after drying, or before pressing if the destination is a "no-dry" station

destination code—see **Code, destination**

DIP switches—dual in-line package switches; a row of (usually six or eight) miniature switches in a single housing used to permanently select or configure certain options on microprocessor boards; on Milnor® microprocessor controls these switches are used most often to specify the communications address for each machine in a system

discretionary data field—any field in the microprocessor control system that can be updated through the keyboard or keypad; also, a machine configuration field, such as temperature units, that is not limited by hardware or equipment in the machine

display—the component by which the machine provides data to the operator; the component may be one of several types, including vacuum fluorescent or liquid crystal (two lines of 20 alpha-numeric characters), color graphic liquid crystal (320 pixels by 240 pixels), or CRT monitor of various resolutions.

door, manual—machine door which is opened and closed by hand, without power assistance

door, power operated—machine door which is normally operated through electro-mechanical controls rather than manually; usually, the machine must be energized for the door to operate

download—process of transferring data, usually configuration and programming instructions, from a machine to another machine or to a memory storage device

drain speed—one of several ways to end a wash formula; goods are kept in motion at a speed approximating the force of gravity (1g) until the operator is ready to discharge them

dry code—see **Code, dry**

EPROM—erasable programmable read-only memory; the portion of some Milnor® microprocessor control systems used to store the fixed instructions (software) that determine how the machine functions

extraction—the removal of excess water from goods discharged from the tunnel washer

formula—instructions used by the machine control to operate motors, valves, and other components during a standard cycle

formula code—see **Code, formula**

goods—articles processed or conveyed by a machine

hardware—electronic boards that control the machine

hold code—function of a programmable output which answers the question, "If a hold condition is encountered while this function is actuated, should the function continue to operate even if its commanded parameters have not been achieved?"

inching—a control mechanism with which an operator can manually align one pocket of a divided cylinder machine with the loading doors

input, direct—signals that enter the processor board directly; direct inputs are provided by switches on the machine, including limit switches, the *Signal Cancel* button, and the *Run/Program* keyswitch

input, standard—signals to the microprocessor controller that certain standard conditions exist; these inputs enter the processor board through the standard input/output board(s); include *Bag Ready*, *Load Conveyor Ready*, and remote customer and goods codes, etc.

jogging—intermittent rotation of the cylinder on certain Milnor® machines can be used to dislodge goods from the cylinder wall after extraction, or to assist in discharging goods from the tilted cylinder, etc.

level switch—device that signals the controller when the bath liquor has reached a preset level

liquor—bath solution, usually consisting of water and chemicals at a specified temperature, for processing goods

load—the amount of goods, measured by weight or pieces, that a machine normally handles during a cycle

loading device—in a system, this is the device which loads another device; example: a shuttle may be the loading device for a dryer

loading direction—the direction the goods are loaded into or onto a device

MMQ—minutes, minutes, and quarter minutes (e.g., 043 = 4 minutes and 45 seconds); see also **SS** and **SSS**

model—designation of machine without regard to options; for most devices, the model includes some dimensional representation of the effective machine size

motor contactor box—enclosure containing the high voltage motor contactors

password—three-character code entered to access or change values in certain display pages, used to prevent unauthorized programming. The instructions for changing the password are contained in a separate document sent only to the owner of the machine. See also **Minipass**

password, default—password when shipped from the Milnor® factory that automatically replaces any field-programmed password after a failed Program Memory check, or if a new password has not been entered since the processor board memory was cleared or a new processor board was installed

permanent press—a fabric or finish which is heat-set after the article is manufactured to minimize wrinkling and to retain creases

program mode—mode which allows programming of wash formulas, dry cycles, and other discretionary data; see also **Run mode**

pumped chemical supply system—chemicals flow into the machine when the machine control or operator commands the pump to operate

reversing—one of several ways to end a wash formula; goods are kept in motion at wash speed by the rotating cylinder until the operator is ready to discharge them

run mode—mode of operation that allows devices to run automatically; see also **Program mode**

software—fixed information contained in EPROMs (programming by Milnor®) or on disk files that determines how a machine or computer operates

soil side—the side of a pass-through machine into which soiled goods are loaded for processing

spray-down—a feature which allows the operator to facilitate loading the machine by spraying the goods with water as they are loaded

SS (SSS)—seconds, i.e., "SS" means two digits (usually 00-99 seconds), "SSS" means three digits (usually 000-255 seconds); see also **MMQ**

step timer—counts time for each individual step in a formula or dry code

supply injector—compartmented hopper into which chemicals are loaded before beginning a wash cycle; the chemicals are flushed from the hopper compartments into the machine automatically when commanded by the control

thermistor—temperature sensing device that varies its resistance to an electrical current with regard to temperature; used frequently in CBW® washers, washer-extractors, and textile machines

three-wire circuit—circuit that provides control power for all machine functions; any of several safety devices in the three-wire circuit will open the circuit and stop machine operation if a malfunction is detected; once open, the three wire circuit can only be closed by manual intervention and then only if the condition that opened the circuit is rectified

Thermo-water—method of controlling incoming water temperature by modulating (alternately and oppositely opening and closing) the hot and cold water valves

toggle switch—one of several types of hand-operated switches with a single operating lever that can be moved to two or more positions (e.g., the *Master* switch)

trickle charge—process of slowly and continuously charging a microprocessor backup battery during machine operation to maintain a full charge

tumbling—goods are kept moving after the cycle is complete until the operator is ready to discharge them

washer-extractor—machine that both washes and extracts (spins the goods) to remove a large percentage of the absorbed water

— End of BIUUUK05 —

BICWFO04 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

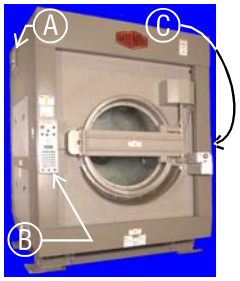
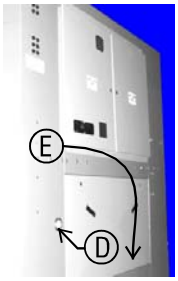
1.5. Controls on Mark VI WTB+ Washer-extractors

The Mark VI WTB+ control is designed to operate the washer-extractor in a fully automatic system while allowing operator to perform certain tasks from the machine control panel. Refer to this document (Section 1.5.2 through Section 1.5.5) for the location and basic function of individual controls. Do not use this document as instructions for operating the machine.

1.5.1. Where are the Controls?

Controls for manual operation are located on the front control panel (Figure 2). Additional controls and connections are located elsewhere on the machine, as described here.

Figure 2: Locations of Controls

Front Left View	Rear View	Legend
		**A.** Microprocessor control box (68036F_B shown) **B.** Control panel **C.** Manual supply flush button **D.** Hydraulic pressure gauge for loading door **E.** Air pressure gauge for tilt system (behind lower rear panel)

1.5.2. Where do I Connect the Data Storage Device?

The microprocessor box in the upper rear corner of the machine left side panel (see Figure 2) contains a DIN-type connection for serial communications. Use this connection, labelled as shown in Figure 3, with a serial data transfer device to save or restore machine programming and configuration memory.

Figure 3: Serial Connection for Data Transfer

1.5.3. What are the Operating Controls?

The primary operating controls are required to start and stop the machine and perform other tasks outside the control of the automatic loading/discharge system.

Figure 4: Mark VI Control Panel

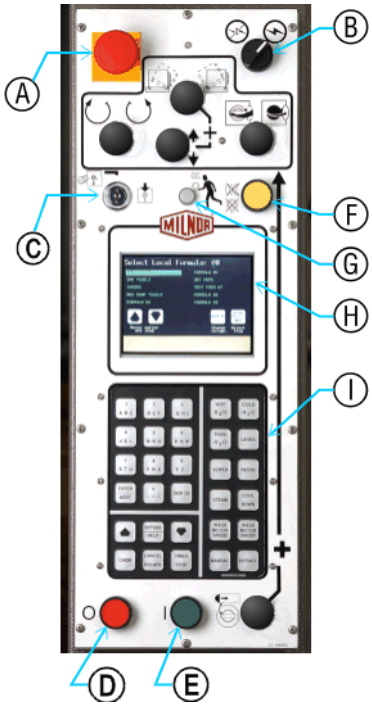
Panel and Controls	Legend
	**A.** *Emergency stop* button **B.** *Master switch* for power **C.** *Run/Program keyswitch* **D.** *Stop* button **E.** *Start* button **F.** *Operator signal cancel* button **G.** *Operator signal* light **H.** Liquid crystal graphic display **I.** Keypad

Figure 5: Keypad

Emergency stop button—disables the 3-wire circuit. This switch locks in when pressed, so you must turn it a quarter turn to allow it to return to the normal position to allow the machine to run.

Notice 3: Press the *emergency stop* button immediately in any emergency situation. This disables the 3-wire circuit, which stops all machine operation and causes the drain to open.

- When you reset this button, you have the option of cancelling or resuming the interrupted formula. The formula resumes where it was interrupted or at the beginning of the previous

bath step, depending on the operation in progress when the *emergency stop* button was pressed.

Master power switch (/)—removes power from the control system. If you turn the *master switch* off ( ) while a formula is running, the immediate result is similar to pressing the *emergency stop* button: the machine stops and the drain opens. Unlike the *emergency stop* button, resumed formulas start at the beginning of the step in which power was lost, but chemicals are not injected in the resumed step.

Operator signal cancel button ( )—cancels the *operator signal*. Press this button to silence the buzzer and turn off the *operator signal* light (see below), or to allow injection of a chemical programmed to require a signal before injection.

Operator signal light—indicates that the machine has encountered an error or that the operator must perform some action, such as pressing the *start* button or unloading the machine. The *operator signal* circuit includes a buzzer behind the control panel, and may include an optional beacon light mounted separately from the control panel.

Liquid crystal graphic display—displays information and help about the machine. The information on the display changes according to the status of the machine and the function selected by the operator.

Keypad—allows the operator to communicate with the machine control system. The keypad is divided into three areas: alphanumeric buttons, general buttons, and function-specific buttons. Each button may perform more than one function, based on the current machine status. Some buttons are also used in combinations for additional functions.

Start button ( )—starts the selected wash formula. The *start* button energizes the 3-wire circuit to allow the machine to operate.

Stop button ( )—stops machine operation. Like the *emergency stop* button, the *stop* button disables the 3-wire circuit; however, the *stop* button doesn't require you to manually reset it after use.

Run/Program keyswitch (/)—in the *Program* position, allows changes to machine configuration and wash formulas, among other actions. In the normal *Run* position, formulas and configuration are protected and formulas can be run.

1.5.4. Where are the Loading Controls?

Loading controls allow you to open and close the door, as well as tilt and jog the cylinder; used primarily when loading and unloading a tilting machine. Because Milnor WTB+ model washer-extractors are designed for fully automatic loading and discharge, conventional switches for tilting the machine and operating the door are not necessary. If it is necessary to load or unload the machine manually, all control functions are available through the keypad on the front of the machine. See Section 2.3. "WTB+ Manual Loading and Discharging" for details.

Milnor WTB+ models tilt pneumatically from pivot axes near the front and rear of the machine. These models tilt to load by inflating air bladders below the front of the machine, and tilt to unload by inflating air bladders below the rear of the machine.

The hydraulic circuit pressure gauge for the loading door is located on the rear panel of the machine. This gauge displays the pressure in the hydraulic circuit when the door is opening and closing. During normal operation, this gauge registers 0 unless the hydraulic door is opening or closing. When the door is moving, this gauge indicates about 900 psi (62 bar) if the hydraulic system is properly adjusted.

1.5.5. What Does This Switch Do?

Other buttons and switches are used to control additional standard and optional machine functions. These miscellaneous controls are located and described in this section.

Mildata/Local selector switch (Figure 6)—located on the microprocessor control box, allows the machine to communicate with a Mildata network. A Mildata network connects several machines together and allows them to share wash formulas and other data with the Mildata computer. When this switch is in the *Mildata* position (💻) and you enter a formula number, the machine requests the contents of the formula from the Mildata computer. When set to the *Local* position (📝), only formulas present **in the machine** are available.

Figure 6: Mildata/Local Selector switch

Manual supply flush button (Figure 7)—On machines equipped with an optional flushing supply injector, press this button to spray water into the supply injector to flush any remaining chemicals into the cylinder. If you manually add supplies during a wash formula, press this button to flush any remaining undiluted chemicals out of the supply chute. If the machine is not equipped with the optional supply injector, press this button to flush the liquid chemical inlets with fresh water.

Figure 7: Manual Supply Flush button

— End of BICWFO04 —

Chapter 2
Operating

BICWFO02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

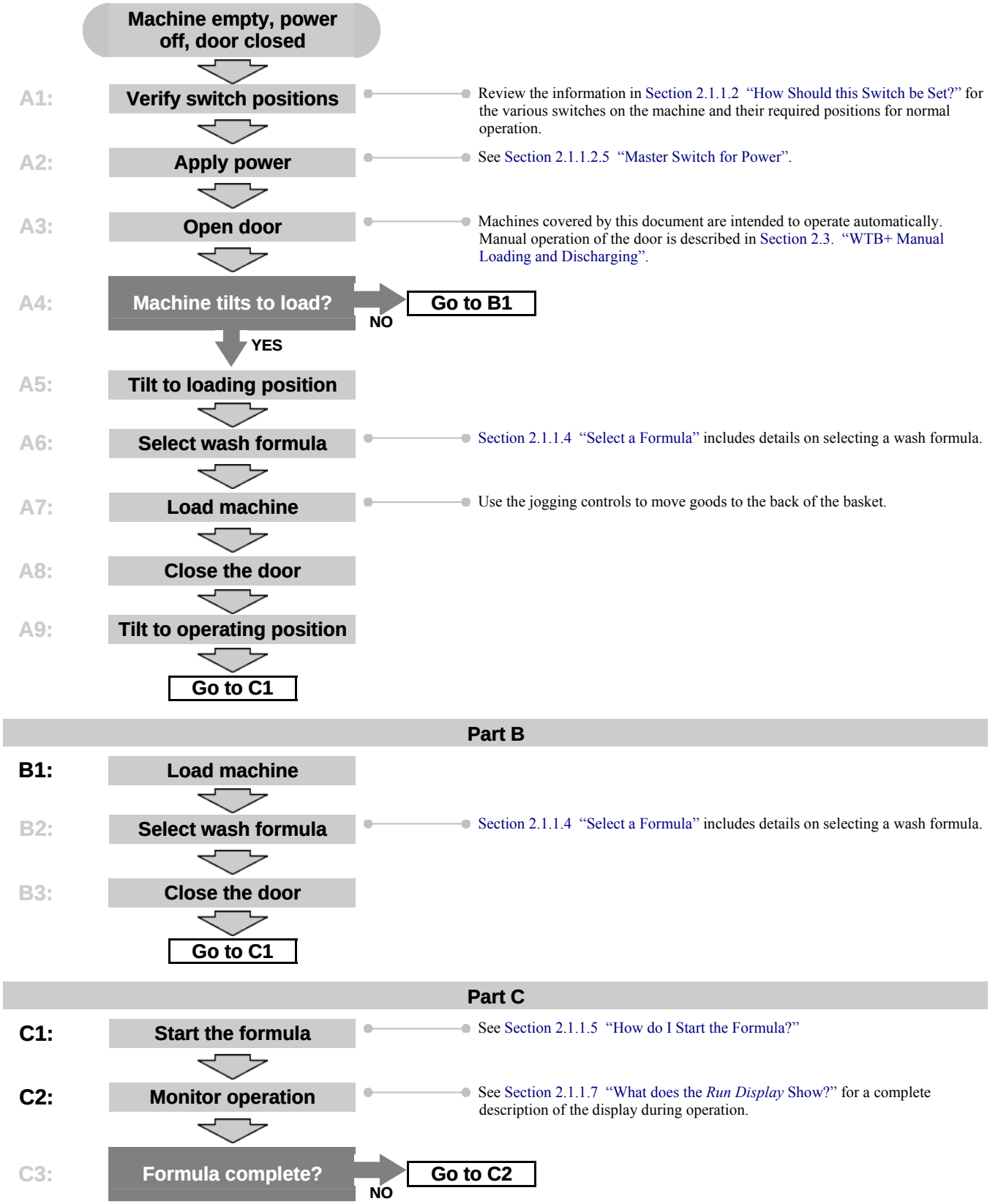
2.1. Normal Operation

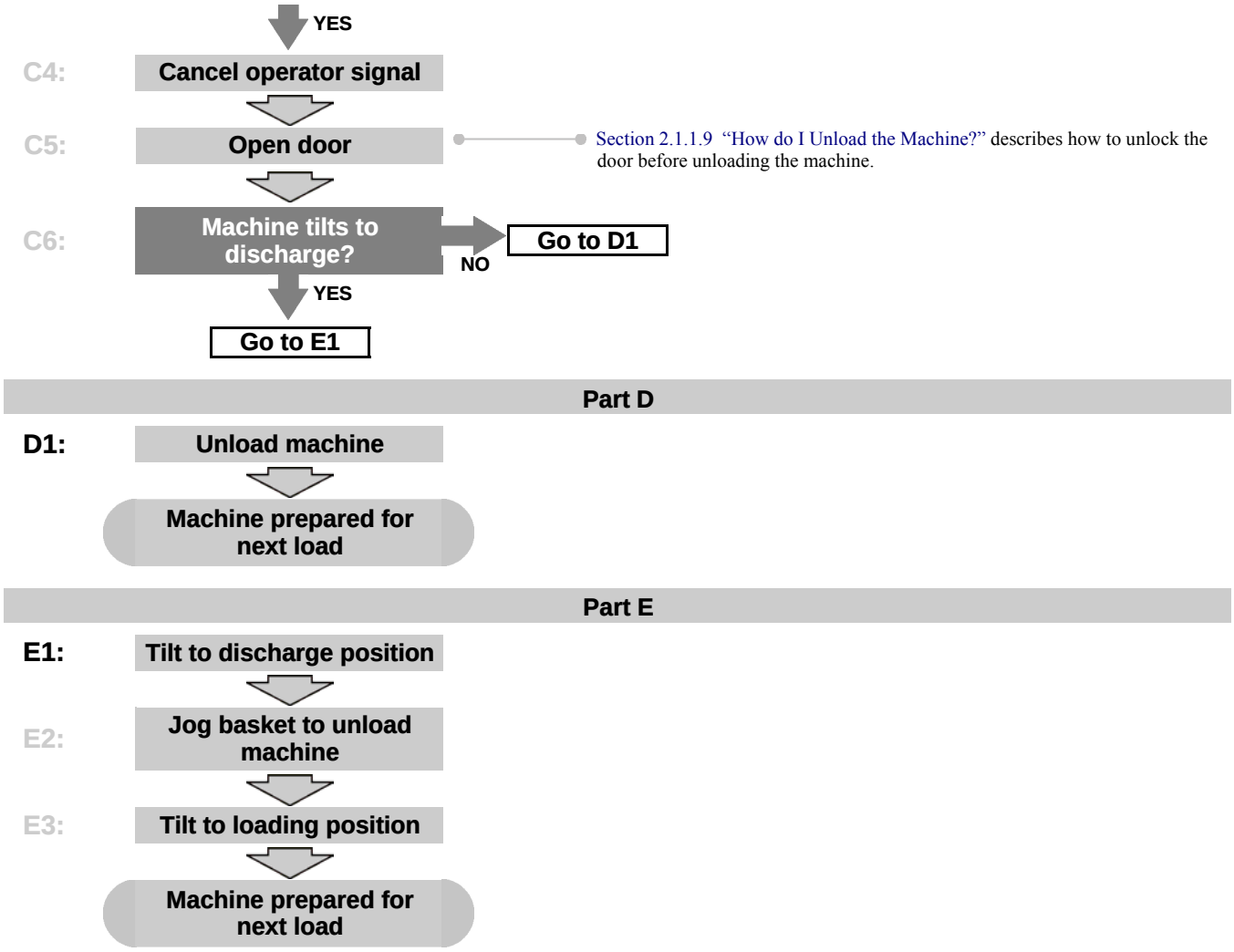
2.1.1. How Do I Use this Machine?

The Milnor® Mark VI control system helps you at every step of operating this washer-extractor. This document details how to perform each step of processing goods, and will point you to other documents in this manual for more information on other areas.

These are the simple steps to effectively using this machine, and the location in the manual where you'll find detailed instructions:

2.1.1.1. Simplified Washer-extractor Operation





2.1.1.2. **How Should this Switch be Set?**—Many features on this model washer-extractor are enabled with operator switches. You must set some of these switches in specific positions for the machine to operate, while others are used only when the machine is idle, as during loading and unloading. This section describes the required position for each standard and optional switch on the machine. Refer to Section 1.5.1 "Where are the Controls?" for switch locations on the machine. Switches not mentioned in this section do not influence normal machine operation.

2.1.1.2.1. Run/Program Keyswitch—Ensure that the *run/program* keyswitch is set to the *run* position ( ) before applying power to the machine. Formula and configure memory are protected only when the run/program keyswitch is in the *run* position. Applying power to the machine with this switch at the *program* position ( ) may scramble memory.

2.1.1.2.2. Emergency Stop Button—All emergency stop buttons must be in the *out* position (not depressed) for operation. Every machine has one or more *emergency stop* buttons to stop machine operation. These buttons disable the 3-wire circuit but not control power, allowing the machine controller to operate, but preventing motors and other components from receiving power. Release any depressed emergency stop button by turning it about a quarter turn clockwise and allowing it to pop out.

2.1.1.2.3. Alternate Drain Switch (Option)—Alternate drain is an option to facilitate overnight soak baths with the machine controller *off*. This option provides a second power source to the drain valve to prevent it from opening when the machine master switch is off. For normal automatic operation, set this switch to the *automatic* position ( ).

Supplement 1

Overnight Soaking without the Alternate Drain Option

Overnight soak can be accomplished even if the machine is not equipped with the alternate drain option. To accomplish an extended bath on a machine without the alternate drain option, simply program a bath step of the maximum time (63:45) with *do not drain* commanded. Copy this step as many times as necessary to achieve the desired bath time.

2.1.1.2.4. Mildata Remote/Local Switch—Set the switch to the *local* position ( ) if the machine is not connected to a Mildata network, or if you wish to remove the machine from the network temporarily. If this machine is part of a Mildata network, set this switch to the *Mildata* position ( ). If this machine is part of a Mildata network, you must also configure the machine for Mildata and enter a valid network address.

2.1.1.2.5. Master Switch for Power—The *master* switch must be set to the *on* position ( ) for the control system to operate any part of the machine. If the normal power-up display sequence shown in Section 2.1.1.3 doesn't appear when the *master* switch is turned *on*, immediately turn the machine *off* and begin troubleshooting.

2.1.1.3. The Normal Power-up Display Sequence [Document BICWFF01]—Each time you turn on power to your Milnor® Mark VI WTB+ machine, certain screens appear as the microprocessor checks the machine and prepares for operation. This sequence provides useful troubleshooting information which can be helpful if you need to contact your dealer or Milnor® customer service for assistance.

1. The *display firmware version* screen (Figure 8) appears immediately when the LCD panel receives power. This screen is quickly replaced by the *title screen* with the Milnor® logo if the display and the processor board in the machine are communicating.

   The *display firmware version* screen contains information relating specifically to the LCD panel. The version number, creation date, and copyright date are stored in the display and do not represent the firmware instructions used by the microprocessor to control the machine.

Figure 8: *Display Firmware Version* screen

Typical Display	Legend
	**A.** Display firmware version number **B.** Compile date of **display** firmware

2. The *title screen*, shown in Figure 9, displays the version numbers of both the machine controller firmware and the display firmware near the upper right corner. In the lower center of the screen, the logo screen displays the configure checksum and the formula checksum. The machine controller uses these values to verify that programmed formulas and the machine controller configuration haven't changed.

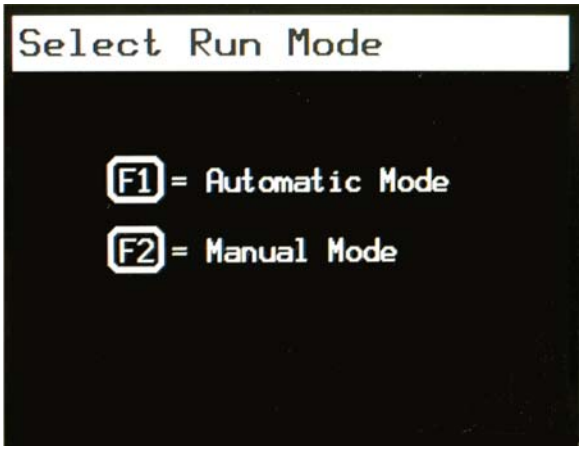
   If the title screen doesn't replace the display firmware version screen, you can assume that the LCD panel and the processor board are not communicating.

Figure 9: *Title* screen

Typical Display	Legend
	**A.** Machine controller version number (second line) and display firmware version number (bottom line) **B.** *Configure checksum* (C:xxxx) and *formula checksum* (F:xxxx)

3. When the Mark VI controller completes the power-up sequence, the display shows the *Select Run Mode* screen (Figure 10). This screen allows the operator to select whether the machine operates in *automatic* mode (rail loading and automatic discharge) or in *manual* mode, with loading and discharging operations controlled by the operator.

Figure 10: *Select Run Mode* Screen



4. If the operator chooses *manual* mode, the machine controller prompts for the appropriate formula number.

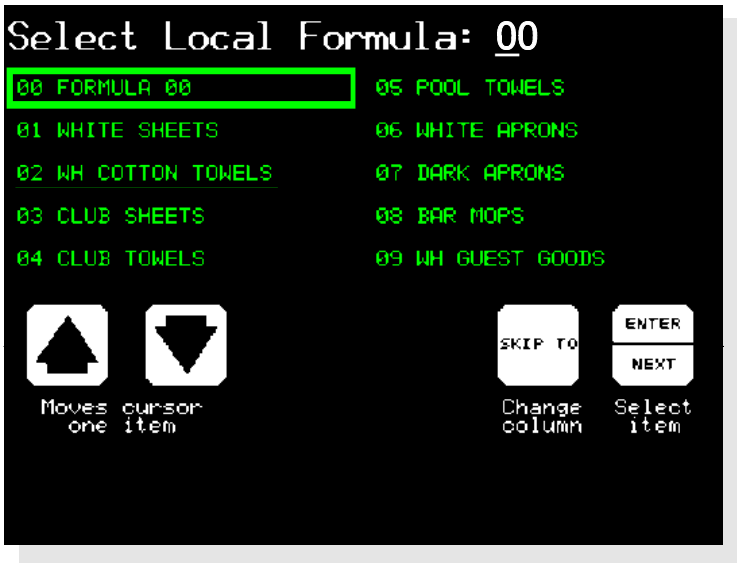
2.1.1.4. Select a Formula—One of two *Select Formula* screens appears when the machine is ready to operate. If this machine is a "stand-alone machine," meaning that it's not configured for or connected to a Mildata network, then you'll select the wash formula from a screen similar to Figure 11. All formulas stored in the memory of this machine are available. How to select a formula on a stand-alone machine is described in Section 2.1.1.4.1.

If this machine is properly connected to a Mildata network, configured with a Mildata address, and the Mildata computer is running, then you have access to all wash formulas stored on the Mildata computer that are valid for this machine.

2.1.1.4.1. Select a Local Formula—The Milnor Mark VI controller can hold up to 99 different wash formulas or a total of 500 formula steps in the machine. The formulas are shown on the *Select Local Formula* screen in groups of 10, starting with 00 or another formula number that you type on the keypad.

> **Note 3:** In most cases, formula numbers without names are empty formulas. If you try to select an empty formula, the control will briefly display a message that the formula does not exist. When the message goes away, the empty formula number will be the first of the 10 formulas shown.

Figure 11: *Select Local Formula* screen



Display or Action	Explanation
↑ / ↓	move the selection box cursor up or down in the current column of formulas
F9	toggle current column

1. If the desired formula is visible on the display, press ↓ or ↑ on the keypad to move the *selection box* to the formula. Press F9 to toggle between the left and right columns on the display.

   If the desired formula is not visible, enter two digits as the number of the first formula to appear on the display. The formula number you entered will be the first of 10 formulas displayed. For example, to see formulas 15 through 24, press 1 5. Formula 15 will be selected and waiting for confirmation, but any other visible formula number can be selected by scrolling or entering another two-digit number.
2. After you've selected the formula to run, press Enter to confirm the selected formula.

2.1.1.4.2. Select a Remote (Mildata) Formula—If the machine is part of a Mildata network and the network is available, you can choose any suitable wash formula stored on the Mildata computer.

> **Note 4:** You can store up to 1000 different wash formulas on the Mildata computer. All of these formulas are available to all washer-extractors that are part of the Mildata network and have compatible hardware.

Figure 12: *Select Remote Formula* Screen

Display or Action	Explanation
0 9 2 8	Select formula 928 (example) stored on the Mildata computer. The Mark VI controller requests the formula from the Mildata computer and displays the formula name, as shown in Figure 12.
Enter	Confirm that the displayed formula name is the formula you want to run. If the displayed formula isn't the right one for the loaded goods, press Escape to clear the formula number, then enter another number.

After you've retrieved and verified the formula, the Mark VI controller prompts for any configured *batch data*.

2.1.1.4.3. Enter Batch Codes for Mildata—The Mark VI controller uses a screen similar to Figure 13 to prompt you for the specific batch data fields selected when the machine was configured (see Section 3.1.9.1 "When is Configuring Required?"). The data you enter is sent to the Mildata computer for accounting and report generation. Refer to Section 3.1.9.1 for instructions on changing what batch data is collected.

Figure 13: Batch Data for Remote Formula

Weight—the weight of the batch of goods in the machine. This information is usually used along with other batch data to calculate customer charges or employee productivity. In machines equiped with optional flow meters and configured for **metered water**, the *weight* value is also used to determine how much water is required to process the batch. The *weight* value can be up to three digits.

Customer Code—the identifying code for the customer. This information can help you determine how much work each customer is submitting. Ten digits are available for *customer code*.

Employee Number—the identifying code for the employee responsible for this batch. The *employee number* may be up to five digits long.

Pieces—the number of pieces in the machine. This value sometimes replaces the *weight* value, especially when charges are made by the piece rather than by weight. Four digits are available for the number of *pieces*.

Lot Number—the identifying code for several related batches or customers. At your discretion, the value entered here might represent a particular route number common to several accounts. A *lot number* can be up to 10 digits long.

2.1.1.5. How do I Start the Formula?

Display or Action	Explanation
①	starts the selected formula

If all the requirements for operation have been achieved, the machine starts. The complete list of actions at the beginning of a formula may vary according to the type of machine or how the formula is programmed, but will usually be similar to this:

1. The drain closes. If you selected the formula early to enable pre-filling to the tilt level, the drain is already closed.
2. The basket begins turning and the water valves turn on to fill the machine to the level programmed for the first step.
3. Depending on how the formula is programmed, the steam valve may open to raise the bath temperature. Chemical injections programmed to occur *with fill* also start.

4. The step timer begins counting down when level and temperature are achieved. The formula may also be programmed to start the step timer when **level** alone is achieved, regardless of temperature.

Automatic operation begins when the operator presses ① and continues until one of three events happens:

- the formula runs to completion and ends normally,
- an error conditions occurs, or
- the operator terminates the formula manually.

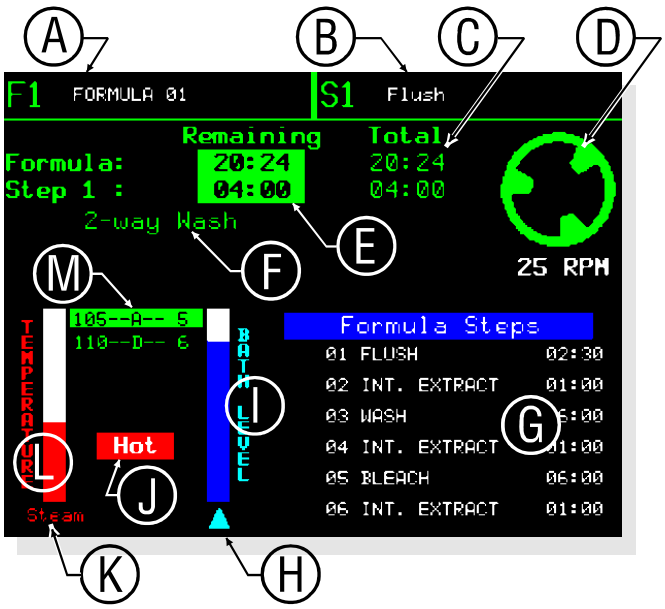
2.1.1.6. How do I Stop a Running Formula?

Display or Action	Explanation
⊗	Turn **off** the *master switch* to remove power from the control and stop operation. **The door remains locked.** The door requires control power to open. To open the door, turn **on** the master switch (⊘) and wait for any safety delay timer to expire.
Emergency Stop	Press any *emergency stop button* on the machine to immediately stop operation and open the drain. The door interlock delay prevents opening the door before the basket has had sufficient time to coast to a stop. The duration of this delay depends on the machine model and the action the machine was performing when you stopped operation. When you reset the *emergency stop button*, the machine remains idle until the door interlock delay time expires and the *start* button (①) is pressed. After the delay time expires, press ① to silence the operator signal and resume operation where the formula was interrupted. The timer resumes counting down when level is achieved.
⓪	Stops the machine and opens the drain. Like the emergency stop button, the door interlock delay must expire before you can open the door. Press ① to resume operation where the formula was interrupted.
☞	Ends the formula and unlocks the door after the door interlock delay time expires.

2.1.1.7. What does the *Run Display* Show?—While the machine is running the formula you selected, the display appears similar to the one shown in Figure 14. The information shown here is explained below.

Figure 14: Elements of the *Run Display*

Typical Display



Legend

- **A.** Formula number and name
- **B.** Step number and name
- **C.** Total time for formula and current step
- **D.** Basket rotation graphic and speed
- **E.** Remaining time for entire formula and current step
- **F.** Machine status message
- **G.** Formula steps: number, name, and duration
- **H.** Indicator for filling or draining
- **I.** Graphic bath level indicator
- **J.** Water valves indicators
- **K.** Indicator for optional steam and cooldown valves
- **L.** Graphic bath temperature indicator
- **M.** Bath temperature and level data

2.1.1.7.1. Formula and Step Information—The top line of the display always shows the number and name of the current formula and step. The *formula number* appears in the upper left corner of the display, following the letter "F."The *formula name* follows the number.

The *step number and name of the current step* are displayed to the right of the formula information. The Mark VI controller updates the formula number and name when a formula starts and at the beginning of each subsequent step.

Below the formula and step names is *time information*. The numbers in the "Total" column (green numbers) show the total time required for the formula and step to run to completion, not including the factors described in Note 5. The controller calculates the "Formula" value when the formula begins, and this value doesn't change while the formula is running. The controller calculates and displays the "Step x" value at the start of each step.

The numbers in the "Remaining" column of the time area (black numbers on a green background) indicate the *time remaining* in the formula and in the current step. These numbers indicate the **minimum** amount of time remaining (see Note 5).

> **Note 5:** The duration of some wash formula events can't be estimated, so the controller stops the timer until a requirement is met. For example, the time required for the machine to fill to the desired level depends on the water pressure to the plant, the size of the piping to the machine, and how many other machines are filling at the same time. In addition to the time required to fill, the time required to achieve temperature or for an operator to verify a chemical injection are variable. Error conditions can also stop the timer.

The controller displays the current *machine status* below the step number and remaining time. Some of the possible machine states are listed in Table 5. Error messages appear immediately below the machine status message when required.

Table 5: Machine Status Messages

Status Message	Description
1-way Wash	bath step with basket rotating clockwise only
2-way Wash	bath step with basket rotating clockwise and counter-clockwise
Soak	bath step with basket stationary
Pre+Final Extract	low extract speed, coast, wash speed in both directions, drain speed, high extract speed
Intermediate Extract	extract procedure usually used between two bath steps
Final Extract	extract procedure usually used as the last step
Double Extract	low extract speed, coast to stop, drain speed, high extract speed
Coasting	basket slowing to a lower speed
Waiting to Discharge	finished
Waiting for Load	WTB models only
Power-up Delay	safety delay before user controls are enabled
Draining to Sewer	bath liquor not retained for reuse
Draining to Reuse	bath liquor retained for reuse later
Timer Stopped	operator pressed Timer Stop key

2.1.1.7.2. Basket Rotation—The *basket rotation graphic* near the upper right corner of the display represents the relative basket speeds in wash, drain, and extract speeds. Immediately below the basket rotation graphic, the controller displays the desired basket speed in either revolutions per minute (RPMs) or in gravitational units (G's).

2.1.1.7.3. Bath Temperature and Level—*Water valve indicators* appear when the corresponding water valve is open.

The graphic *bath temperature indicator* shows the approximate temperature in the machine. The vertical indicator bar is solid red when the temperature in the machine is at the maximum allowable value of 205 degrees Fahrenheit (95 degrees Celsius).

The *steam* or *cooldown* indicator appears below the *graphic temperature indicator* when either of these optional features is enabled. “Steam” appears when the steam valve is open, and “Cooldown” appears when the cooldown output is enabled.

The *graphic bath level indicator* shows the percentage of the desired level that's achieved. The vertical indicator bar is solid blue when the programmed level is achieved, and solid white when there is no water in the machine.

The *level direction indicator arrow* points upward when the actual bath level in the machine is increasing (when the machine is filling), and points downward when the drain opens. The arrow is not visible when level is achieved, or during extract steps.

The controller displays *bath temperature and level data* between the temperature and level indicators. The top line displays the temperature and level that are currently achieved in the machine, and the bottom line displays the desired values.

2.1.1.7.4. Formula Steps and Chemical Injection—When a formula begins, the controller displays the

first six steps in the *formula steps list* in the lower left area of the screen. If the program contains more steps than can be displayed at one time, the list scrolls to display more steps as the earlier ones end. The current step is highlighted.

The list of programmed *chemical injections* replaces the formula steps list during each injection, with a highlight box on the chemical that's currently injecting. The counter to the left of the chemical name indicates the number of seconds remaining in the injection. If multiple chemicals are programmed for injection at the same time, all counters run simultaneously.

2.1.1.8. **How can I Change a Running Formula?**—While a formula is running, the operator can make certain changes to the formula in progress. These changes include operating water and steam valves, changing the basket speed, and draining the bath liquor. These modifications are accessible directly from the keypad.

2.1.1.9. **How do I Unload the Machine?**—When the formula ends, the operator signal sounds and the machine displays a message that it is *waiting to discharge*. Use one of the procedures outlined below to unload the goods.

Figure 15: Typical Message when Formula Ends

2.1.1.9.1. For any *End Code*—The Mark VI controller allows you to program one of four possible actions for the end of the formula: *stopped*, *reversing at wash speed*, *turning at drain speed*, or *tumbling*. You use the same unloading procedure for formulas using the first three actions. For the fourth action, you also have the option of using the procedure described in Section 2.1.1.4.

Display or Action	Explanation
	Remove power from the 3-wire circuit, silence the operator signal, and stop any basket motion in progress. This button also unlocks the door so you can open it.
Emergency stop	You can also remove power from the 3-wire circuit, silence the operator signal, and stop any basket motion that was in progress with any of these buttons. However, if you use any of these buttons, you'll still need to unlock the door with before you can open it. If you use any of these buttons to stop a formula with *end code 3* (see Section 2.1.1.4), the formula is terminated and cannot be resumed.
+	Open the door for unloading.

2.1.1.9.2. For *End Code 3* (Tumbling)—*End code 3* (Tumbling) allows you to open the door and remove some of the goods, then close the door and resume tumbling to loosen more goods from the basket.

Display or Action	Explanation
	When the basket stops turning, open the door and remove some or all of the goods from the machine.
	Remove any desired portion of the load.
+	Close the door.
①	Resumes the tumbling action without the operator signal. Tumbling continues for another two minutes, or until you press .

2.1.2. How do I Resume an Interrupted Formula?

2.1.2.1. If the Machine Didn't Lose Power—You can resume an interrupted formula where it stopped if the microprocessor controller did not lose power.

Display or Action	Explanation
①	resumes operation at the time where the formula was interrupted. The timer starts counting down after level is achieved.

2.1.2.2. If the Machine Lost Power—If power to the machine is lost, the microprocessor will lose some information gathered since the current step began. In this situation, the controller will prompt you to resume operation at the beginning of the step where power was lost, or to terminate the interrupted formula and return to the *Select Formula* screen.

Figure 16: Resume Formula Display

— End of BICWFO02 —

BIWUUO01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

2.2. 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 if these guidelines are followed:

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 actually be placed in the cylinder.

The maximum weight of soiled goods that a washer-extractor cylinder will accept depends on the following factors:

- the internal volume of the cylinder (the space into which the goods can be placed), and
- 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 and a reasonable soil content.

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.

— End of BIWUUO01 —

BICWFO03 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

2.3. WTB+ Manual Loading and Discharging

This document describes how to manually load your Milnor® washer-extractor with the Mark VI WTB+ controller, select and start a wash formula, then manually discharge the goods from the washer-extractor. Each action required to operate the machine with operator intervention is described.

1. Select *manual operation*: Section 2.3.1
2. Position the machine for loading: Section 2.3.2
3. Load the machine from a rail system: Section 2.3.3
4. Position the machine for washing: Section 2.3.4
5. Select and start a wash formula: Section 2.3.5
6. Position the machine to discharge: Section 2.3.6
7. Discharge from the machine to a shuttle device: Section 2.3.7
8. Exit *manual operation*: Section 2.3.8

2.3.1. Select Manual Operation

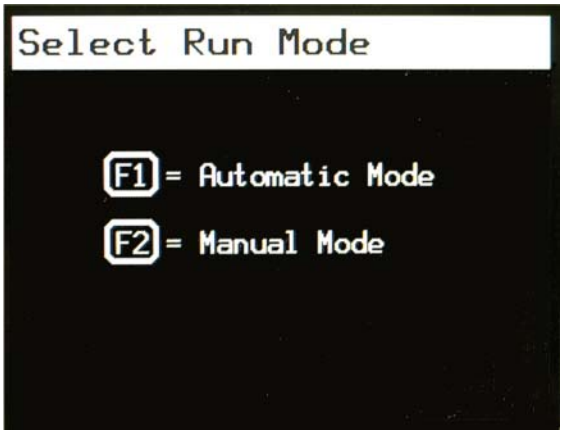
When the machine is first powered up, the *Select Run Mode* screen (Figure 17) appears. Section 2.3.1.1 describes how to select the *manual* mode immediately after you turn the machine *master switch* to power the machine. The manual mode can also be accessed any time the machine is idle (not running a formula) and the *Run/Program* keyswitch is in the *Run* position. Use the procedure described in Section 2.3.1.2 to access the manual mode if the *Select Run Mode* screen is not visible.

For normal operation, the machine *master switch* and the *run/program* keyswitch must be set as described here:

Display or Action	Explanation
/ =	machine *master switch* enabled to power the machine.
/ =	*run/program keyswitch* in the *run* position allows the machine to operate.

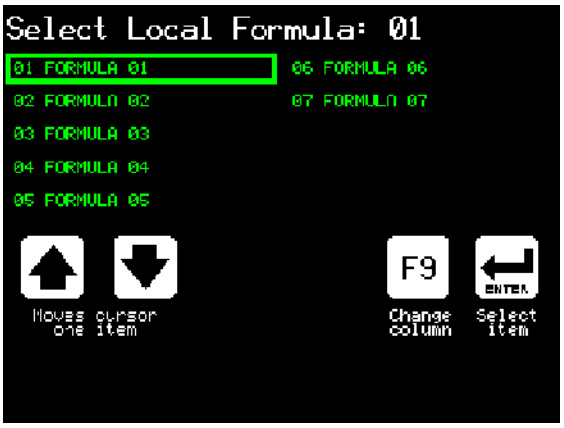
2.3.1.1. **At Power-up**—If the *run/program* keyswitch is in the *run* position when you turn the *master switch* to power the machine, the *Select Run Mode* screen (Figure 17) appears immediately after the blue Milnor® title screen.

Figure 17: *Select Run Mode* Screen



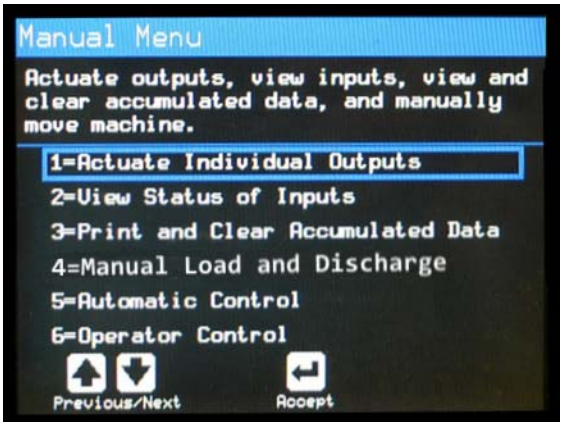
Display or Action	Explanation
F2	sets the machine in *manual* mode and displays the *Select Local Formula* screen (Figure 18). The *Select Remote Formula* screen appears here if the machine is part of a Mildata network.

Figure 18: *Select Local Formula* Screen



Display or Action	Explanation
	accesses the *Manual Menu* screen (see Figure 19).

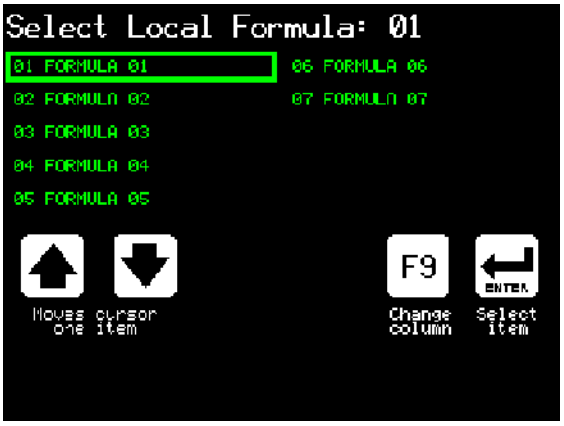
Figure 19: *Manual Menu* screen



Display or Action	Explanation
4 or ↓	selects *4=Manual Load and Discharge*.
Enter	accepts the selection and allows you to tilt the machine, operate the door, and position the elbow to receive goods from the rail system. See Section 2.3.2 for details on positioning the machine to receive goods.

2.3.1.2. After Power-up—When manual loading is required after initial power-up, use this procedure.

Figure 20: *Select Local Formula* Screen



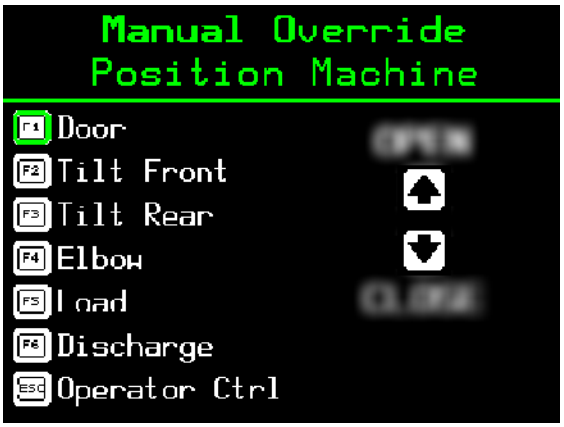
Display or Action	Explanation
Manual	accesses the *Manual Menu* screen, as shown in Figure 19.
4 or ↓	selects *4=Manual Load and Discharge*.
Enter	accepts the selection and allows you to tilt the machine and position the elbow to receive goods from the rail system. See Section 2.3.2 for details on positioning the machine to receive goods.

2.3.2. Position the Machine for Loading

CAUTION 4: Tilting machines only—The machine can crush your body or limbs if you are caught between the tilting housing and a stationary object. Some machines tilt automatically.—

Use the controls on the *Manual Override—Position Machine* screen (Figure 21) to prepare the machine for receiving a load from a bag on the overhead rail system.

Figure 21: *Manual Override—Position Machine* screen



Three conditions must be achieved before the machine can receive a load:

1. The machine door must be fully open.
2. The loading elbow must be down to direct the goods into the cylinder.
3. The front of the machine must be tilted up.

2.3.2.1. Open the Door

WARNING 5: Strike and Crush Hazards—Machines with power operated door—The moving door can strike you or crush or pinch your limbs if caught between the door and machine. Some doors move automatically.

- Understand the consequences of operating manually.
- Keep yourself and others clear of movement areas and paths.

Display or Action	Explanation
F1	enables the door controls to allow opening and closing the door
(hold)	opens the door. Hold this button until the door is fully open; the door will stop automatically when the *door full open* switch is made.

2.3.2.2. Lower the Elbow

Tip: The *door full open* input must be present before the elbow controls can be enabled.

Display or Action	Explanation
F4	enables the elbow controls to allow moving the elbow down to the loading position and up to the normal run position.
(hold)	lowers the elbow. Hold this button until the elbow is fully down; the elbow will stop automatically when the *elbow down locked* switch is made.

2.3.2.3. Tilt the Front of the Machine Up

Tip: The front tilt control can be enabled only if the rear of the machine is fully down. See Section 2.3.4.3 for how to lower the front and rear of the machine.

Display or Action	Explanation
F2	enables the front tilt controls to allow tilting the front of the machine up to the loading position and down to the normal run position.
(hold)	tilts the front of the machine up. Hold this button until the front of the machine is fully tilted; tilting will stop automatically when the *front full up* switch is made.

2.3.3. Load the Machine from a Rail System

Loading the machine from an overhead rail system requires you to use controls on both the rail system and the washer-extractor to transfer the goods from the bag to the washer-extractor.

WARNING 6: Entangle and Sever Hazards—Contact with goods being processed can cause the goods to wrap around your body or limbs and dismember you.

- Do not touch goods inside or hanging partially outside the turning cylinder.
- Do not reach into the machine housing or frame.

Display or Action	Explanation
F5	enables the manual load controls for flushing goods through the elbow and blowing water out of the elbow after loading finishes
	Position the bag over the opening of the elbow.
= Ready	tells the controller that the bag is in position and ready to drop into the elbow. The basket begins rotating clockwise at drain speed and the elbow flush valve opens to flush goods through the elbow.
Tip:	The flush valve turns off when the water level in the cylinder reaches the configured low level. This situation will not occur if the drain valve is open during the loading sequence.
	The basket will continue to rotate and the flush valve will remain open until after you tell the controller the load is *Done*.
	Release the contents of the bag into the elbow.
	Ensure that the entire load enters the machine.
= Done	tells the controller that loading is finished.
	The flush valve remains open for the configured elbow flush time.
	When the elbow flush timer counts down to 0, the flush valve closes to stop water flowing through the elbow. After a brief delay to allow excess water to run into the machine, the elbow blow valve opens to blow air through the elbow and force more water into the machine.
	Any valid control input during the blowing phase will immediately close either the elbow flush valve or the elbow blow valve and turn off the wash motor.

2.3.4. Position the Machine for Washing

Use the controls on the *Manual Override—Position Machine* screen (Figure 21) to put the machine in wash position.

2.3.4.1. Raise the Elbow

Display or Action	Explanation
F4	enables the elbow controls to allow moving the elbow down to the loading position and up to the normal run position.
(hold)	moves the elbow up to the normal run position. Hold this button until the elbow is fully up; movement will stop automatically when the *elbow up locked* switch is made.

2.3.4.2. Close the Door

WARNING 7: Strike and Crush Hazards—Machines with power operated door—The moving door can strike you or crush or pinch your limbs if caught between the door and machine.

Some doors move automatically.

- Understand the consequences of operating manually.
- Keep yourself and others clear of movement areas and paths.

Display or Action	Explanation
F1	enables the door controls to allow opening and closing the door
▼ (hold)	closes the door. Hold this button until the door is fully closed; the door will stop automatically when the *door closed* switch is made.

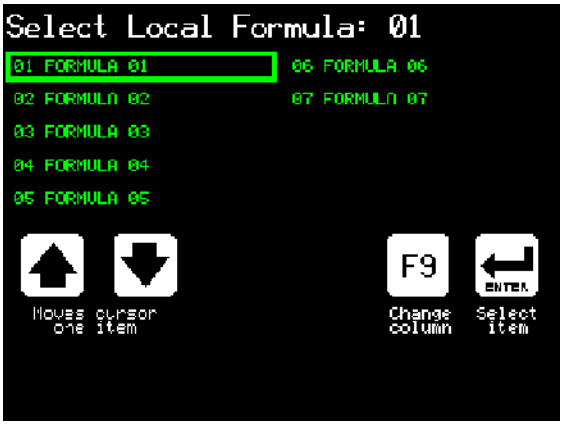
2.3.4.3. Lower the Front and Rear of the Machine—The machine must be completely down before a wash formula will start.

Display or Action	Explanation
F2	enables the front tilt controls to allow tilting the front of the machine up to the loading position and down to the normal run position.
▼ (hold)	tilts the front of the machine down. Hold this button until the front of the machine stops descending; descending will stop automatically when the *front full down* switches are made.

2.3.5. Select and Start a Wash Formula

Display or Action	Explanation
Escape	exits the *Manual Override—Position Machine* screen and displays the *Select Local Formula* screen.

Figure 22: *Select Local Formula* Screen



Display or Action	Explanation
▼ / ▲	selects the program from the list of available local formulas.
①	Press the *Start* button to start the selected wash formula.
	When the formula ends, press the *Signal Cancel* button to silence the operator signal and display the *Select Local Formula* screen.

2.3.6. Position the Machine to Discharge

When the wash formula ends, use this procedure to discharge the goods to the shuttle device:

Display or Action	Explanation
Manual	accesses the *Manual Menu* screen.
4 or ↓	selects *4=Manual Load and Discharge*.
Enter	accepts the selection and allows you to tilt the machine and to discharge goods to the shuttle device. See Section 2.3.2 for details on positioning the machine to receive goods.

2.3.6.1. Open the Door

WARNING 8: Strike and Crush Hazards—Machines with power operated door—The moving door can strike you or crush or pinch your limbs if caught between the door and machine. Some doors move automatically.

- Understand the consequences of operating manually.
- Keep yourself and others clear of movement areas and paths.

Display or Action	Explanation
F1	enables the door controls to allow opening and closing the door
↑ (hold)	opens the door. Hold this button until the door is fully open; the door will stop automatically when the *door full open* switch is made.

2.3.6.2. Tilt the Rear of the Machine Up

Display or Action	Explanation
F3	enables the rear tilt controls to allow tilting the rear of the machine up to the discharge position and down to the normal run position.
↑ (hold)	tilts the rear of the machine up. Hold this button until the rear of the machine is fully tilted; tilting will stop automatically when the *rear full up* switch is made.

2.3.7. Discharge from the Machine to a Shuttle Device

WARNING 9: Entangle and Sever Hazards—Contact with goods being processed can cause the goods to wrap around your body or limbs and dismember you.

- Do not touch goods inside or hanging partially outside the turning cylinder.
- Do not reach into the machine housing or frame.

Display or Action	Explanation
F6	enables the discharge controls to allow discharging the goods onto a shuttle device.
= Ready	releases the cylinder brake and begins the configured discharge jog sequence described below: 1. The cylinder rotates clockwise for the configured *clockwise discharge time* at the configured jog speed. 2. The cylinder stops for the configured *discharge dwell time*. 3. The cylinder rotates counter-clockwise for the configured *counter-clockwise discharge time* at the configured jog speed. The discharge jog sequence repeats until you stop it.
= Done	stops the discharge sequence.

2.3.8. Exit Manual Operation

Display or Action	Explanation
Escape	exits the *Manual Override—Position Machine* screen and displays the *Select Local Formula* screen.

— End of BICWFO03 —

BICWFT02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

2.4. Manual Intervention While a Formula is Running

2.4.1. About the Manual Password

The machine controller can be configured to require a password before the operator can access any manual intervention mode (configure decisions *X* and *Manual Password*). The manual password is four numeric digits.

If a manual password is required (*configure decision X* = 1), the controller will display *Enter Password:* if the machine is running a formula and the operator presses Manual or any key combination described below. The controller allows about five seconds for the operator to enter a keystroke before the prompt disappears.

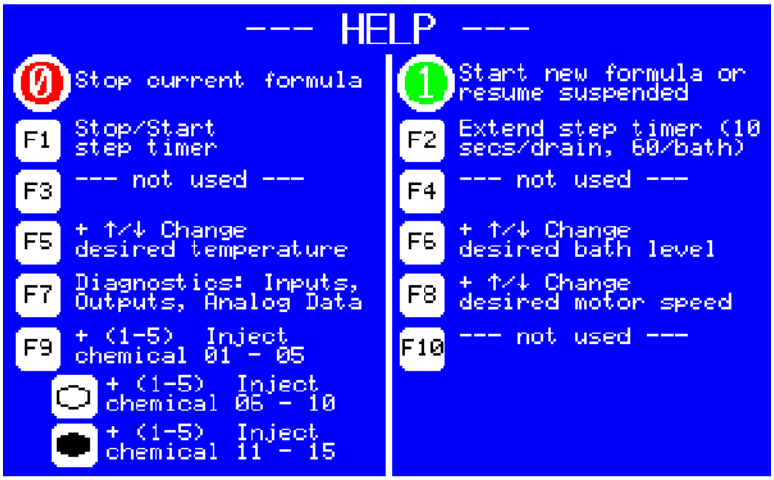
When the four-digit password is correctly entered, manual intervention is allowed until 10 seconds after the last keystroke.

2.4.2. Actions Available in *Run Manual* Mode

Certain operator functions are available while a formula is running. These functions allow the operator to change the formula in progress for this time only. The next time the formula runs, the programmed parameters will be used.

Display or Action	Explanation
? (hold)	displays the run mode help screen, shown in Figure 23.

Figure 23: Run Mode Help Screen



2.4.2.1. *Run Manual* Mode in All Steps—In any step of a wash formula, the run manual mode allows you to stop the formula timer, stop or cancel the formula, extend steps, or advance to the next step.

Display or Action	Explanation
0	stops the formula in progress. All functions end. Press 1 to resume the formula.
0 Escape	cancels the formula in progress. You can not resume a stopped formula after you press Escape.
F1	stops and starts the formula timer. All functions in progress continue.
F2	extends the current bath or extract step one minute, or the current drain step 10 seconds. Press again to add more time.

2.4.2.2. *Run Manual* Mode in Bath Steps—In a bath step, the *run manual* mode allows you to change the desired temperature and bath level, change the motor speed, and inject chemicals. These actions are available when the *run screen* is displayed.

2.4.2.2.1. Bath Temperature and Level

Display or Action	Explanation
F5 + ↓	reduces the desired **bath temperature**. The controller allows a minimum desired temperature of 32 degrees Fahrenheit (0 degrees Celsius). If you adjust the desired temperature below the achieved temperature before the programmed level is achieved, the controller will modulate the water valves to try to achieve the new desired temperature. If the programmed level is already achieved, the controller will **not** add cold water to lower the temperature.
F5 + ↑	increases the desired **bath temperature**. The controller allows a maximum desired temperature of 205 degrees Fahrenheit (95 degrees Celsius). If you increase the desired temperature, the controller modulates the available water valves and turns on the steam valve if the machine is configured for steam. After level is achieved, the controller will **not** add hot water to increase the temperature.
F6 + ↓	decreases the desired bath level if the programmed level is not already achieved. If the programmed level is already achieved, the controller will **not** open the drain.
F6 + ↑	increases the desired bath level. The controller modulates the programmed water valves to achieve the new level at the programmed temperature.

2.4.2.2.2. Diagnostics

Display or Action	Explanation
F7	toggles through the available diagnostics screens. These screens allow the operator to view the current status of microprocessor inputs, outputs, and analog data.

2.4.2.2.3. Basket Speed

Display or Action	Explanation
F8 + ↓	decreases the desired basket speed. See Table 6 for the available speed range for your machine model.
F8 + ↑	increases the desired basket speed.

Table 6: Basket Speed Ranges

Machine Model	Bath Step Speeds				Extract Step Speeds			
	Minimum		Maximum		Minimum		Maximum	
	RPMs	G's	RPMs	G's	RPMs	G's	RPMs	G's
30022 F_W	5	0.01	40	0.68	200	17.03	835	296.81
36030 F_W	5	0.01	43	0.94	200	20.43	810	335.17
36030 F_S / F_R	5	0.01	43	0.94	200	20.43	700	250.32
42032 F_W	5	0.01	40	0.95	200	23.84	750	335.24
42032 F_S / F_R	5	0.01	40	0.95	200	23.84	700	292.04
42044 SP_ / WP_	25	0.01	35	0.73	200	23.84	735	321.97
48040 F_W	10	0.07	38	0.98	240	27.25	665	301.21
60044 SP_ / WP_	25	0.53	33	0.93	200	34.06	575	281.50
68036 F_N	25	0.6	32	0.99	240	38.6	558	300.45

2.4.2.2.4. Chemical Injection—From the keypad, you can enable any chemical supply output with F9 in combination with one or more number keys, as described below.

Display or Action	Explanation
hold F9 + 1 – 5	enables chemical supply output x, where x is chemical supply output 1 through 5
hold F9 + ⬬ + 1 – 5	enables chemical supply output x, where x is chemical supply output 6 through 10
hold F9 + ⬭ + 1 – 5	enables chemical supply output x, where x is chemical supply output 11 through 15

2.4.3. *Bare Manual* Mode for Troubleshooting

Bare manual mode allows you to control individual machine functions for troubleshooting. Because some safeguards which might hinder the troubleshooting process are disabled, the bare manual mode is available only when the machine is not running a formula. This mode is detailed in Section 4.2. "Viewing Inputs, Testing Outputs, and Managing Accumulated Data".

2.4.4. *Manual Intervention* Mode

While a formula is running, the operator can make certain changes to bath level, temperature, etc. that only affect the step for the current instance. Changes made through manual intervention, such as decreasing the desired temperature, are not retained after the current step ends.

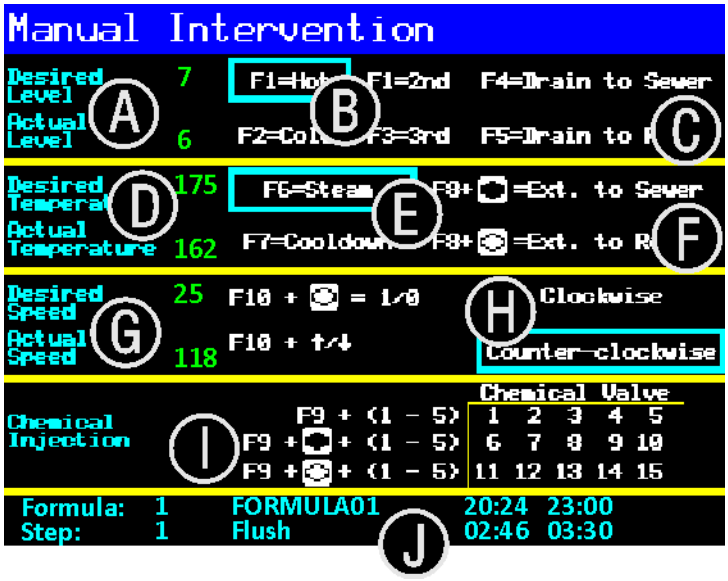
Manual intervention is available during bath steps only.

Display or Action	Explanation
	stops the step timer and stops all functions except the *Close Drain* output. The *Manual Intervention* screen is displayed to assist with manual formula modification. See Section 2.4.1 "About the Manual Password" if the controller prompts, "Enter Password." When you press  , all water (including cooldown) and steam valves close and the basket motor stops. The timer stops counting down. All functions for unsatisfied parameters will resume when you exit the *Manual Intervention* screen. For example, when you exit manual intervention to the run display, the controller will turn on water valves and the basket motor as programmed.
	ends any function that was previously started from the *Manual Intervention* screen. If all functions are off, returns to the *Run* screen.

Tip: Press  only the correct number of times to get the result you want. If a password is **not** required for manual intervention, pressing this key too many times may cancel the remainder of the step in progress.

Figure 24: *Manual Intervention* Screen

Typical Display



Legend

- **A.** Units of bath level, desired and actual
- **B.** Water valve functions (Hot *ON* in this example)
- **C.** Drain functions
- **D.** Units of bath temperature, desired and actual
- **E.** Steam and cooldown functions
- **F.** Manual extract functions
- **G.** Units of basket speed, desired and actual
- **H.** Motor direction functions
- **I.** Chemical injection and status message area
- **J.** Current formula and step data

Display or Action	Explanation
F1	opens the hot water valve. This action is available only during a bath step. The valve remains open until you press Escape to turn it off or the programmed level is achieved. After the programmed level is achieved, depress and hold the button to inject additional water.
Tip:	If the machine is configured for 2nd and cold water valves (no hot water valve), this button controls the 2nd water valve.
F2	opens the cold water valve. This action is available only during a bath step. The valve remains open until you press Escape to turn it off or the programmed level is achieved. After the programmed level is achieved, depress and hold the button to inject additional water.
F3	opens the third water valve, if the machine is configured for this option. This action is available only during a bath step. The valve remains open until you press Escape to turn it off or the programmed level is achieved. After the programmed level is achieved, depress and hold the button to inject additional water.
F4	opens the sewer drain. The bath liquor drains from the machine to the sewer.
F5	opens the reuse drain, if configured. The bath liquor drains from the machine to the reuse tank.
F6	opens the steam valve, if configured.

Display or Action	Explanation
	The steam valve remains open until the programmed temperature is achieved, then closes. To inject additional steam after the programmed temperature is achieved, you must depress and hold the button.
F7	operates the cooldown system, if configured.
F10 + ↓	decreases the desired wash motor speed as described in Section 2.4.2.2.3 "Basket Speed".
F10 + ⬭	starts the motor to turn the basket as defined in the wash formula. The motor turns the basket in both directions if the interrupted bath step was programmed as a two-way wash.
F8 + ⬭	performs a manual extract to the sewer. The controller commands the motor to turn the basket counter-clockwise, then clockwise at wash speed. The selected drain opens a few seconds after the motor accelerates the basket to drain speed. After sufficient time at drain speed, the motor accelerates to turn the basket at low and high extract speeds. The controller maintains high extract speed until you press Escape to terminate the extract.
F8 + ⬭	performs a manual extract to the reuse tank (if configured). The controller commands the motor to turn the basket counter-clockwise, then clockwise at wash speed. The selected drain opens a few seconds after the motor accelerates the basket to drain speed. After sufficient time at drain speed, the motor accelerates to turn the basket at low and high extract speeds. The controller maintains high extract speed until you press Escape to terminate the extract.

— End of BICWFT02 —

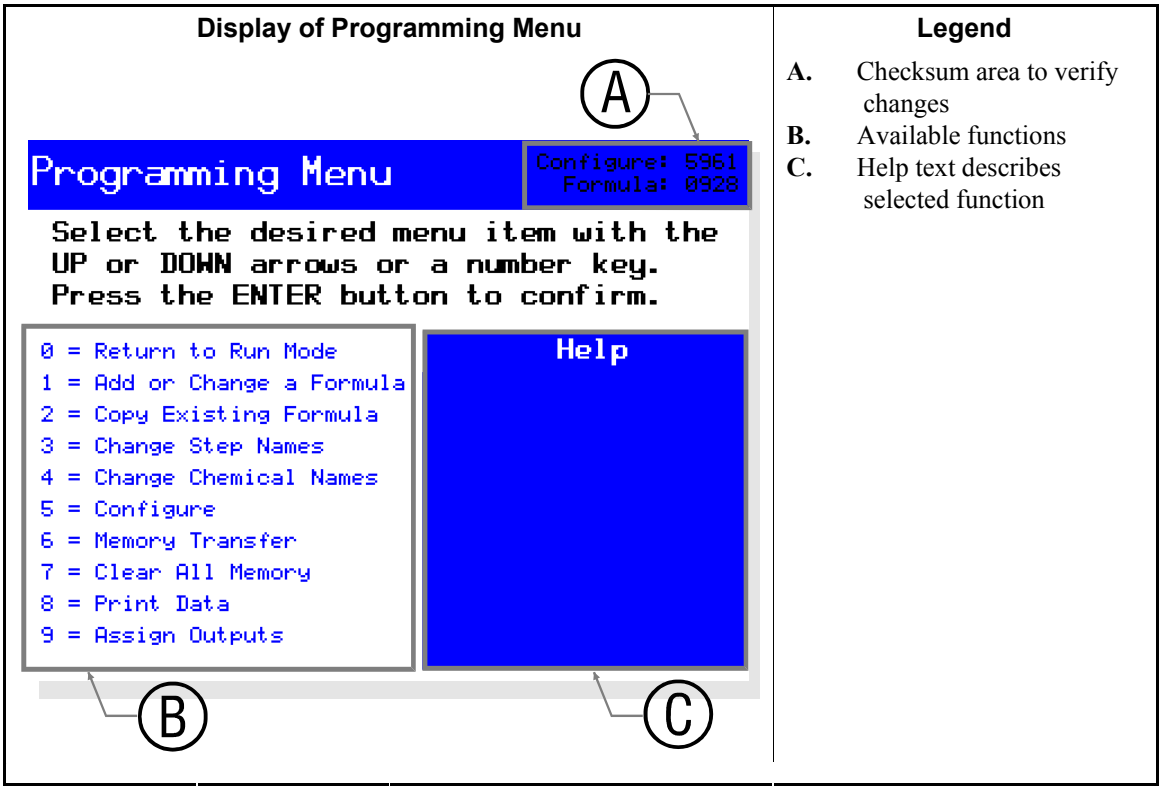
Chapter 3
Programming

BICWFP01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

3.1. Programming the Milnor® Mark VI WTB+ Washer-Extractor Control

Machine functions that are intended to be performed only by laundry management or certain authorized personnel are available only when Enter is pressed while the *Programming* keyswitch is in the *Program* position ( ). The *Main Programming Menu* (Figure 25) allows authorized personnel to quickly see the available functions and choose the one they want. These functions are described briefly in Section 3.1.2 "Introduction to *Main Programming Menu* Functions" and explained in detail in Section 3.1.5 through Section 3.1.13.

Figure 25: Main Programming Menu



3.1.1. How to Enter the *Programming Mode*

The programming mode is protected by a keyswitch to prevent unauthorized access to options which could damage the machine or have other negative consequences. After initial commissioning and configuration, remove the key from the keyswitch. Allow only authorized personnel access to the programming key.

When power is applied to a machine or a running formula ends, the *Select Local Formula* screen appears unless the machine is part of a Mildata system. If the machine is connected to a Mildata network and properly configured as a machine on the network, the *Select Remote Formula* screen appears.

1. With the *Select Formula* screen on the display, insert the programming key and turn the keyswitch to the *Programming* position ( ).
2. Press Enter on the machine keypad to enter the *Programming* mode.

3.1.2. Introduction to *Main Programming Menu* Functions

This section briefly describes the purpose of each available function when the machine is in *Programming* mode. See Section 3.1.5 through Section 3.1.13 for complete explanations of these selections and instructions on using them.

0 = Return to Run Mode—To exit the programming mode and prepare to run a wash formula, select this option, turn the *Programming keyswitch* to , and press Enter. The display changes to the *Select Formula* screen. See Section 3.1.4 "0 = Return to Run Mode" for a complete explanation of this option.

CAUTION 10: Data Loss Hazard—The electronic memory which stores the configuration and programming information for the machine is vulnerable to corruption if the machine loses power while the *Programming keyswitch* is set to .

- Never remove power from the machine while the *Programming keyswitch* is set to .
- Restrict access to the programming key to authorized personnel only. Never leave the key where it is freely available.
- Before leaving the machine unattended, always return the machine to the *Run* mode and remove the key.
- Never turn the key from to unless prompted by the display.

1 = Add or Change a Formula—This option allows you to create a new wash formula, or change or delete an existing formula. Select this option and press Enter to view the *Select Formula to Edit* screen. All programming decisions are described in Section 3.1.5.

2 = Copy Existing Formula—Use this option to copy an existing formula to an empty formula number. When you need to program several similar formulas, program the first formula as desired. Then copy the programmed formula the desired number of times to other formula numbers. Finally, edit each copy of the original formula to meet your specific needs. This procedure is detailed in Section 3.1.6 "2 = Copy an Existing Formula".

3 = Change Step Names—The control contains 15 predefined step names, which appear on the display at the appropriate time while a formula is running. Use this option to change any of these step names as described in Section 3.1.7 "3 = Change Step Names".

4 = Change Chemical Names—The control contains 64 predefined chemical names, which appear on the display at the appropriate time while a formula is running. Use this option to change any of these chemical names as described in Section 3.1.8 "4 = Change Chemical Names".

5 = Configure—The control used to operate this machine is also capable of operating other machine models. Configuring the control tells the it which machine model to run and which optional devices are present. Other configure decisions, such as temperature units, are for the

convenience of owners and users, and have no effect on the operation of the machine. Each configure decision is described in Section 3.1.9.

6 = Memory Transfer—Memory transfer allows you to copy the programming and configure information of one machine into the memory of another machine, thus saving significant programming time. You can also use this selection to make a backup copy of the wash formulas so the machine can be returned to service quickly if the programmed data is lost. Section 3.1.10 "6 = Memory Transfer" describes the procedures and benefits of using memory transfer.

7 = Clear All Memory—Use this selection to remove all formulas from the machine memory. This option is usually used only when the machine is first commissioned and if the electronic board containing the microprocessor and its memory are replaced. See Section 3.1.11 for how to clear memory and learn about the consequences.

8 = Print Data—This selection allows you to print the programmed formulas, machine configuration codes, and step and chemical names for reference. The printed documents can be used to configure and program a machine if an electronic copy of the data is not available.

9 = Assign Outputs—Assignable outputs are optional on all machines. This selection provides you with an interface for assigning a programmable output to enable at a specific time in any formula and step, and to remain enabled for a certain number of seconds. Details and requirements for assigning programmable outputs are described in Section 3.1.13.

3.1.3. Navigating the *Main Programming Menu*

Only three keypad buttons are required to select an option on the *Main Programming Menu*. The two arrow keys (and) allow you to move the selection rectangle up or down through the list of available options. The selection rectangle wraps around the list if an arrow key is pressed with the top or bottom option selected.

When the appropriate option is surrounded by the selection box, press the *Enter* key ( ) to go to that option. Each option on the *Main Programming Menu* opens another screen for confirmation before the controller changes any stored information.

3.1.4. 0 = Return to Run Mode

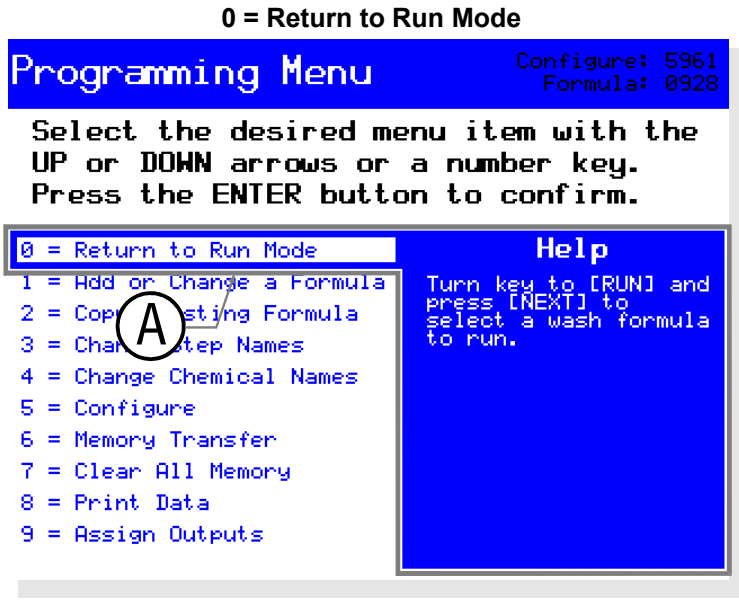
The *Return to Run Mode* menu option, shown in Figure 26, is pre-selected when the *Main Programming Menu* appears. This selection indicates that all conditions are achieved to safely return the machine to *Run* mode.

To select this option from any other option on the *Main Programming Menu*, use the arrow keys (and) to scroll the selection box up or down until it surrounds the desired item, or press the keypad number key shown at the left end of the item (through).

CAUTION 11: Data Loss Hazard—The electronic memory which stores the configuration and programming information for the machine is vulnerable to corruption if the machine loses power while the *Programming keyswitch* is set to .

- Never remove power from the machine while the *Programming keyswitch* is set to .
- Restrict access to the programming key to authorized personnel only. Never leave the key where it is freely available.
- Before leaving the machine unattended, always return the machine to the *Run* mode and remove the key.
- Never turn the key from to unless prompted by the display.

Figure 26: Programming Menu



Legend

A. Selection box with *0 = Return to Run Mode* selected

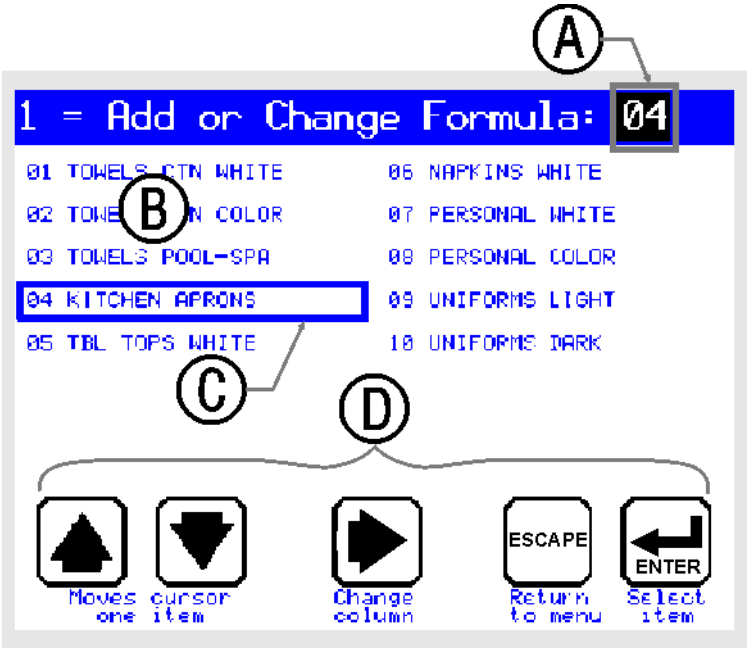
1. To return the machine to the *Run* mode when this option is selected, turn the *Programming keyswitch* to the *Run* position ( ) and press Enter on the keypad.
2. Remove the key and store it in a safe place.

3.1.5. 1 = Add or Change a Formula [Document BICWFP02]

This menu selection guides you through the steps necessary to create a new formula at any empty formula number, or to edit or delete an existing formula. This selection also allows you to view all the details of each step in any formula.

Figure 27: Selection Screen for *Add or Change Formula*

Display



Legend

A. Formula number to add or change
B. Formula list
C. Selected formula number and name
D. Navigation help

3.1.5.1. How to Navigate the *Add or Change Formula* Screens

Display or Action	Explanation
0 — 9	Enter a number at the current cursor position. If the number is valid for the decision, the cursor will automatically advance to the next position or decision. If the number is not valid (outside the allowable range for this position), the controller inserts a valid value for the decision and returns to the first position in the decision for editing.
↓	On the *Add or Change Formula* screen, use this keystroke to move the formula selection box to the next formula number in the current column. If the selection box is already at the bottom of the column, it wraps to the top. On the *programming decisions* screen, use this keystroke to move the cursor to the next decision on the programming screen. This keystroke will advance the cursor forward through all decisions of all steps except decision *E* (*How to End*) of the last step.
↑	On the *Add or Change Formula* screen, use this keystroke to move the formula selection box to the previous formula number in the current column. If the selection box is already at the top of the column, it wraps to the bottom. On the *programming decisions* screen, use this keystroke to move the cursor to the previous decision of the current step.
→	On the *Add or Change Formula* screen, use this keystroke to move the formula selection box to the other column of formula numbers before you select a formula number. For example, if the formula selection box is currently in the left column, this keystroke moves it to the top of the right column. Once you've selected a formula number on the *Add or Change Formula* screen, this keystroke advances through the characters of the **formula name** without making changes. After the last valid character position of the formula name, the cursor returns to the first position in the name. On the *programming decisions* screen, use this keystroke to advance forward through the each step of the formula. The cursor always moves to the first decision (*Name*) of the next step. After the last step in the formula (T=0), this keystroke saves your changes and displays the *Programming Menu*.
Escape	On the *Add or Change Formula* screen, use this keystroke to return to the *Programming Menu* screen. Once you've selected a formula number on the *Add or Change Formula* screen, this keystroke exits the *edit formula name* mode so you can select another formula to change. On the *programming decisions* screen, this keystroke returns the cursor to the first character of the current decision. The cursor moves only if the decision contains more than one character.

Display or Action	Explanation
	On the *Add or Change Formula* screen, this keystroke confirms that you want to change the formula in the formula selection box. Once you've selected a formula number on the *Add or Change Formula* screen, this keystroke saves any changes you've made to the formula name and displays the programming decisions screen. On the programming decisions screen, this keystroke accepts the displayed value for the current decision (if the value is valid) and advances to the next decision. At the last decision of each step, the cursor advances to the first decision of the next step. At the last decision of the last step in a formula, the control saves your changes and displays the *Programming Menu* screen. If the displayed value for any decision is not valid, the Mark VI controller inserts the maximum or minimum valid value for the decision and returns to the first position in the decision for editing.

3.1.5.1.1. Selecting a Formula or Number to Change—There are two ways to select the formula you want to change or to select a formula number for a new formula:

3.1.5.1.1.1. Direct Entry by Number—If you know the two-digit number of the formula you want to add or change, you can enter it directly in the title bar of the *Add or Change Formula* screen.

Display or Action	Explanation
`...Change Formula: 01`	Formula *01* is selected by default whenever you access the *Add or Change Formula* screen. **Note 6:** Although formulas 00 and 99 exist in machine memory, you can't change these two formulas. Therefore, they're not available when the machine is in *program* mode.
	Enter any valid formula number from 01 to 98. The list of formulas scrolls to put the selected formula number formula at the top of the left column if possible, and the selection box highlights that formula.
	Confirm the selected formula number.
`FORMULA 36`	When you confirm that this is the formula you want to modify, the cursor moves to the formula name field. From this screen you can modify the formula name as described in Section 3.1.5.4 "How to Name the **Formula**".

3.1.5.1.1.2. Selecting from the List—If the formula number you want to add or change is visible on the screen, you can select the formula from the list. Use the cursor movement keys on the keypad (described below) to put the formula selection box around the desired formula number, then confirm your selection.

Tip: The keys described below allow you to select a formula number that is one of the 10 formulas visible on the screen. To select a formula that's not visible on the screen, enter a number within 10 slots of the desired formula, but not higher.

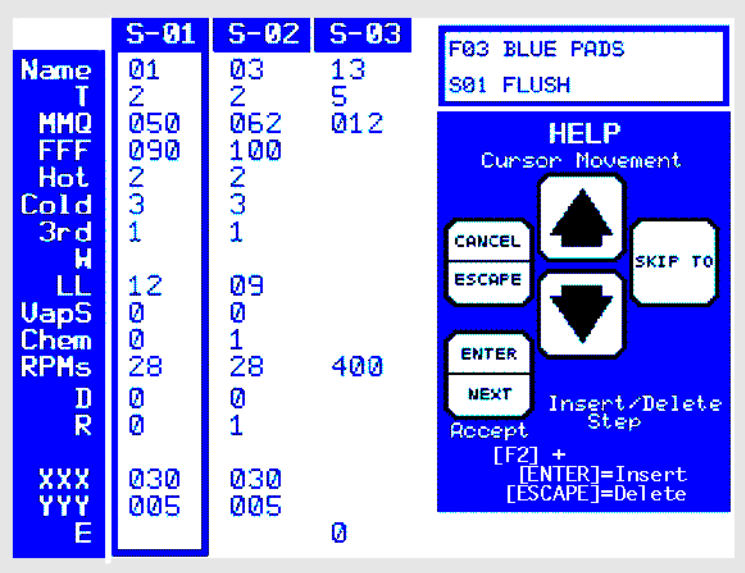
Display or Action	Explanation
	Move the selection box down one item in the current column. The selection box wraps from the bottom of the current column to the top **of the same column**.
	Move the selection box up one item in the current column. The selection box wraps from the top of the current column to the bottom **of the same column**.
	Move the selection box to the top of the other column on the screen. This button toggles between the left and right columns.
Enter	Confirm that you want to change the selected formula or create a new formula in the space with the selected number. The formula number disappears from the list, and the cursor moves to the selection box so you can change the formula name.
Escape	Return to the main *Programming Menu*.

3.1.5.1.2. Entering Data in Step Decisions—The cursor automatically advances to the next position when you enter a valid value in the current position. If the current position is the last character of a multi-character decision (e.g., *FFF* or *CCC*), the cursor will advance to the next decision.

3.1.5.2. How to Delete a Formula—To delete a wash formula, program *0* for the step type for the first step (S-01) of the formula. This procedure is described in more detail in Section 3.1.5.5.2 "Type of Step".

3.1.5.3. How to Insert or Delete a Step in a Formula—A single step can be inserted or deleted from a formula if the formula is opened for editing (Figure 28), but the first programming decision has not yet been selected (no programmed value is flashing).

Figure 28: Inserting or Deleting a Formula Step



Display or Action	Explanation
F9 + Enter	inserts a copy of the selected step as the next step
F9 + Escape	deletes the selected step

3.1.5.4. **How to Name the Formula**—For each wash formula in the machine, you can program a formula name up to 15 characters long. The name you enter here appears on the *Select Local Formula* screen when the machine is ready to run a formula (see Section 2.1.1.2 "How Should this Switch be Set?" or Section 2.3. "WTB+ Manual Loading and Discharging"), as well as on reports you print (see Section 3.1.12 "8 = Print Data") from the machine control panel.

3.1.5.5. **The Step Decisions Explained**—You program a **wash formula** by programming a series of **steps**. You program these steps by entering values in a list of **decisions**. This part of this document describes what each programming decision means, so you can enter the best value for the specific wash formula you're programming.

Table 7: Step Decision Quick Reference

Prompt	Description	Range	More Information
Name	Step name	00-15	"Step xx" or pre-defined name
T	Step type	0-7	3 bath types, 4 extract types, and end
MMQ	Duration	000-633	Units are minutes, minutes, and quarter-minutes
FFF	Bath temperature	050-205	Requires steam, modulating water, or both
CCC		000-100	
Hot	Hot water valve	0-2	0=off, 1=on, 2=on to raise temperature
Cold	Cold water valve	0-1, 3	0=off, 1=on, 3=on to lower temperature
2nd	2nd water valve	0-3	Optional; choose value by temperature
3rd	3rd water valve	0-3	
W	Overhead tank	0-1	Optional machine-mounted tank
LL	Liquor level		Units are inches or centimeters
LLLL	Metered water		Optional; units of volume, weight, etc.
S	Steam code	0-6	Requires steam
Chem	Chemical injection	0-2	0=none, 1=programmed, 2=add or change
CC	Chemical valve	00-16	00-05 and 16 are standard; 16=signal only
NN	Name number	00-64	"Chemical" or pre-defined name
W	When to inject	0-2	0=with fill, 1=level OK, 2=level+temp OK
SSS	Injection duration	001-127	Units are seconds
Signal	Signal with injection	0-1	0=no, 1=yes (injection delayed for operator input)
RPMs	Basket speed	Depends on machine model	First range for bath steps, second range for extracts
G's			
D	Fill and drain actions	0-6	Two fill actions and four drain actions
R	Drain to reuse?	0-1	Optional
C	Recirculation	0-1	Optional
XXX	Motor ON time	005-999	Units are seconds
YYY	Motor OFF time	003-254	
E	How to end	0-3	0=finished, 1=reversing, 2=drain speed, 3=tumbling

3.1.5.5.1. How to Name the **Step**—Select the *step name* to appear on the normal operating screen when this step is running. There are 16 step names available to choose from, and all but selection *00* can be changed (see Section 3.1.7 "3 = Change Step Names"). Selection *00* causes the step number to appear on the normal operating screen when this step is running. Selections *01* through *15* provide the most common descriptive names (*01* through *12*) and three additional names (*13* through *15*) are defaulted to "Name_Me," for you to change to any desired value.

The factory default value for each step name is listed in Table 8. The step names available on your machine won't match this list if the step names have been changed.

Display or Action	Explanation
`Name 00`	Display the step number while this step is running.
`Name 13`	Display "Extract" while this step is running.

Table 8: Default Step Names

00	Step #		08	Soursoft
01	Flush		09	Softener
02	Break		10	Mildcide
03	Wash		11	Finish
04	Bleach		12	Starch
05	Rinse		13	Extract
06	Antchlor		14	Name_Me
07	Sour		15	Name_Me

3.1.5.5.2. Type of Step

Display or Action	Explanation
T	Select the type for this step. The type defines the general action of the basket and other components while this step is running. There are eight step types available, but some of them may not be valid in certain situations.
T 0	**0** = End of cycle Set the type of step to *End of cycle* (T = 0) to tell the controller that you've finished programming the wash formula. The controller advances immediately to the *How to end* decision (E) unless this is the first step of the formula. **If you program an *End of cycle* for the first step (S-01) of an existing formula, the controller prompts you to confirm your decision, then *deletes the entire formula from memory*.**
T 1	**1** = Bath 1-way Set the type of step to *Bath 1-way* (T = 1) to tell the controller that this is a bath step and that the basket should rotate continuously in the clockwise direction during this step.
Tip:	This choice controls the basket action only while the step is actually in progress, i.e., while the timer is counting down during this step. The basket actions while the machine is filling to level before this step and while it is draining after this step are defined later (see Section 3.1.5.5.11 "Actions during Filling and Draining").
T 2	**2** = Bath 2-way Set the type of step to *Bath 2-way* (T = 2) to tell the controller that this is a bath step and that the basket should rotate both clockwise and counter-clockwise. The number of seconds of rotation in either direction and the dwell between directions are programmed later, as described in Section 3.1.5.5.13 "Basket Rotation and Dwell Duration".
Tip:	This choice controls the basket action only while the step is actually in progress, i.e., while the timer is counting down during this step. The basket actions while the machine is filling to level before this step and while it is draining after this step are defined later (see Section 3.1.5.5.11 "Actions during Filling and Draining").
T 3	**3** = Bath Soak Set the type of step to *Bath Soak* (T = 3) to tell the controller that this is a bath step and that the basket should remain stationary during this step.
T 4	**4** = Pre- and High Extract

Display or Action	Explanation
	A *Pre- and high extract* step partially extracts the goods, then redistributes the goods around the basket before performing a high extract. This step type is available only if the preceding step is a bath step with water. 1. When the bath time expires, the basket turns clockwise for four seconds if necessary. 2. The basket accelerates to distribution speed with the drain closed for four seconds. 3. Drain opens and distribution speed continues for the time configured in *Drain Code* (configure decision *G*). 4. When the drain sequence ends, the basket accelerates to a fixed pre-extract speed of 250 RPMs for 90 seconds. 5. When the 90 seconds of pre-extract time expires, the step timer pauses and the basket decelerates to a stop. 6. The machine redistributes the load by turning the basket counter-clockwise for eight seconds, dwelling for two seconds, then turning clockwise for 10 seconds. 7. In preparation for the high extract portion of the step, the basket accelerates to drain speed for 20 seconds. 8. The basket accelerates to 250 RPMs for 90 seconds. 9. The step timer restarts and the basket accelerates to the programmed extract speed (see Section 3.1.5.5.10 "Basket Speed"). The extract speed can be any speed up to the maximum speed allowed by the controller. 10. When the step timer expires, the basket coasts to a stop and the step ends.
T 5	**5** = Intermediate Extract An *Intermediate extract* step is usually programmed when you want to extract goods between bath steps. This step type is available only if the preceding step is a bath step with water. **Note 7: For balancing machines only:** An intermediate extract step does not include the necessary functions to drain water out of the basket ribs. Draining the ribs prevents re-wetting the goods as the basket slows, but requires additional time after the extract time expires. Because the goods will undergo another bath step after an intermediate extract, the water draining from the ribs and slightly wetting the goods doesn't matter. 1. When the bath time expires, the basket turns clockwise for four seconds if it was turning counter-clockwise or stopped when the step timer expired. 2. The basket accelerates to distribution speed with the drain closed for four seconds.

Display or Action	Explanation
	3. Drain opens and distribution speed continues for the time configured in *Drain Code* (configure decision *G*). 4. The basket accelerates to the programmed extract speed. 5. When the step timer expires, the basket coasts to a stop and the step ends.
T 6	**6** = High Extract A *High extract* step is usually programmed as the last step in a formula. In non-balancing machines, this step type is equivalent to an *Intermediate extract* (Type = *5*). In balancing machines, this step type includes the functions necessary to drain the water out of the basket ribs without wetting the just-extracted batch. This step type is available only if the preceding step is a bath step with water.
T 7	**7** = Double Extract A *Double extract* step is similar to a *Pre- and high extract* step, except that the machine does not reverse at wash speed to re-distribute the goods. This method uses an alternate acceleration rate to distribute the load before the second extract. This step type is available only if the preceding step is a bath step with water. 1. When the drain sequence ends, the basket accelerates to a fixed pre-extract speed of 250 RPMs for 90 seconds. 2. When the 90 seconds of pre-extract time expires, the step timer pauses and the basket decelerates to a stop. 3. In preparation for the second high extract, the basket accelerates to drain speed for 30 seconds. The fixed alternate acceleration rate used here distributes the goods around the basket. 4. The step timer restarts and the basket accelerates to the programmed extract speed (see Section 3.1.5.5.10 "Basket Speed"). The extract speed can be any speed up to the maximum speed allowed by the controller. 5. When the step timer expires, the basket coasts to a stop and the step ends.

3.1.5.5.3. Duration—The MMQ field of each step defines how long the step will run. The units are minutes and quarter-minutes, with two digits available for minutes. The minimum time for any step is 15 seconds, entered as *001*. The maximum time for any step is 63 minutes and 45 seconds, entered as *633*.

Display or Action	Explanation
MMQ 012	Example of a step duration of one minute and 30 seconds, as might be used for an extract between two bath steps.
MMQ 060	Example of a step duration of six minutes, as might be used for a bath or final extract step.
MMQ 633	Example of a step duration of 63 minutes and 45 seconds, as might be used for a bath step which will be copied several times to make an overnight soak formula.

3.1.5.5.4. Temperature—Define the desired temperature for this bath step if this machine is configured for one or more temperature probes (configure decision *T*). Depending on the units configured in *Temperature Units* (configure decision *A*), the prompt here is either "FFF" for Fahrenheit or "CCC" for Celsius.

If degrees Fahrenheit is configured, the prompt is *FFF* with a value of *000* (no temperature commanded), or from *050* (50 degrees) to 205 degrees. If degrees Celsius is configured, the prompt is *CCC* with a value of 000 (no temperature commanded), or from *010* (10 degrees) to a maximum value of *095* (95 degrees).

Display or Action	Explanation
FFF 000	No specific temperature programmed for this bath. Program the temperature to *000* if the water supplied to the machine is at a suitable temperature for this step.

Tip: If a temperature is commanded here and neither steam nor modulating water is available to achieve that temperature, the cursor returns to this decision for a valid temperature (usually "000").

FFF 050	Required bath temperature is 50 degrees Fahrenheit, the allowable **minimum** Fahrenheit temperature. If the machine is configured for degrees Celsius, 10 degrees is the allowable minimum.
FFF 205	Required bath temperature is 205 degrees Fahrenheit, the allowable **maximum** Fahrenheit temperature. If the machine is configured for degrees Celsius, 95 degrees is the allowable maximum.

3.1.5.5.5. Water Valves—Depending on how this machine is configured, up to three water valves may be available for programming. In North America machines are usually configured with *hot* and *cold* valves, and sometimes with a third (*3rd*) water valve that controls reclaimed water from another process. In Europe, machines are usually configured with *cold* and second (*2nd*) water valves, and sometimes with a third valve.

Display or Action	Explanation
`Hot 1`	Define how the *hot* water valve will be controlled while filling for this step. *0* = Off; the *hot* water valve will not open while filling for this step. *1* = On; the *hot* water valve opens and remains open until the programmed level for this step is achieved. *2* = Increase temperature; the *hot* water valve opens only when required to raise the actual bath temperature to the desired temperature while the machine is filling for this step. *3* = not available for this valve
`Cold 1`	Define how the *cold* water valve will be controlled while filling for this step. *0* = Off; the *cold* water valve will not open while filling for this step. *1* = On; the *cold* water valve opens and remains open until the programmed level for this step is achieved. *2* = not available for this valve *3* = Decrease temperature; the *cold* water valve opens only when required to decrease the actual bath temperature to the desired temperature while the machine is filling for this step.
`2nd 1`	Define how the *second* water valve will be controlled while filling for this step. *0* = Off; the *second* water valve will not open while filling for this step. *1* = On; the *second* water valve opens and remains open until the programmed level for this step is achieved. *2* = Increase temperature; this valve opens only when required to increase the actual bath temperature to the desired temperature while the machine is filling for this step. *3* = Decrease temperature; this valve opens only when required to decrease the actual bath temperature to the desired temperature while the machine is filling for this step.
Tip:	For selections 2 or 3 to be useful in programming this water valve, the water available through this valve must be consistently either hotter or colder than the other water source(s) used to fill for this step.
`3rd 1`	Define how the *third* water valve will be controlled while filling for this step.

Display or Action	Explanation
	0 = Off; the *third* water valve will not open while filling for this step. *1* = On; the *third* water valve opens and remains open until the programmed level for this step is achieved. *2* = Increase temperature; this valve opens only when required to increase the actual bath temperature to the desired temperature while the machine is filling for this step. *3* = Decrease temperature; this valve opens only when required to decrease the actual bath temperature to the desired temperature while the machine is filling for this step.
Tip:	For selections 2 or 3 to be useful in programming this water valve, the water available through this valve must be consistently either hotter or colder than the other water source(s) used to fill for this step.

Supplement 2

How to Modulate Water Valves to Regulate Incoming Water Temperature

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

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

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

The display details below are **examples** of how certain water valves might be programmed for best results at a given temperature. How you program your machine for best results may differ depending on the water valves on your machine and the water temperatures available at each configured valve.

Display or Action	Explanation
FFF 185 Hot **1** Cold **3**	To achieve a bath temperature of 185 degrees Fahrenheit, program the hot water valve on (*1*) and the cold water valve to open only if the bath temperature rises above the programmed temperature (*3*).
FFF 090 Hot **2** Cold **1**	To achieve a bath temperature of 90 degrees Fahrenheit, program the hot water valve to open only if the bath temperature falls below the programmed temperature (*2*). Program the cold water valve to remain on until level is achieved (*1*).
FFF 115 Hot **1** Cold **3** 3rd **1**	To achieve a bath temperature of 115 degrees Fahrenheit in a machine with the three water valves shown, this programming approach is best only if the water temperature at the third water valve is higher than the desired temperature.

3.1.5.5.6. Fill from Overhead Tank?—An overhead liquor retention tank is an option on some machine models. If a machine is equipped with and configured for an overhead tank, the tank becomes the water source of highest priority. If *Fill from Overhead Tank* is commanded for a bath step, the machine will fill from the tank until level is achieved or until the configured *Fill Error* time (configure decision *I*) expires. If the fill error time expires before the desired level is achieved, the water valves will open as programmed (see Section 3.1.5.5.5) until level is achieved.

Display or Action	Explanation
W 0	Do not use the water from the overhead tank in this bath step.
W 1	Use the water from the overhead tank in this bath step first, then make up any shortfall to the desired level with the programmed water valves after the fill error time expires.

3.1.5.5.7. Define the Bath Level—Depending on how this machine is configured, one of two methods may be used to determine the amount of water injected into the machine cylinder for a bath step.

- *Standard levels* (see Section 3.1.5.5.7.1) are available if the machine is configured for no flow meter (configure decision *N = 0*) on the incoming water line.
- If the machine is equipped with and configured for a flow meter and *metered water* (configure decision *N = 1*), a specified number of units of water can be programmed, described in Section 3.1.5.5.7.2.

3.1.5.5.7.1. Standard Levels—If this machine is not configured for an optional flow meter (configure decision *N = 0* for **no flow meter**), enter the desired bath levels in either inches or centimeters, depending on how the machine is configured (configure decision *A = 0* for inches, *A = 1* for centimeters). If necessary, refer to Section 3.1.9.3 "Standard Configure Decisions".

Supplement 3

More about Standard Levels

The **minimum** level in a bath step followed by an extract step is the configured *medium level*. The minimum value for a bath step **not** followed by an extract step is the configured *low level*. The configure decisions are described in Section 3.1.9.2.

The **maximum** level in a bath step is the configured high level.

For example, let's assume a machine is configured with *low level = 5*, *medium level = 08*, and *high level = 18*. If we program a bath step followed by another bath step, the **first** bath step can be programmed at any level from 5 to 18 inches. However, if the second bath step is followed by an extract step, the minimum allowable level is 8 inches (medium level). Restricting the minimum level before an extract to medium level helps ensure that the goods distribute evenly around the basket at the end of the bath step, resulting in a smooth extract with a minimum of vibration and recycling.

> **Note 8:** Steam is enabled only after the bath level is within about 1.5 inches (4 cm) of the configured low level. This helps prevent injecting steam into an empty cylinder.

Display or Action	Explanation
`LL 06`	Six inches.
`LL 11`	11 inches or centimeters.

3.1.5.5.7.2. Metered Water—If this machine is equipped with a flow meter on the incoming water line, bath levels are programmed in units of weight or volume (pounds, kilograms, gallons, etc.) rather than units of depth (inches or centimeters). Program the amount of water in the same units that you used when you configured the *Counts per 100* value described in Section 3.1.9.3 "Standard Configure Decisions".

Display or Action	Explanation
`LLLL 0650`	This bath requires 650 units of water.

3.1.5.5.8. Steam—If this machine is equipped with and configured for steam injection (configure decision *H = 1, 2, or 3*), you have several options available for steaming. These options are summarized in Table 9 and explained below the table.

Table 9: Steam Codes

Steam Code	Early	After	Timer
0	No steam in this step		
1	No	Yes	Runs
2	No	No	Stops
3	No	Yes	Stops
4	Yes	Yes	Runs
5	Yes	No	Stops
6	Yes	Yes	Stops

- The *Early* field defines when steaming should begin. Answer *Yes* to start steaming at the lowest safe level. Answer *No* if steaming should only begin after the commanded level is achieved. Usually, a "Start Steaming Early" code (4, 5, or 6) is used when the machine receives only cold water or when the hot water in the plant has a relatively low temperature. Use a *No* response if the machine has both hot and cold water valves and the commanded temperature is lower than the hot water temperature.
- The *After* field defines whether steam is allowed in this bath after temperature has been achieved once and subsequently fallen below the commanded temperature. Answer *No* to prevent injecting steam to return to the desired temperature after that temperature has been achieved and lost, or if chemicals or goods may be damaged by steam after a chemical injection (as in bleach baths). Answer *Yes* if temperature should be maintained for the full duration of the

bath step and goods or chemistry will not be adversely affected by the introduction of steam into the cylinder.

- The *Timer* field defines whether the timer runs or stops while steaming up to temperature. Answer *Stops* if you want the timer to stop counting the step time until the commanded temperature is first achieved. Answer *Runs* if you can accept some temperature fluctuations or if you're certain that the commanded temperature will be nearly achieved while filling. Use *Stops* if temperature must be achieved before adding chemicals. If you use *Runs* and the bath time expires before the desired temperature is achieved, the programmed chemicals will not be injected.

3.1.5.5.9. Programming a Chemical Injection—Five chemical injection signals are standard on all machines, with an additional 10 signals optionally available. Up to 10 chemical injections can be programmed in any bath step. The five decisions required for programming a chemical are available only if you enter *2* in the *Chem* field.

Display or Action	Explanation
`Chem 0`	No chemical desired in this step. The control advances to the decision for basket speed.
`Chem 1`	At least one chemical is already programmed for this step. The control advances to the decision for basket speed.
`Chem 2`	Add a chemical to this step, or change a current chemical injection. The control opens the chemical injection window to accept your chemical programming choices.

3.1.5.5.9.1. Chemical Number—The chemical number corresponds to the individual relay controlling the chemical injection device. Valid entries in this field are 00 for no chemical injection, 01-15 for chemicals, and 16 for actuating the operator signal without injecting any chemical.

Display or Action	Explanation
`CC 00`	No chemical injection. This is the default value of this field if no chemical is currently programmed. Enter *00* in this field to delete a chemical injection that was previously programmed, or to exit the chemical injection window. Deleting a chemical injection also deletes all following injections **in the same bath step**.
`CC 03`	Inject the chemical connected to chemical output 3.
`CC 16`	Sound the operator signal without injecting a chemical. This signal can alert the operator that a bath step is beginning, that level is achieved, or that level and temperature are achieved.

3.1.5.5.9.2. Chemical Name—Select the *chemical name* to appear on the normal operating screen while this chemical is injecting. There are 64 chemical names available to choose from, and all but selection *00* can be changed (see Section 3.1.8 “4 = Change Chemical Names”). Selection *00* displays “CHEMICAL” on the normal operating screen when this step is running. Selections *01* through *15* provide the most common descriptive names. Additional names in positions *16* through *64* are defaulted to “CHEM NAME xx” (where “xx” is the chemical name number) for you to change to any desired value.

The factory default value for each chemical name is listed in Table 10. The names available on your machine won't match this list if you've made changes.

Display or Action	Explanation
NN 00	Display “CHEMICAL” on the normal operating screen while this chemical is injecting. This value is automatically inserted by the controller when a new chemical injection is programmed.
NN 03	Display the name assigned to selection *03* while this chemical is injecting. This is “DETERGENT”if the default chemical names are used.

Table 10: Default Chemical Names

00	CHEMICAL		09	Sour
01	Alkali		10	Softener
02	Soap		11	Sour + S
03	Detergent		12	Starch
04	Soap + A		13	Anti-Mil
05	Deterg +		14	Anti-Bac
06	Chlorine		15	Finishing
07	Oxygen B		16 - 64	Chem Nam
08	Antichlo			

3.1.5.5.9.3. When to Inject—You can program chemical injections to occur at three different times in a step: while the machine is filling with water, when bath level is achieved, or when bath level and temperature are both achieved.

Display or Action	Explanation
W 0	Inject with fill. Choose this option to get the chemical into the bath as early as possible, allowing the maximum amount of time for the chemical to work. The programmed injection time begins when the step begins, whether the step timer is running or stopped. Choose another option if the goods might be damaged by exposure to the undiluted chemical. This may be the best option if your chemical supply system uses a manifold that thoroughly dilutes the chemical before injecting it into the machine.
W 1	Inject at level OK. Choose this option to inject the chemical only after the bath level has been achieved. This option is best for a chemical that might damage goods if it's injected without sufficient dilution, but that isn't likely to be neutralized if steam or hot water is injected after the chemical.
W 2	Inject at level and temperature OK. Choose this option to inject the chemical only after the desired level and temperature are achieved. This option allows the least amount of time for the chemical to work, but reduces the chance of damaged goods or neutralized chemicals.

3.1.5.5.9.4. Duration of Injection—Each chemical injection begins as specified in the *W* decision described above, and continues for the number of seconds programmed here. The minimum valid injection time is one second, and the maximum valid time is 127 seconds (2:07).

Whenever possible, avoid injection times at the extremes of the available range. Very short injection times make adjustment difficult (see caution statement **12**), and very long injection times may require much of the bath time to get the desired amount of chemical into the machine. Install pumps that are appropriately sized to deliver the required amount of chemical in a reasonable time, as determined by laundry management and your chemical supplier representative.

Display or Action	Explanation
SSS 001	One second, the minimum injection time. The chemical signal will be energized for one second, although an injection time this short should only be used to signal an auxiliary chemical supply controller (supplied by others), as described in Note 9.

> **Note 9:** Some chemical supply systems provided by others depend on the injection time from the washer-extractor control system only to determine what internal injection code to use. In systems of this type, the injection time programmed here may not be the actual number of seconds that the chemical is being injected. Contact your chemical supplier for more information.

CAUTION 12: Risk of Poor or Inconsistent Wash Quality—If the duration of each chemical injection is determined by the washer-extractor controller, chemical injections should always have a duration of at least 10 seconds. With shorter injection times, fine adjustments are not possible, and variations in response times will have an exaggerated effect on the quantity delivered.

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

W 025	Actuate the chemical signal for 25 seconds.
W 127	Actuate the chemical signal for 127 seconds, the maximum.

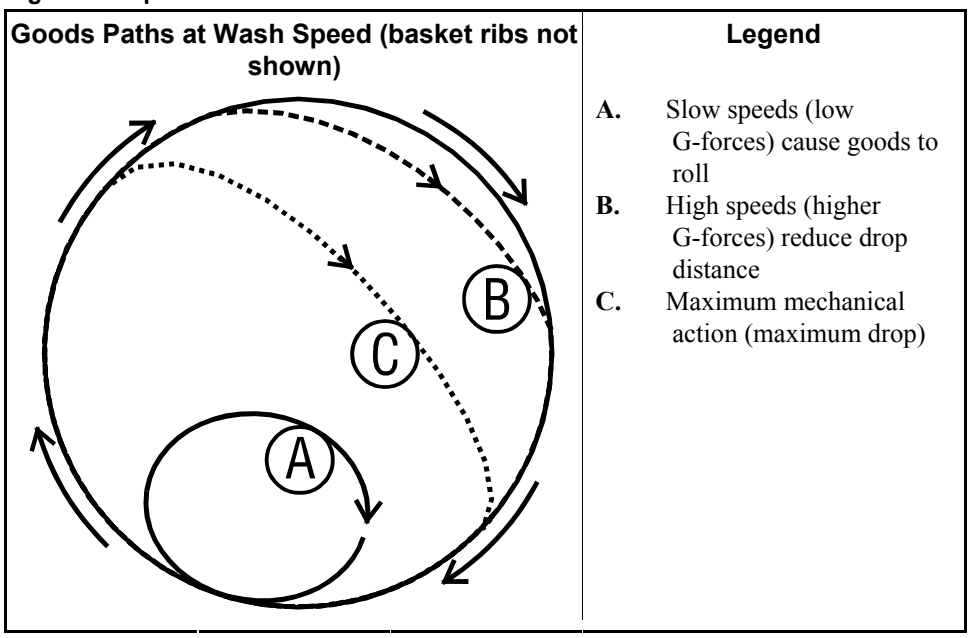
3.1.5.5.9.5. Signal before Injection?—Program a signal with a chemical injection if you want to call the machine operator to the machine before the injection begins. This feature is used if the operator should manually add a chemical to a step.

Display or Action	Explanation
Signal 0	No signal with this chemical. The chemical injection will appear on the normal operating display, but will occur without operator action.
Signal 1	Signal with this chemical. The chemical injection will appear on the normal operating display, but the bath timer stops and the chemical injection is delayed until the operator presses to end the signal.

3.1.5.5.10. Basket Speed—The basket speed determines the mechanical action of a wash step, or the extraction force of an extract step. If the machine is configured for programming in RPMs (configure decision *D = 1*), program the desired number revolutions per minute for this step. If the machine is configured for programming in G-forces (configure decision *D = 0*), program the desired number of G's.

Tip: Very low wash speeds (G-forces) may cause goods to roll along the bottom of the basket, virtually eliminating the “lift and drop” component of mechanical action. Figure 29 illustrates the effects of wash speed on mechanical action. High wash speeds (approaching 1 G-force) also tend to reduce mechanical action on the goods by reducing the distance the goods fall. To maximize mechanical action, program a wash speed or G-force that drops the goods from near the top of the basket to near the bottom. The best way to determine this value is usually through observation with the goods type and average load weight that you will process most often.

Figure 29: Speed Relation to Mechanical Action



Display or Action	Explanation
`RPMs 25`	Depending on machine model, the minimum valid speed for a non-soak wash step (*T = 1 or 2*) ranges from 5 to 25 RPMs.
`RPMs 32`	Depending on machine model, the maximum valid speed for a non-soak wash step (*T = 1 or 2*) ranges from 32 to 43 RPMs.
`RPMs 200`	Depending on machine model, the minimum valid speed for an extract step (*T = 4 through 7*) ranges from 200 to 240 RPMs.
`RPMs 558`	Depending on machine model, the maximum valid speed for an extract step (*T = 4 through 7*) ranges from 558 to 835 RPMs. Speed ranges for various basket diameters are shown in the related table in document BICWFT03.
`G's 60`	For a 68036F_N model machine, the minimum valid G-force for a non-soak wash step (*T = 1 or 2*) is 0.60 G's. Program as 6 0.
`G's 99`	For a 68036F_N model machine, the maximum valid G-force for a non-soak wash step (*T = 1 or 2*) is 0.99 G's. Program as 9 9.
`G's 040`	For a 68036F_N model machine, the minimum valid G-force for an extract step (*T = 4 through 7*) is 040 G's. Program as 0 4 0.
`G's 300`	For a 68036F_N model machine, the maximum valid G-force for an extract step (*T = 4 through 7*) is 300 G's. Program as 3 0 0.

Table 11: RPMs and G-forces for 68-inch Basket Diameter

Wash Speeds					
RPMs	G-force	RPMs	G-forces	RPMs	G-forces
25	0.6	28	0.76	31	0.93
26	0.66	29	0.82	32	0.99
27	0.71	30	0.87		
Sample Extract Speeds					
RPMs	G-force	RPMs	G-forces	RPMs	G-forces
204	40	381	140	499	240
252	60	408	160	520	260
288	80	432	180	539	280
322	100	456	200	558	300
353	120	478	220		

Supplement 4

More about Programming Basket Speed

The Mark VI controller allows you to program all basket speeds for all formulas in RPMs or G-forces (G's). Formulas programmed in G's will provide the same mechanical action and extraction forces if the formula is copied to a machine with a different basket diameter. Because basket radius is a factor in converting RPMs to G's, a machine with a smaller basket radius requires more RPMs to achieve the same G-force as a machine with a larger basket radius.

If you program a 250-G extract in a 68036F5N model machine (basket diameter is 68 inches), you can copy the formula to a 48040F7W machine (basket diameter is 48 inches) and get the same extract force, but the basket speeds will differ by about 100 revolutions per minute. The controller automatically adjusts the basket speed to achieve the same extract force. Use the equation below to convert RPMs to G-forces.

$$G = (S^2 \times D) / 70471$$

Where:
G = G-forces
S = Basket speed in revolutions per minute
D = Basket diameter

3.1.5.5.11. Actions during Filling and Draining—This decision allows you to control the basket motion during the fill and drain portions of the step.

Table 12: Fill and Drain Actions

Value	Action while Filling	Action while Draining
0	Standard	Standard
1	Standard	2-way Wash
2	Standard	Don't Drain
3	Standard	Stopped
4	Stopped	Standard
5	Stopped	Stopped
6	Stopped	Don't Drain

Display or Action	Explanation
D 0	Use the standard fill action while filling the machine, and use the standard drain action while draining.
D 3	Use the standard fill action while filling the machine, and hold the basket stationary while draining.
D 6	Hold the basket stationary while filling, and retain the bath liquor in the cylinder for the next step.

Standard—available while filling and while draining. The standard **fill** action is defined by the value you entered in Section 3.1.5.5.2 "Type of Step". The standard **drain** action is clockwise rotation at approximately one G-force. The actual speed of the basket in RPMs varies according to the basket diameter.

Stopped—available while filling and while draining. The basket is stationary. This selection is most often used with delicate and specially treated goods which might be damaged if they rub together with little or no water in the cylinder.

2-way Wash—available while draining. The basket turns in both directions at the wash speed programmed for the step. The values programmed for the rotational and dwell periods for this step are used.

Don't Drain—available while draining. The drain valve remains closed when the step timer expires, so the bath liquor is retained for the next step. This action is often used when programming a bath longer than 63 minutes, 45 seconds or to stage chemical injections throughout a long bath time. Program as many bath steps as necessary to achieve the desired time. By using either 2 or 6 for the value here, the water and chemicals are retained.

3.1.5.5.12. Drain to Reuse Tank?—This decision appears only if your machine is equipped with an optional second (reuse) drain valve. This option allows you to drain most of the bath liquor from selected bath steps into a tank so you can reuse it later.

> **Note 10:** Machines equipped with two drain valves drain to the sewer during all extract steps. The reuse drain is commanded open while the machine is in drain speed to retain most of the bath liquor in the reuse tank. To prevent excess lint in the reuse tank, the reuse drain closes and the sewer drain opens when an extract step begins.

Display or Action	Explanation
R 0	Drain to sewer. The bath liquor is not retained.
R 1	Drain to a user-supplied reuse tank. The reuse drain valve opens at the end of this bath step and remains open until the drain sequence ends. At the end of the drain sequence, the reuse drain closes and the sewer drain opens. The sewer drain remains open through the extract step to prevent sending excess lint to the reuse tank.

3.1.5.5.13. Basket Rotation and Dwell Duration—These two decisions apply only to two-way (reversing) bath steps (*T = 2*). During a two-way bath step, the motor turns the basket clockwise for the number of seconds programmed in *XXX*, then stops (dwells) for the number of seconds programmed in *YYY*. When the dwell time ends, the motor starts again in the opposite direction.

Display or Action	Explanation
XXX 020	motor run time in seconds. The range for this decision is five seconds to 999 seconds (*005* to *999*).
YYY 003	motor stop time in seconds. The range for this decision is three seconds to 254 seconds (*003* to *254*).

3.1.5.5.14. How Should the Formula End?—This decision determines what the machine does after the last step in the formula ends. The most common choice for this decision is Finished (*E = 0*), which stops the basket. If you process goods that are very likely to remain plastered to the basket after extraction, one of the other choices may help loosen the goods.

Display or Action	Explanation
E 0	**Finished.**
	When the last step ends, the operator signal begins sounding and the motor stops, allowing the basket to coast. The display shows "Waiting to Discharge."
	silences the operator signal.
	accesses the manual menu
E 1	**Reversing.**
	When the last step ends, the operator signal sounds and the basket reverses at wash speed. The reversing cycle is 20 seconds in either direction with three seconds of dwell between directions. The display shows "Waiting to Discharge."
	stops the motor, silences the operator signal, and unlocks the door for unloading. This is the preferred action for a wash formula programmed to end with this code.
	stops the motor and silences the operator signal, but leaves the door locked.
E 2	**Drain speed.**
	When the last step ends, the operator signal begins sounding and the basket turns clockwise at drain speed. The display shows "Waiting to Discharge."
	stops the motor, silences the operator signal, and starts the 20 second safety delay timer. After 20 seconds for the machine to coast to a stop, the door unlocks for unloading. This is the preferred action for a wash formula programmed to end with this code.
	stops the motor and silences the operator signal, but leaves the door locked.
E 3	**Tumbling.**
	This selection allows you to open the door to remove some goods, then close the door and resume the tumbling action. When the last step ends, the operator signal sounds and the basket reverses at wash speed for two minutes with "Waiting to Unload" displayed.
	unlocks the door. The operator signal continues to sound until the door is **closed**. This is the preferred action for a wash formula programmed to end with this code.
	if the door is closed, tumbling resumes for another two minutes or until is pressed.

Display or Action	Explanation

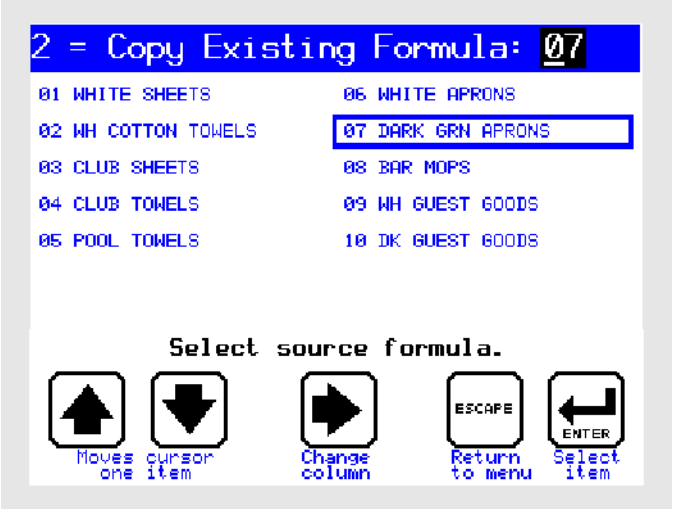
The two-minute tumbling timer resets and the basket resumes tumbling. If the timer expires without any operator action, the basket stops and the operator signal sounds. The operator signal will not sound again unless the timer expires.

stops the motor and silences the operator signal, but leaves the door locked. Tumbling will not resume.

3.1.6. 2 = Copy an Existing Formula [Document BICWFP03]

This menu selection guides you through the steps necessary to copy an existing formula (the **source** formula) to an unused formula number (the **destination** number). For example, to program a new wash formula similar to a formula already in the machine, you can use the screen shown in Figure 30 to copy the existing formula to the new formula number, then use the *Add or Change a Formula* menu selection (described in Section 3.1.5) to change the new formula to meet your specific needs.

Figure 30: *Copy Existing Formula* Screen



3.1.6.1. How to Navigate the *Copy Existing Formula* Screen

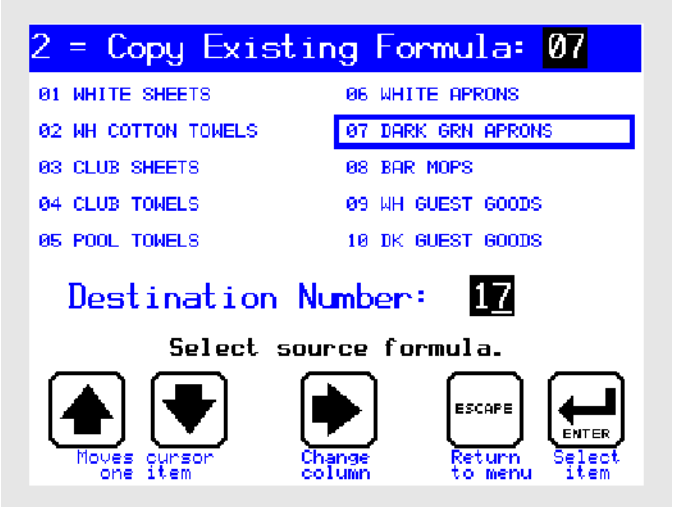
Display or Action	Explanation
Enter	Accepts the current value and advances the control to the next step in the copying process.
Escape	Cancels the current operation and backs up one step. Press this button again to return to the *Programming Menu* without copying a formula.
→	Toggles the selection box between the two columns of formula numbers.
↑ / ↓	Moves the selection box up or down in the current column.
0 7	Selects any valid formula number (formula *07* in this example) as the source formula or the destination formula. If you select a formula number that's not visible on the screen, the selected number moves to the top position of the left column and the next nine formula numbers are displayed.

Tip: A valid source formula number contains a programmed formula and is **not** *00* or *99*. A valid destination formula number is empty and is **not** *00* or *99*. Formulas 00 and 99 are reserved formulas and can't be copied, deleted, or changed.

3.1.6.2. Example of Copying an Existing Formula

Display or Action	Explanation
0 7	Example: select formula *07* as the source formula. On the *Copy an Existing Formula* screen, select the source formula. The source formula must be previously programmed, and it can't be *00* or *99*. Programmed formulas usually have a formula name beside the formula number.
Tip:	You can also select any formula number that's visible on the screen by using ↑, ↓, and → as described in Section 3.1.6.1 "How to Navigate the *Copy Existing Formula* Screen".
Enter	Confirm that the selected formula number is the source formula you want to use. The control prompts for the destination formula number, as shown in Figure 31. If you try to select a source formula that has not been programmed yet, the controller briefly displays "ERROR: Source does not exist."

Figure 31: Prompt for Destination Formula Number



Display or Action	Explanation
1 7	Example: select formula number *17* as the destination. The selected number moves to the top position of the left column and the next nine formula numbers are displayed. The destination formula number must not contain a wash formula. Empty formula numbers never have a formula name associated with them.
Tip:	You can also select any formula number that's visible on the screen by using ↑, ↓, and → as described in Section 3.1.6.1 "How to Navigate the *Copy Existing Formula* Screen".
Enter	Confirm that the selected formula number is the destination formula you want to use and copy the source formula to the destination formula number. If you try to select a destination formula that has already been programmed, the controller briefly displays "ERROR: Destination already exists."

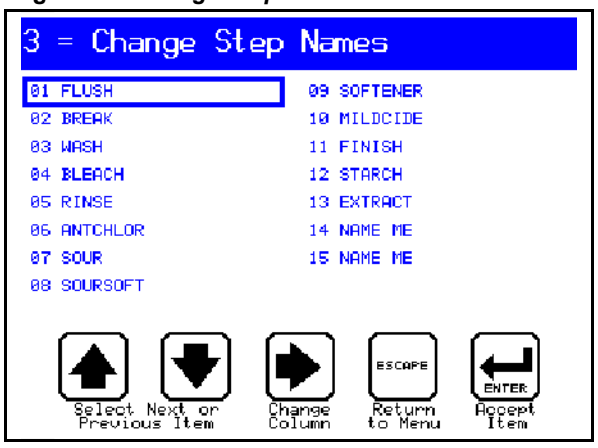
The controller displays the *Programming Menu* screen when it completes the copying operation. The new formula is named *Formula xx*, where *xx* is the destination formula number.

3.1.7. 3 = Change Step Names [Document BICWFP04]

This menu selection guides you through the process of changing any of the 15 editable step names that can be changed.

Note 11: *Step Name 00* is replaced by the step number when a step with this name is running. *Step Name 00* can't be changed.

Figure 32: *Change Step Names* screen



3.1.7.1. How to Navigate the *Change Step Names* Screen

Display or Action	Explanation
↓ / ↑	Moves the selection box down or up in the current column of the main *Change Step Names* screen.
→	Toggles the selection box between the two columns of step names on the main *Change Step Names* screen, or accept the current character and advance to the next one in the *New name* field of the *Change Selected Step Name* window.
Escape	Backs up one step: from the *Change Selected Step Name* window to the main *Change Step Names* screen, or from the *Change Step Names* screen to the *Programming Menu* screen.
Enter	Confirms the selected step name and opens the *Change Selected Step Name* window to change the step name, then confirms the new step name and closes the window after you've entered the new name.
0 - 9	The number and letter keys are valid only in the *New name* field of the *Change Selected Step Name* window. Press any number or letter key one or more times to change the character at the cursor position.
Tip:	Each key represents four characters, so press the 1 key two times to display the letter "B."

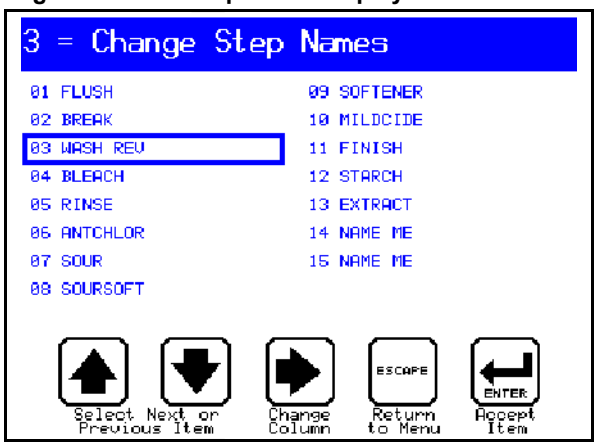
3.1.7.2. An Example of Changing a Step Name

Display or Action	Explanation
↓ ↓	Places the selection box on the third step name in the left column, "WASH."
Enter	Confirms that you want to change the selected step name and opens the *Change Selected Step Name* window, as shown in Figure 33.

Figure 33: *Change Selected Step Name* Window

Display or Action	Explanation
→ → →	Advances the cursor four characters to the right in the *New name* field without making any changes.
0	Puts a blank space (the second character on the "0" key) in the fifth position of the *New name* field.
→	Advances the cursor to the next position of the *New name* field.
6 6 6	Puts an "R" in the sixth position.
→	Advances the cursor to the next position of the *New name* field.
2 2	Puts an "E" in the seventh position.
→	Advances the cursor to the next position of the *New name* field.
8	Puts a "V" in the eighth position.
Enter	Confirms that you've entered the new name you want, writes the new name to memory, and displays the main *Change Step Names* screen for additional changes. Figure 34 shows the results of this sequence.

Figure 34: New Step Name Displayed

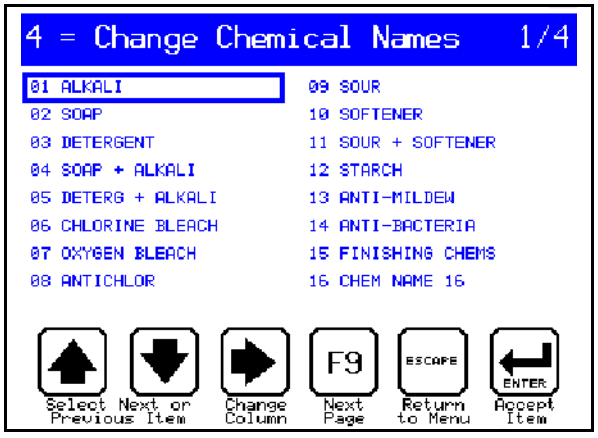


3.1.8. 4 = Change Chemical Names [Document BICWFP05]

This menu selection guides you through the process of changing any of the 63 chemical names that can be changed.

Note 12: *Chemical Name 00* is defined as "CHEMICAL" and can not be changed.

Figure 35: *Change Chemical Names* screen



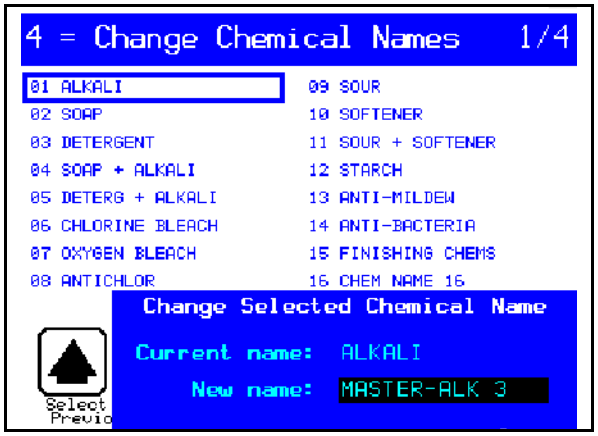
3.1.8.1. How to Navigate the *Change Chemical Names* Screen

Display or Action	Explanation
↑ / ↓	Moves the selection box down or up in the current column of the current *Change Chemical Names* screen.
→	Toggles the selection box between the two columns of chemical names on the main *Change Chemical Names* screen, or accepts the current character and advances to the next one in the *New name* field of the *Change Selected Chemical Name* window.
F9	Advances through the four pages of available chemical names.
Escape	Backs up one step: from the *Change Selected Chemical Name* window to the main *Change Chemical Names* screen, or from the *Change Chemical Names* screen to the *Programming Menu* screen.
Enter	Confirms the selected chemical name and opens the *Change Selected Chemical Name* window to change the chemical name, then confirms the new chemical name and closes the window after you've entered the new name.
0 - 9	The number and letter keys are valid only in the *New name* field of the *Change Selected Chemical Name* window. Press any number or letter key one or more times to change the character at the cursor position.
Tip:	Each key represents four characters, so press the 1 key two times to display the letter "B."

3.1.8.2. An Example of Changing a Chemical Name

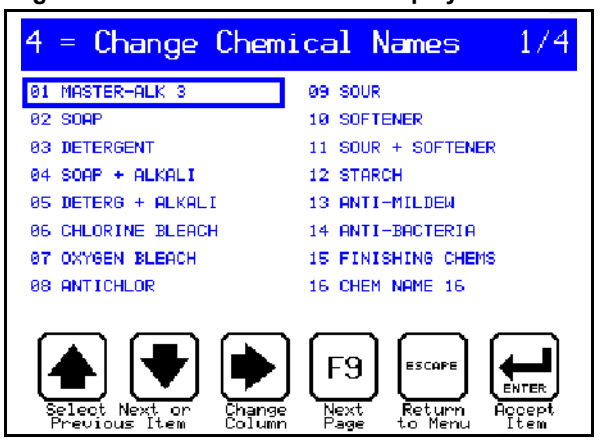
Display or Action	Explanation
Enter	Confirms that you want to change the selected step name and opens the *Change Selected Chemical Name* window, as shown in Figure 36.

Figure 36: Change Selected Chemical Name Window



Display or Action	Explanation
5	Changes the first character in the *New name* field from “A” to “M” (the first character on the “5” key).
1	Puts a blank space (the second character on the “0” key) in the fifth position of the *New name* field.
F9	Advances the cursor to the next position of the *New name* field.
6 6 6	Puts an “R” in the sixth position.
F9	Advances the cursor to the next position of the *New name* field.
2 2	Puts an “E” in the seventh position.
F9	Advances the cursor to the next position of the *New name* field.
8	Puts a “V” in the eighth position.
Enter	Confirms that you've entered the new name you want, writes the new name to memory, and displays the main *Change Chemical Names* screen for additional changes. Figure 37 shows the results of this sequence.

Figure 37: New Chemical Name Displayed

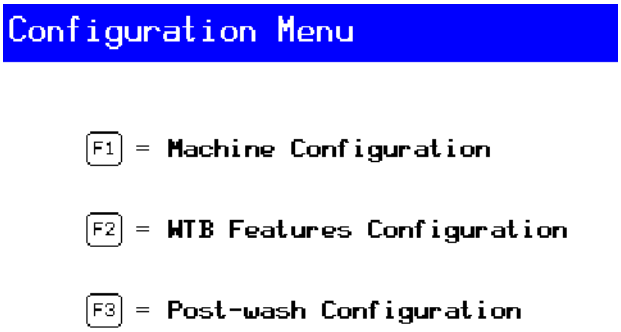


3.1.9. How to Configure the Mark VI Controller [Document BICWFC01]

The Milnor® Mark VI controller is designed to operate several machine models, each with multiple options and user preferences. The *Configuration* menu (Figure 39) displays all the configure decisions for this machine. This document describes how to use the configuration screen to tell the controller what type of machine it's operating, what options are on the machine, and what your preferences are.

From the *Programming* menu, the controller displays the *Configuration* menu (Figure 38).

Figure 38: *Configuration* Menu



Display or Action	Explanation
F1	Configure the standard features of the machine as described in Section 3.1.9.3 "Standard Configure Decisions". The standard machine configuration describes the machine completely except the features specific to WTB models. WTB models load and discharge automatically.
F2	Configure the WTB features of the machine, including the discharge sequence and elbow operation. These decisions, described in Section 3.1.9.5 "Configure WTB Operation", apply to WTB models only.
F3	Configure the post-wash decisions (dryer formula and destination code) for each wash formula. These decisions are described in Section 3.1.9.6 "Configure Post-wash Codes for Each Wash Formula".

3.1.9.1. **When is Configuring Required?**—Your machine was configured when it was tested at the factory, but you should verify that all decisions match your hardware and preferences before putting the machine in service. When the factory configured your machine, we attached a metal *configure nameplate* stamped with the required values for all hardware-dependent decisions. The machine should always be configured to match the values on this nameplate unless additional equipment is added to the machine. You should also write all configuration values, including your user preferences, in the *Setting* column of Table 13 "Quick Reference to Configure Decisions".

After you verify that all configure decisions match the hardware on the machine or your preferences, you will only need to use this screen if you change your preferences, the processor board in the machine, or modify the hardware on the machine.

Table 13: Quick Reference to Configure Decisions

Configure Decision				Configure Decision			
	User- or Hardware-dependent	Setting	Description		User- or Hardware-dependent	Setting	Description
A	User		Temperature Units	N	Hardware		Flow meters
B	User		Language	O	—	—	reserved
C	Hardware		Machine Type	P	Hardware		Feedback Speed Control
D	User		Program RPMs?	Q	Hardware		Recirculation
E	—	—	reserved	R	—	—	reserved
F	—	—	reserved	S	Hardware		AmpSaver Option
G	Hardware		Drain Code	T	Hardware		Temperature Probes
H	Both		Steam Error	U	—	—	reserved
I	User		Fill Error	V	—	—	reserved
J	Both		Cooldown Error	W	—	—	reserved
K	Hardware		Water Option	X	User		Manual Password
L	Hardware		Reuse Option	Y	—	—	reserved
M	Hardware		Overhead Tank	Z	—	—	reserved

(Manual Password): * * * *	Mildata Batch Codes
Number of Chemical Valves:	Formula:
Machine Name:	Work Order:
Simulator Version:	Goods Code:
Drain Washout Time:	Customer Code:
Mildata: Address:	Employee Code:
Bath Levels	Weight:
Low:	Pieces:
Medium:	Lot Number:
High:	Liquor Ratio
Wet-down	Counts per 100:
Bath Level Offset:	Offset Valve Time:
Jog Speed (RPMs):	
AutoSpot Speed:	
Programmable Outputs:	

3.1.9.2. How to Navigate on the Configure Screens—We designed the *configuration screens* on the Mark VI controller to make configuring the machine a simple process. A flashing cursor indicates the current character, and the cursor advances automatically when a valid key is pressed in most decisions. All navigation commands are described below.

Note 13: When the *Configure* screen is visible, you must advance through all decisions to exit.

Display or Action **Explanation**

For all configuration decisions except *Machine Name*, entering a valid character in the last position accepts the complete value and advances to the next decision.

Accepts the displayed value and advances to the next decision.

For multi-character fields (e.g., *Machine Name*), accepts the displayed character and advances to the next character. For single-character fields, accepts the displayed value and advances to the next decision.

Moves the cursor to the previous decision.

Moves the cursor to the next decision.

The controller automatically exits the *configuration screen* and returns to the *Programming Menu* when you accept the last configure decision required for your machine.

3.1.9.3. Standard Configure Decisions

Figure 39: Main Configuration Screen

Display or Action	Explanation
A B C D E F ... 0 0 6 1 * * ...	**Temperature units**; user can choose *Configure decision A* determines whether bath liquor temperatures are displayed in degrees Fahrenheit or degrees Celsius and whether bath levels are displayed in inches or centimeters. This decision also determines the format used when the controller prompts for the current date and time at power-up and when accumulated data is printed. 0 = Fahrenheit degrees, inches, and MM/DD/YYYY 1 = Celsius degrees, centimeters, and DD/MM/YYYY
A B C D E F ... 0 0 6 1 * * ...	**Language** for display prompts, messages, and printed reports; user can choose *Configure decision B* determines the language used to display prompts and status messages on the screen. All machines are provided with English and one alternate language. The alternate language is specified when the machine is ordered. 0 = English 1 = alternate language
A B C D E F ... 0 0 6 1 * * ...	**Machine type**; must match machine hardware *Configure decision C* informs the controller which of several machine models it's controlling. This information determines several aspects of machine operation, including maximum and minimum basket speeds, power-up delay time, coast time after extract, etc.
Tip:	This decision is not used on some machines.
... B C D E F G ... ... 0 6 1 * * 2 ...	**G's or RPMs** used to express basket rotation speed; user can choose *Configure decision D* determines whether you're allowed to program basket speeds in G's (gravitational units) or in RPMs (revolutions per minute). In certain cases, formulas programmed in G's can be transferred without modification to other compatible machine models. 0 = G's 1 = RPMs
... C D E F G H ... ... 8 * * * 2 1 ...	*Configure decision E* is not used on this machine model, but is reserved.
... D E F G H I ... ... * * * 2 1 0 ...	*Configure decision F* is not used on this machine model, but is reserved.

Display or Action **Explanation**

CAUTION 13: Machine damage hazard—Configuring an insufficient drain time or extract delay time causes increased wear on the drive motor and belt, and causes the inverter to generate excess heat.

```
... E F G H I J ...
... * * 2 1 0 1 ...
```

Drain code; must match machine hardware

Configure decision G determines the time the machine operates in drain speed between a bath step and another bath, or between a bath step and an extract step. These values are calculated by Milnor using the basket dimensions and other factors. You can configure either or both of these times to be **greater** than the factory setting for your machine, but never use an option with a shorter time for either value.

0 = 30 seconds before a bath step, 30 seconds before an extract step

1 = 45 seconds before a bath step, 45 seconds before an extract step

2 = 60 seconds before a bath step, 60 seconds before an extract step

3 = 75 seconds before a bath step, 75 seconds before an extract step

4 = 90 seconds before a bath step, 90 seconds before an extract step

5 = 90 seconds before a bath step, 120 seconds before an extract step

6 = 30 seconds before a bath step, 60 seconds before an extract step

```
... F G H I J K ...
... * 2 1 0 1 2 ...
```

Steam error; must match machine hardware, but can be adjusted to user preference.

If the machine is equipped with steam, *Configure decision H* allows you to set a maximum time to achieve the temperature programmed in a wash formula. If the programmed temperature isn't achieved before this time expires, the operator signal sounds and the controller displays an error message.

0 = no steam (disables the steam valve output and signal). This selection is required for machines not equiped with steam valves.

1 = 5 minutes

2 = 10 minutes

3 = 50 minutes

Display or Action	Explanation
Tip:	To determine the optimum setting for this decision, program a calibration formula. The calibration formula for this decision should include a cold-only fill to the highest level and temperature used in any formula. Use a stopwatch to determine how much time is required to achieve temperature in this bath, and set *configure decision H* as close to this time as possible.
`... G H I J K L ...` `... 2 1 0 1 2 1 ...`	**Fill error**; user can choose *Configure decision I* allows you to set a maximum time to achieve the level programmed in a wash formula. If the programmed level isn't achieved before this time expires, the operator signal sounds and the controller displays an error message. 0 = 3 minutes 1 = 5 minutes 2 = 10 minutes 3 = 50 minutes
`... H I J K L M ...` `... 1 0 1 2 1 0 ...`	**Cooldown error**; must match machine hardware If the machine is equipped with cooldown, *Configure decision J* allows you to set a maximum time to achieve the cooldown temperature programmed in a wash formula. If the programmed temperature isn't achieved before this time expires, the operator signal sounds and the controller displays an error message. 0 = no cooldown (disables the cooldown output and signal). This selection is required for machines not equipped with the devices required for cooldown. 1 = 5 minutes 2 = 10 minutes 3 = 50 minutes
`... I J K L M N ...` `... 0 1 2 1 0 0 ...`	**Water option**; must match machine hardware *Configure decision K* determines which water supply lines are present at the machine. Most machines in the United States use hot and cold water. Most machines in Europe use cold and second water. The third water valve is usually a source of reuse water, such as retained rinse water from previous batches or water extracted by other devices. 0 = Hot + Cold 1 = Cold + 2nd 2 = Hot + Cold + 3rd 3 = Cold + 2nd + 3rd

Display or Action	Explanation
`... J K L M N O ...` `... 1 2 1 0 0 * ...`	**Reuse option**; must match machine hardware *Configure decision L* specifies which drain valves and drain valve outputs are present on the machine. The second drain valve empties into a reuse tank. This relatively clean water may be used again in processing other goods. 0 = No; the machine is equipped with one drain valve and one output 1 = Yes; the machine is equipped with two drain valves and two outputs
`... K L M N O P ...` `... 2 1 0 0 * 1 ...`	**Overhead tank** option; must match machine hardware *Configure decision M* specifies that the machine is equipped with an overhead tank and a recirculation pump. This option uses three standard outputs to control bath liquor flow between the overhead tank and the cylinder, and to circulate the bath liquor out through the drain and back into the cylinder (through the door on most models). 0 = No, the machine is not equipped with an overhead tank. 1 = Yes, the machine is equipped with an overhead tank and recirculation pump.
`... L M N O P Q ...` `... 1 0 0 * 1 0 ...`	**Flow meter** option; must match machine hardware *Configure decision N* specifies whether the machine uses a flow meter to measure the incoming water, and if so, whether the controller should adjust the amount of water in proportion to the batch weight the operator entered when he loaded the machine. If your machine is equipped with a flow meter and configured to use it, the controller prompts for units of water (gallons, liters, etc.) per step when programming a wash formula, or the controller calculates the amount of water according to the nominal and actual batch weights entered during programming and operation. 0 = No flow meters; bath levels are programmed in inches or centimeters and monitored through an electronic pressure transducer. 1 = Metered water; the machine uses a flow meter to determine the amount of water admitted to the cylinder. Bath levels are programmed in units (gallons, liters, pounds, etc.) per formula step. 2 = Liquor ratio; the controller uses the flow meter to determine the amount of water admitted to the cylinder, and adjusts the amount in proportion to the weight of the current batch to maintain the ratio of water to goods that was programmed for each formula step.

Display or Action	Explanation
`... M N O P Q R ...` `... 0 0 * 1 0 * ...`	*Configure decision O* is not used on this machine model, but is reserved.
`... N O P Q R S ...` `... 0 * 1 0 * 0 ...`	**Feedback speed control** enabled; must match machine hardware *Configure decision P* specifies whether the machine is equipped with the devices necessary to monitor and adjust basket speed to achieve a specific value. Feedback speed control requires a *high speed input/output board* at the first logical address. This configure decision allows you to temporarily operate the machine with a *standard input/output board* in place of the high speed board. If feedback speed control is disabled (P=0), the controller is not able to adjust the actual wash speed after it sends the speed command to the inverter. 0 = No 1 = Yes
`... O P Q R S T ...` `... * 1 0 * 0 1 ...`	**Recirculation** option; must match machine hardware *Configure decision Q* specifies that the machine is equipped with a recirculation pump and additional piping to circulate the bath liquor. *Recirculation* is required (Q=1) if the machine is equipped with an *overhead tank* (M=1). 0 = No 1 = Yes
`... P Q R S T U ...` `... 1 0 * 0 1 1 ...`	*Configure decision R* is not used on this machine model, but is reserved.
`... Q R S T U V ...` `... 0 * 0 1 1 * ...`	**AmpSaver** controller option; must match machine hardware The AmpSaver® controller is a Milnor controller which monitors the total amperage drawn by a bank of washer-extractors and prevents total draw from exceeding a preset maximum by postponing extract steps. If several machines in a group are drawing nearly the maximum allowable amperage when another machine in the group desires to begin an extract step, that machine will not be allowed to extract until the total amperage draw is below a preset threshold. Contact the Milnor factory for more information about the AmpSaver controller and its applications. 0 = No; machine is not part of an AmpSaver system 1 = Yes; machine is part of an AmpSaver system
`... R S T U V W ...` `... * 0 1 * * * ...`	**Temperature probes**; must match machine hardware. At least one temperature probe must be configured if the machine is equipped with and configured for steam.

Display or Action	Explanation
	Temperature probes provide information about bath temperature to the machine controller. The controller uses this information to turn steam and water valves on and off as necessary, as well as to control any other function that depends on the bath temperature. 0 = No temperature probe; modulating water and steam are not available on this machine. 1 = One temperature probe, usually in the machine's drain sump 2 = Two temperature probes. Machines with two temperature probes monitor one probe to control steaming and the other probe to control water valves. This configuration may help control temperature within a very narrow target range.
... **S T U V W X** ... ... 0 1 * * * 0 ...	*Configure decision U* is not used on this machine model, but is reserved.
... **T U V W X Y** ... ... 1 1 * * 0 * ...	*Configure decision V* is not used on this machine model, but is reserved.
... **U V W X Y Z** ... 1 * * 0 * *	*Configure decision W* is not used on this machine model, but is reserved.
... **U V W X Y Z** ... 1 * * 0 * *	**Manual password** required; user can choose The manual password can be required to prevent unauthorized personnel from making manual changes to a formula while it's running. Enable this option (X=1) and define a manual password (see below) if machine operators might cancel certain steps or otherwise modify a formula in progress. 0 = No; do not require a manual password to change a running formula. 1 = Yes; require the operator to enter a password before manually changing a running formula.
... **U V W X Y Z** ... 1 * * 0 * *	*Configure decision Y* is not used on this machine model, but is reserved.
... **U V W X Y Z** ... 1 * * 0 * *	*Configure decision Z* is not used on this machine model, but is reserved.
Manual Password: 0928	Set manual password; user can choose. You can enter this field only when *configure decision X* (Manual Password) is *1* (Yes). Enter any four numeric digits. The operator will be required to enter this password before making manual modifications to a running formula.

Tip: The manual password, if used, is visible on the configure screen. To protect the security offered by this password, never leave the programming key in the keyswitch of an unattended machine.

Display or Action	Explanation
`Number of Chemical Valves: 05`	range is 00 to 15 and depends on hardware; user can choose to connect up to 15 chemical injection devices to the machine. Five chemical output signals are standard; an additional 10 signals are available if the machine is equipped with an optional second 24-output board. How many chemical signals will this machine control? These signals may control peristaltic pump systems (supplied by others), or optional chemical valves or a *flushing supply injector* on the machine. **Note 14:** Do not include the *manifold flush valve* when counting the number of chemical valves.
`Machine Name: 68036F5N NO 1`	user can choose up to 20 characters to identify this machine on printed reports. Reports are described more completely in Section 3.1.12 "8 = Print Data".
`Simulator Version: 0`	A properly authorized user can choose whether this controller operates a real machine or simulates a machine for programming and employee training. A simulator will not operate the machine or turn on any outputs, but can print reports and communicate with a *serial data download device* (see Section 3.1.10 "6 = Memory Transfer"). 0 = No; controller is part of a complete washer-extractor and operates the machine. This setting is required for the machine to operate. 1 = Yes; the controller is used for training and to develop wash formulas, but **will not operate a machine**. This setting disables communication with peripheral devices (inputs and outputs) and enables certain keystrokes to allow you to simulate changes in level and temperature without operating any valves. It also reassigns the speed switch input and disables the brake fault and bearing pressure fault inputs to allow the machine to simulate running a formula without running the motor.
`Drain Washout Time: 20`	How many seconds should the cold water valve open to flush dry soil out of the drain after a no-water bath? The controller always uses the **shorter** of this value or the *Bath* value you chose in *configure decision G* (Drain code). This value is used when a no-water bath is programmed to shake loose soil out of the goods (dust control goods, etc.) and the bath is programmed to drain as if water had been used. When the drain opens at the end of the step, the cold water valve also opens to flush the dry soil out of the machine. 00 = 0 seconds; minimum valid time 20 = 20 seconds (example) 45 = 45 seconds; maximum valid time

Display or Action	Explanation
`Mildata: 1`	Is this machine part of a Mildata® computer network? The Mildata computer network provides tools for monitoring multiple machines, compiling reports, and programming machines from a central location. 0 = No; this machine is not connected to a Mildata network. 1 = Yes, this machine communicates with a Mildata network.
`Address: 215`	What is the address for this machine on the Mildata network? Each washer-extractor or other device connected to the Mildata network must have a unique *address* on the network. This address identifies the specific machine to the Online Communicator and the Milnor Machine Programmer modules on the Mildata computer. All three components (washer-extractor, Online Communicator, and Machine Programmer) must use the same address. 000 = minimum value for Mildata address 011 = example 255 = maximum value for Mildata address

Display or Action	Explanation
`Bath Levels:`	Configured bath levels can have different uses between machines that are equipped with a flow meter and those that are not. Understand the application of each bath level to your machine before making any changes. Also, verify that the setting for *configure decision N* (Flow meter) corresponds to whether or not your machine is equipped with a flow meter. Low level: minimum 4 inches (10 cm), maximum 6 inches (15 cm) Medium level: minimum 6 inches (15 cm), maximum 10 inches (25 cm) High level: minimum 10 inches (25 cm), maximum 30 inches (75 cm) Wet-down level: minimum 0 inches (0 cm), maximum 38 inches (99 cm)
`Low`	range is 4 to 10 inches (10 to 15 cm); user can choose any value in this range, regardless of machine model. This value is not used if the machine is equipped with a flow meter, that is if *configure decision N* (Flow meter) is *1* (Metered water). If your machine is **not** equipped with a flow meter (if *configure decision N* = 0), this is the lowest programmable level for any bath step. Also, steaming on non-flow meter machines is allowed only after the bath level is within 4 cm (about 1.5 inches) of the level configured here.

Display or Action	Explanation
`Medium`	range is 6 to 10 inches (15 to 25 cm); user can choose any value in this range above the configured *low level*, regardless of machine model. This value is not used if the machine is equipped with a flow meter. If your machine is **not** equipped with a flow meter (if *configure decision N* = 0), this is the minimum level required in any bath step followed by an extract step.
`High`	range is 10 to 30 inches (25 to 75 cm); user can choose any value in this range above the configured *medium level*, regardless of machine model. If your machine is equipped with a flow meter, this value is used to modulate the bath level during a cooldown step, and to stop the machine from overfilling if the flow meter fails. If your machine is not equipped with a flow meter, this value is used to modulate the bath level during a cooldown step and as the upper limit for level in any bath step.
`Wet-down`	range is 0 to 38 inches (0 to 99 cm); user can choose any value in this range, regardless of machine model. This is the maximum level the machine will achieve while tilted to the loading position.

Tip: The machine may be easier to load and achieve the desired level faster if *wet-down level* is configured so the actual bath level when the machine is tilted approximates the lowest expected bath level in the first bath step of any wash formula.

Tip: On some models, it is possible to configure a wet-down level high enough that water will spill onto the floor if you return the machine to the normal wash position while the door is open.

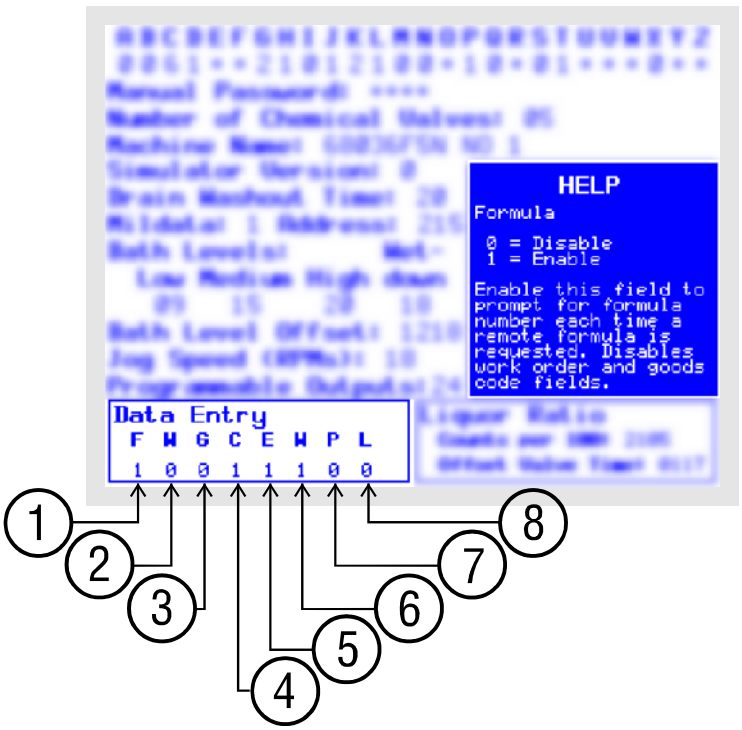
Display or Action	Explanation
`Bath Level Offset:` `1218`	How much water is required to fill the machine exactly to the bottom of the basket farthest from the door? The range is 0001 to 4094 to add more water, and 5001 to 9094 to add less water. **Do not enter values from 4095 to 4999 or greater than 9094.** The pressure transducer measures air pressure created in a tube which attaches to (taps into) the drain sump. Because of the pressure transducer tap location and electronic manufacturing tolerances, an offset in either direction may be required to calibrate the transducer to the machine. The value entered here is dependent on many factors, including manufacturing tolerances of the pressure transducer and other components. If the pressure transducer or another component of the water level system is replaced, calibrate the transducer (see Section 4.3.1 "How to Calibrate the Transducer using the *Bath Level Offset*") to establish the new value.

Display or Action	Explanation
	0001 to 4094 **increases** the actual level of water in the cylinder for any given indicated level. 5001 to 9094 **decreases** the actual level of water in the cylinder for any given indicated level
`Jog Speed (RPMs): 18`	Enter the speed the basket should turn when manual jogging is used to unload goods. This decision is replaced by *AutoSpot Speed* on StaphGuard models. You can manually jog the basket in either rotational direction to help unload goods after processing. For the operator's safety, the manual jog procedure requires that the operator use two hands on the controls. 05 = minimum value 18 = typical value (example) 40 = maximum value
`Programmable Outputs:20`	number of programmable outputs available on this machine; must match machine hardware Programmable outputs are optional output relays that are operated by the machine controller according to rules defined through the *Assign Outputs* menu. See Section 3.1.13 "9 = Assign Outputs" for a detailed description of how to define the operation of these outputs. 0 = minimum 20 = maximum

3.1.9.3.1. *Mildata Batch Codes* Decisions—*Mildata batch codes* are used only if this machine is part of a Mildata network. When the operator selects a formula at a machine on the Mildata network, the Mark VI controller prompts for data in each field that's enabled here. Each column in the batch codes area of this screen represents a particular piece of data for all wash formulas. Enter *1* in the fields you want to enable and *0* in the fields you want to skip.

Figure 40: Mildata Batch Codes Decisions

Detail of Configure Screen



Legend

1. Formula number
2. Work Order number
3. Goods Code number
4. Customer number
5. Employee number
6. Weight
7. Pieces
8. Lot number

Tip: Some combinations of fields cannot be used together, and others can only be used when you enable certain fields. These restrictions are described below. For example, you can't configure the machine to prompt for both a *formula* number and a *work order number*.

When the machine is loaded, the Mark VI machine controller will prompt for all enabled data fields. After the operator enters data in each available field and presses the *start button* (①), the machine controller sends all the data to the Mildata computer and requests the formula. If any data that the operator entered is invalid (if the employee code doesn't exist), the Mildata computer tells the machine controller which data must be corrected. The machine controller then displays a message that some data was invalid or not found. The machine runs the selected formula when all data fields contain valid information and all other requirements for safe operation are met.

Display or Action	Explanation
F W G C E W P L 1 0 0 0 0 0 0 0	**Formula number**; if you enable this field the controller disables the *work order* and *goods code* fields and will not allow you to change them. On the Mildata computer, each remote wash formula is assigned a number between 0001 and 1000.
F W G C E W P L 1 0 0 0 0 0 0 0	**Word order number**; this field can be enabled only if the *formula number* field is disabled.
F W G C E W P L 1 0 0 0 0 0 0 0	**Goods code**; this field can be enabled only if **both** *formula number* and *work order number* fields above are disabled.
F W G C E W P L 1 0 0 0 0 0 0 0	**Customer code**; this field can be enabled only if *work order number* above is disabled.
F W G C E W P L 1 0 0 0 0 0 0 0	**Employee code**; this field can be enabled in any combination of data entry codes to prompt the operator to enter an employee code. The employee code is validated only if the machine is communicating with the Mildata computer
F W G C E W P L 1 0 0 0 0 0 0 0	**Weight**; this field can be enabled in any combination of data entry codes to prompt the operator to enter a weight for the batch.
F W G C E W P L 1 0 0 0 0 0 0 0	**Pieces**; this field can be enabled in any combination of data entry codes to prompt the operator to enter the number of pieces in the batch.
F W G C E W P L 1 0 0 0 0 0 0 0	**Lot number**; this field can be enabled in any combination of data entry codes to prompt the operator to enter a lot number for the batch.

3.1.9.3.2. *Liquor Ratio* Decisions

Display or Action	Explanation
`Counts per 100:`	number of flow meter counts accumulated for 100 units of water; range is 0001 to 9999.
`Offset Valve Time:`	time, in tenths of seconds, to prevent overshooting the desired number of flow meter counts; range is 000 to 255. If the Mark VI controller commands the water valves to close when the flow meter reaches the desired number of counts, some additional water will be injected while the valve is closing. The *offset valve time* causes the valve to begin closing before the flow meter detects the programmed number of counts, stopping the flow of water before the desired level is exceeded.

3.1.9.4. How to Navigate on the *WTB Configuration* Page—A blinking character indicates the cursor position. The cursor advances automatically when a valid key is pressed in most decisions. All navigation commands are described below.

Display or Action	Explanation
or	Accepts the displayed value and advances to the next decision. Changes are not saved until you exit this page.
	For multicharacter fields, this keystroke accepts the displayed character and advances immediately to the next character.
	For multicharacter fields, this keystroke moves to the previous character.
	Moves to the previous decision.
	Abandons all changes made during this session and returns to the *Programming* menu.

3.1.9.5. Configure WTB Operation—The decisions described in Section 3.1.9.5.1 to Section 3.1.9.5.9 determine specific factors that apply only to WTB models. These decisions are not available on other models.

3.1.9.5.1. A = Clockwise Discharge Time—This determines the duration of clockwise rotation for each discharge sequence of clockwise, dwell, and counter-clockwise. This entry is in tenths of a second.

Display or Action	Explanation
01	1/10 second, minimum valid value
45	4.5 seconds, example
99	9.9 seconds, maximum valid value

3.1.9.5.2. B = Counter-clockwise Discharge Time—This determines the duration of counter-clockwise rotation for each discharge sequence of clockwise, dwell, and counter-clockwise. This entry is in tenths of a second.

Display or Action	Explanation
01	1/10 second, minimum valid value
45	4.5 seconds, example
99	9.9 seconds, maximum valid value

3.1.9.5.3. C = Discharge Dwell Time—This determines the duration of dwell between cylinder rotations for each discharge. This entry is in tenths of a second.

Display or Action	Explanation
00	no dwell, minimum valid value
25	2.5 seconds, example
50	5 seconds, maximum valid value

3.1.9.5.4. D = Number of Discharge Sequences—This determines the number of discharge sequences

performed when the machine discharges.

Display or Action	Explanation
02	2 repeats, minimum valid value
20	20 repeats, maximum valid value

3.1.9.5.5. E = End Time Duration—This determines the number of minutes the machine will run in *End* mode before it desires to discharge.

Display or Action	Explanation
0	Minimum value; the machine desires to discharge immediately after the formula ends.
2	The machine desires to discharge two minutes (2:00) after the formula ends.
8	Maximum value; the machine desires to discharge eight minutes (8:00) after the formula ends.

3.1.9.5.6. F = Program Post-Dry?—Should the controller prompt for a dryer formula number and a destination code during formula programming?

Display or Action	Explanation
1	Yes, prompt for post-wash formula data during programming. The decisions are described in Section 3.1.9.6 "Configure Post-wash Codes for Each Wash Formula".
0	No, do not prompt for post-wash formula data. This data can be added later through a selection on the *Configuration* menu, shown in Figure 38.

3.1.9.5.7. G = Elbow Delay Time—This decision determines the delay between the end of the loading sequence and when the elbow begins tilting up. Shorter times reduce the cycle time for each batch, while longer times reduce the chance of goods not being completely loaded into the machine.

Display or Action	Explanation
000	No delay; the elbow begins tilting up immediately when the loading sequence ends.
030	30 seconds; the elbow begins tilting up 30 seconds after the loading sequence ends.
255	255 seconds; maximum value

3.1.9.5.8. H = Elbow Flush Time—This decision determines how many seconds the machine flushes the elbow to discharge the goods. Shorter elbow flush times reduce cycle time and save water, while longer times minimize loading errors.

Display or Action	Explanation
000	No flush.
030	30 seconds; the elbow flushes for 30 seconds.
255	255 seconds; maximum value.

3.1.9.5.9. I = Miltrac Address—This decision determines the address this machine occupies on the Miltrac network.

Display or Action	Explanation
000 - 255	valid Miltrac addresses. Each device on the network must occupy a unique address.

3.1.9.6. Configure Post-wash Codes for Each Wash Formula—Use this screen to assign a dryer formula and destination code to each wash formula. This data will be passed from the washer-extractor when the goods are discharged.

Display or Action	Explanation
`Wash Formula`	Select the wash formula. This number advances after each valid destination decision.
`Dryer Program`	Enter the number of the dryer program to be passed from this machine whenever a batch with the selected wash formula discharges.
`Destination`	Enter the number of the destination to be passed from this machine whenever a batch with the selected wash formula discharges.

Display or Action	Explanation
F10	Save the displayed data and all data entered previously during this session, then exit this screen.
Escape	Discard any data entered during this session and exit this screen.

3.1.10. 6 = Memory Transfer [Document BICWFP06]

With the Milnor® Mark VI washer-extractor controller, you can transfer formulas from a personal computer running Milnor's programmer software, between machines, or between the machine and a personal computer that's part of a Mildata network. You can also transfer machine configuration data between machines or a machine and a computer running the programmer software, but configuration data should only be transferred if the machines are nearly identical with respect to both hardware and software. See Table 14 for guidelines on when data can be safely transferred between devices.

The specifications for cables and other devices used for memory transfer, as well as general instructions, are described in Section 5.4. "Construction of External Serial Link Cables".

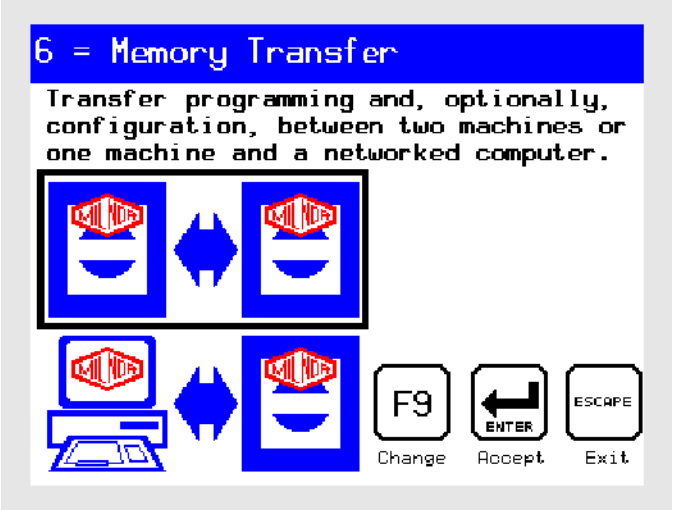
Table 14: Memory Transfer Guidelines

Similarity between Sending and Receiving Machines			OK to transfer		
Software	**Basic model**	**Options**	**Safe to transfer formulas?**	**Safe to transfer configure?**	**Actions after transferring**
Identical	Identical	Identical	Yes	Yes	none
Identical	Identical	Different	Yes	Maybe	Verify configure data
Identical	Different	Different	Yes	No	Reconfigure, then verify formulas
Different	Doesn't matter	Doesn't matter	No	No	Formula and configure data are invalid

3.1.10.1. **Transfer between Two or More Washer-extractors**—If your facility has two or more similar washer-extractors (see Table 14) which share identical formulas, you can save time by programming all the formulas in one machine and transferring the programmed formulas directly to the other machines.

1. Connect the necessary cable between the microprocessor control boxes of each machine. The microprocessor box is mounted near the upper rear corner of the left side of 68036F5N models. This location may be different on other machine models. Use the external connector labelled ⎚.
2. Use ↑ or ↓ to select the *machine-to-machine* (upper) graphic, then press Enter. Figure 41 illustrates this screen.

Figure 41: *Machine-to-Machine* Memory Transfer Selected

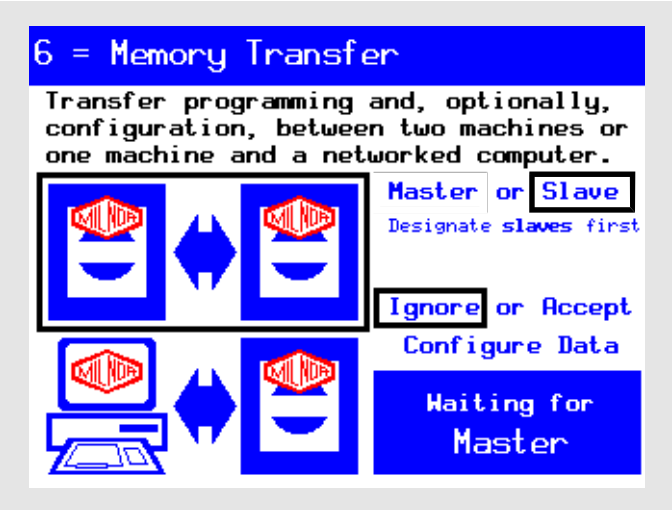


3. If necessary, use ↑ or ↓ to select *Slave*, then press Enter.

   Master—the machine with the good data. Data transfer begins immediately when a *Master* machine is designated. For this reason, designate all *Slave* machines that should receive the data before designating a *Master*. **The *Master* device always sends its data to the *Slave* device.**

   Slave—the machine with bad data, or with no information at all. Specify all machines that should receive the data as *Slaves* before designating the *Master* machine. **The *Slave* device always receives data from the *Master* device.**
4. Use ↑ or ↓ to choose to *Ignore* or *Accept* the configure data from the *Master* machine, then press Enter. See Note 15.
5. When the *Slave* machine is designated, "Waiting for Master" appears in the lower right area of the display (see Figure 42).

Figure 42: Typical Display on *Slave* Machine while Waiting

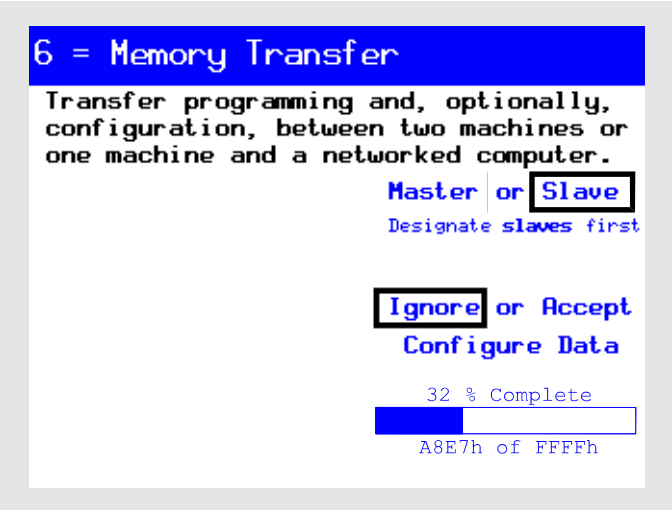


Notice 14: Data transfer begins immediately when a *Master* device is designated. If the *Slave* devices aren't ready when you designate the *Master*, set up the *Slave* and try again..

6. Designate the machine with the good data as the *Master*, then press Enter to begin transferring data. The progress meter in the lower right part of the display shows the percent of the data transfer that's completed, as well as the last memory address (in hexadecimal format) transferred. For current software versions, 100 percent of the data is equivalent to a memory address of FFFFh (see Note 15). A progress meter, shown in Figure 43, also appears on the *Slave* device during transfer.

   Note 15: The *Master* device always sends the same amount of data, which includes the configure data. The *Slave* device also receives configure data, but discards it if "Ignore Configure Data" is selected.

Figure 43: Transfer in Progress (Typical Display)



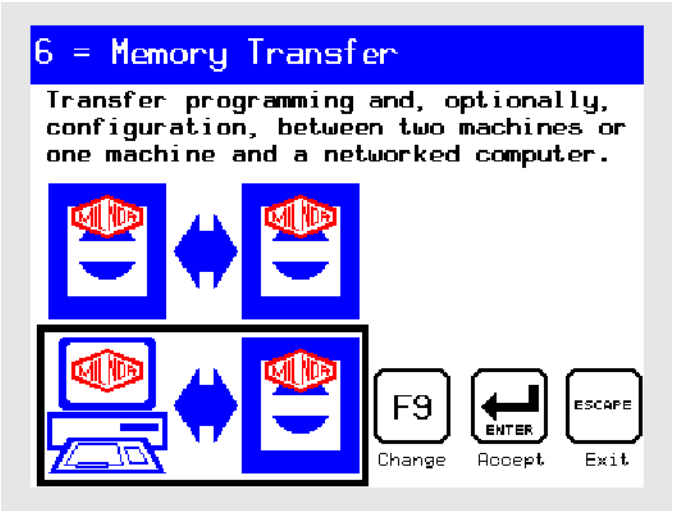
7. When prompted, after all data is transferred, press Enter to return to the *Programming menu*, then disconnect and store the cables.

3.1.10.2. Transfer between *Machine Programmer* and Washer-extractor—Milnor can provide Machine Programmer software which allows you to configure and program virtual washer-extractors on a personal computer, then transfer the pre-programmed data directly into one or more machines. The washer-extractor is considered the *Slave* device when the "good" data is on the personal computer. Remember, the *Slave* device always receives the data.

This computer software also allows you to copy the formulas and configuration from a washer-extractor to the personal computer for storage or modification. The washer-extractor is considered the *Master* device when it contains the "good" data.

1. Connect the necessary cable between the serial port of the personal computer and the microprocessor control box on the washer-extractor. The connector on the washer-extractor is labelled .
2. Use ↑ or ↓ to select the *computer-to-machine* (lower) graphic, then press Enter. Figure 44 illustrates this screen.

Figure 44: *Computer-to-Machine* Transfer Selected

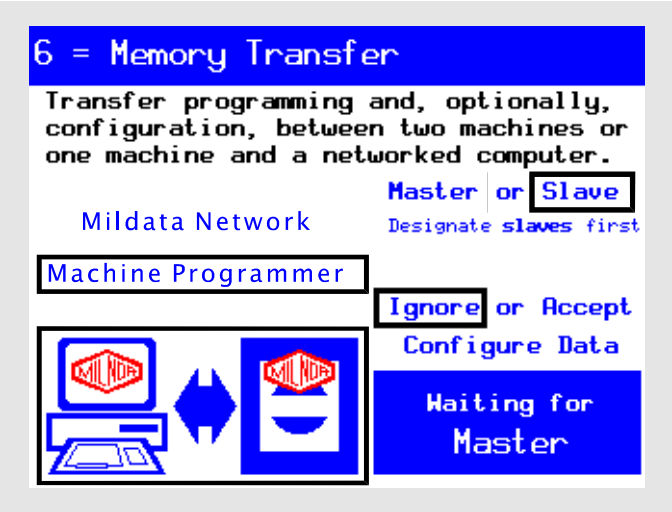


3. Refer to either Section 3.1.10.2.1 "Transferring from Computer to Washer-extractor" or Section 3.1.10.2.2 "Transferring from Washer-extractor to Computer" for further instructions.

3.1.10.2.1. Transferring from Computer to Washer-extractor

1. If necessary, use ↑ or ↓ to select *Slave*, then press Enter.
2. Use ↑ or ↓ to choose to *Ignore* or *Accept* the configure data from the *Master* machine, then press Enter. See Note 15.
3. Use ↑ or ↓ to choose *Machine Programmer*, then press Enter.

Figure 45: *Computer-to-Machine* Transfer Selected, Machine Waiting as *Slave*



4. On the personal computer, start the Machine Programmer software.
5. In the Machine Programmer software, select *Programmer*, then *Washer-extractor*.
6. Click on the *Download* tab.
7. If necessary, select the appropriate machine group, software version (*Software versions 98004 and later* for Mark VI washer-extractors), and machine profile.
8. Click the *Download* button below the machine profile list to begin transferring data.
9. When prompted, after all data is transferred, press Enter to return to the *Programming menu*, then disconnect and store the cables.

3.1.10.2.2. Transferring from Washer-extractor to Computer

1. On the personal computer, start the Machine Programmer software.
2. In the Machine Programmer software, select *Programmer*, then *Washer-extractor*.
3. In the Machine Programmer software, select *Groups*, then *Upload Data from Machine*. The Machine Programmer indicates that it is “Waiting for 'MASTER' machine to start uploading.”
4. Use ↑ or ↓ to choose *Machine Programmer*, then press Enter.
5. At the washer-extractor, use ↑ or ↓ to select *Master* to begin transferring data. The progress meter in the lower right part of the display shows the percent of the data transfer that's completed, as well as the last memory address (in hexadecimal format) transferred. For current software versions, 100 percent of the data is equivalent to a memory address of FFFFh (see Note 15in Section 3.1.10.1).
6. When prompted, after all data is transferred, press Enter to return to the *Programming menu*, then disconnect and store the cables.

3.1.10.3. Transfer from Mildata Computer to Washer-extractor—If the washer-extractor is part of a Milnor® Mildata® network, it is good practice to transfer the most important formulas (up to 99) to the protected formula memory in the washer-extractor. This practice allows production to continue with established formulas even if the Mildata network is not available. This safeguard does not affect washer-extractor operation in any way when the Mildata network is available.

Notice 15: When the Online Communicator component of the Mildata software is running on the Mildata computer, you can send data from the Mildata computer to the washer-extractor. However, you can not send data in the reverse direction.

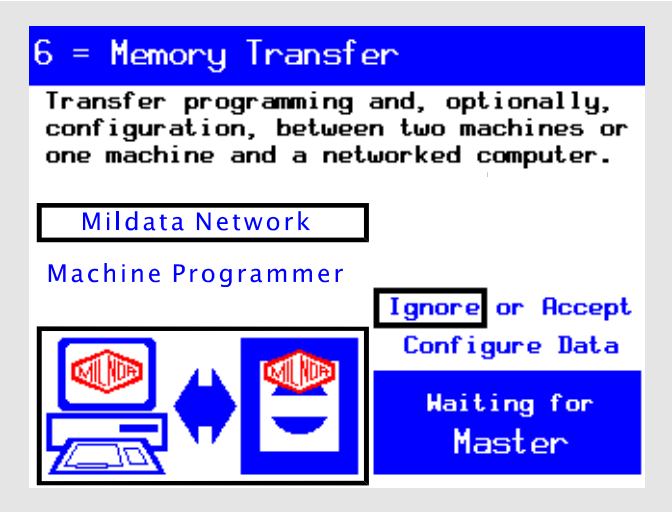
- Shut down the Online Communicator software and use the procedure described in Section 3.1.10.2.2 "Transferring from Washer-extractor to Computer" to send data from the washer-extractor to a computer with Mildata present.

1. At the washer-extractor, use ⬆ or ⬇ to select the *computer-to-machine* (lower) graphic, then press Enter. Figure 44 illustrates this screen.
2. Use ⬆ or ⬇ to choose *Mildata Network*, then press Enter.

   Note 16: When the Online Communicator component of the Mildata system is running, the Mildata computer is always the *Master*, and the washer-extractor is always the *Slave*.

3. Use ⬆ or ⬇ to choose to *Ignore* or *Accept* the configure data stored on the Mildata computer, then press Enter. See Note 15.

Figure 46: Typical Mildata-to-Machine Transfer Screen

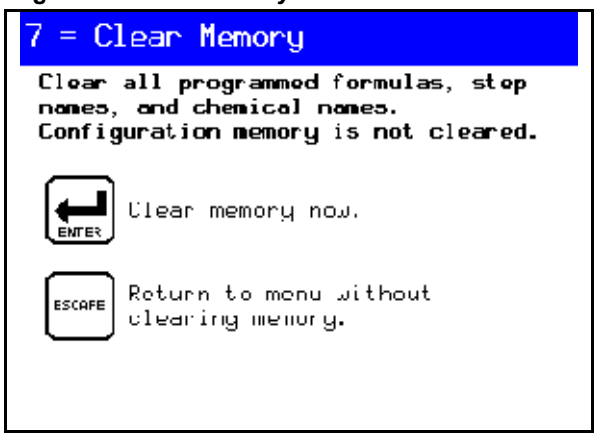


4. At the Mildata computer, command the Mildata software to begin transferring the desired data to the washer-extractor. The progress meter in the lower right part of the display shows the percent of the data transfer that's completed, as well as the last memory address (in hexadecimal format) transferred.
5. When prompted, after all data is transferred, press Enter at the washer-extractor to return to the *Programming menu*, then re-start On-line Communicator on the Mildata computer.

3.1.11. 7 = Clear All Memory [Document BICWFP07]

This menu selection guides you through the steps of voluntarily clearing the controller memory (except configure data) and restoring the available default values.

Figure 47: *Clear Memory* Screen



When you use this menu selection, **all** actions in the list below occur. It's not possible to clear only a part of memory.

- **All existing user-programmed formulas are erased.** After memory is cleared, formulas 00 and 99 remain available for commissioning the machine and developing new formulas.

  You can re-program wash formulas as described in Section 3.1.5 "1 = Add or Change a Formula"; or use the procedure described in Section 3.1.10 "6 = Memory Transfer" to restore formulas that were previously saved, or copy existing formulas from another machine.
- All step names are reset to the default values, as shown in Section 3.1.7 "3 = Change Step Names".
- All chemical names are reset to the default values, as shown in Section 3.1.8 "4 = Change Chemical Names".

Display or Action	Explanation
Escape	Returns to the main *Programming Menu* from either the *Clear Memory* screen or the *confirmation* ("Are you sure?") screen.
Enter	Prepares the machine for clearing memory. The next screen will prompt you to confirm your choice or cancel the procedure.

From the *confirmation* ("Are you sure?") screen:

Enter + F9	Clears memory immediately.

3.1.12. 8 = Print Data [Document BICWFP08]

The *Print Data* screen (Figure 48) displays the reports available with this controller. This document describes how to access each report and provides example printouts. Of course, these printouts are available only if you have a suitable printer connected to the machine and ready.

3.1.12.1. Date and Time for Reports—Each time you select and confirm the *Print Data* menu item, the controller prompts you for the current date and time. This information is printed in the header of each report.

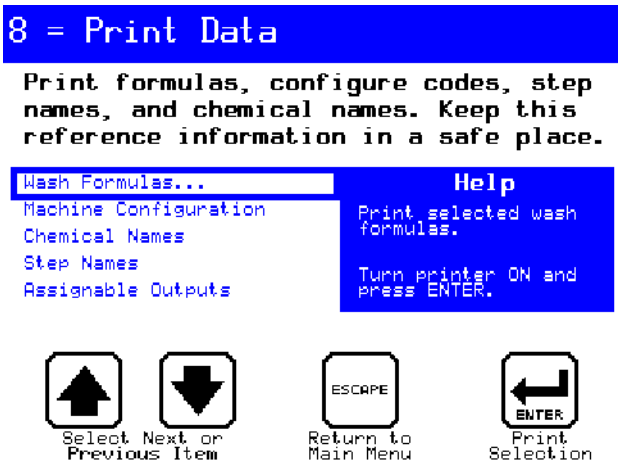
Tip: Machines configured to display temperature in degrees Fahrenheit (configure decision A = 0) prompt for date information according to the **Month/Day/Year** format most common in the United States. Machines configured to display temperature in degrees Celsius prompt for **Day/Month/Year**, as is common in Europe and elsewhere. The general procedure for entering

values is the same for either format.

Display or Action	Explanation
`Month: 1`	Controller prompt for the month.
0 9 Enter	Enter the current month (“09” for September in this example), then confirm your entry and advance to the next field.
`Day: 6`	Controller prompt for the day.
	Enter and confirm the current day, then the year, hour, and minutes.

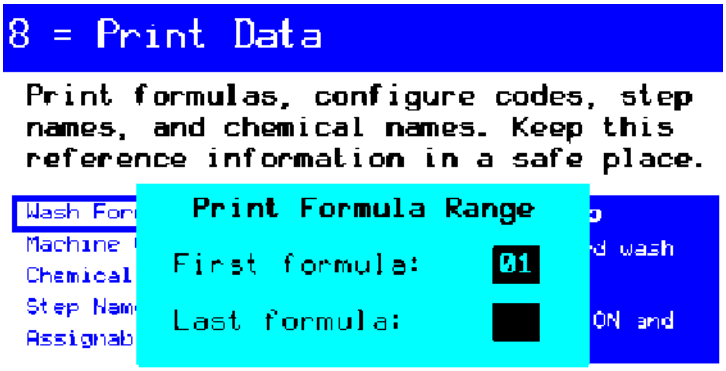
3.1.12.2. Wash Formulas. . .—This report provides a complete description of each wash formula in the specified range.

Figure 48: Print Wash Formula Data



Display or Action	Explanation
`Wash Formulas...`	select the menu item for printing selected wash formulas
Enter	Confirm your selection and advance to the *Formula Range* window (see Figure 49).

Figure 49: Formula Range Selection Window

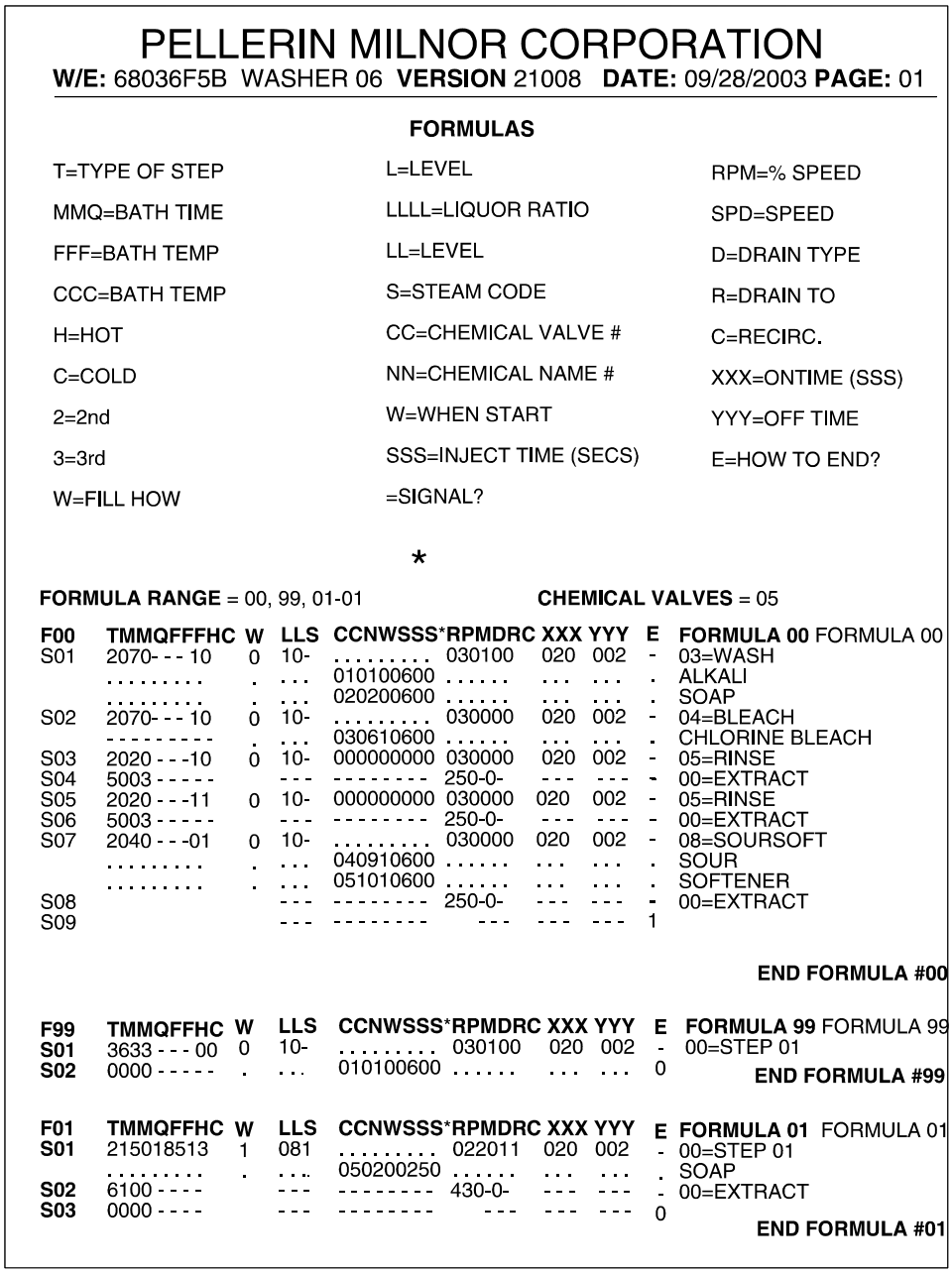


Display or Action	Explanation
0 1 Enter	Select and confirm formula 01 as the first formula to print.
4 6 Enter	Select and confirm formula 46 as the last formula to print.
Escape	Cancel the printing in progress. When the printer stops after you cancel a report, you'll need to advance the printer to the top of the next page before printing another report.

Figure 50 shows a typical *Formulas* report.

- Only valid formulas are printed. Empty formula numbers will not appear in the report.
- When all formulas in the specified range have been printed, the printer will advance to the top of the next page and wait for the next report.

Figure 50: *Formulas* Report



PELLERIN MILNOR CORPORATION

W/E: 68036F5B WASHER 06 **VERSION** 21008 **DATE:** 09/28/2003 **PAGE:** 01

FORMULAS

T=TYPE OF STEP	L=LEVEL	RPM=% SPEED
MMQ=BATH TIME	LLLL=LIQUOR RATIO	SPD=SPEED
FFF=BATH TEMP	LL=LEVEL	D=DRAIN TYPE
CCC=BATH TEMP	S=STEAM CODE	R=DRAIN TO
H=HOT	CC=CHEMICAL VALVE #	C=RECIRC.
C=COLD	NN=CHEMICAL NAME #	XXX=ONTIME (SSS)
2=2nd	W=WHEN START	YYY=OFF TIME
3=3rd	SSS=INJECT TIME (SECS)	E=HOW TO END?
W=FILL HOW	=SIGNAL?	

*

FORMULA RANGE = 00, 99, 01-01 **CHEMICAL VALVES** = 05

F00	**TMMQFFFHC**	**W**	**LLS**	**CCNWSSS***	**RPMDRC**	**XXX**	**YYY**	**E**	**FORMULA 00** FORMULA 00
S01	2070- - - 10	0	10-	.....	030100	020	002	-	03=WASH
	.....	.	...	010100600	.....	...	...	.	ALKALI
	.....	.	...	020200600	.....	...	...	.	SOAP
S02	2070- - - 10	0	10-	.....	030000	020	002	-	04=BLEACH
	- - - - - - - - -	.	...	030610600	.....	...	...	.	CHLORINE BLEACH
S03	2020 - - -10	0	10-	000000000	030000	020	002	-	05=RINSE
S04	5003 - - - - -		---	- - - - - - - -	250-0-	---	---	-	00=EXTRACT
S05	2020 - - -11	0	10-	000000000	030000	020	002	-	05=RINSE
S06	5003 - - - - -		---	- - - - - - - -	250-0-	---	---	-	00=EXTRACT
S07	2040 - - -01	0	10-	.....	030000	020	002	-	08=SOURSOFT
	.....	.	...	040910600	.....	...	...	.	SOUR
	.....	.	...	051010600	.....	...	...	.	SOFTENER
S08			---	- - - - - - - -	250-0-	---	---	-	00=EXTRACT
S09			---	- - - - - - - -	---	---	---	1	

END FORMULA #00

F99	**TMMQFFHC**	**W**	**LLS**	**CCNWSSS***	**RPMDRC**	**XXX**	**YYY**	**E**	**FORMULA 99** FORMULA 99
S01	3633 - - - 00	0	10-	.....	030100	020	002	-	00=STEP 01
S02	0000 - - - - -	.	...	010100600	.....	...	...	0	

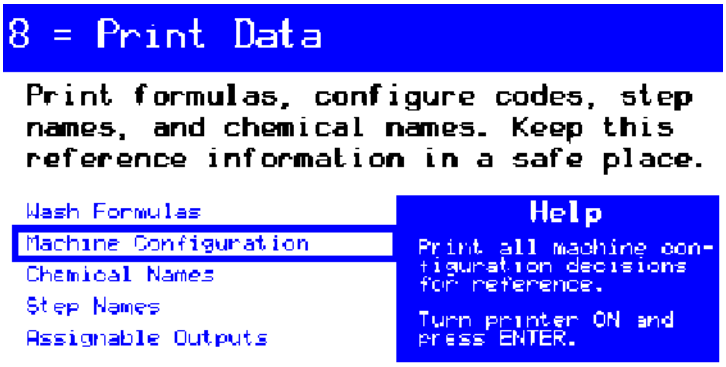
END FORMULA #99

F01	**TMMQFFHC**	**W**	**LLS**	**CCNWSSS***	**RPMDRC**	**XXX**	**YYY**	**E**	**FORMULA 01** FORMULA 01
S01	215018513	1	081	.....	022011	020	002	-	00=STEP 01
	.....	.	...	050200250	.....	...	...	.	SOAP
S02	6100 - - - -		---	- - - - - - - -	430-0-	---	---	-	00=EXTRACT
S03	0000 - - - -		---	- - - - - - - -	---	---	---	0	

END FORMULA #01

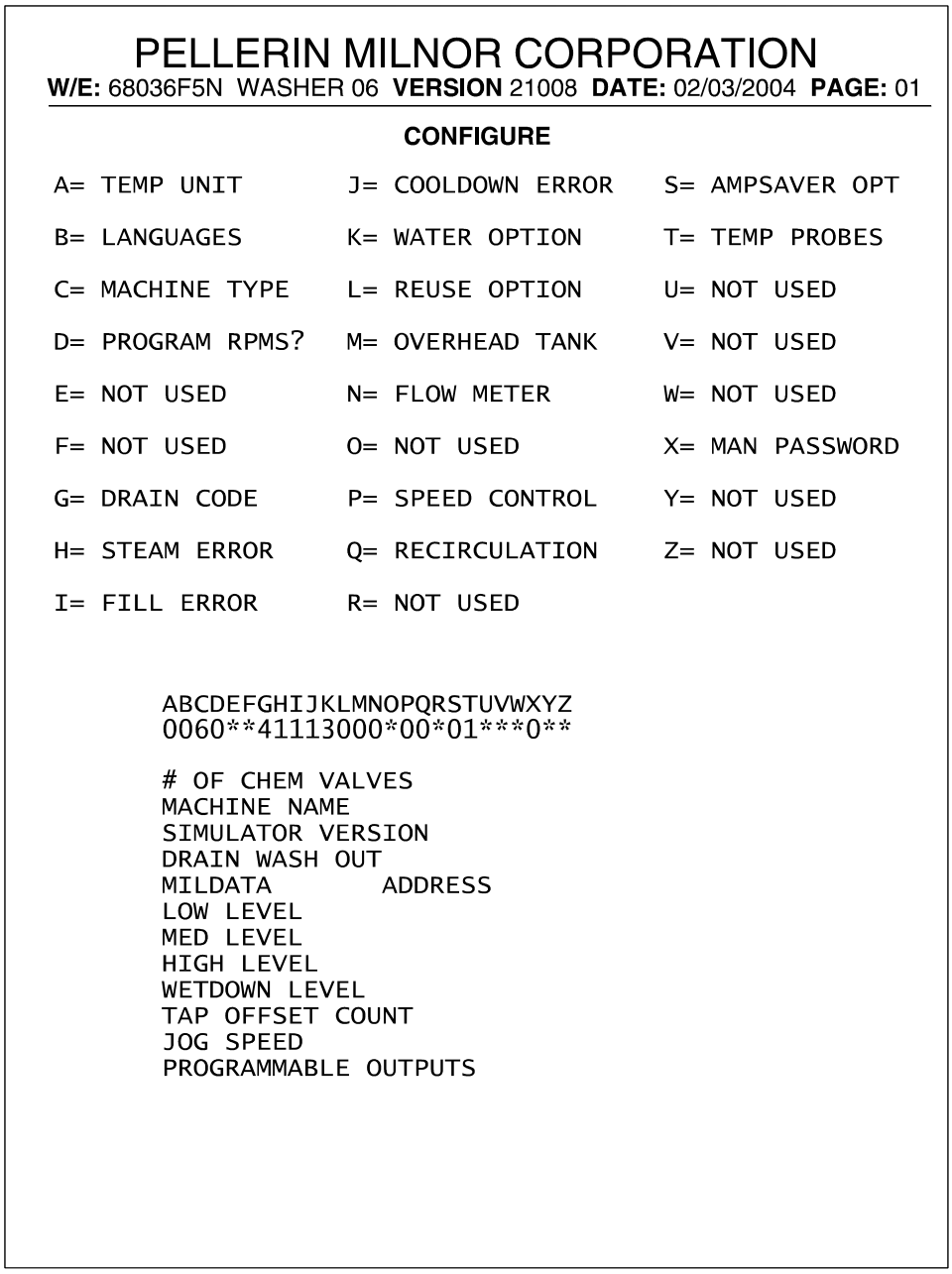
3.1.12.3. Machine Configuration—A printed record of machine configuration is important if you need to change the processor board or completely clear memory, especially if an electronic backup is not available.

Figure 51: Print Machine Configuration Data



Display or Action	Explanation
Machine Configuration	select the menu item for printing the machine configuration
Enter	Confirm your selection and begin printing immediately. Figure 52 shows a typical *machine configuration* report.
Escape	Cancel the printing in progress. When the printer stops after you cancel a report, you'll need to advance the printer to the top of the next page before printing another report.

Figure 52: Machine Configuration Report



PELLERIN MILNOR CORPORATION

W/E: 68036F5N WASHER 06 **VERSION** 21008 **DATE:** 02/03/2004 **PAGE:** 01

CONFIGURE

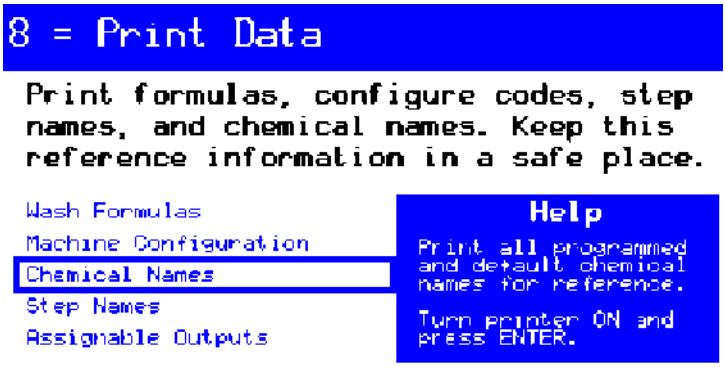
A= TEMP UNIT	J= COOLDOWN ERROR	S= AMPSAVER OPT
B= LANGUAGES	K= WATER OPTION	T= TEMP PROBES
C= MACHINE TYPE	L= REUSE OPTION	U= NOT USED
D= PROGRAM RPMS?	M= OVERHEAD TANK	V= NOT USED
E= NOT USED	N= FLOW METER	W= NOT USED
F= NOT USED	O= NOT USED	X= MAN PASSWORD
G= DRAIN CODE	P= SPEED CONTROL	Y= NOT USED
H= STEAM ERROR	Q= RECIRCULATION	Z= NOT USED
I= FILL ERROR	R= NOT USED	

ABCDEFGHIJKLMNOPQRSTUVWXYZ
0060**41113000*00*01***0**

OF CHEM VALVES
MACHINE NAME
SIMULATOR VERSION
DRAIN WASH OUT
MILDATA ADDRESS
LOW LEVEL
MED LEVEL
HIGH LEVEL
WETDOWN LEVEL
TAP OFFSET COUNT
JOG SPEED
PROGRAMMABLE OUTPUTS

3.1.12.4. Chemical Names—The printed list of chemical names isn't necessary for normal operation, but can help you restore chemical names lost when the processor board is replaced or memory is cleared.

Figure 53: Print Chemical Names



Display or Action	Explanation
`Chemical Names`	select the menu item for printing chemical names
Enter	Confirm your selection and begin printing immediately. Figure 54 shows a typical *chemical names* report.
Escape	Cancel the printing in progress. When the printer stops after you cancel a report, you'll need to advance the printer to the top of the next page before printing another report.

Figure 54: Chemical Names Report

PELLERIN MILNOR CORPORATION

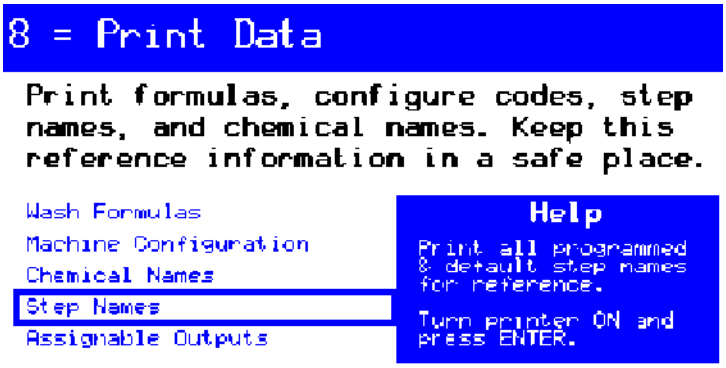
W/E: 68036F5B WASHER 06 **VERSION** 21008 **DATE:** 09/28/2003 **PAGE:** 01

CHEMICAL NAMES

01 ALKALI	23 CHEM NAME 23	45 CHEM NAME 45
02 SOAP	24 CHEM NAME 24	46 CHEM NAME 46
03 DETERGENT	25 CHEM NAME 25	47 CHEM NAME 47
04 SOAP + ALKALI	26 CHEM NAME 26	48 CHEM NAME 48
05 DETERG + ALKALI	27 CHEM NAME 27	49 CHEM NAME 49
06 CHLORINE BLEACH	28 CHEM NAME 28	50 CHEM NAME 50
07 OXYGEN BLEACH	29 CHEM NAME 29	51 CHEM NAME 51
08 ANTICHLOR	30 CHEM NAME 30	52 CHEM NAME 52
09 SOUR	31 C EM NAME 31	53 CHEM NAME 53
OFTENER	32 M NAME 32	54 CHE AME 54

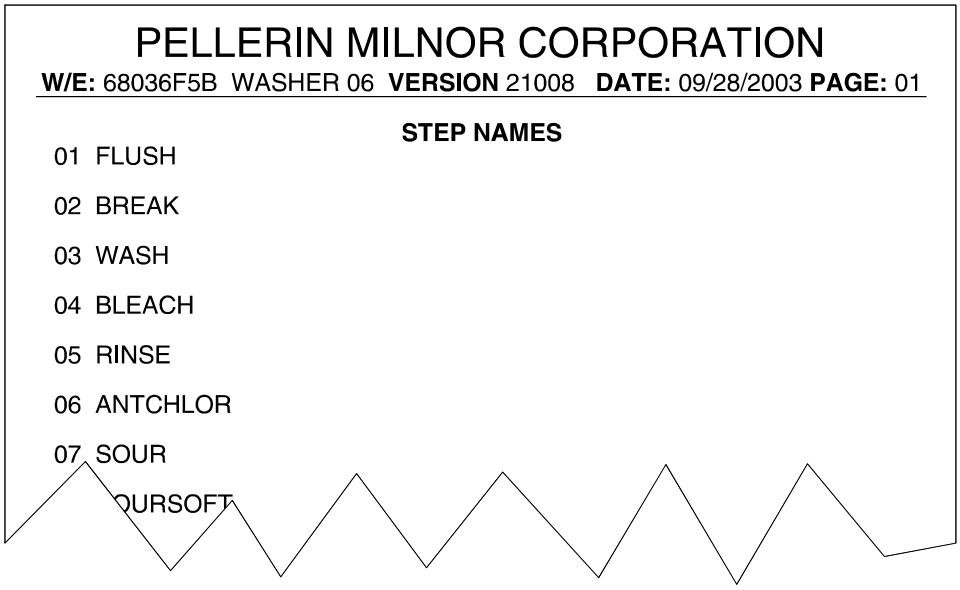
3.1.12.5. Step Names—The printed list of step names isn't necessary for normal operation, but can help you restore this information if it is lost when the processor board is replaced or memory is cleared.

Figure 55: Print Step Names



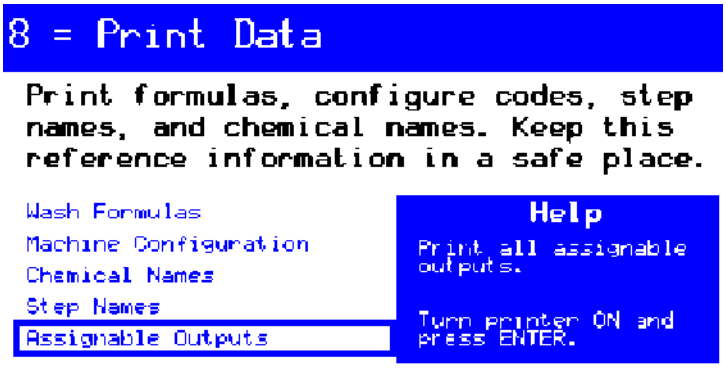
Display or Action	Explanation
Step Names	select the menu item for printing step names
Enter	Confirm your selection and begin printing immediately. Figure 56 shows a typical *step names* report.
Escape	Cancel the printing in progress. When the printer stops after you cancel a report, you'll need to advance the printer to the top of the next page before printing another report.

Figure 56: Step Names Report



3.1.12.6. **Assignable Outputs**—If your machine is configured for optional assignable outputs, this report can be very important in recovering this information.

Figure 57: Print Assignable Outputs



Display or Action	Explanation
Assignable Outputs	select the menu item for printing assignable output information
	Confirm your selection and begin printing immediately. Figure 58 shows a typical *assignable outputs* report.
	Cancel the printing in progress. When the printer stops after you cancel a report, you'll need to advance the printer to the top of the next page before printing another report.

Figure 58: Assignable Outputs Report

PELLERIN MILNOR CORPORATION

W/E: 68036F5B WASHER 06 **VERSION** 21008 **DATE:** 09/28/2003 **PAGE:** 01

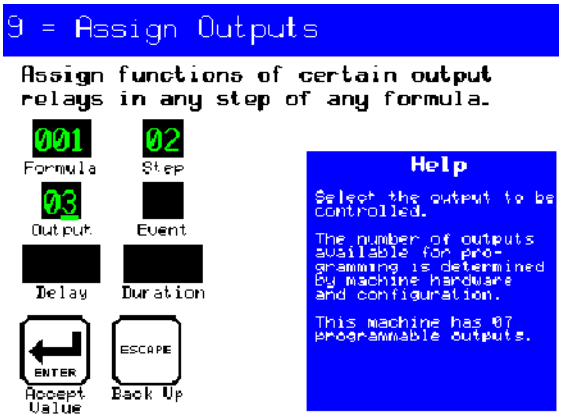
ASSIGNABLE OUTPUTS

Formula	Step	Event	Delay	Duration	Formula	Step	Event	Delay	Duration
Output 00 Function: _____									
01	03	2	0015	0120	01	05	2	0015	0120
02	06	0	0060	0360	03	03	2	0015	0120
Output 01 Function: _____									

3.1.13. 9 = Assign Outputs [Document BICWFP09]

The Milnor® Mark VI washer-extractor controller can operate up to 20 optional output relays. The *Assign Outputs* menu selection allows you to specify the formula and step in which the output operates, what type of event triggers the output, and the delay and duration that the output is actuated. Figure 59 illustrates the screen where these characteristics are programmed. Approximately 4,000 entries can be programmed, with a maximum of 20 per step.

Figure 59: *Assign Outputs* Screen



An example of how programmable outputs can be used is a system which retains the bath liquor from several types of steps in separate holding tanks for reuse. In this system, each washer-extractor drains all bath liquor to a closed sump serving only one machine. Programmable outputs controlling pumps and valves direct the bath liquor to the appropriate holding tank, depending on the chemicals used in the bath. In this example, the detergent liquor from all machines is directed to the *Detergent* holding tank, while the bleach liquor from all machines is directed to the *Bleach* tank, etc.

3.1.13.1. ***Formula* and *Step***—Enter the formula number (from 001 to 999) and step number (from 01 to 50) in which this output will be used. Each programmable output usually serves only one function (e.g., turn on the pump to drain the machine sump), but this function can be used in multiple formulas and steps.

Tip: You can disable any previously programmed output by programming it to actuate during a formula or step that does not exist in your system. Because formulas numbered higher than 99 are invalid unless the machine is part of a Mildata network, programmable outputs assigned to formula 999 will not function on a non-networked machine. The disadvantage to this approach is that the output will begin functioning if the machine is later connected to a Mildata network and formula 999 is programmed as a valid formula.

3.1.13.2. ***Output Number***—Enter the number of the specific programmable output, from 00 to a maximum of 19. The number of available programmable outputs configured for your machine is shown in the *Help* box when the cursor is in this decision.

3.1.13.3. ***Event***—Enter one of the four event types available for programmable outputs:

0 = Disabled—This selection disables a programmable output entry that was previously programmed. This is the preferred method for preventing the operation of a programmable output.

1 = Bath Step—This selection causes the output to function after the **start** of a bath step. The first step of a formula begins immediately after the operator presses ①. A bath step (or any other type of step) begins when the previous step ends. **The step may begin before the step timer begins counting down.**

2 = Drain—This selection causes the output to function after the **start** of a drain sequence. A drain sequence begins immediately when the step timer expires for the preceding bath step, before the basket accelerates beyond wash speed.

3 = Extract—This selection causes the output to function after the **start** of an extract step. An extract step always begins a fixed time after the drain opens in the preceding drain sequence, while the basket is accelerating from drain speed to extract speed.

3.1.13.4. ***Delay***—Enter the desired number of seconds between the selected event and the actuation of the output. The minimum delay of 0 seconds causes the output to function immediately when the selected event occurs for the selected formula and step. The maximum delay after the start of the selected event is 9999 seconds (approximately 2 hours 47 minutes).

Tip: The output will not actuate if the *Delay* value is longer than the step time.

3.1.13.5. ***Duration***—Enter the desired number of seconds for the output to remain actuated. The minimum duration of 0 seconds prevents the output from operating. The maximum duration is 9999 seconds.

Tip: The output will always turn off at the end of the event which controls it, even if the *Duration* value has not expired.

— End of BICWFP01 —

Chapter 4
Troubleshooting

BICWCT01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

4.1. Error Messages and Troubleshooting

4.1.1. Power-up Errors

4.1.1.1. Screen is Black—The LCD graphic display system is capable of displaying text any time the display system is receiving enough power to operate, even without input from the machine microprocessor. If the display remains blank when the machine has power, troubleshoot the machine power supply and the display voltage regulator.

Current machines are equipped with the 08BSAT3_ power inverter, shown in Figure 62. This board eliminates the need for the separate voltage regulator board that was used on earlier machines with a graphic display. Instead, a voltage regulator on the power inverter converts 12 volts DC from the machine power supply to 5.05 volts DC for the display system.

WARNING 16: Electrocution and Electrical Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

- The high voltage power to the display backlight is several hundred volts (Item H of Figure 62 in Section 4.1.1.2). **Do not attempt to measure this voltage.**
- Lock off and tag off machine power at the main machine disconnect before you remove the front control panel to access the display unit or any other components.
- Handle the front control panel with extreme caution when the panel is out of the mounting box.

1. Carefully inspect the cable connections among the power inverter, the display controller card, and the graphic display panel.
2. If all connections are secure and 12 volts is present at the power inverter, contact the Milnor factory for replacement parts.

4.1.1.2. Screen says "Display Firmware Version xxxxx"—The *display firmware version* screen appears briefly each time power is applied to the machine. If this screen, similar to the one shown in Figure 60, remains visible for more than a few seconds, one of two things is happening:

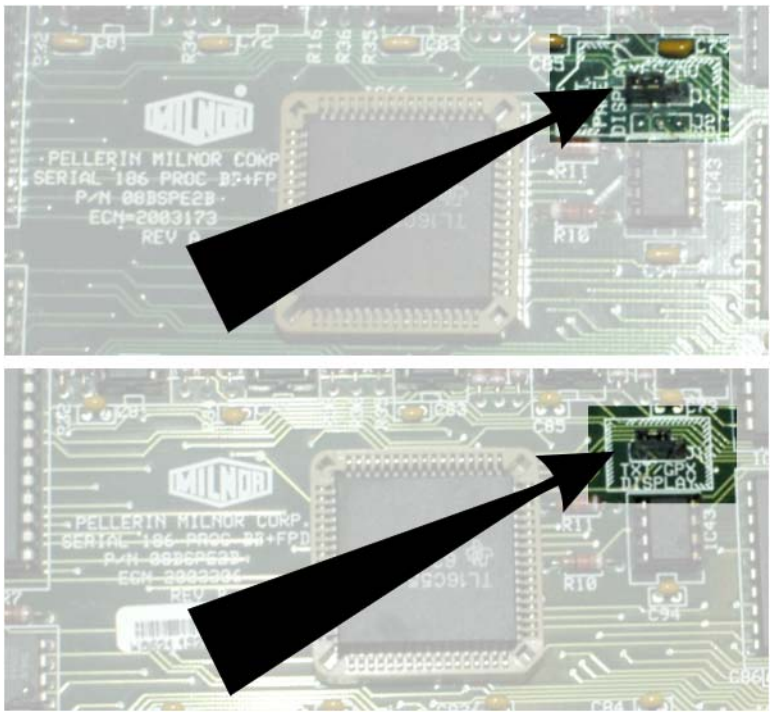
1. The graphic display unit received no signal from the machine microprocessor controller.

Figure 60: *Display Firmware Version* Screen

a. Turn off power at the main machine disconnect, then verify that jumper J1 (Figure 61) on the machine processor board is set to the proper position for the graphic display system. This setting configures the processor board to communicate in both directions (full duplex) with the display unit. One-way communication (half duplex) is used for vacuum fluorescent (text only) display units.

Tip: For revision A of the processor board, the correct setting for the graphic display system is *YES*. For revision B of the processor board, set the jumper to *GPX*.

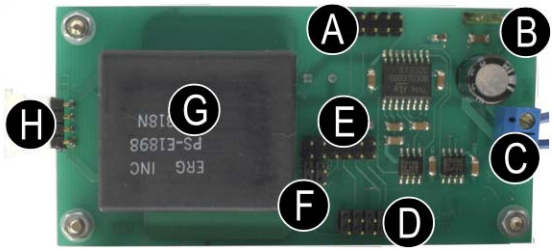
Figure 61: Jumper J1 on Revisions A and B of 08BSPE2_



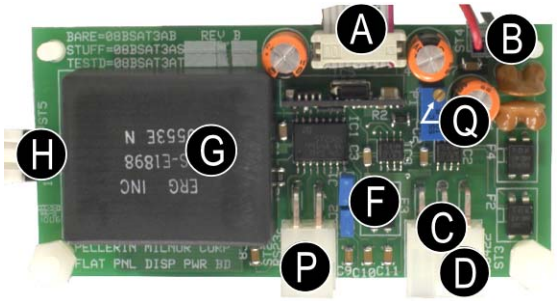
b. If the jumper is properly set, begin troubleshooting from MTA30 on the processor board to the data connection on the display inverter unit. Important connections and components of the display unit are labelled in Figure 62.

Figure 62: LCD Display Unit Control Components

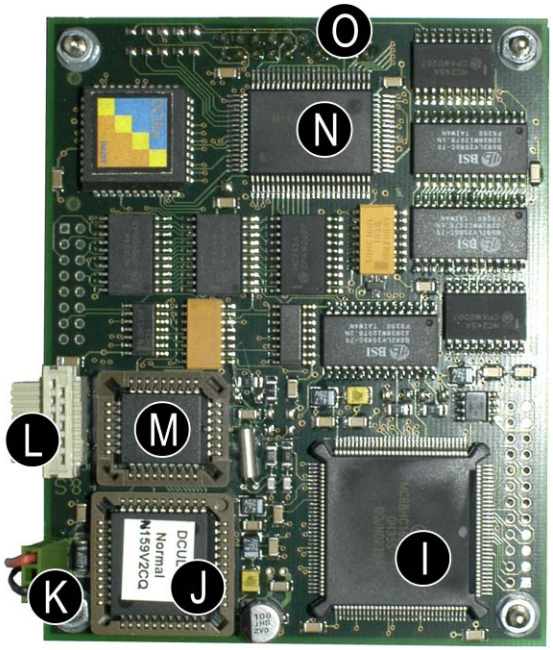
Power Inverter (DCU-AT2, obsolete)



Power Inverter (08BSAT3A_, current)



Display Controller Board



Legend

- **A.** Data output to display controller board
- **B.** Low voltage power output to display controller board
- **C.** Low voltage power input from machine power supply to display power inverter
- **D.** Data input from machine microprocessor
- **E.** Communication protocol (all OPEN)
- **F.** Communication protocol (all CLOSED)
- **G.** Power inverter for display backlight
- **H.** High voltage power to display backlight
- **I.** Graphic controller processor
- **J.** Graphic controller firmware chip
- **K.** Low voltage power input to display controller board
- **L.** Data input from power inverter
- **M.** Graphic controller programmable chip
- **N.** Graphic controller chip
- **O.** Data output to LCD display screen
- **P.** Computer connection (08BSAT3A_ only)
- **Q.** Potentiometer (08BSAT3A_ only)

2. The first time you apply power to the machine after a software upgrade, the machine controller may require up to two minutes to automatically update the display firmware. If the microprocessor is updating the display firmware, a coded status message at the top of the display shows the progress of the update.

4.1.1.2.1. Failed Microprocessor-to-Display Communication—Each time the machine controller sends data to the display, the machine controller waits for a response. The machine controller will not allow the machine to run unless the display is responding to each command.

If the machine controller receives an unexpected response or no response from the display controller, the machine controller initiates the process to update the display controller firmware to the version that corresponds to the controller software version.

Tip: When replacing a machine microprocessor controller board (08BSPE2_), verify before installation that jumper J1 is set properly for the graphics display.

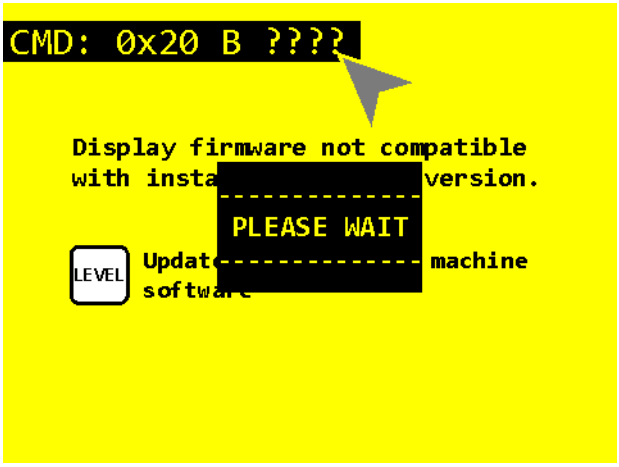
4.1.1.2.2. Automated Display Firmware Upgrade—For the machine to operate properly, the firmware in the display unit must match the software on the machine controller processor board. If the display unit firmware and the machine controller software are not compatible, the machine controller will prompt you to update the display firmware. The machine controller will not operate with incompatible firmware and software.

The screen shown in Figure 63 appears if the display firmware and machine controller software are not compatible. Press the indicated button to begin the update process.

Figure 63: *Display Firmware not Compatible...* Prompt

A screen similar to the one shown in Figure 64 appears during the update process. The arrow in Figure 64 indicates the block number, which increases while the display controller is receiving data. The *Select Formula* screen appears when the update is complete.

Figure 64: Display with Firmware Update in Progress



4.1.1.3. **Screen is Hard to Read**—If the display is hard to read because it's dim or there isn't enough contrast between the dark and light colors, the problem is usually insufficient voltage at the display unit. Measuring at point B of Figure 62 "LCD Display Unit Control Components" in Section 4.1.1.2, verify that the output voltage from the display power inverter to the display controller board is 5.05 volts DC. The potentiometer on the power inverter (08BSAT3A_ only) controls this voltage.

WARNING 17: Electrocution and Electrical Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

- High voltage or 400 to 1000 volts is present at point H of Figure 62 "LCD Display Unit Control Components" in Section 4.1.1.2. Do not attempt to measure this voltage.

Using an accurate digital multimeter, measure the voltage at point B of Figure 62 "LCD Display Unit Control Components" in Section 4.1.1.2. Adjust the potentiometer on the power inverter to measure 5.05 volts DC on the meter.

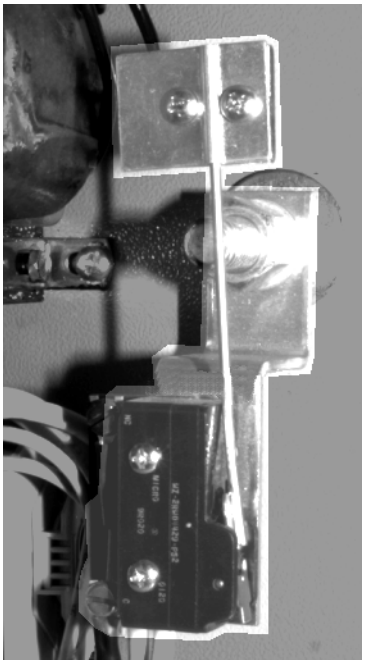
4.1.2. Operating Errors

4.1.2.1. ***Three-wire Disabled* Errors**—These errors immediately stop all machine operation. The three-wire relay provides control circuit power to the machine. When you press ① to energize the three-wire relay, the relay is maintained in the energized state by its own normally-open contact. The three-wire relay is wired in series with other safety devices, including motor overloads and the door interlock circuit. If a contact on any of these devices opens for any period of time, all machine functions stop immediately, the water inlet valves close, the drain opens, the operator signal sounds, and the microprocessor displays an error message.

Display or Action	Explanation
①	Enables the three-wire circuit, clears the error message, and silences the operator signal if you've corrected the cause of the error. If any *three-wire disabled* error occurs during an extract step, pressing ① initiates an *extract recycle*. Recycling comprises a fixed period of counter-clockwise rotation at wash speed, a dwell, then accelleration from clockwise wash speed up to the programmed extract speed or G-force, depending on how the machine is configured. In any step that is not an extract, pressing ① after a *three-wire disabled* error prompts you to either resume operation from the beginning of the interrupted step or to cancel the formula.

4.1.2.1.1. *Vibration Switch Tripped*—The vibration safety switch (Figure 65, usually located in the main control box) detects when the washer-extractor vibrates excessively. Undersized loads and poor load distribution are the most frequent causes of vibration switch errors.

Figure 65: Vibration Safety Switch



If the vibration safety switch trips in a step other than an extract step, press ① to resume operation at the beginning of the interrupted step.

4.1.2.1.2. *Door Opened*—If the microprocessor control senses that the machine door opens during operation, the machine stops and displays this message. Close the door securely and press ① to resume operation at the beginning of the interrupted step. If the error occurs again, or if the door is not open, turn off power to the machine and refer to the schematic manual to troubleshoot the three-wire circuit components associated with the door.

4.1.2.1.3. *Bearing Pressure Fault*—During bath steps, some machine models inject air just behind the bearing housing excluder seal to increase bearing life by forcing water and trash away from the seal. This error indicates that the bearing pressure switch is not detecting the pressure necessary to help protect the bearinngs (approximately 5 psi or 34.5 kPa).

4.1.2.1.4. *Brake Fault*—This error indicates that the brake pressure switch is detecting too little air pressure in the brake release air cylinder to ensure that the brake has released. This error can be caused by low air pressure, a leaking air cylinder piston cup, leaking or pinched air lines, a leaking quick-release air valve, or a faulty pressure switch or pilot air valve.

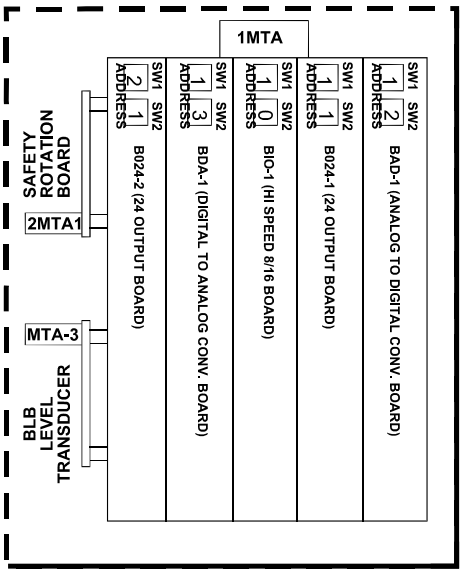
4.1.2.1.5. *Inverter Tripped*—One of the safeties in the inverter powering the machine motor tripped, but the machine control system can't determine the specific inverter error. This message may be caused by over- or under-voltage, three-phase power out of balance, etc. Refer to the inverter documentation provided with your machine to troubleshoot this error.

4.1.2.1.6. *Inverter Overload*—An overload between the main power to the machine and the motor inverter tripped.

4.1.2.1.7. *See Manual*—This error appears when the machine control can't determine why the three-wire circuit is open. This message usually appears because the operator pressed ⓪.

4.1.2.2. *Peripheral Board Failure* Errors—The processor board in the control box is considered the central unit of the system that operates your washer-extractor. The processor board communicates with peripheral boards to monitor machine conditions (e.g., bath level) and control specific functions (e.g., open and close water valves). The peripheral boards are located in the control box and identified by labels inside the box and the control box layout pages in the schematic manual (see Figure 66).

Figure 66: Sample Control Box Layout (Refer to Schematic Manual)



If any of the peripheral boards which communicate directly with the processor board fail, the microprocessor will display an error message identifying the failed board by type and number (if more than one might be used in the configured machine model).

4.1.2.2.1. *Input/Output Board #x*—One of the **8-output/16-input boards** is not communicating with the microprocessor.

4.1.2.2.2. *24-output Board #x*—One of the **24-output boards** is not communicating with the microprocessor.

4.1.2.2.3. *Analog-Digital Board #x*—The **analog-to-digital converter board** is not communicating with the microprocessor. This board converts signals from an analog device, such as a temperature probe, to a digital signal that the microprocessor can interpret.

4.1.2.2.4. *Digital-Analog Board #x*—The **digital-to-analog converter board** is not communicating with the microprocessor. This board converts signals from a digital signal from the microprocessor to an analog signal for another device, usually the power inverter for the machine motor. The analog signal to the inverter allows you to program specific wash and extract speeds.

4.1.2.3. Timing Errors—The machine control maintains internal timers for some operations. If one of these operations runs for more time than the configured maximum time, the microprocessor will display an error message identifying the operation. These errors do not halt machine operation, and are self-clearing when the error condition ends.

4.1.2.3.1. *Too Long to Fill*—The time required for the machine to fill to the programmed level exceeded the configured maximum fill time (see *configure decision I* in Section 3.1.9.3). Possible causes

include low water pressure or a malfunctioning drain valve.

4.1.2.3.2. *Too Long to Cool*—The time required for the machine to cool to the programmed temperature exceeded the configured maximum cooldown time (see *configure decision J* in Section 3.1.9.3). Possible causes include low water pressure or a malfunctioning temperature probe or analog-to-digital board.

4.1.2.3.3. *Too Long to Steam*—The time required for the machine to steam to the programmed temperature exceeded the configured maximum steam time (see *configure decision H* in Section 3.1.9.3). Possible causes include low steam pressure or a malfunctioning steam valve, temperature probe, or analog-to-digital board.

4.1.2.4. Bath Level Errors—All machines equipped with the Mark VI controller are equipped with an **electronic level transducer**, and a **flowmeter** is optional.

4.1.2.4.1. *Level Made after Drain*—This message is displayed if the level transducer detects any level of bath liquor in the cylinder at the end of a *drain* operation. If the cause is a slow drain, the error will clear when the transducer no longer detects water in the cylinder.

4.1.2.4.2. *Check Flow Meter*—This message is displayed if the level transducer detects water at the configured high level before the flow meter detects the programmed number of units of water.

4.1.2.5. *Failed RPM Sensor*—The RPM sensor verifies that the basket is stopped. This message is displayed if the processor board does not receive an input from the RPM sensor at least every 10 seconds. This error does not affect how the machine works during drain operations. However, if the RPM sensor malfunctions during an extract step, the machine controller will not unlock the door until the default coast time expires. This prevents the door from opening while the basket is turning.

4.1.2.6. *Check Temperature Probe(s)*—This message is displayed if a temperature probe detects a temperature below 30 degrees Fahrenheit or above 230 degrees Fahrenheit. Check the position of the probe and all related connections. If the connections are good, disconnect the probe and check the resistance between the leads. Resistance between the two leads should be between 2K and 35K Ohms, and resistance between either lead and ground should be infinite.

— End of BICWCT01 —

BICWFT01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

4.2. Viewing Inputs, Testing Outputs, and Managing Accumulated Data

This section describes functions on the Mark VI microprocessor washer-extractor controller that are available when the machine is idle (formula not running) and in the *run mode*.

> **Note 22:** See Section 2.4.2 "Actions Available in *Run Manual* Mode" for instructions on manually modifying a formula **while the machine is running**.

4.2.1. The *Manual Menu* and How to Access It

4.2.1.1. Available Modes in the *Manual Menu*—The *Manual menu* provides three selections:

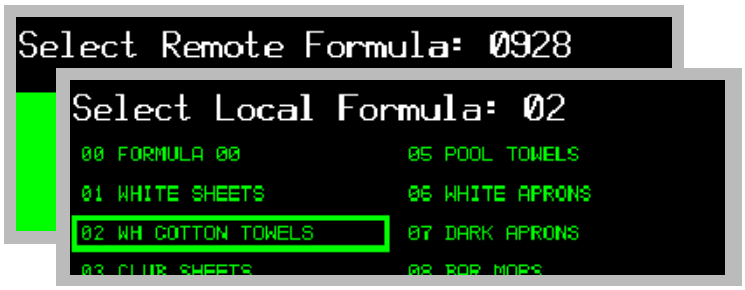
Actuate Individual Outputs—described in Section 4.2.2.1, this menu selection allows you to actuate individual outputs for testing. This is called **bare manual** operation.

View Status of Inputs—described in Section 4.2.2.2, this menu selection allows you to view the on/off status of each input during idle conditions (the machine is not running a formula).

Print and Clear Accumulated Data—described in Section 4.2.2.3.2, this menu selection allows you to print and erase the accumulated productivity data.

4.2.1.2. How Do I Access the *Manual Menu*?—The *Manual menu* is available only when the machine is idle (see Figure 67).

Figure 67: *Select Formula* Screens



From the *Select Formula* screen, press Manual to access the *Manual menu*.

4.2.2. Selecting and Commanding Manual Washer-extractor Functions

4.2.2.1. *Actuate Individual Outputs*—This selection allows you to troubleshoot problems by individually actuating any output in the control system. Use this simple procedure to actuate individual outputs:

1. From the *Manual Menu*, select the option to "*Actuate Individual Outputs*."
2. Press ① to enable the three-wire circuit if necessary. The controller will prompt you.
3. Press ↑ or ↓ to display the page containing the output you want to test. The outputs contained on each page are listed in Table 15 through Table 18.
4. Enter the number of the questionable output. For example, enter 4 to select *output 4* on the page for 8-output 16-input board 1. This selects the *Chemical 1* output.

   Notice 18: The next step may turn on chemical pumps, open water valves, etc. Know the consequences of actuating the selected output before going any further in this procedure.

5. Press Enter to enable the selected output.
6. Test for proper operation.
7. Press Escape to turn the output off. Press Escape again to return to the *Select Formula* screen.

Table 15: Outputs on 8-output 16-input Boards

Output Number	Connections on Board	Function	Output Number	Connections on Board	Function
8/16 Board #1					
0	1MTA5-10 and 5-19	Recirculation Pump	4	1MTA5-4 and 5-14	Chemical 1
1	1MTA5-9 and 5-18	Cooldown	5	1MTA5-3 and 5-13	Chemical 3
2	1MTA5-8 and 5-17	Flush	6	1MTA5-2 and 5-12	Chemical 2
3	1MTA5-7 and 5-16	Chemical 4	7	1MTA5-1 and 5-11	Chemical 5
8/16 Board #2 (StaphGuard models only)					
0	2MTA5-10 and 5-19	Transfer Control	4	2MTA5-4 and 5-14	Clean Side Buzzer
1	2MTA5-9 and 5-18	Don't Transfer Control	5	2MTA5-3 and 5-13	Brake Release
2	2MTA5-8 and 5-17	Transfer Control 1	6	2MTA5-2 and 5-12	Door Unlock 1
3	2MTA5-7 and 5-16	Don't Transfer Control 1	7	2MTA5-1 and 5-11	Spotting Underway
8/16 Board #2 (WTB+ models only)					
0	2MTA5-10 and 5-19	Discharge Commanded	4	2MTA5-4 and 5-14	Start Discharging
1	2MTA5-9 and 5-18	Start Loading	5	2MTA5-3 and 5-13	Not Used
2	2MTA5-8 and 5-17	Load Unload Allowed	6	2MTA5-2 and 5-12	Door Unlock 1
3	2MTA5-7 and 5-16	Load Commanded	7	2MTA5-1 and 5-11	Spotting in Progress
8/16 Board #3 (WTB+ models only)					
0	3MTA5-10 and 5-19	Elbow Blow	4	3MTA5-4 and 5-14	Elbow Flush
1	3MTA5-9 and 5-18	Elbow Up Lock Release	5	3MTA5-3 and 5-13	Discharge Terminated
2	3MTA5-8 and 5-17	Elbow Down Lock Release	6	3MTA5-2 and 5-12	Elbow Up
3	3MTA5-7 and 5-16	Load Desired	7	3MTA5-1 and 5-11	Elbow Down

Table 16: Outputs on 24-output Board #1

Output Number	Connections on Board	Function	Output Number	Connections on Board	Function
0	1MTA13-11 and 13-1	Tank to Machine	1	1MTA13-2 and 13-12	Alternate Extract Decel.
2	1MTA13-13 and 13-3	Door Unlock	3	1MTA13-4 and 13-14	Clockwise Wash
4	1MTA13-5 and 13-15	Counter-clockwise Wash	5	1MTA13-16 and 13-6	Steam Valve
6	1MTA13-17 and 13-7	Operator Signal	7	1MTA13-8 and 13-18	Three-wire Relay
8	1MTA13-2 and 13-12	Alternate Drain Accel.	9	1MTA14-1 and 13-10	Water Valve #1
10	1MTA14-2 and 14-11	Water Valve #2	11	1MTA14-3 and 14-12	Water Valve #3
12	1MTA14-4 and 14-13	Drain to Sewer	13	1MTA14-4 and 14-14	Drain to Reuse
14	1MTA14-10 and 14-5	Machine to Machine	15	1MTA14-10 and 14-15	Machine to Tank
16	—	A'spot Brake (reserved)	17	—	Not Used
18	—	Not Used	19	—	Not Used
20	—	Not Used	21	—	Not Used
22	—	Not Used	23	—	Not Used

Table 17: Outputs on 24-output Board #2

Output Number	Connections on Board	Function	Output Number	Connections on Board	Function
0	2MTA13-11 and 13-1	Chemical 14	1	2MTA13-12 and 13-2	Chemical 9
2	2MTA13-13 and 13-3	Chemical 13	3	2MTA13-14 and 13-4	Flush
4	2MTA13-15 and 13-5	Chemical 15	5	2MTA13-16 and 13-6	Chemical 11
6	2MTA13-17 and 13-7	ChemSave & Timer stop	7	2MTA13-18 and 13-8	Drain Saver
8	2MTA13-19 and 13-9	Chemical 10	9	2MTA13-10 and 14-1	Amp Saver
10	2MTA14-2 and 14-11	Chemical 6	11	2MTA14-3 and 14-12	Chemical 7
12	2MTA14-4 and 14-13	Chemical 8	13	2MTA14-4 and 14-14	Chemical 12
14	2MTA14-10 and 14-5	Auto Recirculation	15	—	Not Used
16	—	Not Used	17	—	Not Used
18	—	Not Used	19	—	Not Used
20	—	Not Used	21	—	Not Used
22	—	Not Used	23	—	Not Used

Table 18: Outputs on 24-output Board #3 (Optional)

Output Number	Connections on Board	Function	Output Number	Connections on Board	Function
Optional Programmable Outputs					
0	3MTA13-1 and 13-11	Pgm Output 00	1	3MTA13-2 and 13-12	Pgm Output 01
2	3MTA13-3 and 13-13	Pgm Output 02	3	3MTA13-4 and 13-14	Pgm Output 03
4	3MTA13-5 and 13-15	Pgm Output 04	5	3MTA13-6 and 13-16	Pgm Output 05
6	3MTA13-7 and 13-17	Pgm Output 06	7	3MTA13-8 and 13-18	Pgm Output 07
8	3MTA13-9 and 13-19	Pgm Output 08	9	3MTA13-10 and 14-1	Pgm Output 09
10	3MTA14-11 and 14-2	Pgm Output 10	11	3MTA14-12 and 14-3	Pgm Output 11
12	3MTA14-4 and 14-13	Pgm Output 12	13	3MTA14-4 and 14-14	Pgm Output 13
14	3MTA14-10 and 14-5	Pgm Output 14	15	3MTA14-10 and 14-15	Pgm Output 15
16	3MTA14-10 and 14-6	Pgm Output 16	17	3MTA14-10 and 14-16	Pgm Output 17
18	3MTA14-10 and 14-7	Pgm Output 18	19	3MTA14-10 and 14-17	Pgm Output 19
20	—	Not Used	21	—	Not Used
22	—	Not Used	23	—	Not Used

Table 19: Outputs on 24-output Board #4 (Optional)

Output Number	Connections on Board	Function	Output Number	Connections on Board	Function
WTB+ Models Only					
0	4MTA13-1 and 13-11	Hydraulic Pump	1	4MTA13-2 and 13-12	Open Door
2	4MTA13-3 and 13-13	Close Door	3	4MTA13-4 and 13-14	Discharge Desired
4	4MTA13-5 and 13-15	Load Unload Terminate	5	4MTA13-6 and 13-16	Tilt Up
6	4MTA13-7 and 13-17	Tilt Down	7	4MTA13-8 and 13-18	Tilt Front
8	4MTA13-9 and 13-19	Tilt Rear	9	4MTA13-10 and 14-1	Deflate Door
10	4MTA14-11 and 14-2	Elbow Deflate Up Seal	11	4MTA14-12 and 14-3	Flag Down
12	4MTA14-4 and 14-13	Tilt Door Latch	13	4MTA14-4 and 14-14	Door Unlatch
14	4MTA14-10 and 14-5	Seq. Load Allowed	15	4MTA14-10 and 14-15	Seq. Load Desired
16	4MTA14-10 and 14-6	Not Used	17	4MTA14-10 and 14-16	Not Used
18	4MTA14-10 and 14-7	Seq. Flag Down Discharge	19	4MTA14-10 and 14-17	Seq. Load Unload Terminate
20	4MTA14-10 and 14-8	Seq. Discharge Desired	21	4MTA14-10 and 14-18	Seq. Discharge Allowed
22	4MTA14-10 and 14-9	Not Used	23	4MTA14-10 and 14-19	Not Used

4.2.2.2. View Status of Inputs

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

The display shows a plus sign (+) to indicate any input that is present (grounded). A minus sign (–) indicates that the input is not present.

Input signals come into the processor board and 8-output 16-input boards. Use ⬆ or ⬇ to select the desired input page.

4.2.2.3. Print and Clear Accumulated Data

4.2.2.3.1. How Data Accumulation Works

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

- **Formula Number**—the number used to select the formula.
- **Formula Name**—the programmed name of the formula. This area can be empty if no formula name is programmed.
- **Date**—the date of the report, according to the washer-extractor controller.
- **Lot Number**—the lot number for the load, if the machine is configured to prompt for this data (see Section 3.1.9.3.1 "*Mildata Batch Codes* Decisions").
- **Formula Start**—the time of day when the formula started, in 24-hour format.
- **Formula Stop**—the time of day when the formula ended, in 24-hour format.
- **Duration**—the number of hours, minutes, and seconds that the formula ran.
- **Step**—the step number in the program.
- **Step Name**—the name of the step.
- **Start Time**—the time of day when the step started, in 24-hour format.
- **Stop Time**—the time of day when the step ended, in 24-hour format

- **Chemical Name**—the names of all chemicals injected during the step.
- **Temperature**—the maximum temperature achieved during the step, followed by the programmed desired temperature.

Note 23: The accumulators will store data for formulas 00 through 99, whether these are internal or downloaded from Mildata®. They do not store data on Mildata® formulas higher than 99. However, Mildata® itself provides this capability.

4.2.2.3.2. Available Modes in the *Data Accumulation* Menu

Print Saved Data—described in Section 4.2.2.3.3.1; use this menu selection to print out hard copy of accumulated data on a serial printer.

Erase Saved Data—described in Section 4.2.2.3.3.2; use this menu selection to erase all accumulated data.

4.2.2.3.3. How to Access the *Data Accumulation* Menu

1. Access the *Data Accumulation* menu from the *Manual* menu. With the machine idle (not running a formula) and a *Select Formula* screen visible, press Manual to access the Manual menu.
2. From the *Manual* menu, press ↑ or ↓ to select the *Print and Clear Accumulated Data* option.
3. Press Enter to accept the selected option.

4.2.2.3.3.1. Print Saved Data

—Accumulated data may be printed on a serial printer that conforms to the specifications in Section 5.3. "Printer Requirements and Settings". Figure 68 is an example printout.

Figure 68: Example Data Accumulation Printout

```
Formula Number: 0007
Formula Name : TEST FORMULA 07
Date : 05/02/99
Lot Number : 123AX456Y78
Formula Start : 11:19:58
Formula Stop : 11:25:14
Duration : 00:05:16
Step   Step Name   Start Time   Stop Time   Duration   Chemical Name   Temperature
01     BREAK       11:19:58     11:23:17    00:03:29   OXYGEN BLEACH   A=141/D=140
02     EXTRACT     11:23:17     11:25:07    00:01:50   NO CHEMICAL     A=090/D=000
.
.
.


Formula Number: 0008
Formula Name : TEST FORMULA 08
Date : 05/02/99
Lot Number : 456ZX123Y78
Formula Start : 12:39:53
Formula Stop : 12:45:15
Duration : 00:05:22
Step   Step Name   Start Time   Stop Time   Duration   Chemical Name   Temperature

01     BREAK       12:39:53     12:43:37    00:03:44   OXYGEN BLEACH   A=141/D=140
02     EXTRACT     12:43:37     12:45:14    00:01:37   NO CHEMICAL     A=080/D=000
```

Display or Action	Explanation
Enter	With the *Data Accumulation* display visible, this key sends all accumulated data to the serial port on the washer-extractor. The *Select Formula* screen appears after all data is sent to the printer, even though the printer may still be printing.
Escape	Cancels the operation and displays the *Select Formula* screen.

Note 24: Pressing CANCEL to cancel printing only stops the machine from sending additional data to the printer. Any information already stored in the printer but not yet printed will print.

4.2.2.3.3.2. Erase Saved Data—Accumulated data may be cleared whenever the machine is idle. All data is cleared simultaneously and can't be recovered.

Display or Action	Explanation
F9 + Enter	When the controller prompts "*Are you sure?,*" this combination of keys confirms that you want to clear all saved data. Data is immediately cleared.
Escape	Cancels the operation and displays the *Select Formula* screen.

— End of BICWFT01 —

BICWCC02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

4.3. How to Test and Calibrate the Level-sensing Pressure Transducer

This machine uses a *pressure transducer* to detect the level of the bath liquor in the cylinder. The transducer operates by converting the pressure of the water column to a varying voltage. Other components in the control system convert the voltage to a digital signal for the microprocessor controller.

The pressure transducer controls levels for all bath steps unless the machine is equipped with a *flow meter* and configured for *metered water* or *liquor ratio*. Even on machines using a flow meter, the level transducer provides certain information during normal operation, as well as a level of safety against overfilling the machine if the flow meter fails.

4.3.1. How to Calibrate the Transducer using the *Bath Level Offset*

You calibrate the transducer by changing the *Bath Level Offset* value on the *Configure* screen. When the pressure transducer is properly calibrated, the machine will display an actual level of *0* when the bath level just touches the bottom of the basket farthest from the door.

Use this procedure to determine the correct *bath level offset* value:

CAUTION 19: Confined space hazards—Confinement in the cylinder can kill or injure you. Hazards include panic, burns, poisoning, suffocation, heat prostration, exposure to harmful chemical and biological agents, and crushing.

- Do not enter the cylinder until it has been thoroughly purged, flushed, drained, cooled, and immobilized.
- Do not reach into the moving parts of any machine—including the cylinder of this washer-extractor—unless machine power is locked off and tagged out at the main wall disconnect and all additional plant safety procedures are followed.

1. Put a mark on the back of the basket at the height configured for *high* level.
2. Configure the machine for a *bath level offset* value of 000.
3. Run the calibration formula and observe the water level.
   - **If the water does not reach the high level mark**, terminate the calibration formula and set the configured bath level offset to **0050**, then run the calibration formula again. Repeat this procedure with increasing offset values until the water level is at or just above the high level mark. The maximum offset that increases the amount of water in the cylinder is 4095.
   - **If the water goes over the high level mark**, terminate the calibration formula and set the configured bath level offset to **5050**, then run the calibration formula again. Repeat this procedure with increasing offset values until the water level is at or just above the high level mark. The maximum offset that decreases the amount of water in the cylinder is 9095.

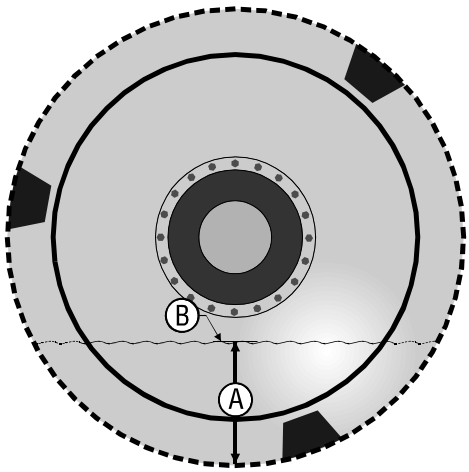
Tip: Offset values from 0001 to 4095 increase the amount of water injected for a configured level. Offset values from 5001 to 9095 decrease the amount of water injected for a configured level. Values from 4096 to 4999 will cause unpredictable results; do not enter values in this range.

4.3.2. How to Accurately Determine Bath Levels

To measure bath levels accurately, the basket must be stationary and empty. Always set levels and calibrate the pressure transducer with the cylinder at rest and empty of goods.

Figure 69: Measuring High Bath Level

View Inside Basket (Door Open)



Legend

A. Measure from bottom inside of basket vertically to configured *High level*

B. Mark on back of basket at configured *High level* height

4.3.3. How to Disable the Flow Meter

If the machine has a flow meter and is configured for either metered water or liquor ratio (*configure decision N*=1 or 2), the pressure transducer must be properly calibrated to ensure that certain internal lockouts are effective.

1. Use the *Print Data* selection from on the programming menu to print the current values for all configure decisions. Write down the values if you don't have a working printer attached to the machine. Some of the configure values will be erased during the next step, and must be restored for normal operation.
2. Set *configure decision N* to 0 to disable the flow meter. This allows you to program a configuration formula using inches or centimeters of water, as explained in Section 4.3.5 "How to Program a Calibration Formula".

CAUTION 20: Data Loss and Machine Malfunction Hazards—Existing formulas contain water data which is generated by the flow meter. This data is not provided when the flow meter is disabled.

- Do not access any existing formulas while the flow meter is disabled. Accessing existing formulas will delete the previous water data.
- Do not run any existing formula while the flow meter is disabled. The machine will malfunction when the required water data is not provided.

4.3.4. How to Set the Level Ranges

The *low*, *medium*, and *high level* configure decisions determine the ranges within which bath levels may be programmed. Set each level as desired. The *tilt level* configure decision specifies the level to which a tilting machine will fill while tilted to the loading position.

4.3.5. How to Program a Calibration Formula

The job of calibrating the pressure transducer is much easier if you program a *calibration formula*. The calibration formula consists of one bath step with these specifications:

- cylinder does not turn during the step (programming decision $T = 3$)
- temperature is not programmed (decision *FFF* or *CCC* = 000)

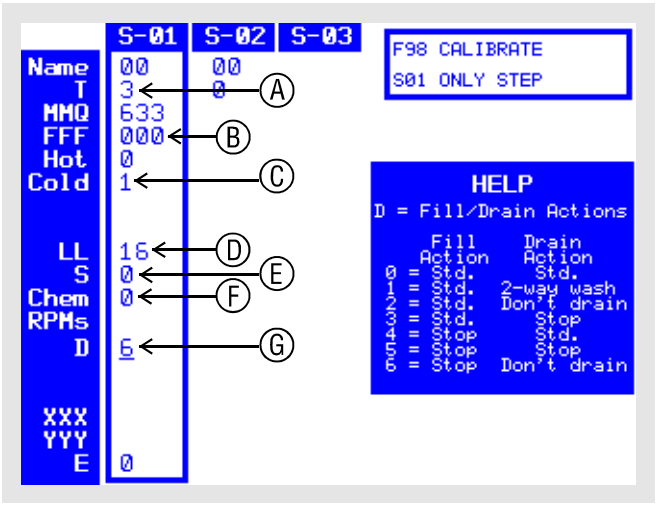
- fill with cold water to high level as marked inside basket (decision *LL* = location of mark)

Tip: The level prompt *LL* indicates that the flow meter is disabled (correct). If the prompt here is *LLLL*, review the instructions in Section 4.3.3 and disable the flow meter.

- chemicals are not programmed (decision *Chem* = 0)
- steam is not programmed (decision *S* = 0)

Figure 70: Calibration Formula

Typical Programming Screen



Legend

A. Type of step = 3 (Soak Bath)
B. Temperature = 000 (none)
C. Cold = 1 (On)
D. Level = 16 (Example *High level*)
E. Steam = 0 (none)
F. Chemicals = 0 (none)
G. Fill and Drain Action = 6 (Stop while filling, do not drain)

4.3.6. How to Test the Transducer

1. Test for a faulty transducer.
   a. Disconnect the pressure transducer output wire from MTA3-4.
   b. Measure the voltages on the transducer. Voltage on the input pin should be +12VDC. With no water in the cylinder, voltage on the output pin should be about 1VDC.
2. Test for an air leak.

CAUTION 21: Avoid overflowing the machine.—The following test requires injecting water into the cylinder with the pressure transducer output disconnected. You must turn the water supply off manually to prevent overflowing the cylinder.

   a. With the output wire still disconnected, have an assistant run the calibration formula described in Section 4.3.5 **and manually shut off the cold water supply** when high level is achieved.
   b. While the machine is filling, measure the voltage on the output pin of the transducer. The voltage should rise from 1VDC to some value less than 6.0VDC. Voltage is proportional to bath level at about 1 volt per 11 inches (28cm) of water.
   c. Monitor the voltage while high level is achieved. The voltage should remain stable.
3. Test for correct shielding between the transducer box and the low voltage control box cable.

   The shield on this 4-conductor cable must be **grounded** to the copper bus bar in the l*ow voltage control box* and **disconnected** in the *transducer box*.

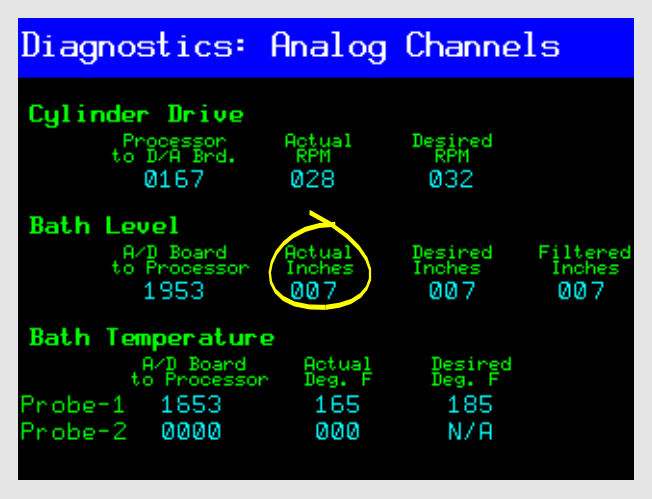
   a. Connect the wire to the output pin of the transducer.

b. Change the stationary bath step of the calibration formula to a two-way bath.

c. Run the calibration formula.

d. While the machine is filling with the basket turning in both directions, press 9 on the keypad to display the *Diagnostics: Analog Channels* screen (Figure 71).

Figure 71: Typical Analog Channels Screen



Monitor the *Actual Inches* or *Actual CMs* value. If this value changes from 000 when the basket is turning to the correct value when the basket is stopped, the shield isn't properly grounded. Verify that the shield is connected as described above.

e. Press CANCEL to close the analog channels screen and return to the run status screen.

4.3.7. How to Re-enable the Flow Meter

If you disabled the flow meter as described in Section 4.3.3 "How to Disable the Flow Meter", use the steps below to turn the flow meter on again for metered water or liquor ratio formulas.

Tip: If you need to test the transducer, do this after you've finished testing.

1. Set *configure decision N* to 1 to enable the flow meter.
2. As you step through all remaining configure decisions, compare the displayed values with the values you printed or wrote down in Section 4.3.3.
   - Do not change any of the four level settings that you just established (low, medium, high, or wet-down).
   - Do not change the *bath level offset* value.
3. In the *Liquor Ratio* box, restore *Counts per 100* and *Offset Valve Time* to the values you recorded earlier.

— End of BICWCC02 —

Chapter 5
Supplemental Information

BICWCF02 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.1. About ChemSave and Timer Stop

The Milnor® Mark VI washer-extractor controller is capable of communicating certain signals between itself and a chemical supply controller, provided by others. This communication helps to ensure that each machine receives the full dose of chemical, and that the chemical is allowed to interact with the goods for the desired time. The two approaches to achieving these goals are separated by whether the chemical supply system grounds the *ChemSave/Timer Stop* input **before** or **after** the Milnor machine signals that it is injecting. The same input to the Milnor microprocessor is used in both approaches.

- If the *ChemSave/Timer Stop* input **is** grounded at any time during the two seconds immediately before the programmed injection begins, the Milnor machine stops its step timer. When the chemical control system releases the input, the Milnor machine waits for two seconds, then signals for the injection to begin by actuating the appropriate chemical injection output(s) and the *I am Injecting* output.
- If the *ChemSave/Timer Stop* input **is not** grounded during the two seconds immediately before a chemical injection is programmed to begin, the Milnor® machine turns on the appropriate output(s) to begin the chemical injection and actuates the *I am Injecting* output. If the external chemical supply system can't deliver the requested chemical immediately, it should ground the input to stop the step timer until the injection is completed.

5.1.1. An Example Laundry System

Assume that a sample system consists of a chemical supply controller and three Milnor washer-extractors with Mark VI controls (Machines A, B, and C). If all machines are started at approximately the same time and running similar formulas, there's a good chance that one of the washer-extractors will request a chemical while the chemical controller is servicing another machine.

To ensure that each machine gets the full desired measure of chemical, the chemical controller allows only one washer-extractor to receive chemical at any point in time.

Similarly, to ensure that the chemical has the full bath time to interact with the goods, the chemical controller stops the bath timer in any washer-extractor until the desired chemical injection for that machine is completed.

5.1.2. How the *ChemSave* System Works

If Machine A is currently receiving chemical, the chemical supply controller must ground the *ChemSave* input on Machines B and C to temporarily prevent those machines from requesting chemicals. When the programmed chemical injection for Machine A is completed, the chemical

supply controller releases the *ChemSave* input to allow the other machines to request chemicals as programmed. A chemical injection that has already started cannot be stopped with this method, which has been replaced in many more recent installations by the *Timer Stop* system, described in Section 5.1.3.

Specifically, when the chemical supply controller is delivering a chemical to any machine, it must ground the *ChemSave* input (processor board 1MTA4-7) of every other machine in the system. These other machines will continue with the bath operation in progress, but the timer does not run.

5.1.3. How the *Timer Stop* System Works

If Machine A is currently receiving chemical—indicated by the closure of the *I am Injecting* output—the chemical supply controller accepts and queues all chemical requests from Machines B and C, then stops the timers on machines requesting chemical. When the programmed chemical injection for Machine A ends, the chemical supply controller releases the timer on Machine A and begins servicing the next chemical request in the queue.

Specifically, when the chemical supply controller sees that the *I am Injecting* output closes on a second machine (one other than the one it's currently servicing), it grounds the *ChemSave/Timer Stop* input (processor board 1MTA4-7) on the second machine to stop the step timer on that machine. When the chemical system finishes the current injection, it releases the *ChemSave/Timer Stop* input on the first machine, then begins servicing the second machine.

— End of BICWCF02 —

BICUDC01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.2. Serial Memory Storage Device Applications

A serial memory storage device similar to one shown below can be used to store machine configuration and formula data for most current models of Milnor® machines. DIP switches inside the storage device allow you to configure the device to accept data from several different machine types and software versions. Use this document to determine the proper DIP switch setting for your machine. After verifying the switch settings, label the storage device with the date, machine name, and serial number to avoid confusion when the device is needed to restore data to a machine.

Figure 72: Serial Memory Storage Device

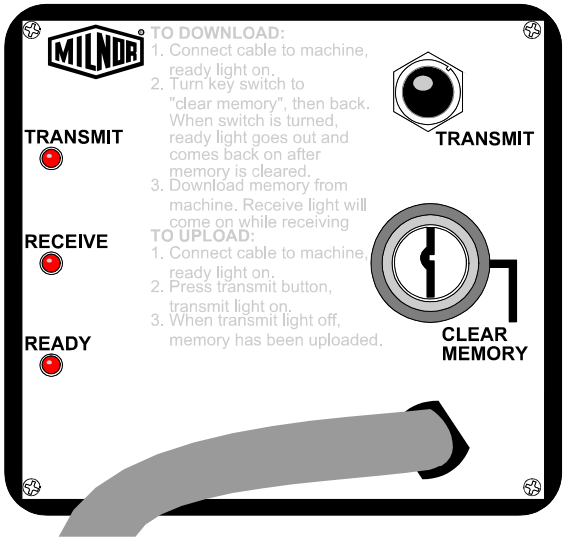


Figure 73: Rear View of Circuit Board

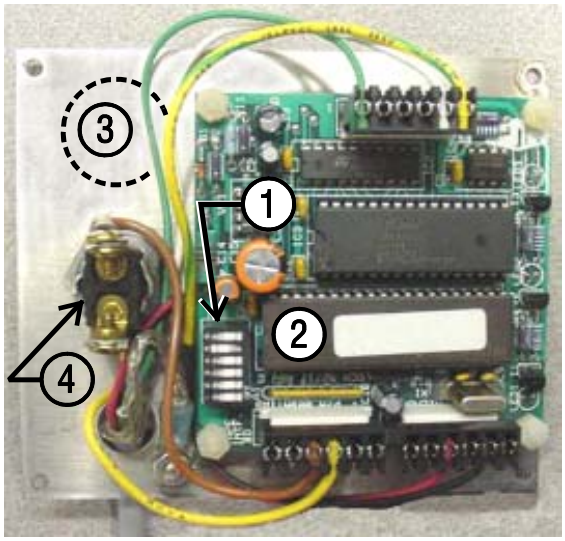
View	Legend
	**1.** DIP switch **2.** Software chip **3.** Location of *Transmit button*, if equipped **4.** Key switch

Table 20: DIP Switch Positions for Machines Requiring an External Transmit Button

Processor Board	Machine Software Versions	DIP Switch Setting
Washer-extractor Models other than Fxx		
8088	All	C
80186	98000-98003	C
	98004-99004	not supported
	99005-9900B	D
	20000-20003	D
FxW, FxP, FxN, FxS, and FxR Washer-extractor models		
8088	All	C
80186	98000-98003	C
	98004-98009	not supported
	9800A-9800H	D
	20000-2000B	D
	2100F and later	D
Textile and Dye Machine Models		
8088	All	C
80186	95000-95305M	C
	95305N-95306	D
	20000-20004	D
Dryer Models		
8088	All	C
80186	All	C
Centrifugal Extractor Models		
8088	All	C
80186	All	C
Single-station Press Models		
8088	All	C
80186	All	C

Key:

A	All switch positions OFF
B	Position 4 ON; all others OFF
C	Position 5 ON; all others OFF
D	Positions 1 and 5 ON; all others OFF
E	Positions 4 and 5 ON; all others OFF

— End of BICUDC01 —

BICWUI01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.3. Printer Requirements and Settings

Notice 22: Because of the many differences among printer makes and models, Milnor® cannot ensure suitability or troubleshoot printers other than those described in this document (or certain older approved models), with the required interface cable.

5.3.1. Cable Requirements

The printer must be connected to the printer port on the machine using the appropriate one of the following Milnor® interface cables:

Table 21: Milnor® Printer Cables

Printer Cable Part Number	Description
10YMK2PNTR	100-formula washer-extractor, dryer, extractor, and Miltron (CBW) controllers
10YCBWPNTR	Non-serial Miltron (CBW) controller
08MPSERCBL	Mentor (CBW) and Mildata controllers

5.3.2. Configuring the Citizen GSX-190 Printer

Table 22 lists the required settings for this printer model to work properly with Milnor® equipment. To print the current settings stored in your printer, move the *Menu* slide switch on the printer to the *VuePrint* position, then hold the *Print* button for three seconds. Hold the *Menu* button for three seconds to enter the *VuePrint* menu system to make changes.

Table 22: Required Settings for Citizen GSX-190 Printer

Menu	Data Field	Value	Menu	Data Field	Value
Install 1	Ribbon	Normal	Character	Slash zero	Off
	A.S.F.	Off		Character set	Graphics
	Emulation	Epson		Intl character set	U.S.A.
Print Style	Font	Draft		Code page	U.S.A.
	Emphasized	Off	Install 2	Tear off	Off
	Pitch	10 characters per inch		Paper out	Enable
	Font lock	Off		Auto linefeed	Off
Page Layout	Line spacing	6 lines per inch		Copy mode	Off
	Form length	Letter		Envelope	Off
	Page skip	Off	Serial I/F	Baud rate	9600
Print Mode	NLQ Dir	Uni-directional		Parity	Even
	Graphic Dir	Uni-directional		Data bits	8 bits
				Stop bits	1 bit
				Protocol	DTR

5.3.3. Configuring the Epson LX300 Printer

The Epson model LX300 printer was supplied by Milnor® prior to March 2001 to print data from microprocessor controllers with printing functions. When shipped from Milnor®, this printer was configured to operate correctly with Milnor® equipment. If the printer is replaced or must be reconfigured for any reason, refer to the user's guide and the following table.

Table 23: Required Settings for Epson LX300 Printer

Data Field	Value	Data Field	Value
Character spacing	10 characters per inch	Tractor	Single
Shape of zero	0	Interface	Serial
Skip over perforation	Off	Bit rate	9600 bps
Character table	PC 437	Parity	Even
Auto line feed	Off	Data length	8 bits
Page length	11 inches	ETX/ACT	On
Auto tear off	Off		

5.3.4. Previous Printer Models

The Epson LX300 printer replaced the Epson LX-810, which replaced the Epson LX-800. For information on these older printer models, request document MSSM0251AE from the Milnor factory.

— End of BICWUI01 —

BICWUC01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.4. Construction of External Serial Link Cables

This document provides information for on-site fabrication of certain types of serial communication cables. An individual machine can be connected to certain makes and models of serial printer (see Note 25) using the printer cable described in Section 5.4.2.2. Programmable data can be transferred between compatible machines or between a machine and a Milnor serial memory storage device (see Note 26), using the download cables described in Section 5.4.2.3 and Section 5.4.2.4 respectively. These cable(s) connect to the cabinet-mounted 9-pin DIN type receptacle shown in Figure 74 and may be installed temporarily or permanently, as appropriate.

If the machine is connected to a Mildata® or Drynet (dryer/shuttle controller) network (see Note 27), downloading is more likely to be handled by these products. Another Milnor document—Section 5.5. "On-Site Installation and Troubleshooting of Permanent Serial Communication Cables"—describes the permanent cables needed to communicate across a Mildata, Drynet, or Miltrac™, network. In the unlikely event that personnel will want to download data via the download cables described herein, rather than via Mildata, all energized machines on the Mildata network will receive the downloaded data. **Turn off power to any machines to which you do not wish to download.**

Note 25: The currently approved printers and printer configuration settings are provided in Section 5.3. "Printer Requirements and Settings". A pre-assembled machine-to-printer cable similar to the cable described here, is available from Milnor (P/N 10YMK2PNTR).

Note 26: The Milnor serial memory storage device (also known as a download box) contains nonvolatile memory to hold a back-up copy of the programming and configuration data for **one machine**. This data is transferred between the machine and the memory storage device via the DIN receptacle on the machine. Two models are currently available: KXMIC00507 and KXMIC00508. The already wired cable and DIN connector are included as part of the memory storage device. Consult the Milnor Service department to determine the correct device for a particular application.

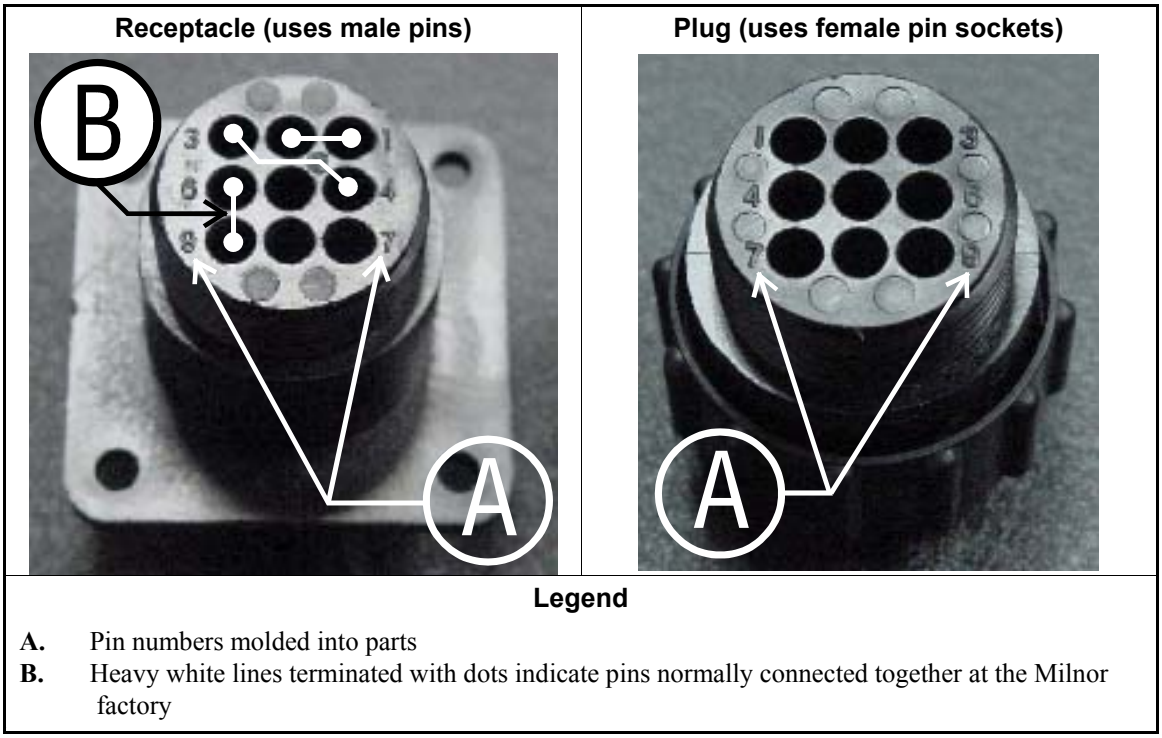
Note 27: Mildata is Milnor's PC-based product for centralized data collection, productivity analysis, report generation, formula development and data downloading. Drynet permits supervisory and manual functions for a group of dryers and the shuttle that serves them to be performed from a central PC.

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

5.4.1. Pin Identification

The download and printing functions use different data communication lines, but the DIN receptacle on the machine contains all of the pins used for either function. Figure 74 illustrates the DIN receptacle (which uses male pins) and the mating plug (which uses female pin sockets), each viewed from the **wire entry** side. The receptacle is normally installed and wired at the Milnor factory. The plug and female pin sockets for customer use are provided in a bag inside the electric box. Table 24 shows the function of each pin.

Figure 74: 9-Pin DIN Connector Pin Identification (from wire entry side of connectors)



Legend

A. Pin numbers molded into parts

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

Table 24: External Serial Link Pin Assignments

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

CAUTION 23: Risk of damage to electronic components—Pin 8 is only used to supply +5VDC power to the download box and will damage components in both devices if not properly connected

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

5.4.2. How to Wire the Cables

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

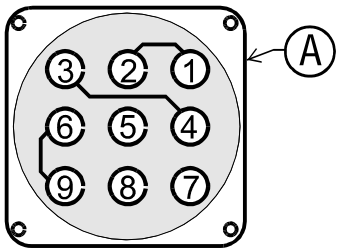
5.4.2.1. Cable Specifications—Multi-conductor shielded cable that meets the following minimum requirements must be used in the applications covered herein. Conforming cable may be purchased from Milnor (P/N 09V300A04S) or purchased from another source:

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

5.4.2.2. Connecting a Machine to a Printer for "Print Data"—Many Milnor microprocessor-controlled machines allow permanent or temporary connection of a serial printer for generating printed copies of formulas or status reports during operation. Figure 75 shows how to wire the machine-to-printer cable. Milnor has tested and approved certain printers for this application (see Note 25).

Figure 75: Wiring Diagram for Cable to Connect a Machine to a Printer

Receptacle



Legend

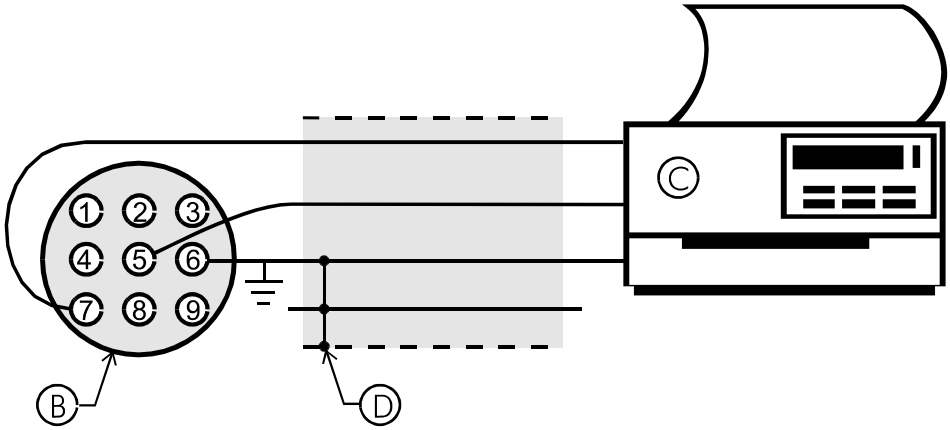
A. Receptacle (with male pins). Pin functions are as follows:
- **5.** Clear to send (CTS).
- **7.** Transmit data (TXD)
- **6&9.** Ground. This application only uses Pin 6.
- **1&2.** Not used in this application
- **3&4.** Not used in this application
- **8.** Not used in this application. See caution statement **23** .

B. Plug (with female pin sockets)

C. Approved serial printer (see Note 25)

D. Tie shield and spare conductor(s) on this end of cable to ground. Leave unconnected on other end.

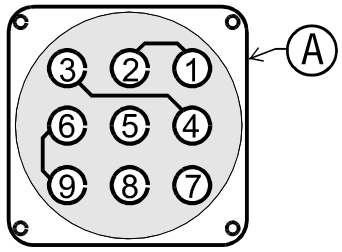
Cable Wiring



5.4.2.3. Connecting Two or More Machines for Machine-to-machine Transfer—Figure 76 shows how to wire a cable to connect a bank of identical machines (the Figure 76 example shows connections for four machines) so that data programmed on one machine in the group can be downloaded to all other machines simultaneously. This cable is referred to as a daisy chain because it runs in segments from machine to machine, connecting all machines in the group.

Figure 76: Wiring Diagram for Cable to Connect Two or More Machines

Receptacle On Each Machine



Legend

A. Receptacle on machine (with male pins). Pin functions are as follows:
- **1&2.** Serial low
- **3&4.** Serial high
- **6&9.** Ground
- **5&7.** Not used in this application
- **8.** Not used in this application. See caution statement **23** .

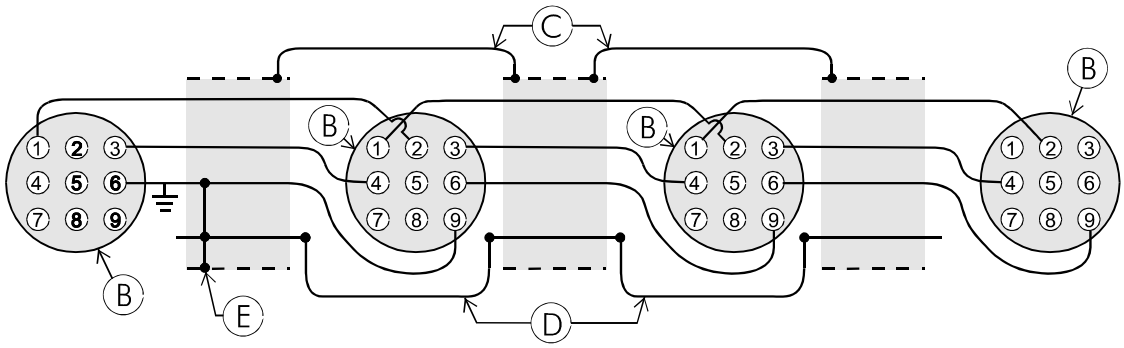
B. Plug on cable (with female pin sockets)

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

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

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

Cable Wiring



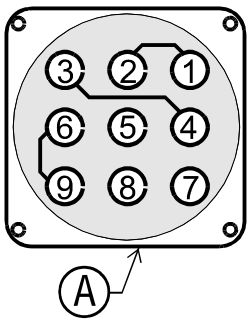
The internal connections on each receptacle (machine) between pins 1 and 2, 3 and 4, and 6 and 9 make it easier to wire the cable because it is not necessary to jumper these pins together on the cable. However, this also means that every plug on the daisy chain must be plugged into a receptacle. Otherwise, the serial low, serial high, and ground conductors will not have continuity across the entire daisy chain and some machines will not receive data.

Rules and details about downloading among machines are fully described in the programming section of the reference manual.

5.4.2.4. Connecting a Machine to a Serial Memory Storage Device—The cable used with the serial memory storage device (download box) available from Milnor, see Note 26, is permanently attached to the storage device. Cable fabrication, as shown in Figure 77, is not required except for replacing a damaged cable. The memory storage device is the only application in which the power conductor (Pin 8) is used.

Figure 77: Wiring Diagram for Cable to Connect a Machine to a Serial Memory Storage Device

Receptacle



Legend

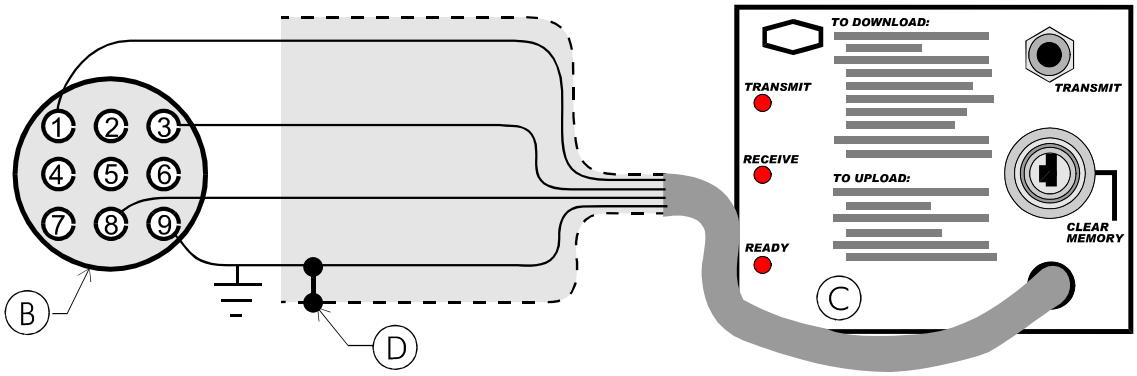
A. Receptacle on machine (with male pins). Pin functions are as follows:
- **1&2.** Serial low. This application only uses Pin 1.
- **3&4.** Serial high. This application only uses Pin 3.
- **6&9.** Ground. This application only uses Pin 9.
- **5&7.** Not used in this application.
- **8.** +5VDC. Provides power to memory storage device.

B. Plug on cable (with female pin sockets)

C. Memory storage device (front panel may be different)

D. Tie shield on this end of cable to ground. Leave unconnected on other end.

Plug and Storage Device



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BICCUC01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.5. On-Site Installation and Troubleshooting of Permanent Serial Communication Cables

Permanent serial communication cables are those that must be connected directly to microprocessor boards via MTA connectors on the board, not those installed via cabinet-mounted DIN receptacles provided for customer use (see BICWUC01 “Construction of External Serial Link Cables”). Permanent serial cables should be installed only by trained technicians.

Miltrac™, Drynet (dryer/shuttle controller) and Mildata®, whether provided separately or included with MultiTrac™, each requires its own serial communication wiring to link the controller with its subordinate machines. Portions of this wiring must be fabricated and installed on site. The portions that do not need to be field installed are those where several components to be connected are located on equipment shipped as a single unit. For example, in systems where the processor boards for all dryers and shuttles are located in a central controls mounting panel (belt box), the corresponding Miltrac data lines on each board are wired together at the Milnor factory. The field wiring need only connect to one of these boards.

All devices connected to a central controller share the same serial port on that controller. Cable routing has no bearing on the ability of the central controller to distinguish devices (this is handled by identification codes preset on each device and configured in the controller software). Hence, the devices can be connected to the controller either via direct controller-to-machine (“home run”) wiring or via “daisy chaining”.

5.5.1. "Home Run" Versus "Daisy Chain" Wiring

home run (recommended)—a method of linking several devices (machines) to a central controller by running a separate serial cable from the controller to each device. With this method, all serial high lines are spliced together on the controller end, as are all serial low lines.

daisy chain (discouraged)—a method of linking several devices (machines) to a central controller by running a single, segmented cable from device to device, throughout the entire bank of devices. Each serial port on a Milnor processor board has two internally-connected pins dedicated to each data line. Serial low is pins 1 and 2 and serial high is pins 3 and 4. In most cases, all four pins, as well as two unused pins (5 and 6) comprise a single, six-pin MTA connector (see Figure 78 in Section 5.5.3.1). By convention, the incoming daisy chain segment is brought in on pins 1 and 3 and the next daisy chain segment begins on pins 2 and 4.

When wired properly, either method is acceptable. However, the home run method is preferred and this is the method on which system cable diagrams prepared by Milnor are now based. Although the daisy chain approach often requires less cable, it has a major disadvantage in troubleshooting. If a wiring problem occurs anywhere along the daisy chain, all downstream machines (on the side opposite the central controller from the problem) are affected. When one or more machines are not responding properly because of a wiring problem on an upstream machine such as an "open" in a line, reversed serial high and serial low lines, or a faulty ground, the problem is often difficult to identify. With the home run approach, such a wiring problem will only affect the one machine served by the offending cable.

5.5.2. Specifications and Requirements

Because the interconnected devices may be at different ground potentials and because the field-installed cabling is particularly susceptible to electrical noise, specific cabling material and grounding procedures must be adhered to.

5.5.2.1. Cable Specifications

—Most new CBW systems include MultiTrac®. MultiTrac always includes PC Miltrac (the Miltrac controller) and Online Communicator software (the Mildata data collection function). In most cases, optional Drynet (the Dryer/Shuttle controller) is also provided. Each of these controllers requires a separate serial link to communicate with its subordinate machines. Miltrac and Online Communicator typically communicate with every Milnor machine in the system. Drynet communicates with every Milnor dryer and shuttle. Hence, it is convenient to run a six-conductor serial communication cable (three serial links) between the MultiTrac console and each dryer and shuttle, and a four- or six-conductor cable between MultiTrac and every other Milnor machine. Cables serving this purpose must conform to the following specification:

- Two twisted pair (four-conductors) or three twisted pair (six-conductors), as follows:
  - » Conductive material: Tinned copper, 18 AWG (1.0mm²)
  - » Insulation: 300VAC, color coded
  - » Positive wire identification by color coding and/or wire number.
- Shielding: Braided tinned copper or foil, minimum 85% coverage
- Jacket: 600VAC insulation

Cables meeting the above specification are available from Milnor, as follows:

Four-conductor—P/N 09V300B04S
Six-conductor—P/N 09V300B06S

5.5.2.2. Conduit Requirements—Consult local codes to determine any requirement to run serial communication cables within conduit. In the absence of such a requirement, consider cable protection, and in any case observe the following precaution:

CAUTION 24: Risk of Bad Data—Inadequate shielding against electrical noise can trigger false signals.

- Do not run serial cables adjacent to, or in the same conduit with wires that provide motor power or similar. It is permissible to run serial cables in the same conduit with Milnor control circuit conductors (DC and/or AC), and with control circuit ground (earth) conductors used to ground the various controllers together.
- If serial cables are run in a cable tray, insure the tray does not also contain wires for motor power or similar **and that such conductors are not subsequently added**.

5.5.2.3. Grounding the Controllers—Connect the high voltage control circuit ground terminals (normally pin 2F) together in all controllers to be linked via a serial cable or via any other control conductors. Use 14AWG (2.5mm²) conductors with 600VAC insulation.

CAUTION 25: Risk of component damage and warranty loss—Powering up machines before controller-to-controller grounds are properly established will burn out microprocessor boards and void the warranties.

- Install secure grounds as described above before first applying power.

5.5.2.4. Grounding the Shield and Unused Wires—Ground the serial cable shield and unused wires as follows, to obtain the best protection against electrical noise and to counteract any tendancy of the spare wires to act as antennas.

5.5.2.4.1. If the "Home Run" Method Is Used—Splice together the shields and any spare wires for all cables where they converge inside the MultiTrac console or central controls mounting panel (belt box). Connect the spliced shields and wires to signal ground (normally pin 2G or pin 7) within the cabinet. On the opposite end of each cable, leave the shields unconnected and individually cap or tape each spare wire.

5.5.2.4.2. If the "Daisy Chain" Method Is Used

1. Connect together the abutting ends of the shield at each location where the daisy chain segments meet (at each intermediate device), but do not connect them to anything else. The objective is to achieve continuity in the shield across the entire length of the daisy chain. If a segment enclosed in an electric box (a factory installed segment) falls **in the middle** of the daisy chain, install a wire inside the electric box to connect the incoming shield to the outgoing shield. Do not ground the shield inside this box.
2. Do the same as above for each spare wire.
3. On the end of the daisy chain that connects to the system controller, connect the shield and spare wires to signal ground (normally pin 2G or pin 7) within the controller's electric box.
4. On the opposite end of the daisy chain, leave the shield unconnected and individually cap or tape each spare wire.

5.5.3. Connecting the Serial Link To Subordinate Devices (Machines)

WARNING 26: Electrocution and Electrical Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

- Do not service the machine unless qualified and authorized. You must clearly understand the hazards and how to avoid them.

5.5.3.1. **Identifying Serial Ports**—As shown in Figure 78, labels imprinted on the processor board (e.g., "1MTA32 RS485 #1") identify the serial ports. By convention, Milnor dedicates the same serial ports on different devices to certain functions (see Table 25). For example, the software for every Milnor machine that can function as a Miltrac device (press, centrifugal extractor, shuttle, dryer, etc.) is written to communicate with Miltrac via the serial port at MTA32. However, do not rely solely on the convention shown in Table 25. Always consult the system connection instructions in the device or system controller schematic manual to confirm serial link connection points.

Table 25: Serial Port Dedicated Uses

Serial Port Identification				Serial Port Function
8088 Board	**Serial Link #**	**80186 Board**	**Serial Link #**	
n/a	--	MTA29	4	Textile machines: Chemflow boards
				CBWs: peripheral boards (second port)***
				Dryers, shuttles: Drynet (dryer/shuttle controller)
				All others: not used
MTA30* (RS232) or** MTA30* (RS485)	4	MTA30* (RS232)	--	Printer****
		MTA30* (RS485)	--	Serial display (on devices so equipped)
MTA32	1	MTA32	1	Miltrac
MTA33	2	MTA33	2	Peripheral boards
MTA34	3	MTA34	3	Mildata / download****

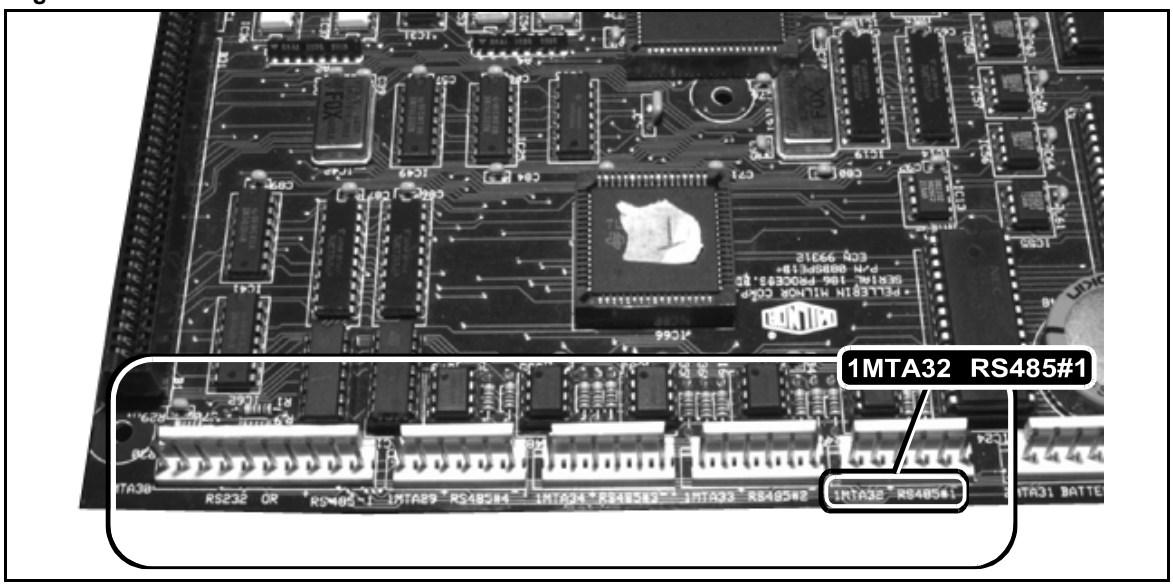
* MTA30 is a 10 pin connector. Pins 1 through 4 are dedicated to the RS485 port and pins 5 through 10 are for the RS232 port.

** On the 8088 processor board, either port, but not both, can be used. On the 80186 board, both ports are available.

*** On the CBW, this provides a second serial port for communication with the peripheral boards. Dividing the connections between two ports speeds communication in longer tunnels with many peripheral boards.

**** Typically, the MTA30 RS232 port and MTA34 are factory wired to different pins on the same cabinet-mounted DIN receptacle, for printer and download access (see BICWUC01 "Construction of External Serial Link Cables").

Figure 78: Serial Ports on Processor Board



5.5.3.2. **Wiring the Serial Low and Serial High Lines**—On a serial port's MTA connector, pins 1 and 2 are serial low and pins 3 and 4 are serial high (on serial ports with six pin MTA connectors, pins 5 and 6 are unused). By convention, Milnor wires the incoming serial link segment (the line coming from the system controller) to pins 1 and 3, and, when daisy chaining, it wires the outgoing serial link segment (the line that continues the daisy chain) to pins 2 and 4. For Miltrac, Milnor uses a black or blue and black striped wire for serial low and a red or blue and red striped wire for serial high (see Note 28), and recommends following this convention in the field. In any event, the serial low and serial high wires must not get crossed, as this will prevent the system from functioning.

Milnor P/N ZXUUACSIIA consists of a bag of connector components. One or more of these are provided for systems installations. The MTA connectors needed for on site fabrication of the serial cables are included in the bag.

> **Note 28:** For daisy chain segments completely enclosed within an electric box or cabinet, it is not necessary to use cable as specified above. The enclosure provides sufficient shielding from electrical noise. For these segments Milnor normally uses individual wires—black or blue/black for serial low and red or blue/red for serial high.

5.5.4. Connecting the Serial Link to the System Controller

The hardware and wiring used to terminate a Miltrac, Drynet, or Mildata/Online Communicator (Mildata) serial link at the system controller changes on occasion, with developments in the various controllers. The connections, as of this writing, are described here. However, refer to the schematic manual and any other documentation provided with the controller, which may reflect more recent changes.

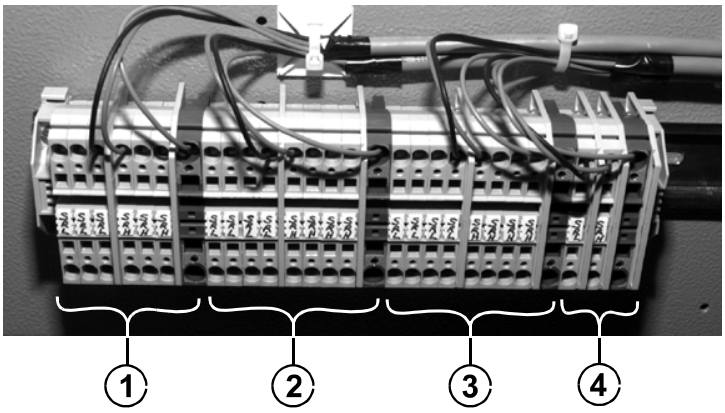
If the “home run” wiring method is used, it is unlikely that there will be a sufficient number of terminals at the controller end to accommodate all of the incoming lines. In this case, splice all corresponding lines from each device (such as Miltrac serial high) at the controller end, to a single conductor which will be used to make the connection to the system controller.

5.5.4.1. MultiTrac (containing Online Communicator, Miltrac, Optional Drynet, and Optional Device Master)—MultiTrac consolidates Online Communicator (which performs the Mildata data collection function), and the Miltrac, optional Drynet, and optional Device Master controllers. The MultiTrac console, which houses the MultiTrac PC and various machine controls, also provides a centralized location for connecting the serial cables associated with each of these control systems (see Note 29). Serial link connections are made on a single IEC terminal block in the lower front compartment (see Figure 79). Multiple serial low (SRL) and serial high (SRH) pins are provided for each type of serial link. Any pin in the group for that serial link may be used for the serial low and serial high conductors, respectively. The shield and any unused wires must be grounded within the MultiTrac cabinet only, as previously stated. Connect the shield and any unused wires to any ground pin on the terminal block in Figure 79.

> **Note 29:** The PC Device Master option utilizes a microprocessor controller as well as the PC Device Master software running on the MultiTrac PC. The only serial link required for Device Master is one that connects the microprocessor controller with the MultiTrac PC. However, because the Device Master microprocessor controller is also located in the MultiTrac cabinet, this serial link is wired at the factory.

Figure 79: MultiTrac Connection Points for Miltrac, Drynet, Mildata and Device Master Serial Links

IEC Terminal Block for Serial Link Connections



Legend

1. Drynet (dryer/shuttle controller)
2. Miltrac
3. Mildata
4. Device Master (see Note 29)

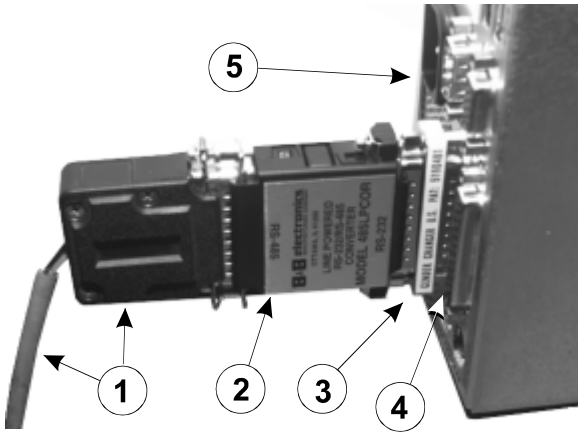
5.5.4.2. Mildata PC With MultiTrac—If the installation includes MultiTrac, the Mildata serial communication lines from each machine do not connect directly to the Mildata PC. Rather, they connect to the MultiTrac PC, where the Online Communicator software performs the Mildata data collection function (see Note 30). The data is shared with the Mildata PC via a standard PC networking connection using CAT 5 cabling.

> **Note 30:** In older MultiTrac installations, the MultiTrac-to-Mildata link functions like a daisy chain segment and the cabling connects to the Mildata PC as described in Section 5.5.4.3 above.

5.5.4.3. Mildata PC Without MultiTrac—If the system does not include MultiTrac, the Mildata PC typically uses Com 1 to communicate with the devices in the Mildata network, although this is configurable. The various components needed to adapt this port to the incoming serial link (e.g., gender converter, RS232-to-RS485 converter, wiring harness) are provided with the PC. The assembled components, as currently used, are shown in Figure 80. The last component in this group, and the one that the incoming Mildata serial link connects to is a 9 pin male DIN connector. A 9 pin female DIN connector and pins are provided in a bag with the PC, for field wiring. When the Mildata daisy chain is fabricated on site, the female DIN connector is wired to the end of daisy chain closest to the PC. Depending on the distance, the customer may want to fabricate an extension cable with the appropriate 9 pin DIN connectors on each end to run between this point and the PC.

Figure 80: Serial Link-To-Com Port Adapters on Mildata PC

Assembled Components



Legend

1. Wire harness with 25-pin connector, one end (shown) and 9-pin male DIN connector, other end (not shown)
2. RS232-to-RS485 adapter
3. Gender converter
4. Com port on PC
5. Rear of Mildata PC

5.5.4.4. Older Drynet (Dryer/Shuttle) Controller—Older dryer/shuttle controllers consist of a dedicated PC with Drynet software and some machine controls (i.e., Power switch, Start and Stop buttons for each dryer and shuttle) mounted in a free-standing cabinet. On these units, the Drynet serial link is connected directly to a com port on the Drynet PC in the same manner as described in Section 5.5.4.3 for a Mildata PC without MultiTrac.

5.5.4.5. Older Miltrac Controller—The older Miltrac is a microprocessor controller with a processor board similar to that used in machines (see Section 5.5.4.1 for PC Miltrac). The board contains serial ports accessed via MTA connectors the same as on the processor boards used by machines. As with machine processor boards, 1MTA32 is dedicated to Miltrac serial communication. However, on the Miltrac processor board, a second port: 1MTA33, is also dedicated to Miltrac communication, to speed communication in larger Miltrac systems. Miltrac controlled devices 0 through 19 must communicate with 1MTA32 and devices 20 through 39 must communicate 1MTA33 via a separate serial link. Note that regardless which port on the Miltrac processor board a device communicates with, the Miltrac serial port on the device's own board is always 1MTA32.

5.5.5. Troubleshooting Reminders for the “Daisy Chain” Method

When troubleshooting communication problems in a system that uses daisy-chaining, the technician will often want to isolate certain devices for testing by disconnecting the serial link from the other devices. Remember that continuity in each of the two serial lines across the entire serial link is provided by the internal connections between pins 1 and 2 (serial low) and between pins 3 and 4 (serial high) on each board. As soon as you remove an MTA connector from the board, the link is broken not only to this machine but to all machines downstream of this connection point (on the side opposite the system controller). If you only want to remove one machine from the link, you must jumper pins 1 and 2 together and pins 3 and 4 together on the removed MTA connector so the downstream machines will remain connected.

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BICMUM01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.6. How to Upgrade Microprocessor EPROM Chips

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

matches the machine hardware, and that the chips are installed in the proper socket positions and orientation.

5.6.1. How to Change EPROMs

WARNING 27: Electrocution and Electrical Burn Hazards—Contact with electric power can kill or seriously injure you. Electric power is present inside the cabinetry unless the main machine power disconnect is off.

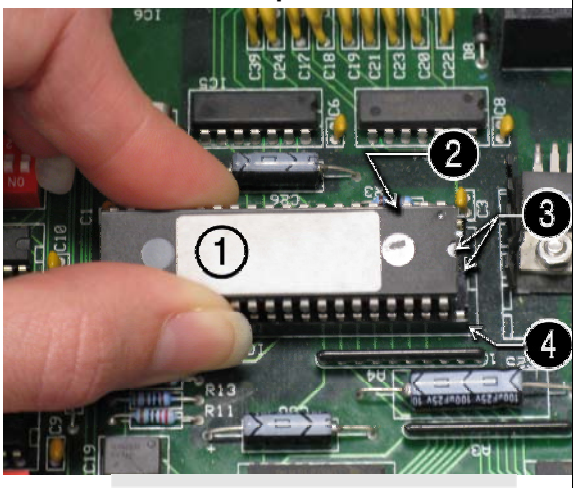
- Do not attempt unauthorized servicing, repairs, or modification.
- Abide by the current OSHA lockout/tagout standard when lockout/tagout is called for in the service instructions. Outside the USA, abide by the OSHA standard in the absence of any other overriding standard.

5.6.1.1. Remove and Replace EPROM Chips

1. Make sure all power to the machine is off.
2. Locate the chips as described in Section 5.6.2 "Location of EPROM Chips". Note the orientation of the chips as shown in the figure(s) below.
3. Use a chip removal tool or another small flat tool to carefully remove each EPROM chip from its base. Be sure to note the numerical order of each chip and the orientation to the key notch on the socket.
4. Install new chips, making sure the key notch on each chip is properly oriented and that all pins enter the proper holes in the socket, as shown in Figure 81. If necessary, slightly bend the pins on the EPROM chip to align the pins with the holes in the socket. After inserting each chip, verify that all pins are seated in the socket.

Figure 81: EPROM Chip Identification and Installation

EPROM Chip and Socket



Legend

1. Label
2. EPROM chip
3. Key notch
4. EPROM socket

CAUTION 28: Machine Damage Hazards—Incorrectly installing any EPROM chip may destroy or damage the chip or cause the machine or the display to operate erratically.

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

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

5.6.2. Location of EPROM Chips

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

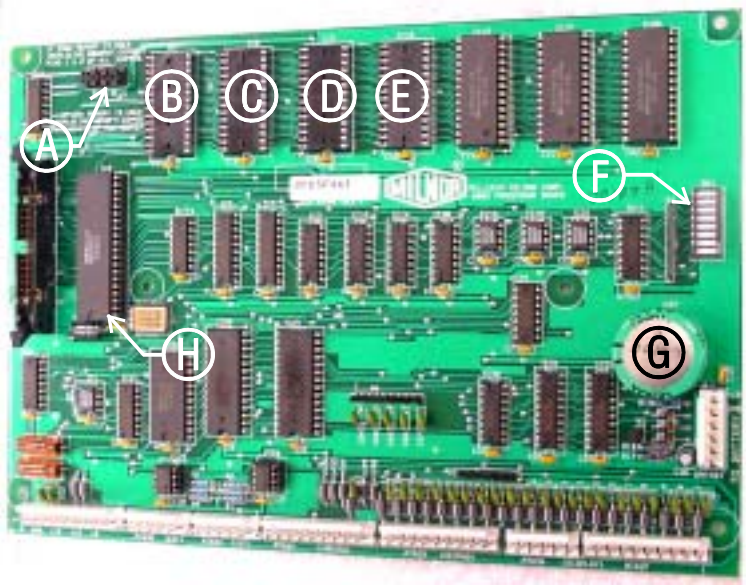
Table 26: Processor Boards and Applications

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

5.6.2.1. **8085 Processor Boards (except Coin Machines)**—See Figure 84. Install EPROM #1 at the end of the row nearest the corner of the board, then #2, #3, and #4. Chip #4 goes next to the two chips soldered to the board. See Figure 83 for where to check for proper voltages.

Figure 82: Replacement Processor Board

08BSPAA_

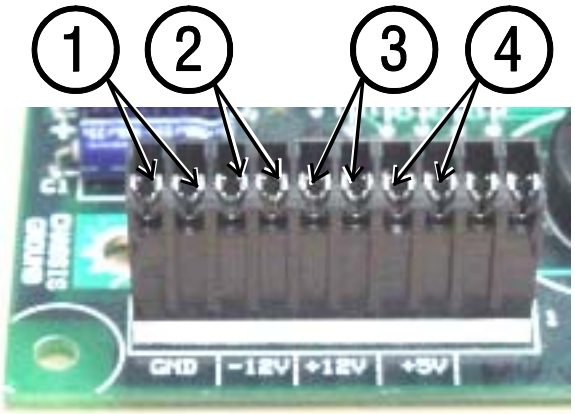


Legend

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

Figure 83: Where to Check Processor Board Voltages

Typical MTA-31

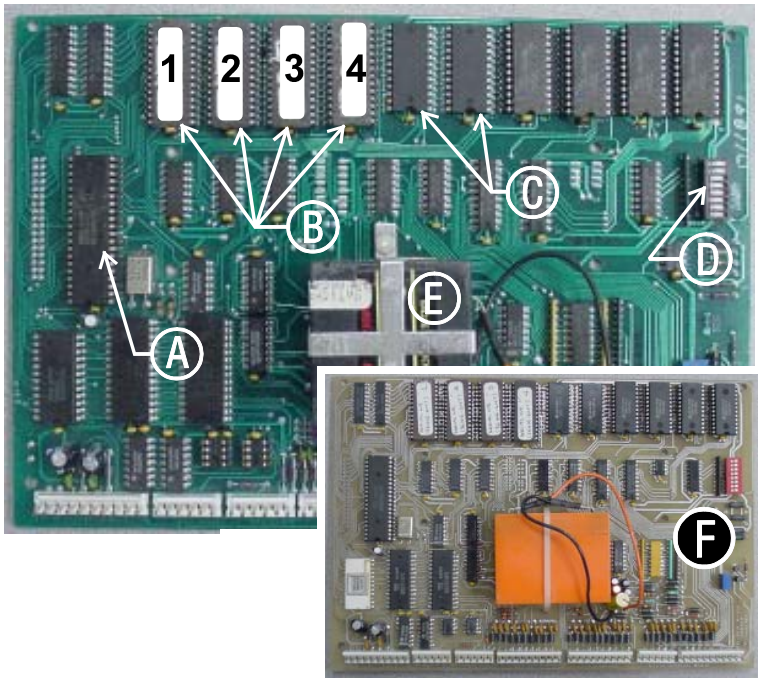


Legend

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

Figure 84: 8085 Processor Boards (Except Coin Machine)

Typical 08BSP_ and 08BSPx_ Processor Boards



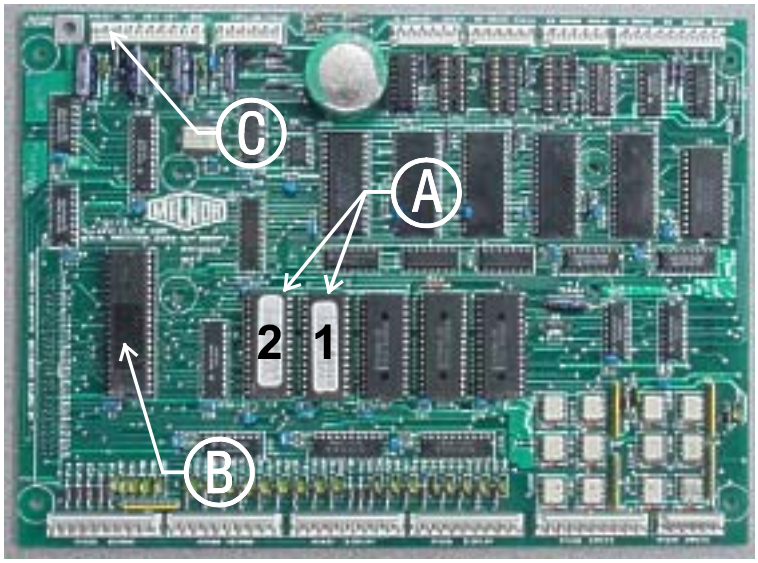
Legend

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

5.6.2.2. 8088 Processor Boards without Memory Expansion Board—See Table 27 "EPROM Locations for 8088 Processor Applications" and Figure 86. If the set consists of only one EPROM, install it in socket A of Figure 86 . If two EPROMs comprise the set, install EPROM #2 in socket A and EPROM #1 in socket B. Always install the highest numbered EPROM in socket A. If the set consists of more than two EPROMs, a memory expansion board must be present in the machine along with the processor board.

Figure 85: Typical 8088 Processor Board without Memory Expansion Board

08BSPC_ Processor Board



Legend

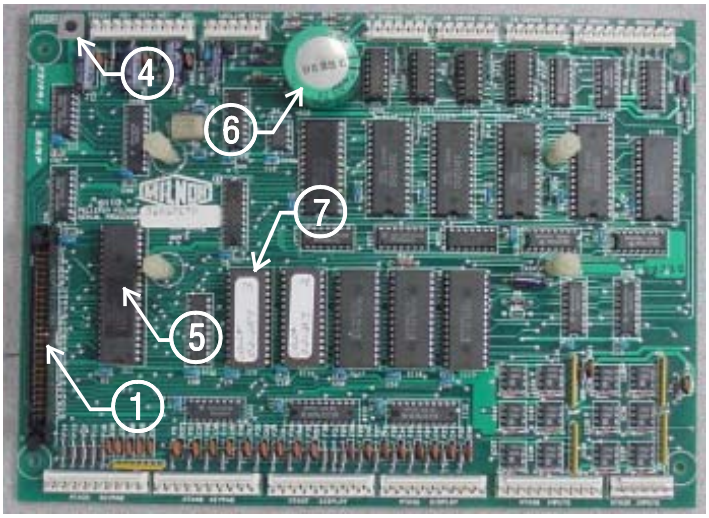
- **A.** EPROMs
- **B.** 8088 processor chip
- **C.** MTA31 for voltage verification

Table 27: EPROM Locations for 8088 Processor Applications

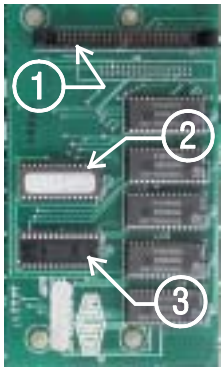
	EPROM Location by Socket			
EPROMS in Set	**A**	**B**	**IC-1**	**IC-2**
4 chips	4	3	2	1
3 chips	3	2	1	—
2 chips	2	1	—	—
1 chip	1	—	—	—

Figure 86: 8088 Processor Board and Optional Memory Expansion Board

8088 Processor Board



Memory Expansion Board



Legend

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

5.6.2.3. **8088 Processor Boards with Memory Expansion Board**—See Table 27 and Figure 86. If the EPROM set consists of three or more EPROMs, install the two highest numbered EPROMs (e.g., #3 and #4 of a four-chip set) on the processor board, with the highest numbered EPROM (EPROM #4 of a four-chip set) in socket A, and the EPROM with the second highest number (EPROM #3 of a four-chip set) in socket B. Install the remaining EPROM(s) on the memory expansion board with the highest numbered of the remaining EPROMs (e.g., EPROM #2 of a four-chip set) in socket IC-1 on the memory expansion board and EPROM #1 in socket IC-2.

5.6.2.4. **80186 Processor Boards**—This processor board (see Figure 87) is used on all Milnor® system controllers (Miltron™, Mildata®, etc.) equipped with a color monitor. It is also used on fully-programmable washer-extractors, textile processing machines with software version 95000 and later, and other models. The single EPROM on this board is located in socket IC-2.

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

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

The third version of 80186 processor board—with part number "08BSPE2_"—can be configured via a jumper on the board (shown in Figure 89) to operate either a vacuum fluorescent **text** display, or a flat panel **color graphic** LCD display. The jumper controls the serial communications port on MTA30.

Supplement 5

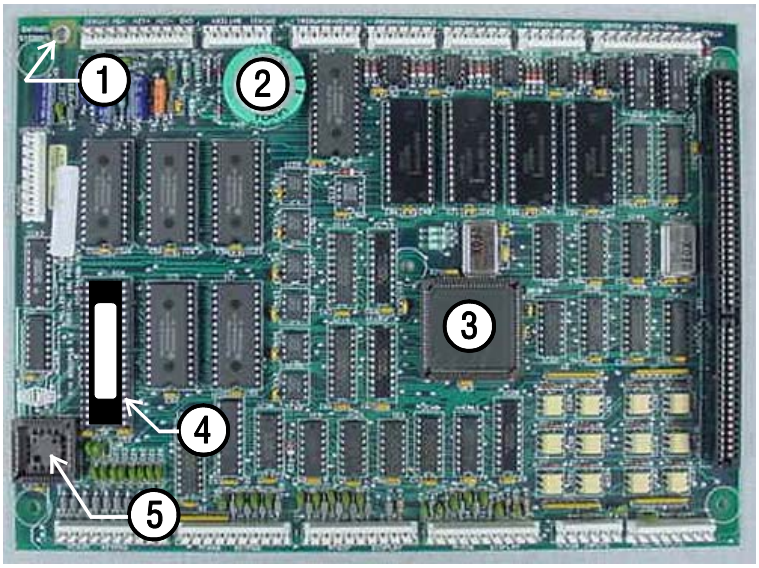
Rules for Replacing 80186 Processor Boards

Processor board "08BSPET" is obsolete. Depending on machine model and build date, this board can be replaced by either "08BSPE1T" or "08BSPE2T," but new software is required. Contact Milnor's service engineering department to determine the appropriate replacement board and software. Be prepared to supply the **model and serial number** of the machine (e.g., model 52038WP1, serial number 12345678), as well as the **software version** and **date code** (e.g., software WUWEHYDY, date code 99007).

Processor board "08BSPE1T" has been superseded by board "08BSPE2T"(see Figure 89). If your machine uses a two-line or four-line vacuum fluorescent text display, either "...E1T" or "...E2T" will work with your existing software. The most important difference between these two boards is jumper *J1* on the "...E2T" board for selecting the flat panel **color graphic** LCD display. This jumper must be set to the *TXT* or *NO* position for machines with a vacuum fluorescent display, or in the *GPX* (graphics) position for machines with a color LCD display.

Figure 87: 08BSPET 80186 Processor Board

Overview



Legend

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

Figure 88: 08BSPE1T 80186 Processor Board

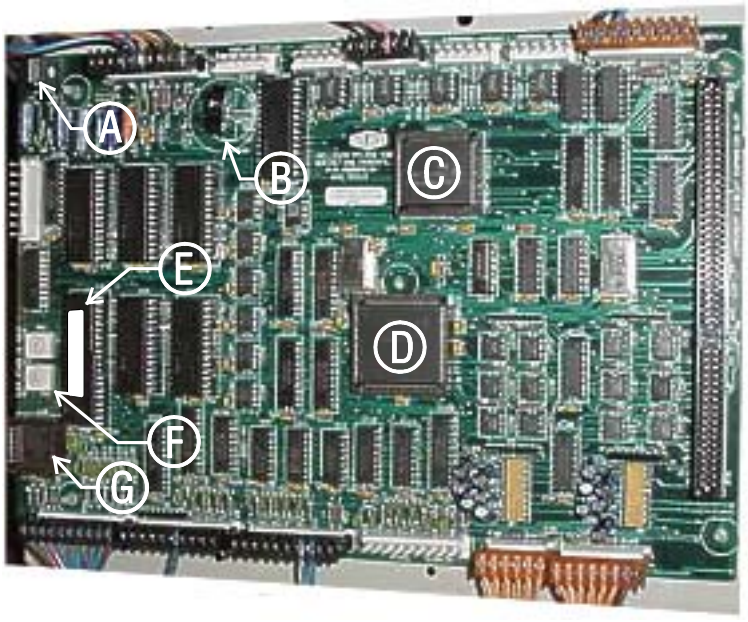
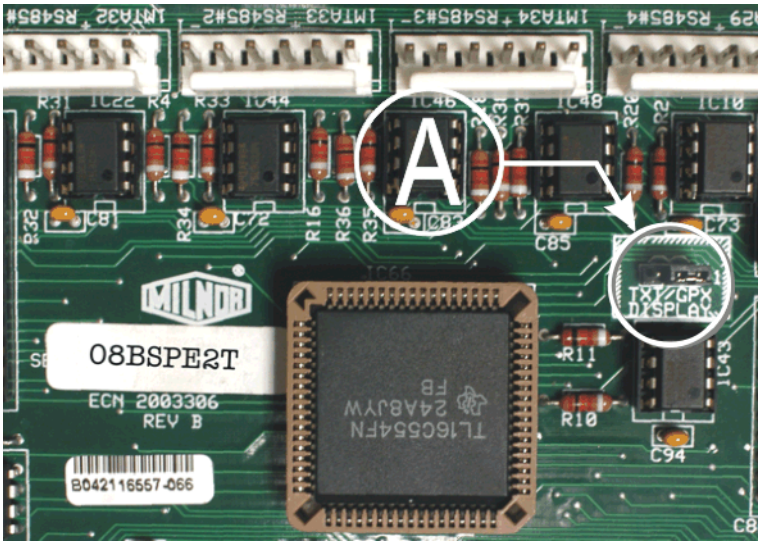
Overview	Legend
	**A.** Chassis ground **B.** Capacitor **C.** Quad-UART chip **D.** 80186 microprocessor **E.** EPROM **F.** Rotary DIP switches for keypad **G.** ROM socket (empty except in Japan)

Figure 89: 08BSPE2T 80186 Processor Board

Detail	Legend
	**A.** Jumper for selecting display type

5.6.2.5. How to Use the Display Module Update Routine [Document BICWCM01]—All Milnor® models which use a graphic display similar to the one shown in Figure 90 require that the display module firmware match the machine controller software. Washer-extractor controller software WUF8WF/21105_ and later contains an automatic routine to update the display module firmware if necessary. In most cases, this is a one-time process that does not need to be repeated unless the machine software is updated or a different language set is installed.

Figure 90: Mark VI Graphic Display (washer-extractor shown)

This information does not apply to machine models which use a text display (either two or four lines of 20 characters each).

5.6.2.5.1. Why is this Necessary?—The graphic display on models with the Mark VI control system must quickly display the changing status of the operating machine. To reduce the amount of time spent transmitting graphics that might be repeated many times during a machine cycle, the information required to display any screen is separated between the *machine controller* and the graphic *display module*.

The display module contains the necessary *graphic elements,*—used like building blocks—for all the display screens. These elements include text, boxes, and lines, each with a specific element number and location on the display. This is the *firmware*.

The machine controller *software* monitors the machine and the user controls, and issues commands to peripheral boards. The controller contains a list of all the element numbers, but it doesn't know where on the screen the element will appear because the location is stored in the display module. When the machine controller software is running, the controller issues commands to the display module to display certain elements.

With each new version of machine controller software, new graphic elements may be needed to display information or prompt the user. Because the machine controller calls each graphic element by number, new elements may change the element numbers for all the subsequent elements in the list, causing unpredictable display behavior. Therefore, the machine controller software and display module firmware must always be compatible.

Tip: The first five characters of the version number for both the controller software and the display module firmware indicate the revision level. The sixth character, if it exists, indicates the alternate language included in the software. For example, **controller software** WUF8WF/211054 is version 21105 of the software with German as the alternate language. The last digit of the **display module firmware** also reflects the alternate language. In this document, the language code is represented by an underscore (_) character.

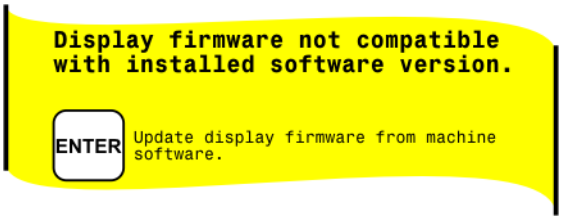
5.6.2.5.2. What is the Procedure?—When the machine powers up, the machine controller tries to read the firmware version number contained in the graphic display module. If the controller receives the appropriate firmware version in response, the machine controller continues the start-up routine.

This routine ends when one of the following three screens is displayed:

- on most washer-extractors, the *Select Local Formula* or *Select Remote Formula* screen,
- on automatically loaded washer-extractors, the *Select Run Mode* screen, or
- on presses, the *Manual Menu* screen.

If the controller does not receive the correct response from the display module, the controller displays a screen similar to Figure 91 and prompts the user to begin updating the display module firmware.

Figure 91: Typical *Firmware Mismatch* screen

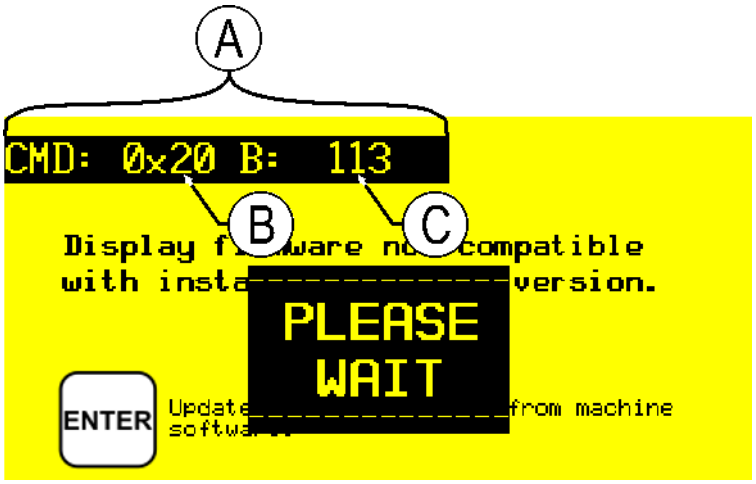


Display or Action	Explanation
	When the screen shown in Figure 91 appears, this key starts the automatic firmware update routine. **Do not turn off power to the machine or otherwise interrupt the routine.**

A screen similar to Figure 92 appears immediately when the update routine begins.

Figure 92: Firmware Update in Progress

Typical screen



Legend

A. Status line indicates update in progress
B. Command indicator
C. Data blocks received

Supplement 6

Details of the Update Routine

The status line near the top of the display contains two types of information about the progress of the update: the *command* and the *block number* received.

1. When the update begins, the status line is `CMD: 0x10 B: 0`. This indicates that a `0x10` command was received to erase the old firmware. The block number remains at 0 until the display module begins receiving the new firmware.
2. Within about one second, the display module will receive and briefly display `0x11`. This code

indicates that the machine controller is verifying that the display module memory is clear and ready to accept the new firmware.

3. When the display module memory is clear, the machine controller begins sending a series of `0x20` commands. Each of these commands contains one *block* (approximately 1 Kb) of the total display firmware. With each block command received and verified at the display module, the block number increases. The total number of blocks received varies according to the software version and language.

   Note 32: You may see the block count pause briefly at any value. This is normal, and indicates that the machine controller and the display module are communicating to correct a block that contained an error.

4. When the display module confirms that it has correctly received the last block, the machine controller resets itself. This causes the display to appear as if machine power were cycled off and on. When the display shows one of the two *Select Formula* screens, the machine is ready for a load.

— End of BICMUM01 —

BICMDF01 (Published) Book specs- Dates: 20090422 / 20090422 / 20090422 Lang: ENG01 Applic: CWD

5.7. Hardware Components of Serial Microprocessor Controllers

5.7.1. General

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

5.7.2. Microprocessor Components

Note 33: This is a list of all components for Milnor® microprocessor controllers. Not every Milnor® microprocessor controller includes all of the following components.

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

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

CAUTION 29: Prevent Unauthorized Programming—To prevent unauthorized programming, store the programming key so that it is not available to unauthorized personnel. Improper programming can damage equipment and goods.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

This board has 25 status lights. The amber light flashes when the board is communicating. Each of the 24 remaining lights represent an input (green lights) or output (red lights) on that board, and illuminates when the corresponding input or output is made. This board has two rotary dials which must be adjusted to set the board's address (see Section 5.7.4 "Assigning Board Addresses" in this document). This board also has convenient test points that can be used to test voltage to the board.

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

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

5.7.2.10. Output Board—A 24-output board contains 24 output relays identical to those described in Section 5.7.2.9 "Input/Output Board".

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

All analog to digital boards have one status light which flashes when the board is communicating. The board has two rotary dials which must be adjusted to set the board's address (see Section 5.7.4 "Assigning Board Addresses"). This board also has convenient test points that can be used to test voltage to the board.

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

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

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

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

5.7.2.14. 8 Output/16 Input Chemical Flow Meter Board

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

5.7.3. Serial Communications Port

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

For more information on the various separate serial cables required for these functions, see Section 5.4. “Construction of External Serial Link Cables”, if applicable.

Table 28: Board Application by Device (Part A)

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

Notes:

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

Table 29: Board Application by Device (Part B)

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

Notes:

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

5.7.4. Assigning Board Addresses

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

Table 30: Rotary Switch Settings

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

Notes:

* Optional boards

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

— End of BICMDF01 —