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Technical Reference

Mark IV and V Microprocessor Shuttle 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.

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MATSHUTLDE/18103A

PELLERIN MILNOR CORPORATION
LIMITED STANDARD WARRANTY

We warrant to the original purchaser that MILNOR machines including electronic hardware/software (hereafter referred to as "equipment"), will be free from defects in material and workmanship for a period of one year from the date of shipment (unless the time period is specifically extended for certain parts pursuant to a specific MILNOR published extended warranty) from our factory with no operating hour limitation. This warranty is contingent upon the equipment being installed, operated and serviced as specified in the operating manual supplied with the equipment, and operated under normal conditions by competent operators.

Providing we receive written notification of a warranted defect within 30 days of its discovery, we will at our option repair or replace the defective part or parts, FOB our factory. We retain the right to require inspection of the parts claimed defective in our factory prior to repairing or replacing same. We will not be responsible, or in any way liable, for unauthorized repairs or service to our equipment, and this warranty shall be void if the equipment is tampered with, modified, or abused, used for purposes not intended in the design and construction of the machine, or is repaired or altered in any way without MILNOR's written consent.

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How to Get the Necessary Repair Components

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

You can get components to repair your machine from the approved supplier where you got this machine. Your supplier will usually have the necessary components in stock. You can also get components from the Milnor® factory.

Tell the supplier the machine model and serial number and this data for each necessary component:

- The component number from this manual
- The component name if known
- The necessary quantity
- The necessary transportation requirements
- If the component is an electrical component, give the schematic number if known.
- If the component is a motor or an electrical control, give the nameplate data from the used component.

To write to the Milnor factory:

Pellerin Milnor Corporation
Post Office Box 400
Kenner, LA 70063-0400
UNITED STATES

Telephone: 504-467-2787
Fax: 504-469-9777
Email: parts@milnor.com

— End of BIUUUD19 —

Trademarks

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

Table 1 Trademarks

AutoSpot™	GreenTurn™	Milnor®	PulseFlow®
CBW®	GreenFlex™	MilMetrix®	PurePulse®
Drynet™	Hydro-cushion™	MilTouch™	Ram Command™
E-P Express®	Linear Costa Master™	MilTouch-EX™	RecircONE®
E-P OneTouch®	Linear Costo™	Miltrac™	RinSave®
E-P Plus®	Mentor®	MultiTrac™	SmoothCoil™
Gear Guardian®	Mildata®	PBW™	Staph Guard®

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SHUTTLE MODIFICATIONS TO SUPPORT AN ENCODER

The shuttle software was modified to add support for an encoder system that tracks the movement of the shuttle along the rail. This software requires a 186 processor board (08BSPET or 08BSPE1T) and 186 shuttle software (WUCOSHH) 98111 or later for non-quad UART 186 and (WUCOSHJ) 20003 for quad UART 186 processors. The 8/16 board #2 must be a high-speed board with WUHSPDBDA software 98002 or later. The shuttle also must be Miltrac receive and discharge. Miltrac software must be version 9400F or later.

The encoder system consists of 3 photo eyes mounted on the Shuttle representing the OOPS, Count and Home inputs. The photo eye grounds an input when it sees its respective target mounted on or between the rails. As the shuttle moves along the rail, the microprocessor sees a series of inputs by the "Count" prox switch. This input is used to increment and decrement a counter to keep track of the Shuttle's position. The shuttle counts up when it moves left and counts down when it moves right. The OOPS target is a fail-safe input located and the far ends of the rail system. If the Shuttle ever makes these inputs, the Shuttle will switch directions and proceed to its intended load or discharge station without need of human intervention.

NEW MILTRAC CONFIGURE DECISION

A configure decision "STATION NUMBER" was added for each device in Miltrac version 9400F. This number is only used if the device discharges to or receives from a shuttle equipped with an encoder. Enter the load or discharge station number for this device. Miltrac sends this number to the shuttle so that the shuttle knows what count value to look for. See the COUNTS AT LOAD STATION and COUNTS AT DISCHARGE STATION configure decisions below.

NEW SHUTTLE CONFIGURE DECISIONS.

The following configure decisions were added.

`SHUTTLE HAS AN ENCODER 0=NO 1=YES`	This enables encoder operation in the shuttle.
`NUMBER OF LOAD STATIONS [0-15]`	Enter the number of load stations that the shuttle receives goods from. This decision only appears if the encoder decision is set to 1 (Yes).
`NUMBER OF DISCHARGE STATIONS [0-15]`	Enter the number of discharge stations that the shuttle transfers goods to. This decision only appears if the encoder decision is set

to 1 (Yes).

A new program menu item was added to configure the station counts. To access it, select program menu item 3

```
PROGRAM  3  MENU
 STATION COUNTS
```

The following configure decisions appear under the STATION COUNTS selection. When setting counts, select an appropriate count for the home target, and then base the station counts off of this. Counts increment as the shuttle moves left and decrement as the shuttle moves right and there is 1 count per inch.

`COUNTS AT HOME STATION`	Enter the counts for the home target. When the shuttle sees the home target, it resets its counts to the number configured here.
`COUNTS AT RESET POINT`	Optionally, a reset target may be added to the rail. Whenever the shuttle passes this target, it resets its counts to the number configured here. Most systems do not use this input. So enter a 0.
`COUNTS AT LEFT OOPS TARGET`	Enter the counts that the shuttle sees when it is in front of the left oops target.
`COUNTS AT RIGHT OOPS TARGET`	Enter the counts that the shuttle sees when it is in front of the right oops target.
`COUNTS AT LOAD STATION XX`	XX = the load station number. This decision appears for each load station. Enter the counts that the shuttle sees when it is in front of the station.
`COUNTS AT DISCHARGE STATION XX`	XX = the discharge station number. This decision appears for each discharge station. Enter the counts that the shuttle sees when it is in front of the station.
`STOP OFFSET COUNTS`	Always enter a 0 for this decision unless: (The shuttle will stop when it is the configured number of counts away from the desired counts. This was done to allow for a longer decel time.)

SLOW DOWN DISTANCE	Always program a 1 for this decision. When the shuttle is within its configured "Slow Down Distance" counts for the desired position, it turns on the SLOW SPEED output.
ALT DECEL TIME	Use a default value of 0 unless: When the slow down output comes on, the alt decel output stays on for the configured time and then turns off. This was done to provide an alternate acel and decel time when running fast.

OPERATION

When the shuttle receives a get ready command from Miltrac, it also receives the station number of the device that it needs to move to. Using the counts configured in the shuttle, it moves towards the station. When the shuttle is within its configured "Slow Down Distance" counts for the desired position, it turns on the SLOW SPEED output. This signals the inverter to switch to a second speed. Usually, normal speed is set to 60 Hz and slow speed is set to 20 Hz. It is very important that any device the Shuttle will be stopping at has a target mounted 12- 14 inches before the actual device target. This target is better known as the "slow down" target. Keep in mind that some devices are approached from both directions.

Whenever the shuttle returns home, it also slows down when it is within the configured "Slow Down Distance" counts from the home target. However, the shuttle is looking for the home input and will only stop when this input is made, regardless of the counts. If the counts are incorrect (for example, on initial power up) and the shuttle sees the home target while moving at high speed, it will stop, reverse direction for 4 seconds, then move back towards the home target at slow speed. This ensures that the shuttle always stops at the same spot when it reaches home.

HELPFUL INFORMATION FOR ENCODER SETUP

To help decipher what the actual/desired counts are while in operation, press the "2" button on the keypad. This will toggle the current display thus showing the Actual Counts denoted by **ACNT** and the Desired counts denoted by **DCNT**.

The display you want to see when toggling the "2" button.

OOPS ACNT DCNT SS FS
0 005 011 4 2

The OOPS represents the number of times the OOPS input was made since Shuttle power up. The SS and the FS can be ignored.

When choosing your initial count values, keep in mind that when the shuttle moves left it increments the current count and moving right always decrements the current count. The Shuttle facing the Dryers justifies the movements, left or right.

INPUTS

TRAVERSE COUNTER	2MTA4-8
RESET COUNTER	2MTA4-11
HOME	1MTA4-15
OOPS	1MTA4-4

OUTPUTS

SLOW SPEED	2MTA5-7 & 5-16

Important Owner/User Information—Machines with a Keypad

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

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

1. Ensure Safety of Laundry Personnel

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

2. Protect Against Data Loss

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

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

3. Customize Data

3.1. When to Customize Data

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

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

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

Table 1: Data Type and Accessibility

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

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

— End of BICM3K01 —

BICPUK01 (Draft) Book specs- Dates: 20030625 / 20030625 / 20030625 Lang: ENG01 Applic: CSU

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. Electro-Mechanical Controls

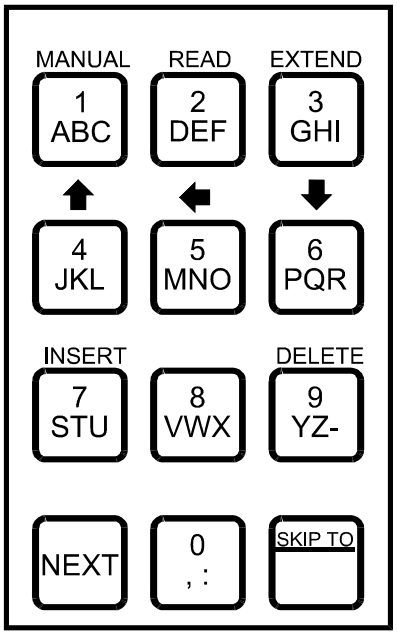
Electro-mechanical controls vary with machine model and are explained in the machine-specific operator manual furnished with the machine.

2. Microprocessor Interface Controls

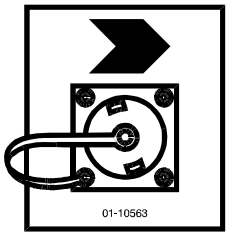
These controls, shown in Figure 1, include the keyswitch, display and keypad located on the main nameplate (position on nameplate varies), and the printer/download connection, located on its own nameplate. These controls permit the user to pass data to and from the microprocessor controller.

Figure 1: Microprocessor Interface Controls

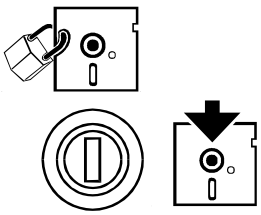
1. Keypad



2. Printer Download Connection



3. Keyswitch



4. Display

```
WAITING FOR LOADING
DEVICE TO GET READY
```

Legend

1. User input to microprocessor controller.
2. Connection for serial printer.
3. Allows the user to modify configuration and programming.
4. Output from control system to user.

Display or Action	Explanation
, NEXT	Turn the keyswitch clockwise to *program* ( ) then press and release the *Next* key.
, NEXT	Turn the keyswitch counterclockwise to *run* ( ) then press and release the *Next* key.
	Press and release the key shown.
/	A slash between symbols means use either key shown. The *up* and *down* arrow keys are often shown this way (i.e., scroll up or down the menu choices).
6 , , 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 alternative way of depicting word and number entries when the exact values are determined by the user. <xx> means enter a two digit number. <response> means enter the value prompted for by the display. <password> means enter the password (or numeric passcode).
0	Press and release the "Stop" button (0).
1	Press and release the "Start" button (1).

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 1: 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.

2.2. Display—This two-line device displays messages and data entry screens. Messages inform the user as to the machine's operating status or alert the user to conditions that must be 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 always shows where the next character will be entered.

2.3. Keypad—The 12-key keypad is used for programming, making selections (e.g., selecting formulas in a washer-extractor), responding to display messages, certain normal operating procedures, and manual operation. Applicable procedures are explained in the remainder of this manual and depicted using symbols to indicate pressing keys on the keypad. These symbols are explained above.

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 elsewhere in this manual.

— End of BICPUK01 —

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Definitions of Terms and Abbreviations

append—to write data after previously recorded data, as opposed to overwriting previously recorded data; useful for applying audit trails in file-by-file backup

archive—long-term on- and/or off-site storage

backup—to copy information from a hard disk onto another data storage medium (e.g., minicartridges or diskettes)

bit—smallest amount of data that can be processed by a computer; represents the binary value of either one or zero

block—number of bytes, an example of a block format is: preamble, data block marker, user data, block address, CRC, postamble; block sizes vary, but 512 or 1024 user data bytes is most commonly used

BOT (beginning of tape)—start of backup tape designated by a specific hole pattern on quarter-inch cartridge tape media

BPI (bits per inch)—number of data bits recorded per inch of tape

byte—one character of information that consists of eight bits

click—to press and release the select button on the mouse while pointing to the choice

command prompt—displayed symbol that indicates where to enter commands

compression—see data compression

configure—to describe the devices, optional features, and programs installed on the computer

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

CRC (cyclic redundancy check)—complex mathematical method used to check that the data written to tape is error-free

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

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

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”

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

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

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.

data—coded representation of information for use in a computer

data block marker—marker that identifies the start of user data in a block

data cartridge—durable tape cassette used to store computer data

data compression—feature that permits increased storage capacities using a mathematical algorithm that reduces redundant strings of data; can be performed by software or hardware

data integrity—validity of recorded information

database—collection of data with a given structure for storing and providing data

DataCare Quality—service and support program for Imation Travan minicartridges

default—value, attribute, or option that is assumed

default password—see **Password, default**

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

density—measurement of amount of data stored in a given length of tape; usually expressed in bits per inch (BPI)

Device Master—Milnor product that regulates the operation, programming, troubleshooting, and monitoring of specialized conveyors and other devices.

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

directory—list of files stored on a disk that contains information about the file; a named group of files such as a washer/extractor program directory

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.

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

double-click—to press and release the select button on the mouse twice in rapid succession while the pointer is over the intended icon

Drynet dryer/shuttle controller—Milnor product that regulates operation, programming, troubleshooting, and monitoring of dryers and shuttles

ECC (error correction code)—mathematical algorithm used to correct errors

EW (early warning)—indicator to the drive that the end of the tape is approaching; technically, the first hole in the EOT hole pattern

edge seek—method of using the recording head to detect the edge of tape and then to reference the tracks from the edge of tape, thus assuring the tracks are positioned accurately

EOT (end of tape)—end of tape designated by a specific hole pattern on quarter-inch cartridge tape media

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

erase—to remove previously-written data by randomizing the magnetic orientation of the media

error—loss of magnetic signal strength to a degree that data is uninterpretable

FRPI (flux reversals per inch)—number of flux changes per inch of tape; this may be equal to the number of bits per inch stored, depending on the recording code in use

FTPI (flux transitions per inch)—same as FRPI

field—area in a window used to input data

file—one or more recorded blocks of data

file-by-file backup—method of backup in which each file is stored separately and sequentially; extremely useful if you need to restore or interchange a single file

filename—name used by a program to identify a package of information; e.g., Mildata stores production data in files named CBWproc.db and process.db

flux transition—change in the magnetic state which can be interpreted to represent a data bit on tape

form factor—physical size of a device; e.g., the width of a data cartridge drive (if the drive is a 5-1/4" form factor this means that the drive is the same size as a 5-1/4" diskette drive and uses the same fixing points; the same principle applies with the 3.5" format, where a 3.5" diskette drive may be exchanged for a 3.5" data cartridge drive in your computer)

format—form in which data is written to the tape; it defines things such as the number and position of tracks, number of bits per inch and the recording code to be used

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

formula code—see **Code, formula**

full height—height of a full-height diskette drive (approximately 3.25")

GB (gigabyte)—1024 Megabytes (MB); 1,073,741,824 bytes

GCR (group code recording)—data encoding method often used on data cartridge drives; combines high data density with relative ease of decoding

goods—articles processed or conveyed by a machine

HSM (hierarchical storage management)—system of ranking and storing information across a variety of device types

half height—height of a half-height diskette drive (approximately 1.6")

hardware—electronic boards that control the machine

headers—blocks of data written at the beginning of cartridges or files that contain specific identification information

help—feature that displays a window with assistance and information

home—the specific position along the shuttle path to which the shuttle returns upon power up; or after discharge, load, or error correction; belt is at receive level 0

icon—pictorial representation of an program; double clicking the icon activates the program

Infinite Disk—software product manufactured by Cheyenne for compressing, moving, and backing up data

initialize—to re-tension and read or write header blocks before a data cartridge is used

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.

installation—process of putting a copy of a program onto a working disk and preparing it for use

interchange—to remove a data cartridge from one drive and read the data on another data cartridge drive

interface—hardware and software used to establish communication between a host and device

internet downloading—receiving data from the internet

KB (kilobyte)—memory storage unit; 1024 bytes; used when referring to storage space

LP (load point)—physical location on the tape where data recording starts; this location is physically marked by the location of a punched hole

Linear COSTA—Milnor® controller to store and track multiple cakes on a belt conveyor

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

MB (megabyte)—memory storage unit; 1024 kilobytes or 1,048,000 bytes; used when referring to storage space or filesize

MFM (modified frequency modulation)—recording code used on floppy-interface QIC drives; it is the most efficient self-clocking code, but requires "good" electronics to decode

Mentor—personal computer-based software system for operating, programming, and monitoring the Milnor® CBW® tunnel washer

menu—list of functions or operations that can be selected

Mildata—control unit that passes batch codes between the various system components and controls the routing of goods based on machine availability and the batch code

Miltrac—PC-based controller that coordinates and tracks the transfer of batches throughout the system

minimize—to reduce a window to an icon so that the program is still running, but is not visible on the computer screen

MMP (Milnor Machine Programmer)—Milnor-produced Windows Machine Programmer for newer machines including extractors; washer-extractors; textile, dye, and outerwear machines; and single stage presses

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

MTBF (mean time before failure)—expected component life before the first failure

MTTR (mean time to repair)—estimated time to repair a failed component

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

modem—device that converts digital data from a computer to a telephone signal that can be sent to another computer

motor contactor box—enclosure containing the high voltage motor contactors

multimedia files—computer files containing audio, video, or graphics

Multitrac—Milnor supplied software/hardware package that includes Miltrac, Online Communicator, Drynet, and Device Master

off track retry—method of improving data recovery under error conditions; it is often possible to recover a data error by moving the head slightly off the track center and re-reading the block

Online Communicator—Milnor product that collects production data for troubleshooting and in conjunction with the separate Mildata product

open—to start a program and make it available for use

operating system—software that controls the processing of programs and manages data on the permanant storage device (hard drive)

overwrite—method of overwriting data on a tape without first erasing it

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**

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

PE (phase encoding)—method of coding data; it has the advantage of being very reliable and easy to decode, but it is not particularly efficient in data density

port—connector on the computer to which device cables are attached; ports can be parallel or serial; the Mildata system uses serial port COM1 to communicate with machines and parallel port LPT1 to send information to the printer

port designation—four-character name assigned to each port, e.g., COM1, COM2, LPT1

postamble—section of recorded data used to synchronize the data decoding electronics to the data stream; it occurs at the end of the data block

preamble—section of recorded data used to synchronize the data decoding electronics to the data stream; it occurs at the start of the data block

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

prompt—message that appears on the screen asking for information or a decision from the user; alternatively, a DOS prompt is a letter followed by a greater-than sign, e.g., C:\>.

QIC (Quarter-Inch Cartridge Drive Standards, Inc)—international trade association comprised of manufacturers of QIC tape drives, media, and critical components with primary charters to identify market needs; educate users, OEMs, system integrators, resellers and dealers; and provide a forum for technical discussions leading to the generation of development standards for compatibility among manufacturers' systems

RLL (run length limited)—family of codes used to encode data; number of zero or one bits is limited to a certain value; GCR is an RLL code

random access—feature that allows access to any particular block by going directly to it; disk devices are random access devices

read after write—method of ensuring that data written to tape is correct by immediately reading the tape on a read head placed just after the writing head

reference burst—multiple flux transitions written at the beginning of the tape to indicate the center line of the tape; this allows the read head of the drive to align itself correctly and improves the data integrity of the drive

remote—system or program accessed through a telephone line

restore—to retrieve information from a tape drive in order to replace data that was lost from a hard disk

retension—to wind the tape from the beginning of tape (BOT) to the end of tape (EOT), or EOT to BOT; a critical step when first inserting a data cartridge into the drive; ensures that the tape in the cartridge is correctly tensioned and will give you the optimum head-to-tape contact for error-free performance

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

SCSI (small computer systems interface)—bus interface that enables many different kinds of devices, such as disk drives, CD-ROM drives, and tape drives, to interface with the host computer

save—to store information on disk

search—method of finding a particular data file without having to read all the preceding data; often done at a different speed than reading and writing; usually applies to start/stop drives

select—to highlight or choose an item in a menu

sequential device—device that reads each data block sequentially, as opposed to a random access device

serial—sequential transmission of one data unit at a time; e.g., serial ports pass one bit at a time

setting—choice that defines characteristics of a program

shutdown—to select the shutdown selection in the Start menu before the computer is powered off so that data is not lost

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

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

start/stop—data cartridge feature that allows stopping and starting before and after each data block written or read from tape

streamer—data cartridge drive that writes or reads blocks without stopping between blocks

Tape-It—software product manufactured by PG Soft

tape mark—unique data block used to separate data files or volumes of data

third height—one-third the height of a full-height drive, or approximately 1 inch

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

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)

track—linear area of media on which data are written

Travan—high capacity minicartridge technology developed by Imation Corporation (formerly a division of 3M Company)

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

underrun—action that occurs when a streaming drive runs out of data to be written to tape; it stops and repositions the tape; this occurs when the processor is too slow to keep up with the streamer

user data—data recorded by the user; user data is differentiated from other information recorded by either the drive or formatter

verify—to compare the data read to data written; verification provides an additional confidence check

volume—logical division of data; consists of a number of files

volume label—data block written at the front of a volume to identify it

VERTSTO—Milnor multi-tiered, non-translating, elevating or non-elevating intermediate conveyor for storing pressed cakes between other cake-moving devices in the CBW® system

window—an area of the screen in which information is displayed; each program is its own window and often contains windows inside of windows

Windows Dryer Programmer—Milnor-supplied software that, when installed on a personal computer, gives the customer flexibility with programming newer Milnor Dryers; included with the Mildata system

— End of BIUUUK05 —

Programming 1

PROGRAMMING
THE MARK IV AND V SHUTTLE CONTROLLER

The *Program Menu* and How To Access It

The Available Modes in the *Program Menu*

0=*OK Turn Key To Run* (permits safe return to *run mode*)
1=*Configure* (tells controller which models and options it is controlling)
2=*Clear All Memory* (Voluntarily)

To Access the *Program Menu*

With shuttle power *on* and shuttle not moving, display=

```
WAITING FOR LOADING
DEVICE TO GET READY
```

⓪ **Disables the three-wire circuit** Display=

```
THREE WIRE DISABLED
 PUSH START TO GO
```

Operator alarm will sound. Do not press ① to silence the alarm at this time, see NOTE under "For Safe Return . . ." below.

 **Accesses the *program menu***

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

Underline indicates cursor position. Select one of two *program modes* by number, or select  before returning to *run mode.*

<x> **Selects *program mode x,*** where <x> is the *program mode* number —example:

```
PROGRAM 1 MENU
CONFIGURE SHUTTLE
```

See "The Available Modes in the *Program Menu*" in this section.

For Safe Return to *Run Mode* From *Program Menu*

 **Selects *program mode 0* if it is elsewhere. Display=**

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

This display must appear before turning keyswitch to *run*.

NOTE: After  is accessed and *Configure* (*program mode 1*) is accessed, it is permissible to press ① to silence the operator alarm. The control always returns to the *program menu* from any accessed *program mode.*

 **If ① *was not* pressed, returns to the *run mode.***

If ① *was* pressed, display=

```
PUSH STOP TO EXIT
    CONFIGURE
```

⓪ **Returns to *run mode* from above display.**

① **Returns the shuttle on-line.**

```
INITIALIZATION IN
    PROGRESS
```

To Access a *Program Mode*

With a program selected—example:

PROGRAM 1 MENU CONFIGURE SHUTTLE

Program mode 1 selected.

ENTER/NEXT **Accesses the selected program.**

NUMBER OF STORAGE BELTS ? 0

Program mode 1 accessed. See "The Configure Decisions" in this section.

How To Avoid Data Loss in the Shuttle Controller!

For Shuttle Controller

Never , ENTER/NEXT **unless the display says**

PROGRAM 0 MENU OK TURN KEY TO RUN

Otherwise, the controller requires clearing the entire memory and prompts

CLEAR MEMORY NOW PRESS 4 + 5 + 6

4 JKL + 5 MNO + 6 PQR **Clears all configure codes while the display=**

CLEARING MEMORY **PLEASE WAIT**

Display then returns to

PROGRAM 0 MENU OK TURN KEY TO RUN

Do not use the above procedure to voluntarily delete configure codes. See "2=*Clear All Memory* (Voluntarily)" in this section for proper procedure.

Never turn power *off* while in *program mode*.

Otherwise, the controller requires deleting the entire memory as explained above.

Reconfigure whenever memory is cleared.

See "1=*Configure* (and Why It Is Necessary)" in this section.

1=*Configure* (and Why It Is Necessary)

Because the microprocessor can control several different models, it is necessary to "configure" each machine to match its specific hardware (number of belts, load-end photo-eyes, allied loading, allied discharge, the Mildata® system, etc.). Such decisions are discrete to the specific machine and must never be changed unless options are later added or removed. However, other configure decisions, such as *Clear Belt Time* or *Extra Discharge Run Belt Time* may be subsequently changed if desired.

Because the shuttle is a goods moving device (not a processing device), configuration is the only programming procedure necessary or possible.

When To Reconfigure and What Configure Codes To Use—Reconfigure at installation and any time a configure error occurs. Although certain codes are discretionary, most configure codes *must* match those shown on the metal configure nameplate, unless optional equipment has been added to or removed from the machine.

How Shuttle Photo-eyes Work—Several configure decisions require an understanding of shuttle photo-eyes. Photo-eyes on Milnor® shuttles are always physically identified (e.g., on the electrical schematics) as "load end" or "discharge end," with respect to forward loading and forward discharging. The "physical" load-end photo-eye is always located on the *receiving* end of the belt for *forward loading*, and the "physical" discharge-end photo-eye is always located on the *discharge* end of the belt for *forward discharge* (see FIGURE 1). If a shuttle must reverse-load or reverse-discharge—i.e, run the belt in reverse to receive goods from a device on what is normally its discharge end, or discharge to a device on what is normally its load end—the "physical" discharge-end photo-eye will automatically function as the "logical" load-end photo-eye, and the "physical" load-end photo-eye will automatically function as the "logical" discharge-end photo-eye.

Physical discharge-end photo-eyes are always furnished. Physical load-end photo-eyes are only supplied on shuttles two or more cakes long and on reverse discharging shuttles.

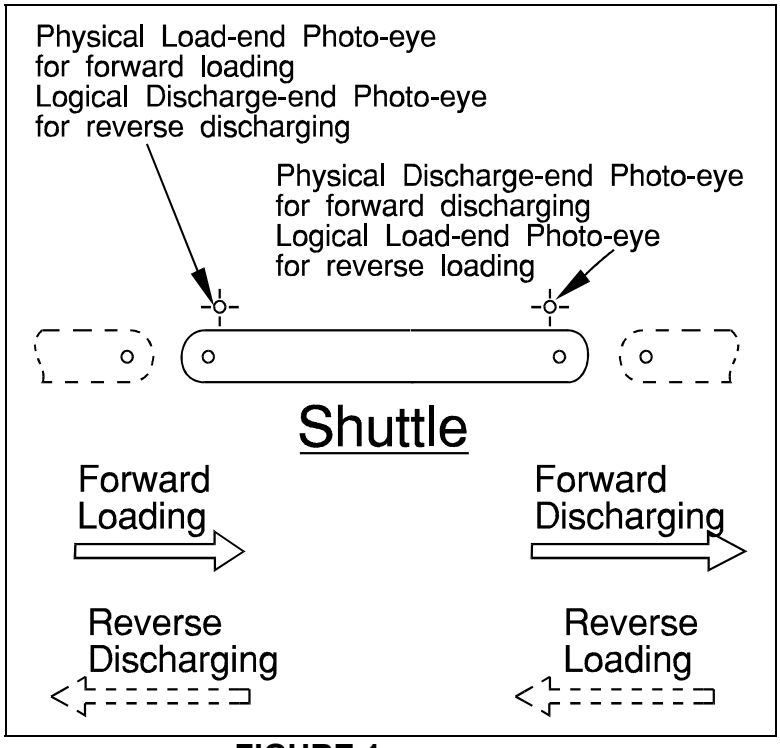


FIGURE 1 (MSOPD432CE)
Identifying Shuttle Photo-eyes

How Miltrac and Allied Interfaces Work—Several configure decisions require an understanding of the two basic types of the shuttle interfaces: Miltrac and allied. A shuttle must communicate with both the device it receives from and the one it discharges to when coordinating goods transfer and passing batch data. When all or most devices in the system are Milnor® machines, the devices usually communicate electronically via a Miltrac controller (older systems used the Milnet® network) which serves as a "traffic cop" for the entire system. However, any non-Milnor® (allied) device must communicate with its neighboring devices electro-mechanically, via inputs and outputs (allied interface). Shuttle inputs and outputs are described in "RUNNING THE MARK IV AND V SHUTTLE IN AUTOMATIC SYSTEMS" (see Table of Contents). Two Milnor® machines in a non-Miltrac system can also utilize an allied interface. Allied interfaces impose certain requirements as explained in this section.

How To Access the *Configure Mode,* Enter Data, and Exit

When the display= | PROGRAM 1 MENU
CONFIGURE SHUTTLE | ENTER/NEXT = | NUMBER OF STORAGE BELTS ?
0 | This is the first configure decision.

① **Silences operator alarm if desired.**

<value> **Enters the value for the current decision,** where **<value>** is the one-, two-, or three-digit number for the currently displayed decision. See "The Configure Decisions" in this section.

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

ENTER/NEXT, ENTER/NEXT, ENTER/NEXT, etc. **Advances through each decision, retaining the previously entered value.**

After advancing past the last configure decision, the display returns to the *program menu.*

When, and only when, the display=

PROGRAM 0 MENU OK TURN KEY TO RUN

proceed as follows:

, ENTER/NEXT **If ① was not pressed, returns to the *run mode.***

If ① was pressed, display=

PUSH STOP TO EXIT CONFIGURE

⓪ **Returns to *run mode* from above display.**

The Configure Decisions

Why the Sequence of Configure Decisions Will Vary—The following describes *all possible* configure decisions and presents them in the *most common* order of appearance. Many configure decisions only appear if certain values were entered in previous configure decisions, and a few configure decisions will appear in a different order than shown here depending on the values entered in other decisions.

A NUMBER OF STORAGE BELTS 1 — 1-4 allowed — Enter the total number of storage belts (number high multiplied by number wide).

B NUMBER OF BELTS PER LEVEL 1 — 1-2 allowed — Enter 1 for a standard shuttle and 2 for a two-wide shuttle. Valve cannot be greater than the *Number of Storage Belts*.

C NUMBER OF CAKES PER BELT 1 — 1-4 allowed — Enter the number of goods positions (cakes) on a belt.
If *A* is 1 or 2, then 1-4.
If *A* is 3 or 4, then only 1 is allowed.

Configure decision D appears only if *A* or *C* is greater than 1.

D IGNORE COMPATIBILITY 0=NO 1=YES 0 — 0-1

0=No, if the shuttle should wait until it is full of compatible goods before leaving that loading station.
1=Yes, if the shuttle should return home and wait for second cake from another device regardless of single cake or compatibility.
NOTE: The shuttle can be released from waiting for load by configuring for *Time Out Waiting For Load*.

Decisions *E* and *F*: How and When To Release a Partially Loaded Cake Shuttle (if *Decision A or C* is greater than 1)

Use the Miltrac system to release a partially loaded multi-cake shuttle when the next cake is not compatible with already loaded cake(s) (see Miltrac manual). Use *Decisions E* and *F* (regardless of compatibility) where early release will increase system efficiency by reducing how often the device(s) served by the shuttle are idle (e.g., how often the tunnel must hold while waiting to receive or discharge).

A: Number Of Storage Belts *C*: Number Of Cakes Per Belt	Both=1	Either>1	
E: Time Out Waiting For Load		No	Yes
F: Max Wait Time For 2nd Cake			**xx** minutes
For the combination of values for Decisions A, C, E, and D shown above, the shuttle declares itself loaded (free to leave the loading position) when it . . .	receives a cake or loose goods	receives last cake	receives last cake or xx minutes after it receives prior cake

E TIME OUT WAITING FOR LOAD 0=NO 1=YES 0 — 0-1

0=No. Shuttle will wait until it is loaded with maximum number of cakes.
1=Yes. Shuttle will declare itself loaded and desire to discharge after *F* has expired. Miltrac "handshaking" may influence this decision. See the Miltrac manual.

Configure decision F only appears if *E*=1.

F | MAX WAIT TIME MM
FOR 2nd CAKE 01 | 01-99 minutes allowed | Enter the maximum time (in minutes) the shuttle will be permitted to wait between the receipt of cakes, before declaring itself loaded.

Decisions G, I, W, and *X*: Controlling Belt Run Time During Discharge

A combination of photo-eye input and the configure values for *Decisions G, I, W*, and *X* controls belt run time during discharge. As the operating characteristics of the system become more evident, these values can be fine-tuned to shorten discharge time and improve system efficiency. *Decisions G, I, W*, and *X* influence belt run time as follows:

Number of Goods Positions	How Long Belt Runs or Stops			
	Runs for Each Cake (Forward Discharge)	**Runs** for Each Cake (Reverse Discharge)	**Stops** Between Cakes	**Runs** After Last Cake
Loose goods or one cake	*Clear Belt Time* or time to clear discharge-end photo-eye*, whichever is longer + *Extra Discharge Run Belt Time*	*Reverse Discharge Run Belt Time* or time to clear discharge-end eye*, whichever is longer + *Extra Discharge Run Belt Time*	not applicable	
Two or more cakes	Time (within *Clear Belt Time*) for this cake to block discharge-end photo-eye* + Time (within *Disch Eye To Be Blocked=Error* time) for this cake to clear eye* + Time (within newly reset *Clear Belt Time*) for next cake to block eye*	Time (within *Clear Belt Time*) for this cake to block discharge eye* + Time (within *Discharge Eye To Be Blocked=Error* time) for this cake to clear eye* + Time (within newly reset *Clear Belt Time*) for next cake to block eye*	Time for devices to talk and belt to elevate (if applicable)	*Extra Discharge Run Belt Time*

G | CLEAR BELT TIME (S)
01 | 01-99 seconds allowed

Where time for discharge is not critical, command sufficient time for the belt to make half of a complete revolution. If necessary, shorten this time so that the belt runs approximately as long as it would under photo-eye control (see FIGURE 2). This time is also used to initialize belts when the shuttle is first powered up.

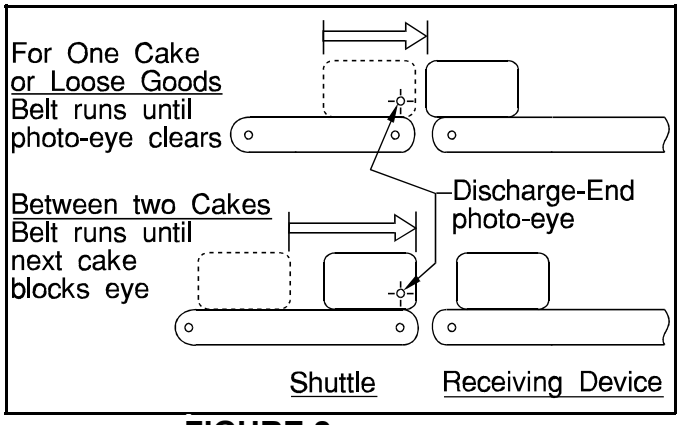


FIGURE 2 (MSOPD432CE)
How Belt Runs Under Photo-eye Control During Discharge

Decision H: Controlling the Pile of Goods on a Loose Goods Shuttle

This decision helps control how goods pile up on the storage belt. Enter a *longer* delay time to cause a larger pile at the *discharge* end of the belt or a *shorter* delay time to cause a larger pile at *receiving* end (see FIGURE 3).

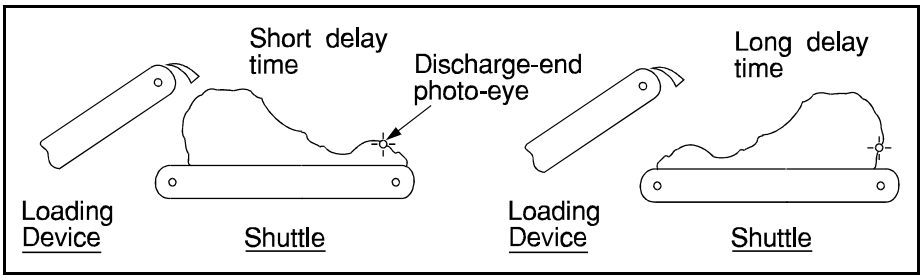


FIGURE 3 (MSOPD432CE)
Effect of *Delay Time Before Run Load Belt* on Pile of Goods

H DELAY TIME BEFORE RUN LOAD BELT (S) 00 — 00-99 seconds allowed

Enter the delay time (in seconds) before running the belt to load.

I EXTRA DISCHARGE RUN BELT TIME (S) 00 — 00-20 seconds allowed

Allow both eyes blocked. This value may be used in place of a longer *Clear Belt Time* to ensure that a trail of loose goods following the cake or pile completely discharges, even if not seen by the photo-eye. Compare "Condition 1" and "Condition 2" in FIGURE 4. Assigning a *Clear Belt Time* that runs the belt for distance D accommodates the overall worst case. However, a better approach is to assign a *Clear Belt Time* yielding distance A and an *Extra Discharge Run Belt Time* yielding distance C, as this provides the same protection while reducing the overall *Run Belt Time* for Condition 2 by distance E. **NOTE:** The belt still runs for distance D when Condition 1 prevails, since the photo-eye causes the belt to run for distance B, and the *Extra Discharge Time* causes the belt to continue running for distance C.

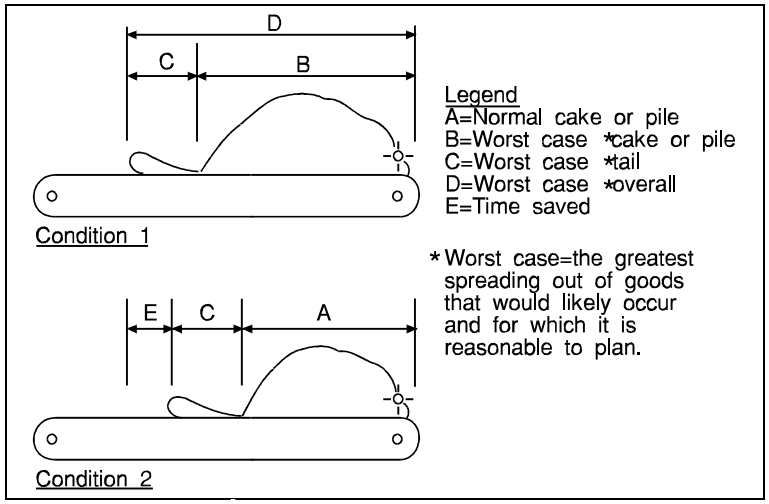


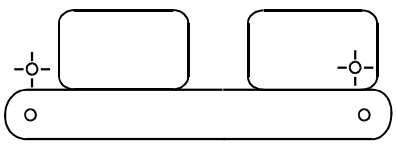
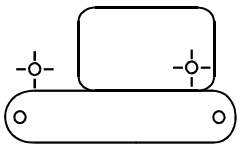
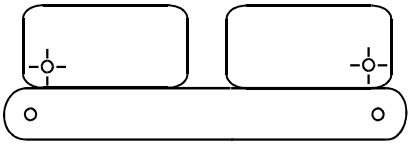
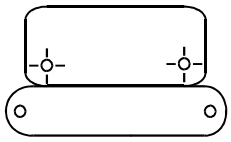
FIGURE 4 (MSOPD432CE)
Effect of Commanding *Extra Discharge Run Belt Time*

J YOU'RE FINISHED RECEIVING INPUT 0 — 0-1

0=No, if you do not want to receive this input.
1=Yes, if you have a multi-cake shuttle receiving from an extractor and the system requires this input to complete the transfer.

Decisions K and *L*: When To Allow Both Photo-eyes Blocked

As previously explained, physical discharge-end photo-eyes are always furnished, but physical load-end photo-eyes are only on long shuttles (two or more cakes long) and on reverse-discharging shuttles. *Decision K* must agree with hardware. *Decision L* depends on cake size. Allow both eyes blocked only if cake(s) or loose goods cannot physically fit without blocking both eyes as shown at right.

A: Number Of Storage Belts	Any	=1		>1	
C: Number Of Cakes Per Belt	>1	=1			
K: Load End Eyes	Yes*	Yes	No	No*	
L: Allow Both Eyes Blocked	Yes/No (see below)	Yes/No (see below)			
* **K** set to this value automatically.					
Do not allow both eyes blocked					
Allow both eyes blocked					

Configure decision K only appears if *A*=1 and *C*=1, but the control automatically inserts a value for *K* in any other instance (see table above).

K — LOAD END EYES 0=NO 1=YES 0 — 0-1

0=No, if shuttle does not have physical load-end photo-eye.
1=Yes, if shuttle is equipped with physical load-end photo-eye.

Configure decision L only appears if *K*=1 or if *K*=1 automatically (see table above).

L — ALLOW BOTH EYES BLOCKED 0=NO 1=YES 0 — 0-1

0=No. Do not allow both eyes blocked.
1=Yes. Allow both eyes blocked.

M — CO-SLIDE TYPE 0=NO 1=YES 0 — 0-1

Is this a *Co-slide* type shuttle? A Co-slide must load allied. This may be manual or semi-automatic (relay logic) loading (see next decision).

Configure decision N only appears if *M*=0.

N — CO-LO-SLIDE TYPE 0=NO 1=YES 0 — 0-1

Is this a *Co-lo-slide* type shuttle? See explanation in "*Decisions M* Through *V* . . ." in this section.

Configure decisions O and *P* only appear if *N*=1. For proper discharge, the extension belt must be running when the storage belt starts and remain running after the storage belt stops. Determine the optimum time between extension belt start and storage belt start and between storage belt stop and extension belt stop through field trials.

O — EXTEND BELT RUN BEFORE DISCH (S) 02 — 2-20 seconds

For discharging, enter the time (in seconds) desired to run the extension belt before the storage belt starts running. This time is added to *Clear Belt Time* (*F*).

P — EXTEND BELT RUN AFTER DISCH (S) 02 — 2-20 seconds

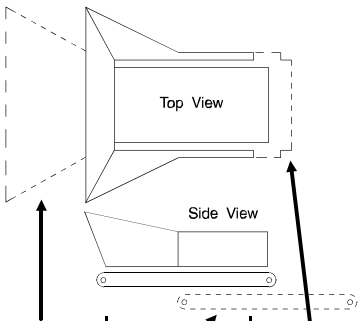
For discharging, enter the time (in seconds) desired to run the extension belt after the storage belt stops running.

Configure decision Q only appears if *M*=0, and *N*=0.

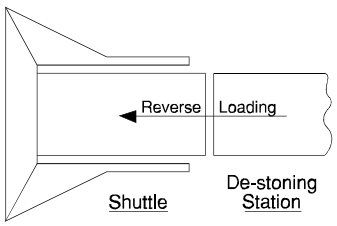
Q | COSLIP TYPE 0=NO 1=YES 0 | 0-1 | Is this a *Coslip* type shuttle? See explanation in "*Decisions M* Through *V* . . ." in this section.

Decisions M Through *V*: Special Purpose Loose Goods Shuttles

Decisions M through *V* enable various special loose goods applications. Each application requires specific hardware capability, and some applications require a specific loading and/or discharge interface (Miltrac or allied).

Features that Determine Configure Values					Configure Decisions
Type of Hardware			Type of Interface		
			Miltrac or Allied		• Type names used in the configure decisions are aliases; not actual model designations. • In this table, type decisions are shown bold with subordinate decisions indented. No more than one type applies. • Selecting any shuttle type supresses further type decisions. A loose goods shuttle may have none of the hardware features shown here, in which case none of the types shown here apply (as shown on the last line of the table). • Only the subordinate decisions for the selected type appear.
Extend 30" (762) to Load	High Speed Extension Belt	Extend 8" (203) to Discharge	Loading	Discharge	
Yes	No	see below	Allied	Miltrac	**M: Co-slide Type?**
		either			**T**: SEMI-AUTO LOADING? (see **NOTE 1**)
					U: SEMI-AUTO LOADING COMPLETED DELAY
		Yes			**V**: EXTEND BELT TO DIS?
No	Yes	No	Miltrac or Allied	Miltrac or Allied	**N: Co-lo-slide Type?** (see **NOTE 2**)
					O: EXTEND BELT RUN BEFORE DISCH
					P: EXTEND BELT RUN AFTER DISCH
No	No	Yes	Miltrac or Allied	Miltrac or Allied	**Q: Coslip Type?**
Yes	No	Yes	Miltrac	Miltrac or Allied	**R: Coflo Type?**
					S: COFLO LOADING JOG ON TIME
					S2: COFLO LOADING JOG OFF TIME
No	No	No	Miltrac or Allied	Miltrac or Allied	A loose goods shuttle which can not be configured for here.

NOTE 1: An example of semi-automatic loading is shown at right. This application uses relay logic to automatically reverse load goods from a de-stoning station back to the shuttle.



NOTE 2: Co-lo-slide has a storage (top) belt and an extension (bottom) belt that extends and runs at high speed to eject the goods dropped from the storage belt.

Configure decision R only appears if *M*=0, *N*=0, and *Q*=0.

R | COFLO TYPE
0=NO 1=YES 0 | 0-1 | Is this a Coflo type shuttle? See explanation in "*Decisions M* Through *V* . . ." in this section.

Configuring a loose goods shuttle to handle two cakes from an extractor

1. *Decision R* (*Coflo Type*) must be set to 1 and *Decision C* (*Number of Cakes per Belt*) must be set to 2.
2. *Decision J* (*You're Finished Receiving Input*) must be set to 1.
3. The Discharge Finished output (1MTA13-8 and 13-18) must be wired to the You're Finished Receiving input on the shuttle (1MTA38-4). If there is more than one extractor, the Discharge Finished outputs should be wired in parallel to the input on the shuttle.

The shuttle will transfer the two loads to a dryer as one load. The data passed is the data from the second cake except for weight which is added up for the two loads.

B

Configure decisions S and *S2* only appear if *R*=1. To control the discharge of goods on the Coflo belt, the belt will run intermittently during loading, starting, and stopping for the times specified in *S* and *S2* below.

S | COFLO LOADING JOG
ON TIME (10ths) 000 | 00-250 tenths of a second | Enter the desired *jog on* time (in 10ths of a second) when loading.

S2 | COFLO LOADING JOG
OFF TIME (10ths) 000 | 00-250 tenths of a second | Enter the desired *jog off* time (in 10ths of a second) when loading.

Configure decision S3 and *S4* only if *M=1* and *C>1*

S3 | MIDDLE EYE
0=NO 1=YES 0 | 0-1 | **0=No.** The shuttle can take up to 4 cakes
1=Yes. The shuttle requires a middle eye and acts like the 2-long Coflo (see "Operation of Specialized Shuttles," see Table of Contents).

B

S4 | LOAD EYE CLEAR
TIME (1/10 SEC) 000 | 00-250 tenths of a second | Enter the length of time (in 10ths of a second) the load eye should be clear before the belt stops running. For the last cake, the shuttle stops when the discharge eye blocks.

Configure decisions T and *V* only if *M*=1.

T | SEMI-AUTO LOADING
0=NO 1=YES 0 | 0-1 | **0=No**. Operator loads shuttle then signals "Loading Completed." No tells the shuttle to get all loading information from the 3rd and 4th 16/8 boards.
1=Yes. Shuttle loads automatically from allied belt. Yes tells the shuttle to look for a 5th 16/8 board which contains all the signals for semi-automatic loading.

Configure decision U only appears if *T*=1. This decision accommodates different types of allied loading devices and interfaces, which may signal "Loading Completed" before all goods have completely transferred to the shuttle.

U

SEMI-AUTO LOADING SS COMPLETED DELAY 02

2-20 seconds

Enter the required time (in seconds) to delay the "Loading Completed" signal from the shuttle.

V

EXTEND BELT TO DIS ? 0=NO 1=YES 0

0-1

Does the shuttle belt extend to discharge?

Configure decision V2 only appears if C≥2 and R=1.

V2

BELT DOES NOT EXTEND 0=NO 1=YES 0

0-1

0=No. The belt should extend to load or discharge.
1=Yes. The belt should not extend to load or discharge. Use this option to control a belt that takes more than 1 load of loose goods.

Configure decision W only appears if *A*=1 and *C*=1.

W

REVERSE DISCHARGE RUN BELT TIME (S) 05

05-25 seconds allowed

Where time for discharge is not critical, command sufficient time for the belt to make half of a complete revolution. If necessary, shorten this time so that the belt runs approximately as long as it would under photo-eye control (see FIGURE 5).

Configure decision X only appears if *C*=2 or greater.

X

DISCH EYE TO BE SS BLOCKED=ERROR 04

04-15 seconds allowed

Enter the maximum time (in seconds) the discharge eye can be blocked before an error is declared. Determine the required time (see FIGURE 5).

The shuttle must count multiple cakes. If the photo-eye stays blocked for this configured time, the shuttle assumes that it cannot distinguish between the individual cakes (usually the result of cakes that have spread apart and are touching) and signals an error.

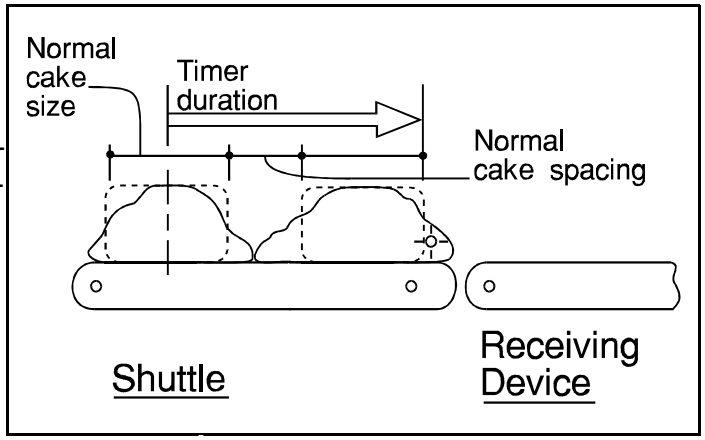


FIGURE 5 (MSOPD432CE)
Determining *Disch Eye To Be Blocked=Error* Time

Decision Y: Controlling Cake Spacing on a Long Cake Mover (if *Decision B* is 2 or greater)

Multiple cakes on a belt must be spaced far enough apart for reliable photo-eye input (see *Disch Eye To Be Blocked Error*) and still accommodate the belt's full cake capacity. This value is the time in tenths of a second for the belt to run after a cake clears the load-end photo-eye, which determines spacing between cakes (see FIGURE 6).

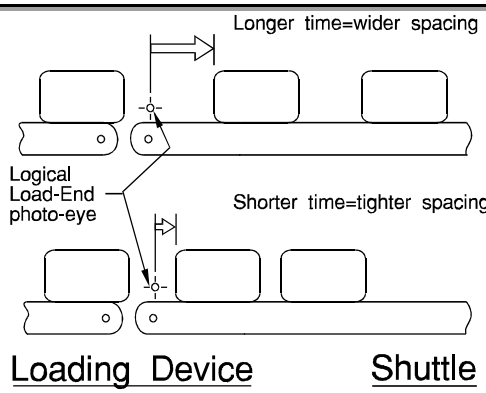


FIGURE 6 (MSOPD432CE)
Effect of *Time After Trailing Edge In Tenths* on Cake Spacing

Y	TIME AFTER TRAILING EDGE(x) IN 10ths 02	02-99 tenths of a second	Enter time as explained above *for each cake* where [x] is cake number (up to four cakes).
Z	ALLOW BOTH EYES BLOCKED 0=NO 1=YES 0	0-1	**0=No**. Do not allow both eyes blocked. Prompts an error message if both eyes are blocked. **1=Yes**. Allow both eyes blocked.
C **Z2**	IGNORE EYE ERROR 3 0=NO 1=YES 0	0-1	**0=No.** Eye Error 3 appears when the discharge end eye blocks and then clears while loading. **1=Yes**. Eye Error 3 never appears.

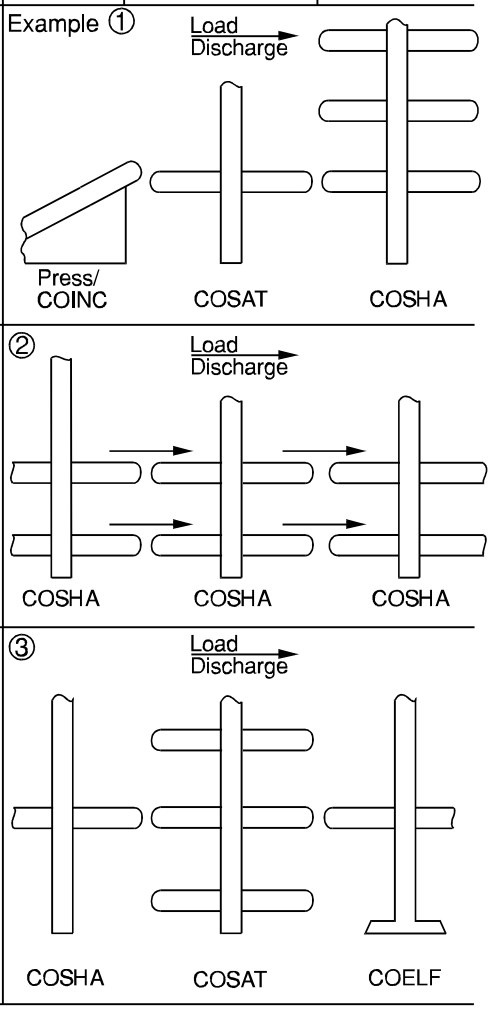
Decisions AA and *BB*: Determining the Number of Receive and Discharge Levels

The following table explains by example, how receive and discharge levels work.

Non-Elevating Shuttles

Non-Elevating Shuttles have one receive and one discharge level, no matter how many belts. Note that the belts and levels are completely independent. Do not count belts on the shuttle to determine levels.

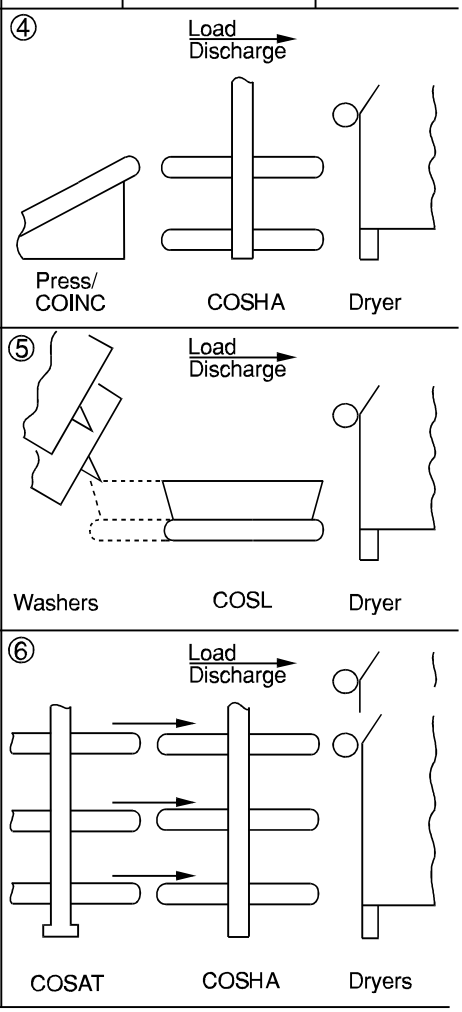
AA=NUMBER OF RECEIVE LEVELS	BB=NUMBER OF DISCHARGE LEVELS	Type of Loading Device	Type of Shuttle	Type of Receiving Device
1	1	Example ①		
1	1	②		
1	1	③		



Elevating Shuttles

Elevating shuttles have as many loading and discharge levels as any belt must align with. In example 6 below, any COSHA belt must align with only one belt on the loading device (COSAT) but each COSHA belt must align with dryers on two levels.

AA=NUMBER OF RECEIVE LEVELS	BB=NUMBER OF DISCHARGE LEVELS	Type of Loading Device	Type of Shuttle	Type of Receiving Device
1	1	④		
2	1	⑤		
1	2	⑥		



AA — NUMBER OF RECEIVE LEVELS ? 1 — 1-4 levels — Enter the number of different receive levels (as explained above) the shuttle must go to.

BB — NUMBER OF DISCHARGE LEVELS ? 1 — 1-4 levels — Enter the number of different discharge levels (as explained above) the shuttle must go to.

Decisions CC and *DD*: Enabling the Shuttle Elevator

Decision CC must match the hardware. If the shuttle can elevate, the time required to move the shuttle belt(s) from full down to full up (see FIGURE 7) must be determined by field trials and entered in *Decision DD*. Use this time when the shuttle is first powered up and is testing the maximum and minimum of its elevating range. If it cannot test these points in the time entered here, an error will occur.

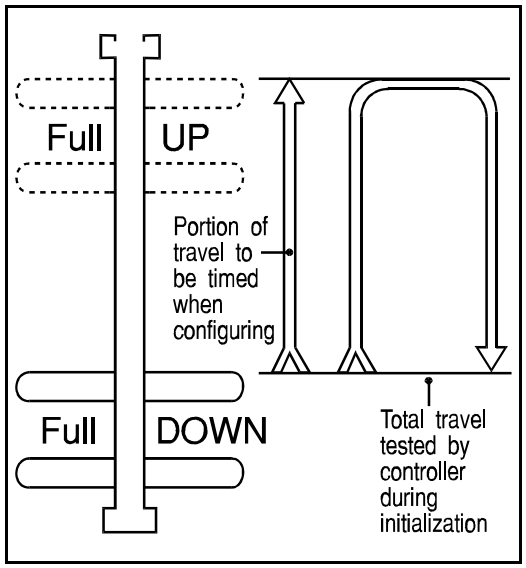


FIGURE 7 (MSOPD432CE)
Timing Vertical Travel

Decisions EE and *FF*: Determining if Belt(s) Must Elevate To Load or Discharge (if *Decision B* is greater than 1)

If a multi-belt shuttle receives from or discharges to another shuttle with the same number of belts, cakes will normally transfer across matching belts (see FIGURE 8). Thus, the shuttle need not elevate to transfer the second or higher cakes. When the shuttle receives from or discharges to any other device, it must elevate between cake transfers.

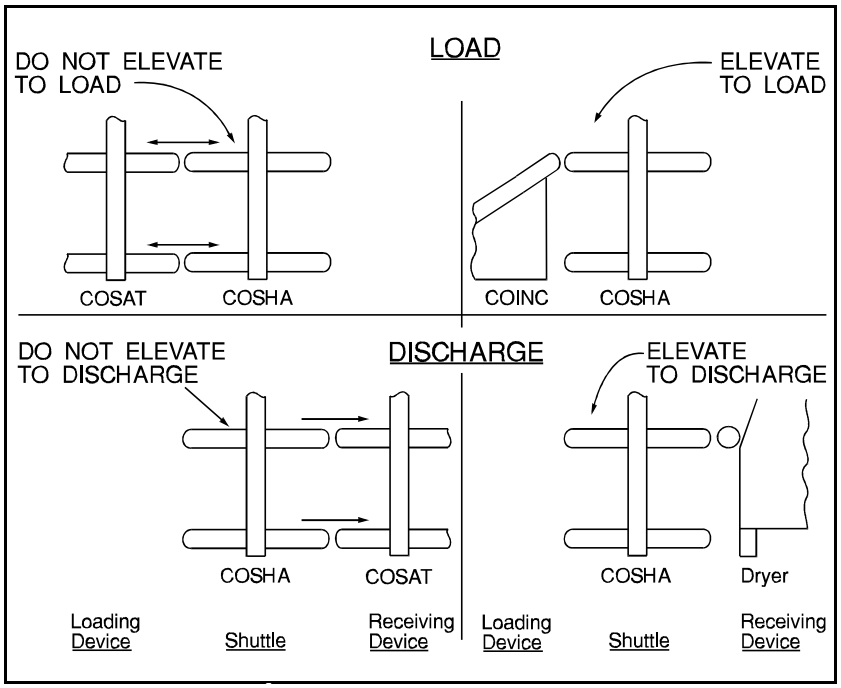


FIGURE 8 (MSOPD432CE)
When Belts Must Elevate To Load/Discharge

CC | ELEVATOR INSTALLED 0=NO 1=YES 1 | 0-1

0=No, if the shuttle cannot elevate.
1=Yes, if the shuttle can elevate.

Configure decision DD only appears if *CC*=1.

DD | TIME TO REACH BOTTOM-TOP (SS) 05 | 5-99 seconds

Enter the time in seconds required to raise the shuttle belt(s) (see FIGURE 7). The controller doubles this time to accomodate up and down movement.

Configure decisions EE and *FF* only appear if *A* is greater than 1 and *CC*=1.

EE | 2ND BELT ELEVATE TO LOAD 0=NO 1=YES 0 | 0-1

0=No. Do not elevate 2nd or higher belts to receive a cake.
1=Yes. 2nd or higher belts must elevate to receive a cake.

FF | 2ND BELT ELEVATE TO DISCH 0=NO 1=YES 0 | 0-1

0=No. Do not elevate 2nd or higher belts to discharge a cake.
1=Yes. 2nd or higher belts must elevate to discharge a cake.

Decision GG: Checking for Peripheral Failure

As a permanent setting, always set this decision to *1* (*Yes*). Only set to *0* (*No*) temporarily, if requested by the Milnor® factory, during troubleshooting.

GG | CHECK FOR PERIPHERAL FAILURE 0=NO 1=YES 0 | 0-1

0=No. Do not check for malfunctioning boards.
1=Yes. Check for malfunctioning boards.

Decisions HH through *MM*: Accommodating Allied Loading

- ***Decision HH***—This decision specifies allied loading (must match the hardware). If *HH*=1, then *Decisions JJ*, *KK*, *LL*, and *MM* appear (permitting the shuttle to accommodate pecularities of various allied controllers) as follows:
- ***Decisions JJ* and *KK***—If the allied device tells the shuttle to accept a load when in fact there is none, a time limit must be imposed to stop the belt if the discharge-end eye is not blocked when the useful loading time has expired. *Decisions JJ* and *KK* provide for such a time limit. This only applies to one-long (accomodate one cake, lengthwise) shuttles, because they use this signal to start the belt. Two-long or longer cake shuttles use the load-end photo-eye to start the belt and are not affected.
- ***Decision LL***—This decision provides for delaying the loading completed input from the shuttle to the allied device, in case the allied controller would otherwise receive the loading completed input signal from the shuttle too early to properly respond or before all goods have transferred.
- ***Decision MM***—With allied loading, data that controls the permissible combinations of cakes on a *multi-cake* shuttle are unavailable from Miltrac, so *Decision MM* provides for specifying which batch codes (formula, dry code, destination, customer, and goods code), if any, must match the first cake when additional cakes are being loaded.

C

Configure decision HH does not appear if *M=1,* instead, the control automatically makes *HH=1* in this instance.

HH | ALLIED LOADING 0=NO 1=YES 0 | 0-1

0=No. If shuttle loads via the Miltrac system.
1=Yes. If shuttle loads from allied device.

Configure decision JJ only appears if *HH=1 and C=1*. However, it will not appear if *M=1* and *T=0*.

JJ | LIMIT LOAD RUN BELT TIME 0=NO 1=YES 0 | 0-1

0=No. No time limit when loading.
1=Yes. Turn off belt after X seconds if a cake has not been identified, where "X" is the time entered in *decision KK* below.

Configure decision KK only appears if *JJ*=1.

KK MAX TIME TO RUN BELT FOR LOADING (SS) 08 — 20-99 seconds — Enter maximum time (in seconds) allowed to run belt before the shuttle controller declares no cake. If time runs out and cake still does not block discharge-end eye, the shuttle will initialize and go to Home position.

Configure decision LL only appears if HH=1.

LL ALLIED LOADING SS COMPLETED DELAY 00 — 00-10 seconds — Enter the time desired (in seconds) to delay the loading completed signal from the shuttle to the allied device.

Configure decision MM only appears if *HH*=1, and *B* and/or *C* are greater than 1.

MM COMPATIBILITY FDDCG 0=N/A 1=MATCH 00000 — 0-1 (each) — Enter the compatibility code desired for each type of data (0=match not required, 1=match required).
F=Formula
D=Dry Code
D=Destination code
C=Customer code
G=Goods code

Decision NN: Applying the Single Cake Code on a Multi-Cake Shuttle

Decision NN specifies whether a "single cake" code issued by the loading device (which tells the shuttle to declare itself loaded when it receives the first cake) should be ignored. The single cake signal is usually only pertinent when processing (e.g., drying). The integrity of this data is preserved and passed to the receiving device even if the shuttle is configured to ignore this signal. Thus, if the shuttle receives two or more cakes, the first of which has the single cake code assigned, it will pass only the first cake to the dryer, along with the appropriate codes (including the single cake attribute). Generally, the system will function more efficiently if the shuttle ignores the single cake signal.

Configure decision NN only appears if *HH*=1, *B* and/or *C* are greater than 1.

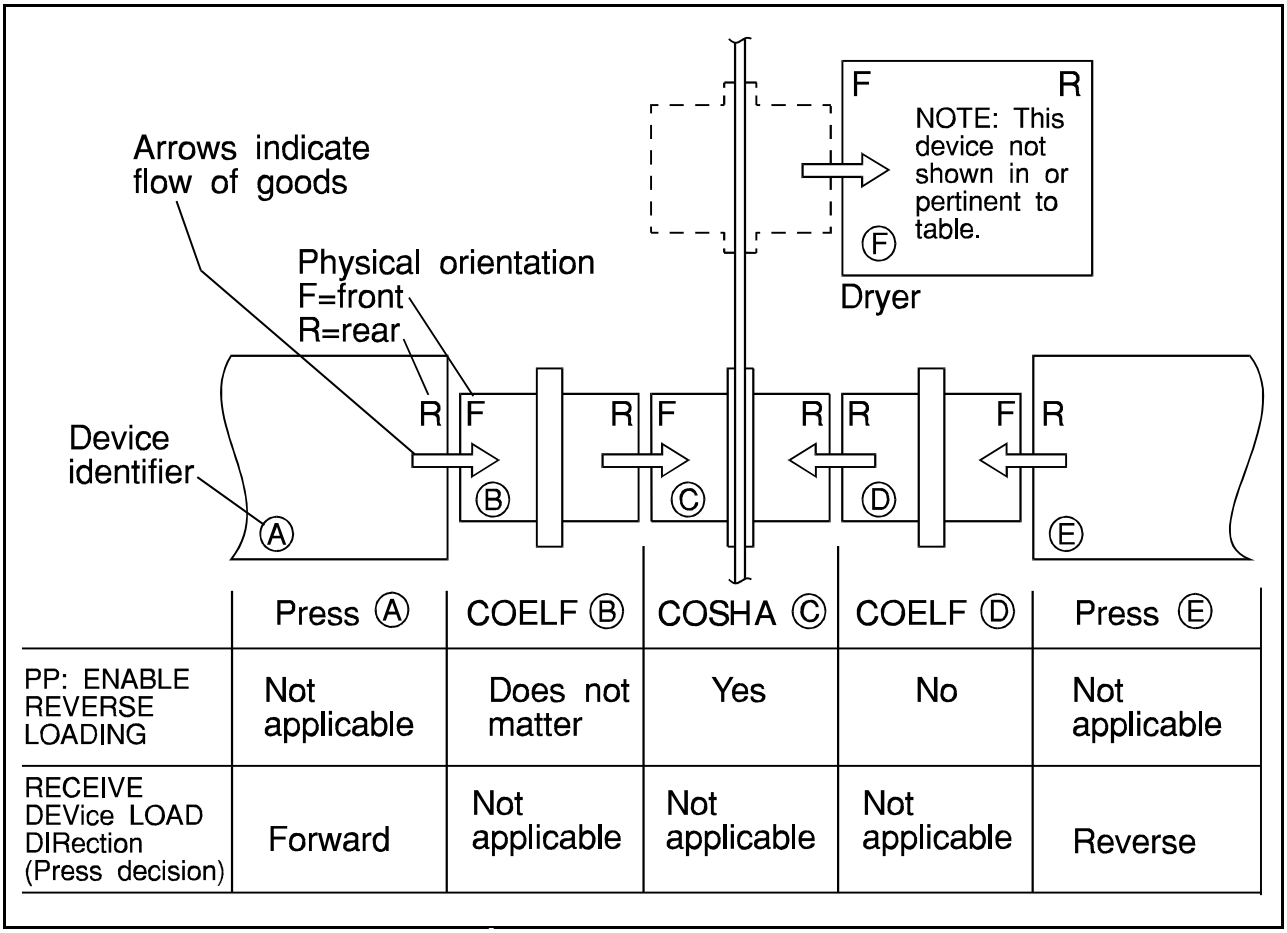
NN DISARMED SINGLE CAKE 0=NO 1=YES 0 — 0-1 — **0=No**, if single cake decision is required at the shuttle.
1=Yes, if it is desired to ignore single cake.

Decisions OO and *PP*: Configuring Reverse Loading Conditions (if *Decision HH*=0)

Depending on the physical layout of the system, a shuttle may have to receive from a device on what is normally its discharge end (shuttle runs its own belt in reverse) or receive from what is normally the load end of its loading device (loading device runs its belt in reverse). With the Miltrac system (or older Milnet® network) loading, the shuttle can be configured to handle these conditions automatically. If the shuttle must run its own belt in reverse to load, the *loading device* tells the *shuttle* which direction to run its belt (*Decision OO: Enable Reverse Loading*). If the loading device must run its belt in reverse to load the shuttle, the *shuttle* tells the *loading device* which direction to run its belt (*Decision PP: Milnet Reverse Loading*).

To properly utilize these features, understand that all devices (even cake shuttles, which look almost the same on either end) have a physical load end (front) and a physical discharge end (rear). Normal belt direction is always from front to rear of the device. Reverse loading comes into play only when a belt on any device must run in reverse (opposite its normal direction) to load the shuttle.

NOTE: See next page for explanation of FIGURE 9.



	Press Ⓐ	COELF Ⓑ	COSHA Ⓒ	COELF Ⓓ	Press Ⓔ
PP: ENABLE REVERSE LOADING	Not applicable	Does not matter	Yes	No	Not applicable
RECEIVE DEVice LOAD DIRection (Press decision)	Forward	Not applicable	Not applicable	Not applicable	Reverse

FIGURE 9 (MSOPD432CE)
Typical Application of *Decision OO: Enable Reverse Loading*

OO ENABLE REVERSE LOADING 0=NO 1=YES 0 0-1

0=No. Do not enable reverse loading. The shuttle will run its belts forward during loading regardless of what Miltrac tells it to do.

1=Yes. Enable reverse loading. The loading device tells shuttle which way to run its belts via Miltrac.

In FIGURE 9, devices A, E, and F are processing devices that can only move goods in one direction. Devices A and E (both presses) are configured to tell their receiving devices which direction to run the belts while loading. Device A specifies forward and device E specifies reverse. Devices B, C, and D are all shuttles. Devices B and D always run their belts forward and device C (Cosha) runs its belt forward when receiving from device B, but must run in reverse when receiving from device D. Set *Enable Reverse Loading* to *1* (*Yes*) in device C so it runs its belts as directed by device B or D when receiving. Set *Enable Reverse Loading* to *0* (*No*) in device D (Coelf) so it ignores the instruction from device E to load reverse, and merely passes this instruction to device C. Since device A tells device B (Coelf) to load forward, the *Enable Reverse Loading* decision in device B has no effect.

PP MILNET REVERSE LOADING 0=NO 1=YES 0 0-1

0=No. Do not use Milnet® reverse loading. Loading device runs its belt forward, regardless of what the Miltrac controller tells it to do.

1=Yes. Use Milnet® reverse loading. Via the Miltrac system, the shuttle tells its loading device which way it should run its belt in order to transfer goods to the shuttle.

Cosha-A receives goods from Cosha-B (see FIGURE 10). But to do so, Cosha-B must run its belt in reverse. Enable Milnet® reverse loading in Cosha-A, to cause Cosha-A to control Cosha-B's belt direction when transferring goods from B to A. The need for Milnet® reverse loading in Cosha-B depends on how it is loaded, which is not shown in this example.

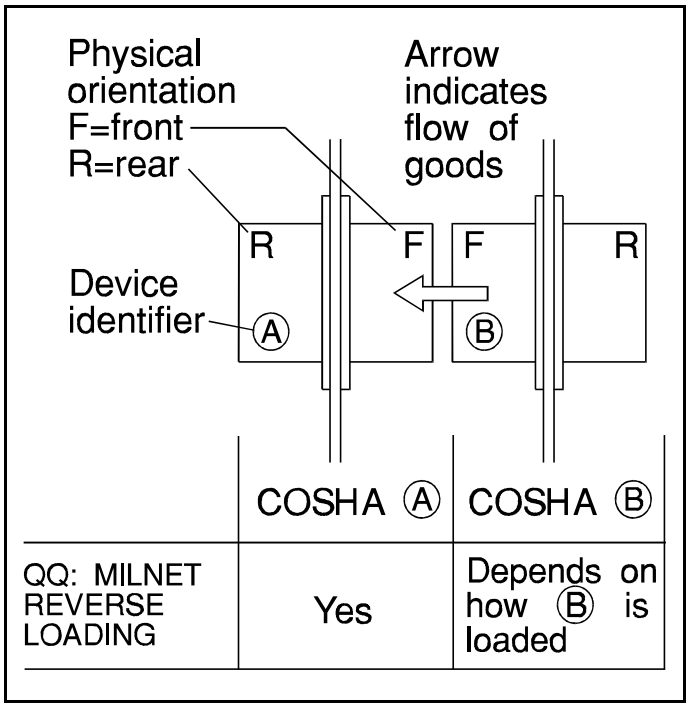


FIGURE 10 (MSOPD432CE)
Typical Application of *Decision PP: Milnet Reverse Loading*

Decisions QQ, RR, and *SS*: Accommodating Special Discharging Conditions

- ***Decision QQ***—Specifies allied discharging (must match the hardware). If the shuttle discharges to a Miltrac device, *not allied*, then *Decisions RR* and *SS* appear.
- ***Decision RR***—Should the unload (receiving device) wait until full? This is only pertinent when the shuttle loads a device (e.g., dryer) with a larger capacity than that of the shuttle. *Decision RR* provides for either 1) releasing the partially loaded receiving device (e.g., dryer starts processing) after the shuttle has fully discharged its current load or 2) holding the receiving device until the shuttle gets another load, thereby fully loading the receiving device. The most efficient choice will depend on the needs of the specific system.
- ***Decision SS***—Should the shuttle wait for the Miltrac "start" command before moving to the receiving device? This decision is hardware-dependent. When a shuttle in one Miltrac system must discharge to a device in another Miltrac system (a linkmaster application), then the shuttle *must* wait for the "start" command for the system to function properly. However, in non-Linkmaster applications, the shuttle should not wait for "start," but should be permitted to begin moving on the Miltrac "get ready" command.

QQ | ALLIED DISCHARGE 0=NO 1=YES 0 | 0-1

0=No. Shuttle discharges via a Miltrac device.
1=Yes. Shuttle discharges to an allied device.

Configure decisions *RR* and *S* only if *QQ*=0.

RR | HOLD UNLD DEVICE TIL FULL 0=NO 1=YES 0 | 0-1

0=No. It is not required to hold the unload device after the shuttle discharges the first load.
1=Yes. Hold the unload device until it is full.

SS | WAIT FOR START BEFORE MOVING 0 | 0-1

0=No. Shuttle can start moving when the Miltrac system gives "get ready" command (no Linkmaster).
1=Yes. Shuttle must wait for the Miltrac "start" command before moving (Linkmaster).

Decision TT: Restricting Shuttle Movement

By default, the shuttle bed can traverse (move left/right) and elevate (move up/down) simultaneously (thus, move diagonally) to minimize travel time between the loading and receiving devices. With *decision UU*, the shuttle can be restricted to traversing only at receive-level zero. This is normally required only if in its diagonal movement, the shuttle bed might collide with an object in its path.

Configure decision ***TT*** only appears if *CC*=1 (*Elevator Installed?*=1).

TT | ALWAYS TRAVERSE LOW 0=NO 1=YES 0 | 0-1

0=No. It is OK for the shuttle bed to move diagonally.
1=Yes. Shuttle is only permitted to traverse at receive level zero.

UU | ALWAYS RETURN HOME 0=NO 1=YES 0 | 0-1

0=No. Shuttle travels to load/discharge station, loads/discharges goods, waits for discharge/load command from Miltrac then moves to next device. The shuttle returns Home at power-up, error, or return from manual. This option requires Miltrac 89101 or later.

1=Yes. Shuttle travels to load/discharge station, loads/discharges goods, then returns Home to reorient itself.

Decisions VV Through *XX*: Facilitating Communication

These decisions facilitate communication between the shuttle and other controllers/devices. If the shuttle receives from and discharges to allied devices (non-Miltrac), *Decisions VV, WW,* and *YY* are meaningless and can remain at their current values. *Decision ZZ* is meaningful only for Mildata® systems.

VV | GOODS UNIT 0=WEIGHT 1=PIECES 0 | 0-1

Enter the appropriate unit of quantity (*0=Weight* or *1=Pieces*) to be displayed when the control prompts for cake data (occurs when the shuttle is powered up with goods on it). The *quantity unit is not passed* to other devices, but the *quantity value for each batch is passed*. Thus the same goods unit *must* be used in all devices in the Miltrac system.

WW | OUTPUT FLAG WHEN EMPTY 0=NO 1=YES 0 | 0-1

0=No. Declared empty output not required.

1=Yes. Declared empty output required.

Decision WW supports a special circuit that augments Miltrac communication in certain systems such as that shown in FIGURE 11. The circuit prevents the Costa from issuing a "desire to discharge" command merely because it has a cake. This circuit only allows the Costa to issue this command when 1) the press does not desire to discharge, 2) the Cosha is empty, and 3) a dryer desires a load. In this example, the Cosha must have *Output Flag When Empty* enabled to provide the "shuttle is empty" signal. This output requires a sixth 8/16 board.

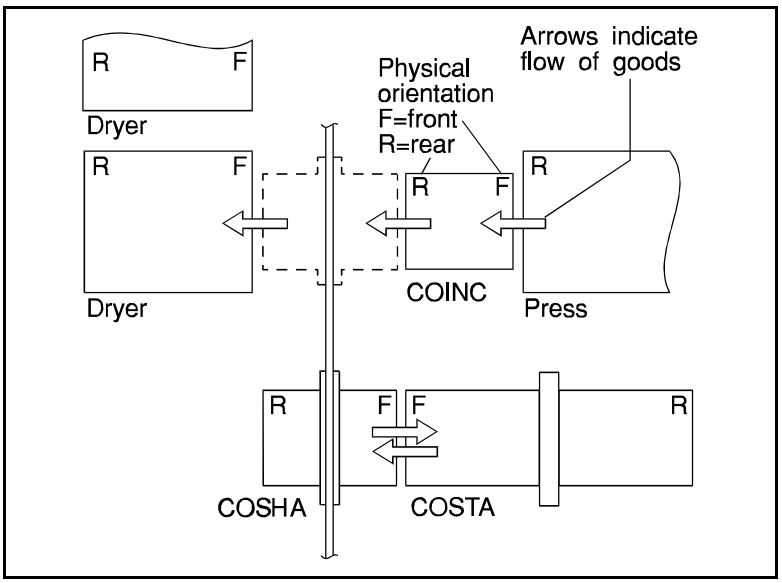


FIGURE 11 (MSOPD432CE)
Typical Application of *Decision WW: Output Flag When Empty*

XX	FINISHED UNLOADING OUTPUT 0=NO 1=YES 0	0-1	**Software version 88108 or later only** **0=No.** **1=Yes.** Allows the shuttle to inform the receiving device that the shuttle is empty and the transfer was completed. This output requires input/output 3.
YY	MILTRAC ADDRESS 000	000-255	Enter the Miltrac address for the shuttle (see Miltrac manual).
YYY	NUMBER OF BYTES IN NETWORK STRING 00	00, 11, 24, 30	**00**=Miltrac system version 89100 or later **11**=Milnet **24**=Miltrac system version 8624 and earlier **30**=Miltrac system version 89001 and earlier
ZZ	MILDATA ADDRESS 000	000-255	Enter the Mildata® address for the shuttle (see Mildata® manual).
**	LANGUAGE 0	0-4	**Software version 88108 or later only** **0**=English **1**=French **2**=Dutch **3**=Spanish **4**=Italian **NOTE:** All languages are available in the same software.

See "How To Access the Configure Mode, Enter Data, and Exit" in this section for displays when exiting configure.

2=*Clear All Memory* (Voluntarily)

When the display= PROGRAM 2 MENU / CLEAR ALL MEMORY

ENTER NEXT = "SKIP" FOR NO CHANGE / "4+5+6" TO CLEAR — No cursor appears.

SKIP TO **Exits this program without clearing memory.** Display= PROGRAM 0 MENU / OK TURN KEY TO RUN

4 JKL + 5 MNO + 6 PQR **Clears all memory.** Configure codes are cleared voluntarily. CLEARING MEMORY / **PLEASE WAIT** then PROGRAM 0 MENU / OK TURN KEY TO RUN

Operating 2

RUNNING THE MARK IV AND V SHUTTLE IN AUTOMATIC SYSTEMS

⚠ DANGER ⚠

CRUSH HAZARD—Moving shuttles and shuttle mechanisms will strike or crush anyone in the shuttle path.

- ☞ **Do not operate the shuttle without owner/user furnished fencing to enclose shuttle path per the guidelines posted on the shuttle.**
- ☞ **Never enter the path of a shuttle or its mechanisms unless power to the shuttle is locked off and tagged out at wall disconnect.**
- ☞ **Know how to use all factory-supplied shuttle safety devices including *emergency stop switches*, pull cords, and kickplates.**
- ☞ **Be sure all personnel are clear of the shuttle path and mechanisms before operating the shuttle in manual or automatic mode. Shuttle may move automatically when ① is pressed, any time cake data is entered, or any time the *Manual/Automatic switch* is set to *automatic.***

Normal Automatic Operation

The normal operating mode of most shuttles is fully automatic. Once the *Manual/Automatic switch* on the shuttle is set to *automatic*, a new batch (and its batch codes) passes from the loading device (e.g., the Milnor® press) to the shuttle each time the loading device discharges, until the shuttle is declared fully loaded. The loaded shuttle will then wait to transfer the batch(es) and the associated codes to a dryer or other post-wash device.

NOTE: Depending on batch codes and shuttle configuration, the shuttle may be declared fully loaded before its physical capacity is met (e.g., a 2x2 shuttle may be fully loaded with only one cake).

The Power Up Sequence

Master switch on **Energizes control power, but not shutle power.** The operator alarm sounds, and the power up displays appear, as shown at right.

`COPYRIGHT PELLERIN MILNOR 1990`	Copyright statement (appears one or more times during sequence)
`ALL RIGHTS RESERVED 'COSHA' 8800G`	Number at lower right is software date code.

The display then prompts

```
THREE WIRE DISABLED
 PUSH START TO GO
```

① **Energizes shuttle power and silences the operator alarm.** The shuttle retracts bed (if equipped and not retracted) and tests for maximum up and down time (if elevating s

RETRACTING BELT

INITIALIZATION IN PROGRESS

RETRACTING BELT

When Entering Cake Data Is Not Required

If no photo-eye detects goods, the shuttle returns to the Home position and it waits for a load.

RETURNING HOME

If goods are detected, and the controller can verify the data via checksum, the shuttle returns to Home, the display=

WAITING TO DISCHARGE BELT *b-p*

Where *b* is belt number and *p* is goods position (see FIGURE 1).

Home is the position along the shuttle path that the shuttle seeks after power up or recovery from an error condition. At the Home position, the shuttle reorients itself (verifies its position). Home is usually either directly in front of the primary loading device or at a location central to all loading devices.

When Entering Cake Data Is Required

If goods are detected and the controller cannot verify cake data via checksum (see "PROGRAMMING THE MARK II, III, IV, AND V SHUTTLE CONTROLLER" (see Table of Contents)), the controller prompts

DOES POSITION p HAVE A CAKE? 0=NO 1=YES 1

For each goods position, where *p*=goods position (see FIGURE 1). Default=1(yes). If yes, see "When Cake Data Must Be Confirmed" in this section. If no, operation continues as shown below.

WAITING FOR LOADING DEVICE TO GET READY

After cake data is entered (0 or 1), if the shuttle has not fully retracted, display=

RETRACTING BELT

Appears until the belt is fully retracted (if equipped).

If the belt is fully retracted, but the shuttle is not at Home position, display=

RETURNING HOME

Appears until the shuttle finds the Home position.

When the shuttle is Home, and cake data has been entered, display=

WAITING TO DISCHARGE BELT *b-p*

Where *b* is belt number and *p* is goods position (see FIGURE 1).

or

If the shuttle was told that no goods are on the belt, display=

WAITING FOR LOADING DEVICE TO GET READY

Belts and Goods Positions—The controller may ask about or reference any one of the goods positions (e.g., *Waiting To Discharge Belt b-p*), so it is important to understand the goods position numbering sequence. A shuttle may have as many as four storage belts (*b*), numbered 0 through 3, starting from the topmost belt. The shuttle may have up to eight goods positions (*p*), numbered 0 through 7 from the discharge end to the load end and topmost belt to bottommost belt as in FIGURE 1. On two-wide shuttles, the belt on the right (when viewed from the load end) is Belt 0 and the left belt is Belt 1.

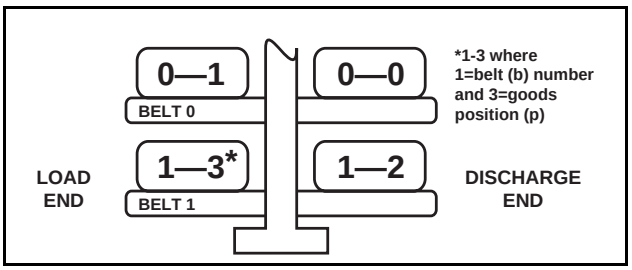


FIGURE 1 (MSOPD440CE)
Belt and Position Numbering

The Displays During Normal Operation

NOTE: Traversing shuttles orient themselves using three types of targets on the shuttle rail: *Home*, *Oops*, and *Device*. The shuttle seeks the fixed *Home* target whenever it is powered up or recovers from an error. The shuttle uses this target to determine which devices are to the right or left of it, so it moves in the correct direction when a device requires service. The shuttle may seek home when it finishes loading and receiving if it is so configured (see *Always Return Home* in "PROGRAMMING THE MARK II, III, IV, AND V SHUTTLE . . .") The *Oops* targets are fixed targets mounted at each end of the rail. These targets indicate that the shuttle has traversed too far right or left. The *Device* target is a normally retracted target that extends downward on command. The target is controlled by the device requiring service which stops the shuttle at the appropriate device. This device extends the target only after the shuttle has begun moving.

LOAD OPERATION

At Home—While the shuttle is idle and waiting to be loaded, display=

```
WAITING FOR LOADING
DEVICE TO GET READY
```

Preparing To Load—When the Miltrac system requests "get ready" or when the shuttle closes the *load allowed output* to tell an allied discharging device to get ready to discharge, display=

```
   FINDING LOAD
STATION AND LEVEL
```

Appears if position is not the Home position.

```
 EXTENDING BELT
```

Appears while shuttle is extending the bed to load (if equipped).

```
WAITING FOR LOAD
BELT b-p
```

Appears when the shuttle has found the correct load station and level, and the bed is in position to accept goods. *b-p* indicates which belt and position goods will be loaded onto (see FIGURE 1).

Loading—If the belt is not equipped with load-end eyes, the belt will begin running when *Loading Belt b-p* is displayed. If the shuttle has load-end eyes, the belt will not run until the photo-eye is blocked and will only stop when the photo-eye is clear for trailing edge time. See "PROGRAMMING THE MARK II, III, IV, AND V SHUTTLE CONTROLLER."

```
LOADING BELT b-p
```

Appears when the load-end photo-eye detects goods (if equipped) or the Miltrac controller tells the shuttle that the loading device is loading goods onto it. *b-p* indicates which belt and position goods are being loaded onto.

```
LOADING BELT b-p
COMPLETE
```

Loading is complete for this belt. *b-p* indicates which belt and position goods were loaded onto.

Returning to the Home position—The shuttle will return Home if it is configured to *Always Return Home* (see *Decision UU* in "PROGRAMMING THE MARK II, III, IV, AND V . . ."). If it is not configured to *Always Return Home*, the shuttle will retract its belt and wait to load another cake or discharge as instructed by the system controller.

RETRACTING BELT	After loading, the shuttle retracts its belt (if equipped).
RETURNING TO LOAD LEVEL **0**	The shuttle moves up and down until it finds level 0.
RETURNING HOME	The shuttle returns to the Home position to reorient itself along the shuttle rail.
WAITING TO DISCHARGE	The shuttle has declared itself loaded and is waiting to be allowed to discharge.

DISCHARGE OPERATION

Preparing to discharge—When the Miltrac controller requests "get ready" or when the shuttle closes the *load allowed output* to tell an allied loading device to get ready to load, display=

FINDING DISCHARGE STATION AND LEVEL	The shuttle has been allowed to discharge and is now searching for the discharge station and the discharge level.
EXTENDING BELT	Appears while shuttle is extending the bed (if equipped) toward the receiving device.

Discharging load

UNLOADING BELT *b-p*	*b-p* indicates which belt and position goods are being unloaded from.
UNLOADING BELT *b-p* COMPLETE	The discharge photo-eye has cleared and unloading is complete for this belt. *b-p* indicates which belt and position goods were loaded onto.

Returning to the Home position—The shuttle will return Home if it is configured to *Always Return Home* (see *Decision UU* in "PROGRAMMING THE MARK II, III, IV, AND V . . ."). If it is not configured to *Always Return Home*, the shuttle will retract its belt and wait to load another cake or discharge as instructed by the system controller.

RETRACTING BELT	After unloading, the shuttle retracts its belt (if equipped).
RETURNING TO LOAD LEVEL 0	The shuttle moves up and down until it finds level 0.
RETURNING HOME	The shuttle returns to the Home postion to reorient itself along the shuttle rail.

When the shuttle is idle and ready to be loaded again, display=

WAITING FOR LOADING DEVICE TO GET READY

NOTE: See "OPERATION OF SPECIALIZED SHUTTLES" for more specific operation information about two-wide shuttles, two-long Coflos, or two-high Coflos/Coslips.

Interruptions in Normal Shuttle Operation

Holds Ahead of the Shuttle—Anytime the flow of goods onto the shuttle stops (as might be caused by a hold condition in the extractor), the shuttle remains at *Waiting For Load*. When the flow of goods resumes, the shuttle resumes operation without manual intervention.

Holds Behind the Shuttle—Anytime the shuttle desires to discharge but cannot because the receiving device (e.g., dryer) is not ready, the shuttle waits and displays *Waiting To Discharge*. As soon as the receiving device is available, the transfer occurs, and normal operation resumes without manual intervention.

Power Loss or Three-Wire Disabled Condition—If the shuttle loses power or the three-wire circuit drops out (as will occur if an *emergency stop switch* is pressed), the shuttle stops immediately. The shuttle resumes operation, as explained in "The Power Restoration Sequences" in this section, as soon as the power or three-wire circuit connection is restored, regardless of how long the shuttle was stopped. See **NOTE** below.

NOTE: It is not usually necessary to load or unload the shuttle before returning it on-line with the controller. Upon restoring power, the shuttle initializes and resumes normal automatic operation. It automatically synchronizes with its interfacing devices (e.g., extractor, dryer), providing the shuttle was not in the middle of loading or receiving goods at power loss. See "The Power Restoration Sequences" in this section.

The Power Restoration Sequences

The intervention required to return the shuttle on-line depends on which of the following conditions occurred:

- Power was lost other than during transfer.
- Power was lost during transfer.
- Three wire was disabled without power loss other than during transfer.
- Three wire was disabled without power loss during transfer.

If Power Was Lost Other Than During Transfer

Master switch on (or power restored)	**Energizes control power, but not shuttle power. The power up display sequence appears, and the operator alarm sounds, display=**	THREE WIRE DISABLED PUSH START TO GO
①	**Energizes shuttle power by closing the three-wire circuit, and silences the operator alarm.**	INITIALIZATION IN PROGRESS

The remaining power up displays appear, and the shuttle resumes normal operation. See "The Power Up Sequence" in this section.

If Power Was Lost During Transfer—In the unlikely event that a transfer was in progress when power was lost, and goods remain both partially on the shuttle and partially in the loading or receiving device, the following procedure ensures that all goods are transferred to either the shuttle or the loading or receiving device.

Master switch on (or power restored) **Energizes control power, but not shuttle power. The power up display sequence appears, and the operator alarm sounds. Display=**

```
THREE WIRE DISABLED
  PUSH START TO GO
```

Upon viewing this display, continue recovery by seeing "If Three-Wire Is Disabled (Without Power Loss) During Transfer" in this section and following steps two through seven.

If Three-Wire Is Disabled (Without Power Loss) Other Than During Transfer—If the shuttle was not transferring when an error disabled the three-wire circuit, proceed as follows:

When display=

```
THREE WIRE DISABLED
  PUSH START TO GO
```

⚠ DANGER ⚠

CRUSHING AND ENTANGLEMENT HAZARDS—Moving shuttles and shuttle mechanisms will strike or crush anyone in the shuttle path.

☞ **Be sure all personnel are clear of the shuttle path and mechanisms before operating the shuttle in manual or automatic mode. Shuttle may move automatically when it is pressed, any time cake data is entered, or any time the *Manual/Automatic switch* is set to *automatic.***

① **Energizes shuttle power, and silences the alarm. Display=**

```
INITIALIZATION IN
    PROGRESS
```

The remaining power up displays appear, and the shuttle resumes normal operation. See "The Power Up Sequence" in this section.

If Three Wire Is Disabled (Without Power Loss) During Transfer—In the unlikely event that a transfer was in progress when the three-wire circuit was disabled, and goods remain both partially on the shuttle and partially in the loading or receiving device, the following procedure ensures that all goods are transferred to either the shuttle or the loading or receiving device.

⚠ CAUTION ⚠

Goods extending past the end of a shuttle belt after a power loss or three-wire disabled condition can catch on machinery during shuttle movement, causing damage to goods or machinery. These goods must be moved either onto the shuttle or into the transferring device before the shuttle is permitted to move automatically.

1. Correct the malfunction that caused the three-wire disabled condition.
2. Set the *Manual/Automatic switch* on the shuttle to *manual*.
3. Press ① at the shuttle controller to enable the three-wire circuit.

⚠ DANGER ⚠

CRUSHING AND ENTANGLEMENT HAZARDS—Moving shuttles and shuttle mechanisms will strike or crush anyone in the shuttle path.

☞ **Always operate the shuttle carefully in manual mode. The operator has total control of shuttle movement immediately after the *Manual/Automatic switch* is set to *manual.***

4. Using the manual controls (switches) on the shuttle, move the goods either completely onto the shuttle or completely into the transferring device, ensuring that any goods on the shuttle are not hanging over the edge of the belt where they can catch on machinery. See "MANUALLY OPERATING . . ."
5. Press the nearest ⓪ *and release it*. This disables the three-wire circuit, preventing the shuttle from moving automatically, even after returning to automatic mode, until ① is pushed.
6. Set the *Manual/Automatic switch* on the shuttle back to *automatic*.

⚠ DANGER ⚠

CRUSH HAZARD—Moving shuttles and shuttle mechanisms will strike or crush anyone in the shuttle path.

☞ **Be sure all personnel are clear of the shuttle path and mechanisms before operating the shuttle in manual or automatic mode. Shuttle may move automatically when it is pressed, any time cake data is entered, or any time the *Manual/Automatic switch* is set to *automatic.***

7. Press ① at the shuttle controller, and the shuttle resumes normal operation.

When Cake Data Must Be Confirmed

When normal operation resumes following a power loss, morning start up, any error (see "MARK II, III, IV, AND V SHUTTLE ERROR MESSAGES"), or manual intervention, the controller runs the belt(s) (i.e., initializes) to determine if any goods are on the belt. If the photo-eye detects goods (i.e., the photo-eye is blocked), the controller prompts the user for certain information, as explained below.

⚠ DANGER ⚠

CRUSHING AND ENTANGLEMENT HAZARDS—Moving shuttles and shuttle mechanisms will strike or crush anyone in the shuttle path.

☞ **Be sure all personnel are clear of the shuttle path and mechanisms before operating the shuttle in manual or automatic mode. Shuttle may move automatically when it is pressed, any time cake data is entered, or any time the *Manual/Automatic keyswitch* is set to *automatic.***

Responding to Prompts for Shuttle Cake Information

To verify its photo-eye has truly detected goods, the control prompts

	DOES POSITION p HAVE A CAKE? 0=NO 1=YES 1	Where *p* indicates position. Default=1(Yes). See **NOTE** below and FIGURE 1.
0, ENTER/NEXT	**(No) Tells the controller that there are no goods for this position.**	WAITING FOR LOADING DEVICE TO GET READY	If all goods positions are answered No (see **NOTE** below), then the shuttle is ready to be loaded.

or

1, ENTER/NEXT or ENTER/NEXT	**(Yes) Tells the controller that goods are still on the shuttle and prompts**	ENTER FORMULA FOR POSITION 0 XXX	Where XXX is the wash formula. Change number if necessary.

ENTER/NEXT **Accepts the displayed formula number**, and the controller prompts for confirmation of additional information: dry code, destination, customer, goods code, weight (or pieces, as determined by configure), cake number.

When all cake data is entered, the normal power up sequence resumes.

NOTE: If the shuttle has more than one goods position per belt or more than one belt (or both), the controller prompts for batch codes for each goods position on every belt where goods have been detected. See FIGURE 1 to identify goods positions.

Viewing Data on the Microprocessor Display During Operation

Cake data (batch codes), inputs, outputs, and Miltrac commands can be viewed while the shuttle is operating (i.e., the three wire is enabled). All this data is useful for troubleshooting, but cake information is also useful for determining the status of individual batches.

How To Access, Scroll, and Exit the Data Menu

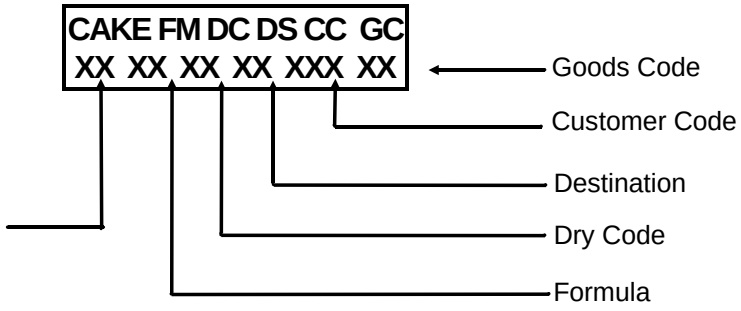
When display= `WAITING FOR LOADING DEVICE TO GET READY`

2 DEF — Displays one of the four types of data each time it is pressed, or scrolls through all menu choices if held depressed. Pressing 2 DEF, with Miltrac commands displayed, returns to the normal run display.

Viewing Cake Information

Hold 2 DEF until this display appears, then release.

Constantly (every two seconds) scrolls through all cake positions (regardless if cake is there or not) to show associated cake information. The first position starts at the load end of belt 0 and progresses.



Example 1

1 long 1 wide 2 high shuttle

Cake 00=Position 0 Belt 0
Cake 01=Position 1 Belt 1

Example 2

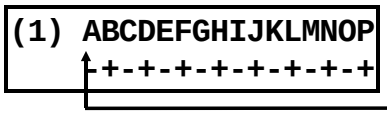
2 long 1 wide 2 high shuttle

Cake 00=Position 0 Load end Belt 0
Cake 01=Position 1 Discharge end Belt 0
Cake 02=Position 2 Load end Belt 1
Cake 03=Position 3 Discharge end Belt 1

Viewing Inputs

Hold 2 DEF until this display appears, then release.

Displays 1st 16 inputs (1: A-P). Located on first 16/8 board.



"+" = input energized
"-" = input not energized

CAPITAL letters represent inputs.

SKIP TO **Displays second 16 inputs (2: A-P)**. Located on 2nd 16/8 board.

SKIP TO **Displays third 16 inputs (3: A-P)**. Located on 3rd 16/8 board.

SKIP TO **Displays fourth 16 inputs (4: A-P)**. Located on 4th 16/8 board.

SKIP TO **Displays fifth 16 inputs (5: A-P)**. Located on 5th 16/8 board.

SKIP TO **Displays sixth 16 inputs (6: A-P)**. Located on 6th 16/8 board.

SKIP TO **Displays last 6 inputs (7: A-F)**. Located on processor board.

Table A: Standard INPUTS for SHUTTLES

Page 1: First 16 Inputs			Page 2: Second 16 Inputs	
Display Code	**Input Name**	**Connector/Pin**	**Input Name**	**Connector/Pin**
A	Belt 0 Discharge Level Switch 1	1MTA4-1	Discharge End Eye Belt 2	2MTA4-1
B	Belt 0 Slack Cable	1MTA4-2	Discharge Level Switch 2 for Belt 0	2MTA4-2
C	Belt 0 Receive Level Switch 1	1MTA4-3	Go Down Before Up	2MTA4-3
D	Left Right Oops	1MTA4-4	Receive Level 3 for Belt 0	2MTA4-4
E	Receive Level Switch 2	1MTA4-5	Discharge Level 3 for Belt 0	2MTA4-5
F	Load End Eye Belt 1	1MTA4-6	First Cake Eye for Belt 0	2MTA4-6
G	Discharge End Eye Belt 0	1MTA4-7	Not Used	2MTA4-7
H	Discharge End Eye Belt 1	1MTA4-8	Not Used	2MTA4-8
I	Belt 0 Receive Level Switch 0	1MTA4-11	Not Used	2MTA4-11
J	Belt 0 Discharge Level Switch 0	1MTA4-12	Not Used	2MTA4-12
K	Manual Switch	1MTA4-13	Not Used	2MTA4-13
L	Three Wire	1MTA4-14	Fully Extended Load	2MTA4-14
M	Shuttle Home	1MTA4-15	Extended Too Far	2MTA4-15
N	Belt 0 Transfer Station	1MTA4-16	Retracted Too Far	2MTA4-16
O	Belt 0 Load Station	1MTA4-17	Fully Extended Unload	2MTA4-17
P	Load End Eye Belt 0	1MTA4-18	Fully Retracted	2MTA4-18

Table A: Standard INPUTS for SHUTTLES (cont'd)

Page 7: Last 6 Inputs		
Display Code	**Input Name**	**Connector/Pin**
A	Not Used	Not Used
B	Program Key	MTA38-03
C	Signal Cancel	MTA38-02
D	Finished Receiving Input	MTA38-05
E	Not Used	Not Used
F	Not Used	Not Used

Table B: Optional INPUTS for SHUTTLES

Page 3: Third 16 Inputs			Page 4: Fourth 16 Inputs	
Display Code	**Input Name**	**Connector/Pin**	**Input Name**	**Connector/Pin**
A	Dry Code 0	3MTA4-1	Customer Code 0	4MTA4-1
B	Dry Code 1	3MTA4-2	Customer Code 1	4MTA4-2
C	Dry Code 2	3MTA4-3	Customer Code 2	4MTA4-3
D	Dry Code 3	3MTA4-4	Customer Code 3	4MTA4-4
E	Dry Destination Code 0	3MTA4-5	Customer Code 4	4MTA4-5
F	Dry Destination Code 1	3MTA4-6	Customer Code 5	4MTA4-6
G	Dry Destination Code 2	3MTA4-7	Go Load Left	4MTA4-7
H	Dry Destination Code 3	3MTA4-8	Go Load Right	4MTA4-8
I	Single Cake	3MTA4-11	Allied Run Load Belt Backwards	4MTA4-11
J	Input Data Valid	3MTA4-12	Coslide Loading Complete	4MTA4-12
K	Discharge Backwards	3MTA4-13	Discharge Right	4MTA4-13
L	Go Discharge at Level 1	3MTA4-14	Allied Discharge Complete	4MTA4-14
M	Allied Discharge Desired	3MTA4-15	Allied Loading Cancelled	4MTA4-15
N	Allied Discharge Allowed	3MTA4-16	Allied Discharge Cancelled	4MTA4-16
O	Discharge Left	3MTA4-17	Go Load at Level 1	4MTA4-17
P	Desire to Load Shuttle	3MTA4-18	New Customer	4MTA4-18

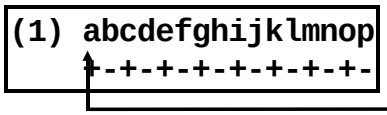
Table B: Optional INPUTS for SHUTTLES (cont'd)

Page 5: Fifth 16 Inputs			Page 6: Sixth 16 Inputs	
Display Code	**Input Name**	**Connector/Pin**	**Input Name**	**Connector/Pin**
A	Dry Code 3	5MTA4-1	Belt 1 Load Station	6MTA4-1
B	Dry Code 2	5MTA4-2	Belt 1 Transfer Station	6MTA4-2
C	Dry Code 1	5MTA4-3	Belt 1 Slack Cable	6MTA4-3
D	Dry Code 0	5MTA4-4	Belt 1 Receive Level Switch 0	6MTA4-4
E	Destination Code 0	5MTA4-5	Belt 1 Discharge Level Switch 0	6MTA4-5
F	Destination Code 1	5MTA4-6	Belt 1 Receive Level Switch 1	6MTA4-6
G	Destination Code 2	5MTA4-7	Belt 1 Discharge Level Switch 1	6MTA4-7
H	Load Left	5MTA4-8	Belt 1 Receive Level Switch 2	6MTA4-8
I	Desire to Load Shuttle	5MTA4-11	Belt 1 Discharge Level Switch 2	6MTA4-11
J	Allied Load Cancelled	5MTA4-12	Belt 1 Receive Level Switch 3	6MTA4-12
K	Load Right	5MTA4-13	Belt 1 Discharge Level Switch 3	6MTA4-13
L	Load Semi-automatically	5MTA4-14	Not Used	6MTA4-14
M	Allied Run Load Back	5MTA4-15	Not Used	6MTA4-15
N	Go Load at Level 1	5MTA4-16	Not Used	6MTA4-16
O	Destination Code 3	5MTA4-17	Not Used	6MTA4-17
P	Dry Code on Board 5	5MTA4-18	Not Used	6MTA4-18

Viewing Outputs

Hold 2 DEF until this display appears.

Displays 1st 16 outputs (1: a-p).



"+" = input made
"-" = input not made

SKIP TO **Displays 2nd 16 outputs (2: a-p).**

SKIP TO **Displays last 9 outputs (3: a-i).**

LOWER CASE letters represent outputs.

Table C: Standard OUTPUTS for SHUTTLES

Page 1: First 16 Outputs					
Display Code	Output Name	**Connector/Pin**	**Display Code**	Output Name	**Connector/Pin**
a	Move Up Belt 0	1MTA5-10 1MTA5-19	**i**	Manual Allowed 2	2MTA5-10 2MTA5-19
b	Move Down Belt 0	1MTA5-9 1MTA5-18	**j**	Signal	2MTA5-9 2MTA5-18
c	Move Left	1MTA5-8 1MTA5-17	**k**	I Am Loading	2MTA5-8 2MTA5-17
d	Move Right	1MTA5-7 1MTA5-16	**l**	Extend Belt 0 Unload	2MTA5-7 2MTA5-16
e	Move Belt 1 Rearward	1MTA5-4 1MTA5-14	**m**	Extend Belt 0 Load/ Belt 2 Reverse	2MTA5-4 2MTA5-14
f	Move Belt 1 Forward	1MTA5-3 1MTA5-13	**n**	Flag 2 Down/ Retract Belt 0 Load	2MTA5-3 2MTA5-13
g	Move Belt 0 Rearward	1MTA5-2 1MTA5-12	**o**	Manual Allowed 1	2MTA5-2 2MTA5-12
h	Move Belt 0 Forward	1MTA5-1 1MTA5-11	**p**	Retract Belt 0 Unload/ Belt 2 Forward	2MTA5-1 2MTA5-11

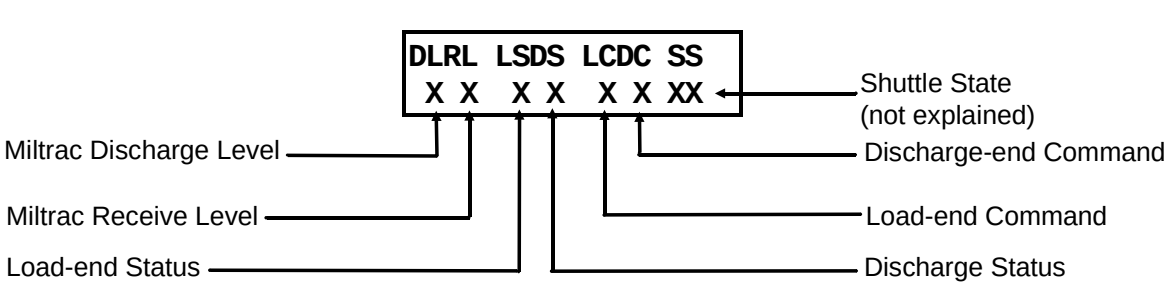
Table D: Optional OUTPUTS for SHUTTLES

Page 2: Second 16 Outputs			Page 3: Last 9 Outputs		
Display Code	**Output Name**	**Connector/Pin**	**Display Code**	**Output Name**	**Connector/Pin**
a	Dry Code 2	3MTA5-10 3MTA5-19	**a**	Extend Belt 1 Unload	5MTA5-10 5MTA5-19
b	Dry Code 3	3MTA5-9 3MTA5-18	**b**	Retract Belt 1 Unload	5MTA5-9 5MTA5-18
c	Load Desired	3MTA5-8 3MTA5-17	**c**	Extend Belt 1 Load	5MTA5-8 5MTA5-17
d	I Want To Discharge	3MTA5-7 3MTA5-16	**d**	Retract Belt 1 Load	5MTA5-7 5MTA5-16
e	Finished Unloading	3MTA5-4 3MTA5-14	**e**	Semi Auto Load Desired	5MTA5-4 5MTA5-14
f	Dry Code 0	3MTA5-3 3MTA5-13	**f**	Finished Unloading	5MTA5-3 5MTA5-13
g	Dry Code 1	3MTA5-2 3MTA5-12	**g**	Not Used	5MTA5-2 5MTA5-12
h	Finished Loading	3MTA5-1 3MTA5-11	**h**	Not Used	5MTA5-1 5MTA5-11
i	Destination Code 2	4MTA5-10 4MTA5-19	**i**	I Am Empty	6MTA5-10 6MTA5-19
j	Destination Code 3	4MTA5-9 4MTA5-18	**j**	Move Up Belt 1	6MTA5-9 6MTA5-18
k	Data Valid	4MTA5-8 4MTA5-17	**k**	Move Down Belt 1	6MTA5-8 6MTA5-17
l	Ready To Unload	4MTA5-7 4MTA5-16	**l**	Not Used	6MTA5-7 6MTA5-16
m	Discharge Partial Load	4MTA5-4 4MTA5-14	**m**	Not Used	6MTA5-4 6MTA5-14
n	Destination Code 0	4MTA5-3 4MTA5-13	**n**	Not Used	6MTA5-3 6MTA5-13
o	Destination Code 1	4MTA5-2 4MTA5-12	**o**	Not Used	6MTA5-2 6MTA5-12
p	Not Finished Unloading	4MTA5-1 4MTA5-11	**p**	Not Used	6MTA5-1 6MTA5-11

Viewing Miltrac Commands

This screen is used when troubleshooting with factory assistance.

Hold 2 DEF until this display appears, then release.



DL (Miltrac Discharge Level)—where the Miltrac system wants the shuttle to accept discharged goods.

RL (Miltrac Receive Level)—where the Miltrac system wants the shuttle to receive goods.

LS (Load End Status)—what the shuttle is telling the Miltrac system about its load end.

0 Cannot Do Anything
1 Want To Receive
2 Ready To Receive
3 I am Finished Receiving
4 I am Finished Receiving (Do Not Hold)

DS (Discharge End Status)—what the shuttle is telling the Miltrac system about its discharge end.

0 Cannot Do Anything
1 Want To Transfer
2 Ready To Transfer
3 I am Finished Transferring
4 I am Finished Transferring (Do Not Hold)

LC (Load End Command)—what the Miltrac system is telling the shuttle to do with respect to its load end.

0 Do Nothing
1 Get Ready To Receive
2 Get Ready To Receive Left
3 Get Ready To Receive Right
4 Start Receiving
5 Finished Receiving
6 You are Finished Receiving (Do Not Hold)

DC (Discharge End Command)—what the Miltrac system is telling the shuttle to do with respect to its discharge end.

0 Do Nothing
1 Get Ready To Transfer
2 Get Ready To Transfer Left
3 Get Ready To Transfer Right
4 Start Transferring
5 You are Finished Transferring
6 You are Finished Receiving (Do Not Hold)

SS (Shuttle State)—not explained (factory troubleshooting only).

OPERATION OF SPECIALIZED SHUTTLES

Two-Wide Shuttle

Description—A two-wide shuttle (any model designation) can be thought of as two single-high shuttles bolted together and operated by the same controller. Each half of the shuttle has separate motors for up/down and left/right; therefore, each half of the shuttle can move up/down independently. However, it moves left/right as a single unit.

A single microprocessor output controls left/right movement of the entire shuttle. Each belt has separate outputs for up and down and separate inputs for Receive and Discharge levels and Slack and Taut Chain.

Operation—At power up, the belts initialize simultaneously, rise to Receive Level 0, and travel home (which is designated by belt 0).

When Miltrac tells the shuttle to load, the shuttle stops with belt 0 at the desired load station. The controller loads belt 0 first (when viewed from the load end, the belt on the right is belt 0). After the shuttle takes the first cake, it will either return home and wait to move to another device to load belt 1, or it will move right and wait to load a second cake from that device onto belt 1.

When Miltrac tells the shuttle to discharge, the shuttle stops with belt 0 at the desired discharge station. After the shuttle has discharged the first cake, it will move right (facing load end) to position belt 1 at the discharge station. After completely loading or discharging, the shuttle returns Home.

If a situation arises where the shuttle returns home and only belt 1 has a load, an error (*Cake Must Be Manually Unloaded*) requiring manual unloading will occur.

Two-Long Coflo

Description—A two-long Coflo (see Coflo description in "PROGRAMMING THE MARK IV AND V SHUTTLE CONTROLLER," "Decisions M Through V: Special Purpose Loose Goods Shuttles") differs from a regular Coflo because it loads two loose goods loads from one belt and discharges those same loads as a single load. B

Operation—At power up, the shuttle operates as described in "RUNNING THE MARK IV AND V SHUTTLE IN AUTOMATIC SYSTEMS." However, when initializing, a two-long Coflo looks for a new input, *First Cake Eye*. During loading of the first load, the belt runs until this eye (typically located in the middle of the belt) is blocked. While loading the second load, the belt runs until the discharge-end eye is blocked. The shuttle returns to the home position, then the goods are discharged as a single load. B

NOTE: Multi-cake Coflo/Coslip shuttles are typically used to receive goods from an extractor. The output, *You're Finished Receiving* (11MTA14-1, 2) from the extractor grounds the input *Finished Receiving* (MTA38-5) on the shuttle to notify the shuttle when the extractor finishes discharging.

Two-High Coflo/Coslip

Description—A two-high Coflo/Coslip (see Coflo and Coslip description in "PROGRAMMING THE MARK IV AND V SHUTTLE CONTROLLER," "Decisions M Through V: Special Purpose Loose Goods Shuttles") differs from a regular Coflo or Coslip because it loads and discharges from two belts (levels) rather than just one. B

Operation—At power up, the shuttle operates as described in "RUNNING THE MARK IV AND V SHUTTLE IN AUTOMATIC SYSTEMS." However, two-high Coflos and Coslips transport two batches of goods, each batch on one of the two shuttle belts. When Miltrac tells the shuttle to load, the shuttle stops with belt 0 at the desired load station. Miltrac loads belt 0 first. After the shuttle takes the first cake, it will either return home, move to position belt 1 to receive a second cake from that device, or move to another device to load belt 1. When Miltrac tells the shuttle to discharge, the shuttle stops with belt 0 at the desired discharge station. After the shuttle has discharged the first cake, it will move to position belt 1 at the discharge station and discharge the second cake. After completely loading or discharging, the shuttle returns home. If a situation arises where the shuttle returns home and only belt 1 has a load, an error with occur. B

NOTE: Multi-cake Coflo/Coslip shuttles are typically used to receive goods from an extractor. The output, *You're Finished Receiving* (11MTA14-1, 2) from the extractor grounds the input *Finished Receiving* (MTA38-5) on the shuttle to notify the shuttle when the extractor finishes discharging.

MANUALLY OPERATING THE MARK III, IV, AND V SHUTTLE

B

The shuttle can be operated manually from either the manual controls on the shuttle itself (see descriptions of the controls in the operator manual) or the *bare manual* menu accessible at the shuttle controller. Though the shuttle can be operated manually from either, the controls at the shuttle are for making subtle movements or for manual goods handling. The shuttle controller, however, is better for moving the shuttle longer distances or in situations that do not require manually handling goods. By actuating outputs in bare manual, most microprocessor outputs can be tested.

While *bare manual* modes 00-13 allow actuating outputs for manual operation or output testing, *bare manual mode 13* (*test inputs*) allows microprocessor inputs to be viewed and tested without returning to automatic operation, a function particularly useful when troubleshooting.

The *Bare Manual Menu* and How To Access It

The Available Modes in the *Bare Manual Menu*

00=Return to Automatic	**03=Run Belt 2-3**	**06=Loading**	**09**=Dry Code	**12**=Belt 1
01=Moving Shuttle	**04=Extend-Retract**	**07=Discharge**	**10**=Dry Destination	Up/Down
02=Run Belt 0-1	**05=Extend-Retract 1**	**08=Data Pass**	**11**=Signal-Manual	**13**=Test Inputs

⚠ DANGER ⚠

CRUSH HAZARD—Moving shuttles and shuttle mechanisms will strike or crush anyone in the shuttle path.

- ☞ **Do not operate the shuttle without owner/user furnished fencing to enclose shuttle path per the guidelines posted on the shuttle.**
- ☞ **Know how to use all factory-supplied shuttle safety devices including *emergency stop switches*, pull cords, and kickplates.**
- ☞ **Always operate the shuttle carefully in *manual mode.* The operator has total control of shuttle movement immediately after the *Manual/Automatic keyswitch* is set to *manual*.**

To Access the Bare Manual Menu

When the display=

```
WAITING FOR LOADING
DEVICE TO GET READY
```

This is the *run mode*. It is possible to enter *bare manual* from other displays, but Milnor® recommends entry from this display.

SKIP TO + 0 — **Accesses *bare manual***

```
**MANUAL OUTPUTS**
00 RETURN TO AUTO
```

0, 1 ABC — **Selects *Moving Shuttle* (example)**

```
**MANUAL OUTPUTS**
01 MOVING SHUTTLE
```

ENTER NEXT	**Accesses the selected mode (example)**	1=RIGHT 2=LEFT 3=UP 4=DOWN	This is the *Moving Shuttle* sub-menu. See "Bare Manual: *01=Moving Shuttle*" in this section.

For Quick Return to *Run Mode* From Any *Bare Manual Mode*

ENTER NEXT	**Turns off any output if it is on and returns to *bare manual* menu**	**MANUAL OUTPUTS** 01 MOVING SHUTTLE	The last-selected mode is displayed.
0, 1 ABC	**Selects**	**MANUAL OUTPUTS** 00 RETURN TO AUTO	
ENTER NEXT	**Returns to *run mode***	WAITING FOR LOADING DEVICE TO GET READY	Shuttle ready for normal automatic operation.

⚠ CAUTION ⚠

Careless operation of the shuttle in *bare manual mode* can result in extensive damage to equipment and/or goods. In *bare manual mode,* the operator is fully responsible for all shuttle movement.

- ☞ **Do not direct the shuttle too far left/right or taut/slack.**
- ☞ **Do not run goods onto the floor.**
- ☞ **Do not extend the bed into equipment.**

Bare Manual: *00=Return to Automatic*

When the display= **MANUAL OUTPUTS**
00 RETURN TO AUTO

ENTER NEXT = WAITING FOR LOADING
DEVICE TO GET READY

Shuttle ready for normal automatic operation

Bare Manual: *01=Moving Shuttle*

When the display=

```
**MANUAL OUTPUTS**
01 MOVING SHUTTLE
```

ENTER/NEXT =

```
1=RIGHT   2=LEFT
3=UP      4=DOWN
```

Controller ignores all inputs. The *oops switch* and associated relays (not controlled by the microprocessor) must prevent the shuttle from going too far left/right or taut/slack chain. The operator must make sure these circuits are operating to prevent damage to the shuttle. Outputs can be actuated simultaneously (e.g., *Right* and *Up*); however, the software prevents simultaneously actuating opposing outputs (e.g., *Right* and *Left* or *Up* and *Down*).

NOTE: Once an output is turned on, press the same button to turn it off.

1 ABC / 1 ABC — **Turns *Right* output on/off.**

2 DEF / 2 DEF — **Turns *Left* output on/off.**

3 GHI / 3 GHI — **Turns *Up* output on/off.**

4 JKL / 4 JKL — **Turns *Down* output on/off.**

ENTER/NEXT — **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *02=Run Belt 0-1*

0 _:; , 2 DEF — **Display=**

```
**MANUAL OUTPUTS**
02 RUN BELT 0-1
```

ENTER/NEXT =

```
B0 1=FORWD 2=BACKWD
B1 3=FORWD 4=BACKWD
```

Controller ignores photo-eyes. **It is possible to run the goods on to the floor.** Outputs can be actuated simultaneously; however, the software prevents simultaneously actuating opposing outputs (e.g., *B0 Forwd* and *B0 Backwd* or *B1 Forwd* and *B1 Backwd*).

1 ABC / 1 ABC — **Turns move belt 0 forward (*B0 Forwd*) output on/off.**

2 DEF / 2 DEF — **Turns move belt 0 rearward (*B0 Backwd*) output on/off.**

3 GHI / 3 GHI — **Turns move belt 1 forward (*B1 Forwd*) output on/off.**

4 JKL / 4 JKL — **Turns move belt 1 rearward (*B1 Backwd*) output on/off.**

ENTER/NEXT — **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *03=Run Belt 2-3*

0 _ ?, 3 GHI **Display=**

```
**MANUAL OUTPUTS**
03 RUN BELT 2-3
```

ENTER NEXT =

```
B2  1=FORWD  2=BACKWD
B3  3=FORWD  4=BACKWD
```

Controller ignores photo-eyes. **It is possible to run the goods on to the floor.** Outputs can be actuated simultaneously; however, the software prevents simultaneously actuating opposing outputs (e.g., *B2 Forwd* and *B2 Backwd* or *B3 Forwd* and *B3 Backwd*).

1 ABC / 1 ABC **Turns belt 2 forward (*B2 Forwd*) output on/off.**

2 DEF / 2 DEF **Turns belt 2 reverse (*B2 Backwd*) output on/off.**

3 GHI / 3 GHI **(Optional) Turns belt 3 forward (*B3 Forwd*) output on/off.**

4 JKL / 4 JKL **(Optional) Turns belt 3 reverse (*B3 Backwd*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *04=Extend-Retract 0*

0 _ ?, 4 JKL **Display=**

```
**MANUAL OUTPUTS**
04 EXTEND-RETRACT  0
```

ENTER NEXT =

```
EXTND  1=UNLD  2=LOAD
RETRT  3=UNLD  4=LOAD
```

Controller ignores all inputs**. It is possible to extend the bed into equipment**. Outputs can be actuated simultaneously; however, the software prevents simultaneously actuating opposing outputs (e.g., *Extnd Unld* and *Retrt Unld* or *Extnd Load* and *Retrt Load*).

1 ABC / 1 ABC **Turns extend belt 0 unload (*Extnd Unld*) output on/off to extend in the unload direction.**

2 DEF / 2 DEF **Turns extend belt 0 unload (*Extnd Unld*) output on/off to extend in the load direction.**

3 GHI / 3 GHI **Turns retract belt 0 unload (*Retrt Unld*) output on/off to retract in the unload direction.**

4 JKL / 4 JKL **Turns retract belt 0 unload (*Retrt Unld*) output on/off to retract in the load direction.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *05=Extend-Retract 1*

0 _ ; , 5 MNO **Display=**

```
**MANUAL OUTPUTS**
05 EXTEND-RETRACT 1
```

ENTER NEXT =

```
EXTND 1=UNLD 2=LOAD
RETRT 3=UNLD 4=LOAD
```

Controller ignores all inputs. **It is possible to extend the bed into equipment**. Outputs can be actuated simultaneously; however, the software prevents simultaneously actuating opposing outputs (e.g., *Extnd Unld* and *Retrt Unld* or *Extnd Load* and *Retrt Load*).

1 ABC / 1 ABC **Turns extend belt 1 load (*Extnd Unld*) output on/off to extend in the unload direction.**

2 DEF / 2 DEF **Turns extend belt 1 load (*Extnd Load*) output on/off to extend in the load direction.**

3 GHI / 3 GHI **Turns retract belt 1 unload (*Retry Unload*) output on/off to retract in the unload direction.**

4 JKL / 4 JKL **Turns retract belt 1 unload (*Retry Load*) output on/off to retract in the load direction.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *06=Loading*

0 _ ; , 6 PQR **Display=**

```
**MANUAL OUTPUTS**
06 LOADING
```

ENTER NEXT =

```
1=DESIRED 2=SM DESRD
3=LOADING 4=FINISHED
```

1 ABC / 1 ABC **Turns load desired (*Desired*) output on/off.**

2 DEF / 2 DEF **Turns semi auto load desired (*Sm Desrd*) output on/off.**

3 GHI / 3 GHI **Turns shuttle is loading (*Loading*) output on/off.**

4 JKL / 4 JKL **Turns finished loading (*Finished*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *07=Discharge*

0, 7 STU **Display=**

```
**MANUAL OUTPUTS**
07 DISCHARGE
```

ENTER NEXT =

```
1=DESIRED  2=READY
3=FINISHED 4=SM FINI
```

1 ABC / 1 ABC **Turns I want to discharge (*Desired*) output on/off.**

2 DEF / 2 DEF **Turns ready to unload (*Ready*) output on/off.**

3 GHI / 3 GHI **Turns finished unloading (*Finished*) output on/off.**

4 JKL / 4 JKL **Turns semi auto finished unload (*Sm Fini*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *08=Data Pass*

0, 8 VWX **Display=**

```
**MANUAL OUTPUTS**
08 DATA PASS
```

ENTER NEXT =

```
1=PARTIAL LOAD
2=DATA VALID
```

1 ABC / 1 ABC **Turns discharge partial load (*Partial Load*) output on/off.**

2 DEF / 2 DEF **Turns *Data Valid* output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *09=Dry Code*

0, 9 YZ- **Display=**

```
**MANUAL OUTPUTS**
09 DRY CODE
```

ENTER NEXT =

```
1=DRY# 0   2=DRY# 1
3=DRY# 2   4=DRY# 3
```

1 ABC / 1 ABC **Turns dry code 0 (*Dry# 0*) output on/off.**

2 DEF / 2 DEF **Turns dry code 1 (*Dry# 1*) output on/off.**

3 GHI / 3 GHI **Turns dry code 2 (*Dry# 2*) output on/off.**

4 JKL / 4 JKL **Turns dry code 3 (*Dry# 3*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *10=Dry Destination*

1 ABC, 0 _ : Display= ****MANUAL OUTPUTS****
10 DRY DESTINATION

ENTER NEXT =

```
1=DEST# 0   2=DEST# 1
3=DEST# 2   4=DEST# 3
```

1 ABC / 1 ABC **Turns destination code 0 (*Dest# 0*) output on/off.**

2 DEF / 2 DEF **Turns destination code 1 (*Dest# 1*) output on/off.**

3 GHI / 3 GHI **Turns destination code 2 (*Dest# 2*) output on/off.**

4 JKL / 4 JKL **Turns destination code 3 (*Dest# 3*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *11=Signal-Manual*

1 ABC, 1 ABC Display= ****MANUAL OUTPUTS****
11 SIGNAL-MANUAL

ENTER NEXT =

```
1=SIGNAL   2=MANUAL1
3=MANUAL2  4=IM EMPTY
```

1 ABC / 1 ABC **Turns *Signal* output on/off.**

2 DEF / 2 DEF **Turns manual1 (*Manual 1*) allowed output on/off.**

3 GHI / 3 GHI **Turns manual2 (*Manual 2*) allowed output on/off.**

4 JKL / 4 JKL **Turns I am empty (*Im Empty*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *12=Belt 1 Up/Down*

1 ABC, 2 DEF Display = ****MANUAL OUTPUTS****
12 BELT 1 UP/DOWN

ENTER NEXT =

```
1=BELT 1 - UP
2=BELT 2 - DOWN
```

1 ABC / 1 ABC **Turns move up belt 1 (*Belt 1-Up*) output on/off.**

2 DEF / 2 DEF **Turns move down belt 1 (*Belt 1-Down*) output on/off.**

ENTER NEXT **Turns all outputs off and returns to *bare manual menu.***

Bare Manual: *13=Test Inputs*

1 ABC, 3 GHI **Display=**

```
**MANUAL OUTPUTS**
13 TEST INPUTS
```

See tables of listed inputs in "RUNNING THE MARK II, III, IV, AND V SHUTTLE . . ."

ENTER NEXT **Displays 1st 16 inputs (1: A-P)**
Located on 2nd 16/8 board

```
(1) ABCDEFGHIJKLMNOP
    +-+-+-+-+-+-+-+-
```

"+" = input energized
"-" = input not energized

SKIP TO **Displays 2nd 16 inputs (2: A-P).** Located on 2nd 16/8 board.

SKIP TO **Displays 3rd 16 inputs (3: A-P).** Located on 3rd 16/8 board.

SKIP TO **Displays 4th 16 inputs (4: A-P).** Located on 4th 16/8 board.

SKIP TO **Displays 5th 16 inputs (5: A-P).** Located on 5th 16/8 board.

SKIP TO **Displays 6th 16 inputs (6: A-P).** Located on 6th 16/8 board.

SKIP TO **Displays last 6 inputs (7: A-F).** Located on Processor Board.

ENTER NEXT **Returns to *bare manual menu.***

Troubleshooting 3

MARK II, III, IV, AND V SHUTTLE ERROR MESSAGES

The following messages can result from an error condition (e.g., improper procedure, microprocessor component failure, mechanical malfunction) or while correcting an error condition.

Power Up Error Messages

CLEAR MEMORY NOW PRESS 4 + 5 + 6	Indicates configure data is corrupt (possibly as a result of turning power *off* while in the *program mode*). **RECOVERY:** Reconfigure machine, as shown below.
	Enables clearing configure memory.
4 JKL + 5 MNO + 6 PQR	Clears entire configure memory. CLEARING MEMORY **PLEASE WAIT** See "PROGRAMMING THE MARK IV AND V SHUTTLE CONTROLLER" to restore configure data.
PROGRAM 0 MENU **OK TURN KEY TO RUN**	The keyswitch was incorrectly in the position at power up, but the control has determined that configure data is good. **RECOVERY:** Turn keyswitch to run.
THREE WIRE DISABLED PUSH START TO GO	At power up, this message appears following the power up displays. **RECOVERY:** Press ① to close the three-wire circuit (which provides power to the shuttle). ① may be pressed at any time during the power up displays, thus silencing the operator alarm and overriding this message. If ① fails to clear this message, see "Operational Error Messages" in this section.
CHECK I/O BOARD x PRESS SIGNAL CANCEL	The controller detects a failed or *missing* control circuit board, where *x* is the board number (see schematic manual). A "missing" board can result from configuring for an option not available (e.g., allied loading) or installing a new board or software that was configured for an option not on this machine. The shuttle uses only I/O boards, which are defined from #1 - #6. **RECOVERY:** Press SIGNAL CANCEL to reset the controller and access the *program menu.* Review configure decisions to ensure that all configured options are available on that shuttle model and with the microprocessor boards available. If everything is configured correctly, replace the failed board. Automatic operation can resume when the problem is resolved.

Operational Error Messages

⚠ DANGER ⚠

SHOCK HAZARD—High voltage electricity is present in electrical device on this machine whenever external power is supplied, even if all power switches are off. Contact with high voltage electricity will kill or seriously injure you.

- ☞ **Lock off and tag out power at wall disconnect before opening any electrical control box or accessing any other electrical component.**
- ☞ **Always employ the services of a licensed, qualified electrician when troubleshooting the electrical system.**

THREE WIRE DISABLED PUSH START TO GO

The three-wire relay, which provides control circuit power to the machine, became de-energized. If the three-wire contact opens, even momentarily, the machine stops and displays *Three Wire Disabled*. This message will remain even if the contact only opened momentarily, and will reappear if the *Master switch* is turned *off* and then *on* again. **RECOVERY:** These messages can only be cleared if the cause of the error is corrected, then the relay is energized by pressing ①. The relay is held energized by its own normally open contacts along with motor overloads, etc.

NOTE: If three wire was disabled because the switch that monitors the chain tension was made (i.e., taut chain error), the *Taut Chain Fault light* illuminates (see the descriptions of controls in the operator manual for full explanation). **RECOVERY:** 1) Turn the keyswitch from *normal operation* to *manual enable*; 2) Press *Enable Down button* until the bed is lowered from the *taut chain switch*; 3) Press the *Reset button* (*Taut Chain Fault light* extinquishes); 4) Ensure operation of level switches; 5) Resume normal operation as follows:

①	Closes the three-wire circuit and may prompt for cake information.
<responses>	Confirms cake data, where <responses> are as explained in "RUNNING THE MARK IV AND V SHUTTLE IN AUTOMATIC SYSTEMS."

CHECK I/O BOARD x PRESS SIGNAL CANCEL

See explanation in "Power Up Error Messages" in this section.

ERROR - CHECK CHAIN PRESS SIGNAL CANCEL

The shuttle failed to run the hoist to its maximum and minimum heights (to verify they operate) within the configured time. This error condition occurs only when the shuttle first powers up. **RECOVERY:** Verify that the hoist is free to move up and down and that enough time is entered in *configure decision G*.

```
ERROR - RAIL LIMIT
PRESS SIGNAL CANCEL
```

The shuttle moved too far left or right, making the *oops switch* on the traversing rail and was not able to move away from the switch within five seconds.
RECOVERY: Verify that the circuit is operational. Manually move the shuttle off of the *oops switch:*

1. Set the *Manual/Automatic switch* to *manual* and, use manual switches at the shuttle to move the shuttle away from the *oops switch*.
2. When shuttle is off the *oops switch*, set the *Manual/Automatic switch* to *automatic*.
3. Resume operation at controller by pressing SKIP TO.

```
ERROR-NOT RETRACTED
PRESS SIGNAL CANCEL
```

The shuttle bed is not fully retracted when moving left/right, up/down, or after initialization. **RECOVERY:** Verify operation of the *Fully Retracted switch*. Correct error, and press SIGNAL CANCEL.

```
ERROR - SLACK CHAIN
PRESS SIGNAL CANCEL
```

The shuttle descended too far while searching for a level, making the *Slack Chain switch*. **RECOVERY:** Verify operation of the level switches (load and discharge) and engagement of targets. Correct error, and press SIGNAL CANCEL.

```
ERROR - TAUT CHAIN
PRESS SIGNAL CANCEL
```

The shuttle ascended too far searching for a level, making the *Taut Chain switch*. **RECOVERY:** Verify operation of the level switches (load and discharge) for operation and engagement of targets. Correct error, and press SIGNAL CANCEL.

```
ERROR -XFER ABORTED
PRESS SIGNAL CANCEL
```

(For Miltrac system loading and/or discharging only) Indicates the transfer was aborted while in progress. **RECOVERY:** Verify that goods are not caught between devices. If goods are caught, use all safety precautions to remove them before clearing the error. Press SIGNAL CANCEL to clear the error.

```
ERROR - EYE ERROR
PRESS SIGNAL CANCEL
```

This error depends on shuttle hardware and the location at which the error occurs; any of the following conditions may cause this error:

1. The shuttle load-end or discharge-end photo-eyes detect goods on a multi-cake shuttle (>1 cake per belt). This may indicate that goods are hanging from either end of the shuttle with the potential to catch on machinery and cause damage.
2. The shuttle is configured as a two-cake belt and the load-end and/or discharge-end photo-eye detects goods when the shuttle tries to move left/right or up /down. This may indicate that goods remain hanging from either end of the shuttle with the potential to catch on machinery and cause damage.
3. The shuttle is configured for two or more cakes per belt and the shuttle knows it received more than one cake. While discharging, the shuttle cannot find the second cake (e.g., both/all cakes were discharged at one time because goods were trailing between cakes, preventing the shuttle from recognizing separate cakes).

ERROR - EYE ERROR PRESS SIGNAL CANCEL

4. The shuttle is configured as a two-cake belt and while loading, the discharge-end photo-eye blocked before the load-end photo-eye cleared. This indicates that goods may be trailing off the load end of the bed with the potential to catch on machinery and cause damage.
5. The shuttle load-end and discharge-end photo-eyes detect goods at the same time. This may indicate that goods are hanging from either end of the shuttle with the potential to catch on machinery and cause damage.
6. The shuttle overshoot eye is blocked, meaning goods may be hanging off the front of the shuttle with the potential to catch on machinery and cause damage.

RECOVERY: Correct error, and press SIGNAL CANCEL.

EXTENDING TOO FAR ADJUST BELT MANUALLY

The shuttle bed extended too far, causing the shuttle to stop.
RECOVERY:
1. Verify operation of the *Fully Extended switch.*
2. Set *Manual/Automatic switch* to *manual*, and use manual switches at shuttle to retract belt.
3. Set *Manual/Automatic switch* to *automatic*.
4. Resume operation at the controller by pressing SKIP TO.

RETRACTING TOO FAR ADJUST BELT MANUALLY

The shuttle bed retracted too far, causing the shuttle to stop.
RECOVERY:
1. Verify operation of the *Fully Extended switch*.
2. Set *Manual/Automatic switch* to *manual*, and use manual switches at shuttle to retract belt.
3. Set *Manual/Automatic switch* to *automatic*.
4. Resume operation at the controller by pressing SKIP TO.

CAKE MUST BE MANUALLY UNLOADED

(For shuttles configured not to elevate the second belt for discharge) A cake is on Belt 1 and not on Belt 0. **RECOVERY:**
1. Set the *Manual/Automatic switch* on the shuttle to *manual.*
2. Using the manual switches, discharge the goods from Belt 1.
3. Return the *Manual/Automatic switch* to *automatic.*
4. Resume operation at the controller by pressing SKIP TO.

ERROR - NO CAKE PRESS SIGNAL CANCEL

(For shuttles having more than one storage position per belt) The shuttle is attempting to discharge a cake, but the discharge eye was not blocked in *Belt Clear Time.* **RECOVERY:** Determine why cake did not block discharge eye in configured *Belt Clear Time* and correct. Press SIGNAL CANCEL to clear the error.

ERROR- WAIT TOO LONG PRESS SIGNAL CANCEL

(For allied discharge only) The shuttle finished discharging, and the receiving device failed to acknowledge completion of the discharge within 30 seconds.
RECOVERY: Check circuitry that indicates discharge completion to the shuttle. Press SIGNAL CANCEL to clear the error.

ERROR - TOO MANY DIR PRESS SIGNAL CANCEL

(For allied loading only) Right and left inputs that tell the shuttle what direction to move have been actuated during semi-automatic loading. **RECOVERY:** Check circuitry that controls right/left inputs for correct operation. Press SIGNAL CANCEL to clear the error.

Supplemental Information

4

Hardware Components of Serial Microprocessor Controllers

1. General

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

2. Microprocessor Components

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3. Serial Communications Port

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

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

Table 1: Board Application by Device (Part A)

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

Notes:

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

Table 2: Board Application by Device (Part B)

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

Notes:

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

4. Assigning Board Addresses

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

Table 3: Rotary Switch Settings

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

Notes:

* Optional boards

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

— End of BICMDF01 —

Summary of Milnor® Allied Interface Capability, Shuttle

A Milnor system machine may need to load from, or discharge to a non-Milnor machine. This document summarizes allied interface capability for the Milnor system machine equipped with Mark 5 microprocessor or later controls, as of this writing (see Note 2).

Note 1: Refer to the document "About Milnor® Allied Interfaces for Automated Laundering System Machines" for a general explanation of allied interfaces. Refer to "Milnor® Allied Interface Specifications and Signals" for technical information needed to implement an allied interface.

Note 2: The allied interfaces offered by Milnor are continually evolving and the available signals can vary from one software version (date code) to another. Milnor Tehnical Support can assist in determining data-passing capacities for specific software versions.

1. How Batch Data Travels Through a System

The types and ranges of batch codes that the devices within an automated laundering system can handle depend on both the individual device controller and the means of communication used to pass this data from device to device. Generally, allied interfaces provide less capacity then the Miltrac controller because they are much more limited by hardware constraints and are developed on an as-needed basis. You will notice in Table 1 that certain types of codes and code ranges do not carry over from device to device, or even from the loading to the discharge interface within the same device. Keep in mind that both down stream and upstream of a given allied interface, data will most likely be passed not via an allied interface, but rather, by the Miltrac controller or a similar system controller supplied by another equipment manufacturer. As of this writing, Miltrac is capable of passing the following codes and code ranges throughout the entire system (among all Miltrac devices): 256 formula codes, 16 press/extract codes, 16 dry codes, 256 goods code, 1000 customer codes, 64 destination codes, 1000 weight values, 256 cake numbers, and the following flags: single cake, empty load, low pressure, third pressure, no pressure.

2. Batch Data Signals

This section summarizes the types and number of batch codes for which, as of this writing, batch data allied interface signals are available. As shown in Table 1, the signals that carry batch data are divided into two general categories, those that pass multi-digit batch codes (e.g., drycode) in binary, and must therefore, function in groups and those that pass a single on/off value (e.g., the "new customer" code).

Both the need for, and the specific use that any type of batch code serves can vary significantly from one installation to another. Signals traditionally used for certain batch codes can sometimes be adapted to new types of batch data. The following are the batch codes traditionally associated with allied interfaces and their traditional definitions.

Formula code—identifies the wash formula used in the tunnel. Although in some systems, the wash formula may affect post-wash processing, formula codes are passed to post-wash devices primarily for accounting and record-keeping purposes (see Note 3).

Extract code—Sometimes called press code, this identifies the extract formula, if a Milnor centrifugal extractor is used, or the press formula, if a Milnor single stage press is used (see Note 3). Extract codes do not apply to the Milnor two-stage press which does not have formulas as such, but can be made to vary the pressure of the main bell via the Low, 3rd, and No Pressure (on/off) signals.

Note 3: Although formula code and extract code are technically different things, they can be thought of as the same by programming the Milnor centrifugal extractor or single stage press so that the proper extract formula is invoked by a formula code of the same number. For example, program extract code 05 so that it is the proper extraction process for batches processed with formula code 05. Then simply pass the formula code to the extractor or single stage press as the extract code.

Dry code—identifies the drying formula to be used in the drying or conditioning equipment.

Cooldown code—identifies the cooldown procedure to be used in the dryer.

Customer code—identifies the customer (commercial laundry) or department (institutional laundry) the batch belongs to.

Goods code—in older Milnor CBW®'s (with Miltron™ controllers), identifies a subset of a general class of goods. All batches conforming to the general class are processed using the same wash formula. But each specific goods code within that class causes variations in processing, essentially extending the range of available wash formulas. Although in some systems, the goods code may affect post-wash processing, goods codes are passed to post-wash devices primarily for accounting and record-keeping purposes.

Destination code—identifies a storage location within the laundry to send the load.

Weight—the dry, soiled weight of a batch, as measured by a weighing device, such as a weighing type load conveyor, upstream of the tunnel. Although in some systems, weight may affect post-wash processing, weights are passed to post-wash devices primarily for accounting and record-keeping purposes.

Cake Number—in older Milnor CBW®'s (with Miltron™ controllers), this is an identification number associated with each batch. The Miltron automatically assigns the numbers 000 to 255 in sequence and starts over at 255. As indicated in Table 1, allied signals are not currently available on any machine for passing this code.

New formula—indicates that the batch being transferred was processed using a different formula than the previous batch (see Note 4).

New customer—indicates that the batch being transferred belongs to a different customer than the previous batch (see Note 4).

> **Note 4:** The intent of both of these signals is to provide a means of segregating batches with different formula, goods, and/or customer codes, in post-dry. They are typically used in systems that are not capable of passing (or do not need to pass) formula, goods, or customer codes. Depending on the specific situation, the signal would be actuated by the washer whenever the formula, goods, and/or customer code changes. In the Milnor dryer controller, the "new customer" signal causes the customer code to increment by one (e.g., from 07 to 08). In such a system, the value of the customer code is irrelevant, but changing it signals downstream devices not to combine these loads.

Single cake—also called "small load" or "little load", this signal tells a shuttle to deliver, and a multi-cake dryer to accept this cake (load) by itself. This is usually done when the cake that follows belongs to a different customer and the goods should not be intermingled.

Empty load—also called "empty pocket" or "pass-empty", this signal tells the receiving device that it will not receive any goods with the batch data it is receiving. Empty pockets are sometimes used in the tunnel to perform a cleaning process or to segregate goods from incompatible baths.

Low (main) pressure—tells the Milnor two-stage press to use the lowest main bell pressure (see Note 5).

3rd (main) pressure—tells the Milnor two-stage press to use a lower than normal main bell pressure (see Note 5).

No (main) pressure—tells the Milnor two-stage press to use no main bell pressure (see Note 5).

> **Note 5:** If the Low, 3rd, and No pressure signals are all off, the press will use standard (high) main bell pressure.

Table 1: Batch Data-passing Capacity for Milnor® Allied Interfaces

Data Format-->	Numeric: Groups of signals pass multi-digit batch codes in binary (number of available batch codes shown)									Non-Numeric: One signal passes a single on/off value (X indicates signal is available)				
Code Name--> Type of Interface	Form-ula code	Press/ Ex-tract code	Dry code	Cool-down code	Cust-omer code	Goods code	destin-ation code	weight (tenths of units)	Cake num-ber	New form-ula	New cust-omer	Single cake	Empty load	Low, 3rd, No press-ure*
Shuttle														
Loading			16		64		16				X	X		
Discharge			16				16					X		
* Low, 3rd, and No Pressure are three separate signals.														

3. Operational Signals

A set of generic functions can be defined that encompasses most operational information that might be needed for any interface. The generic functions are helpful in understanding interfacing in general, even though it is usually possible to successfully interface any two specific machines using only a few of these functions. Table 2 lists the generic functions and which corresponding signals are actually provided on the device(s).

The generic functions only describe the general purpose for a signal. A given signal may have a more specific meaning pecular to the device. The signal names are taken from the schematics (may be abbreviated) and may vary from device to device. As shown in Table 2, the generic functions can be grouped into three categories: directional functions, transfer functions, and confirmation functions.

Directional functions apply specifically to communication with the shuttle or COBUC and tell the shuttle / COBUC where it must travel to align with the device it will receive from or discharge to. These are all inputs to the shuttle / COBUC and include the following:

2nd level—The shuttle/COBUC must elevate to the higher of two possible levels. 2nd level is usually referred to in the documentation as "level 1" (the first level is level 0).

opposite side—The shuttle must run its belt(s) backwards because the device it is receiving from or discharging to is on the opposite side of the rail from normal. See Note 6.

> **Note 6:** Although the Mark 5 COBUC controls provide a signal for this function, it is not needed because the COBUC can only receive and discharge forward.

at left—The shuttle/COBUC must traverse leftward.

at right—The shuttle/COBUC must traverse rightward.

Transfer functions either declare that the device is now in a certain state with respect to transfer, or request that the other device achieve a certain state. The transfer functions include:

early call—applies only to communication between the tunnel and a Milnor centrifugal extractor. This function tells the extractor to end the current cycle in preparation for transfer if minimum extract time has elapsed. The Milnor extractor input is called end extract.

discharge desired—There are actually two possible functions: 1) Allied discharge desired (loading interface input) which tells the Milnor device that the allied loading device is or soon will be ready to send a batch to it, and 2) Milnor discharge desired (discharge interface output) which tells the allied discharge device that the Milnor device is or soon will be ready to send a batch to it.

load desired—There are actually two possible functions: 1) Milnor load desired (loading interface output), which tells the allied loading device that the Milnor device is or soon will be ready to receive a batch from it, and 2) allied load desired (discharge interface input), which tells the Milnor device that the allied discharge device is or soon will be ready to receive a batch from it.

loading mode—tells the receiving device to perform the actions that facilitate receiving. In the centrifugal extractor, the input is called start extractor and causes the load door to open or the load chute to lower, and the cylinder to turn. In the dryer, the input is called dryer is loading and causes the load door to open and the cylinder to turn.

discharge allowed—There are actually two possible functions: 1) allied discharge allowed (loading interface input), which tells the Milnor device that the allied loading device can now send, and 2) Milnor discharge allowed (discharging interface output), which tells the allied discharge device that the Milnor device can now send.

load allowed—There are actually two possible functions: 1) Milnor load allowed (loading interface output), which tells the allied loading device to begin sending, and 2) allied load allowed (discharge interface input), which tells the Milnor device to begin sending.

Confirmation functions provide information on the completion status of transfer and include the following:

transfer not completed—not an error condition (see below) but simply the inverse of transfer completed.

error: cancel transfer—says that an illegal condition was detected when transfer was attempted and to stop the transfer. Currently, this function is only provided as an allied output/Milnor input signal.

data valid—tells the Milnor device (in a loading interface) or the allied discharge device (in a discharge interface) that batch data are set and should now be read. See Note 7.

transfer completed—says that all goods have been transferred. The signal usually passes from discharging device to receiving device. Hence, this is usually an input signal in a loading interface and an output signal in a discharging interface. However, the Milnor shuttle is also capable, via the belt photoeyes, of detecting when it has received a complete load. So if needed, it can communicate this information (in the opposite direction) to the loading device. The signal name varies, depending on the device and type of interface. See Note 7.

Note 7: In most cases, an explicit data valid signal is not needed because another operational signal serves this purpose. Where the data valid signal is not provided, the various tables of non-numeric signals in the document "Milnor® Allied Interface Specifications and Signals" indicate which signal should be used for this purpose.

Table 2: Operational Functions and Available Signals

Function Type-->	Directional Functions				Transfer Functions						Confirmation Functions			
Function Name--> Type of Interface	**2nd level**	**Opposite side**	**At left**	**At right**	**Early call**	**Discharge desired**	**Load desired**	**Loading mode**	**Discharge allowed**	**Load allowed**	**Transfer not complete**	**Error: cancel transfer**	**data valid**	**transfer complete**
Shuttle														
Loading	input: go 2nd load posn.	input: load reverse dir.	input: left of home	input: right of home		input: desires to load shuttle	output: shuttle is empty			output: desires to receive load	output: shuttle loading	input: cancel transfer	input: data valid	†
Discharge	input: go 2nd unload posn.	input: load reverse dir.	input: left of home	input: right of home		output: desires to unload	input: desires load from shuttle		output: ready to unload	input: allowed to receive load	output: not finished unload	input: cancel transfer	output: data valid	††
† All shuttles except the COSLIDE provide a "shuttle is loaded" output. The COSLIDE expects a "belt is loaded" input.														
†† The shuttle provides a shuttle "finished unloading" output. It also expects an "allied discharge complete" input.														

— End of BICALC13 —

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How to Upgrade Microprocessor EPROM Chips

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

1. How to Change EPROMs

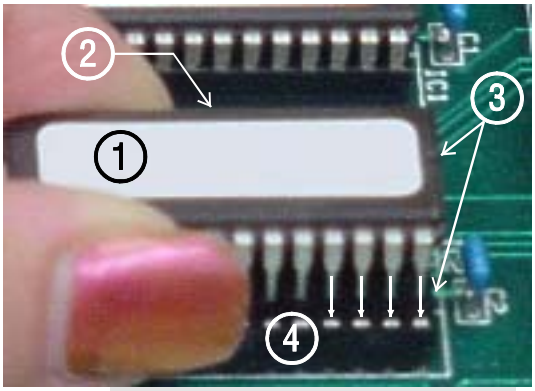
WARNING 1: Electrocution and Electrical Burn Hazards—Contact with high voltage will electrocute or burn you. Power switches on the machine and the control box do not eliminate these hazards. High voltage is present at the machine unless the main machine power disconnect is off.

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

1.1. Remove and Replace EPROM Chips

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

Figure 1: EPROM Chip Identification and Installation

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

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

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

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

2. Location of EPROM Chips

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

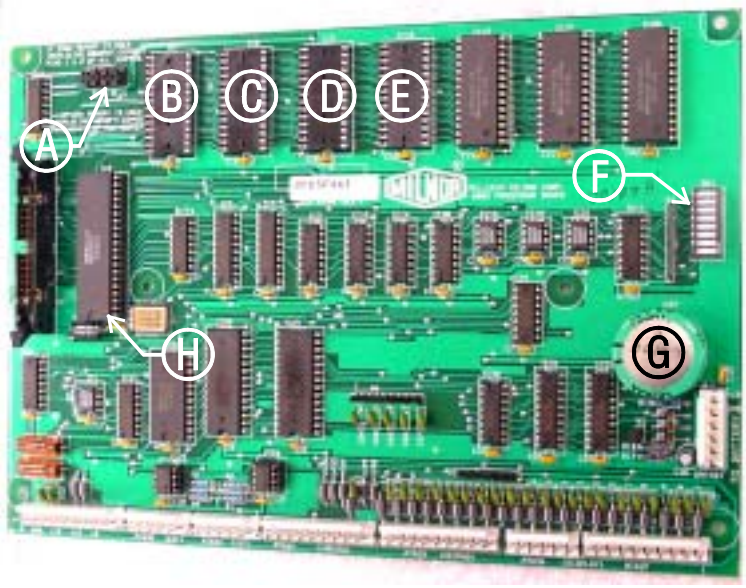
Table 1: Processor Boards and Applications

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

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

Figure 2: Replacement Processor Board

08BSPAA_

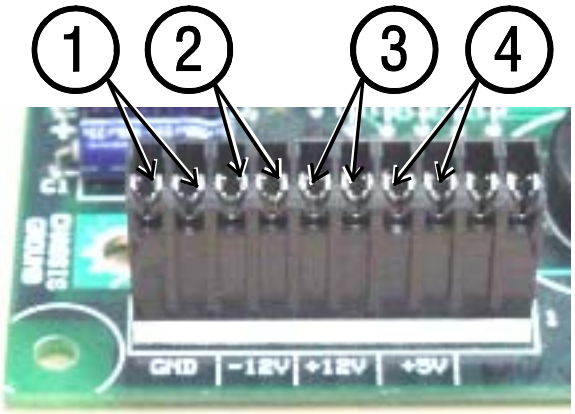


Legend

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

Figure 3: Where to Check Processor Board Voltages

Typical MTA-31

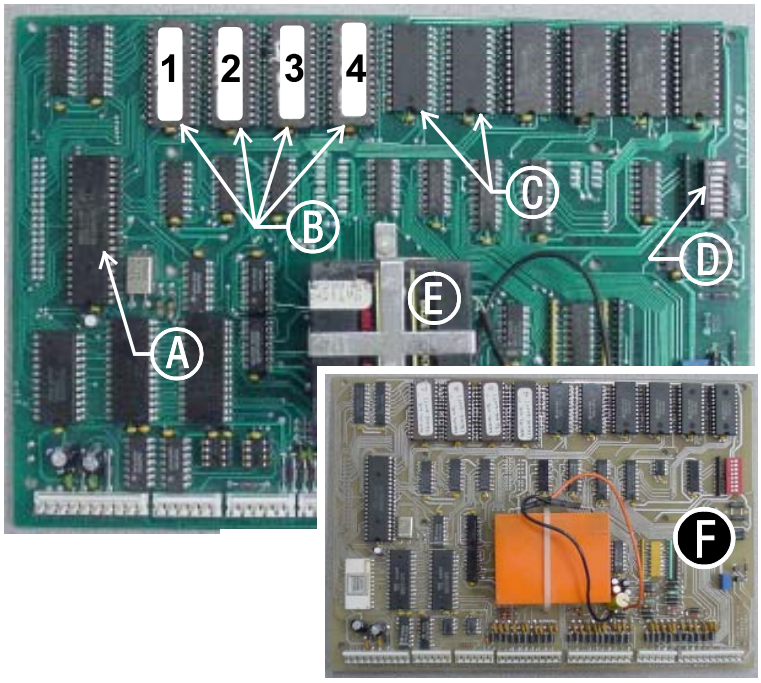


Legend

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

Figure 4: 8085 Processor Boards (Except Coin Machine)

Typical 08BSP_ and 08BSPx_ Processor Boards



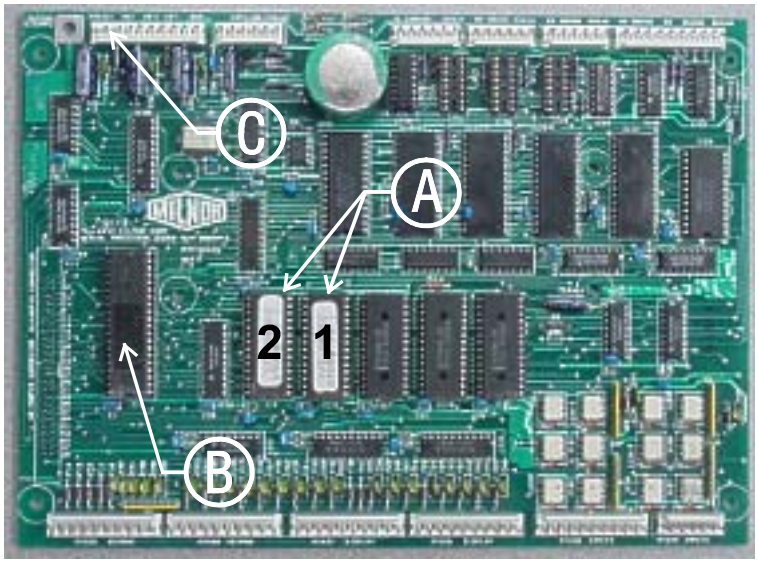
Legend

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

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

Figure 5: Typical 8088 Processor Board without Memory Expansion Board

08BSPC_ Processor Board



Legend

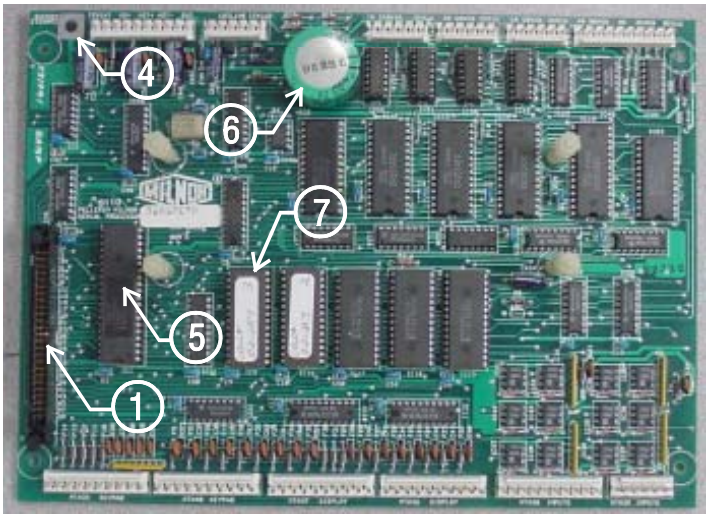
A. EPROMs
B. 8088 processor chip
C. MTA31 for voltage verification

Table 2: EPROM Locations for 8088 Processor Applications

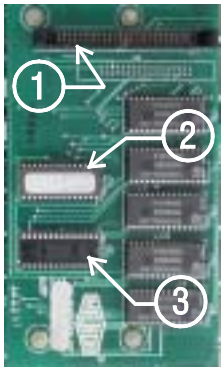
	EPROM Location by Socket			
EPROMS in Set	**A**	**B**	**IC-1**	**IC-2**
4 chips	4	3	2	1
3 chips	3	2	1	—
2 chips	2	1	—	—
1 chip	1	—	—	—

Figure 6: 8088 Processor Board and Optional Memory Expansion Board

8088 Processor Board



Memory Expansion Board



Legend

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

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

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

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

board.

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

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

Supplement 1

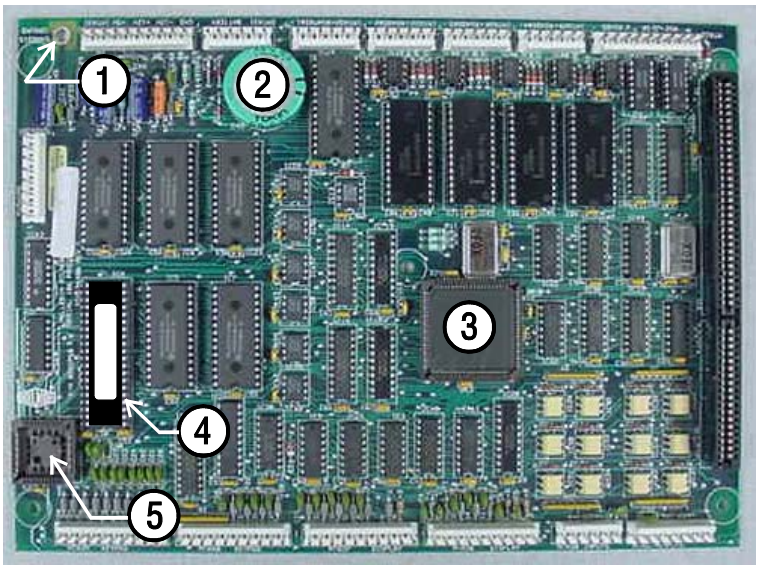
Rules for Replacing 80186 Processor Boards

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

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

Figure 7: Obsolete 80186 Processor Board

08BSPE_ Processor Board

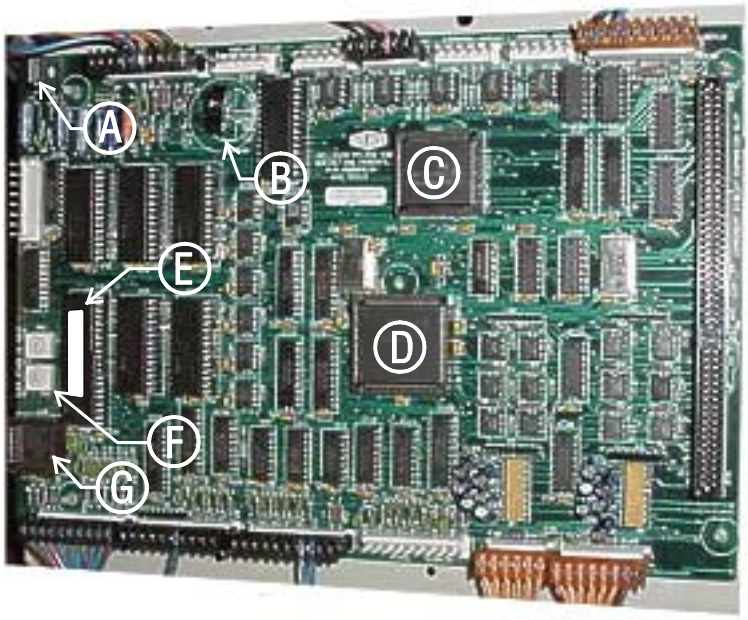


Legend

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

Figure 8: 80186 Processor Board

08BSPE1_ Processor Board

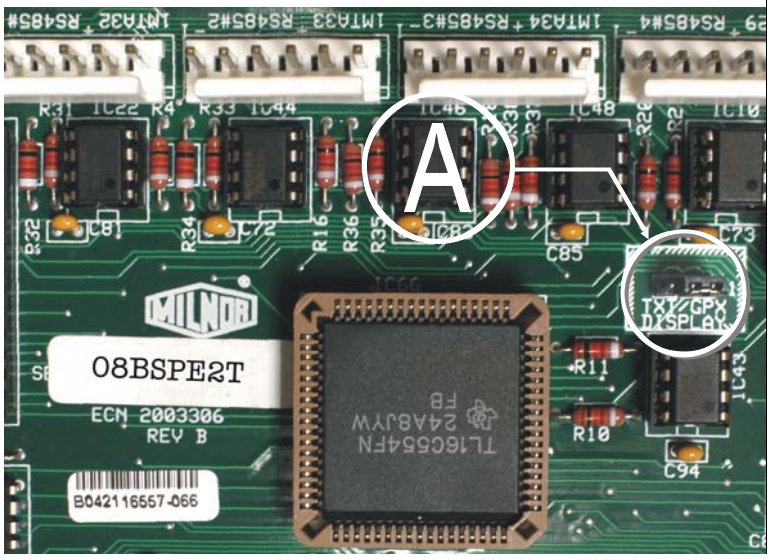


Legend

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

Figure 9: 08BSPE2_ 80186 Processor Board

Detail



Legend

A. Jumper for selecting display type

— End of BICMUM01 —