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Technical Reference—Device Master

Read the Safety Manual

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

Please Read

About the Manual Identifying Information on the Cover

The front cover displays pertinent identifying information for this manual. Most important, are the published manual number (part number) /ECN (date code). Generally, when a replacement manual is furnished, it will have the same published manual number, but the latest available ECN. This provides the user with the latest information applicable to his machine. Similarly all documents comprising the manual will be the latest available as of the date the manual was printed, **even though older ECN dates for those documents may be listed in the table of contents**.

When communicating with the Milnor factory regarding this manual, please also provide the other identifying information shown on the cover, including the publishing system, access date, and whether the document ECN's are the latest available or exact.

References to Yellow Troubleshooting Pages

This manual may contain references to "yellow pages." Although the pages containing troubleshooting procedures are no longer printed on yellow paper, troubleshooting instructions, if any, will be contained in the easily located "Troubleshooting" chapter or section. See the table of contents.

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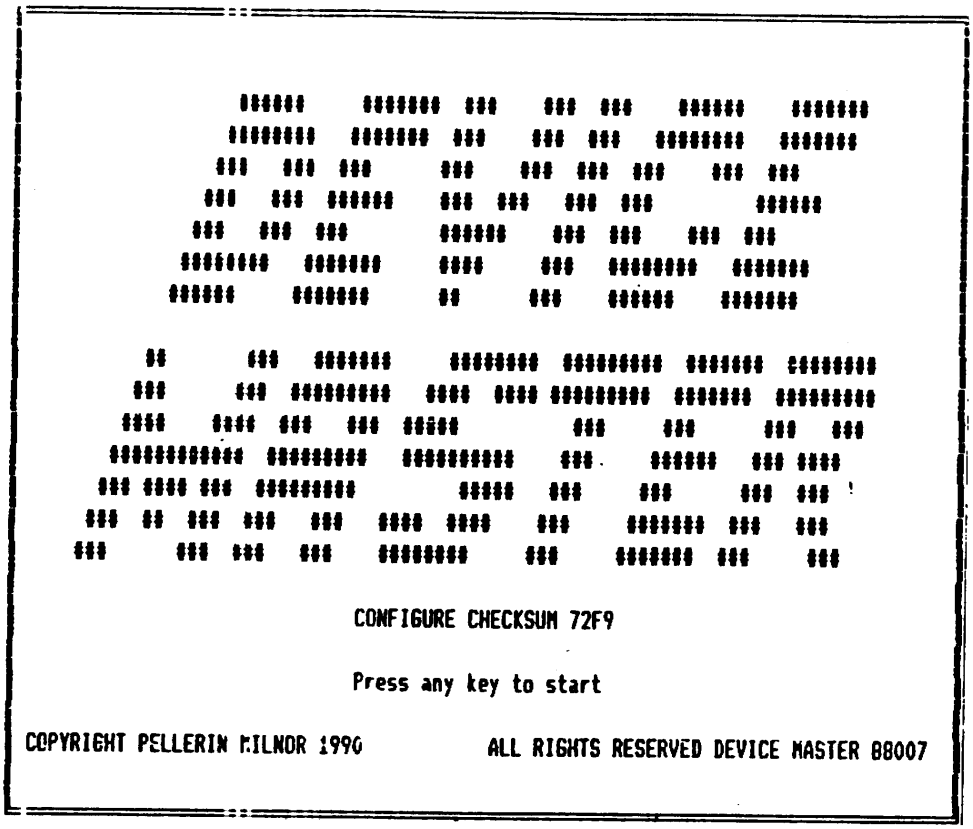
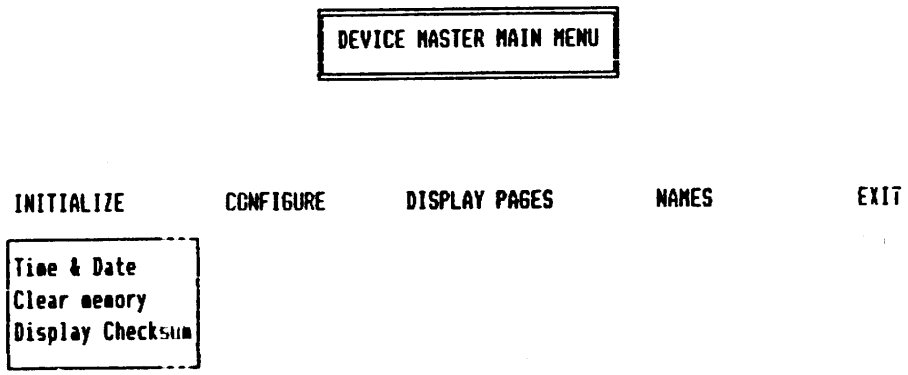


DEVICE MASTER start screen, the number that appears in the bottom right hand corner is the software version number.

PROGRAMMING/INITIALIZE

PROGRAMMING/INITIALIZE



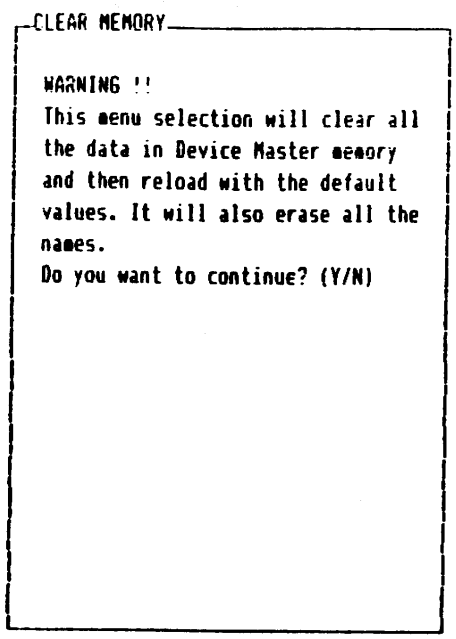
DEVICE MASTER Initialization Menu

Time & Date:	To put in current time and date.
Clear Memory:	To clear the entire memory of the DEVICE MASTER. When configuring the DEVICE MASTER for the first time, the user must clear the memory.
Display Checksum:	To display the checksum of the current data which the DEVICE MASTER holds in its memory.

```
ENTER TIME 15:24
ENTER DATE 10/30/90
```

Enter the current time for the DEVICE MASTER in hh-mm format. (Hour-Min)

Enter the current date for the DEVICE MASTER in mm-dd-yy format. (Month-Date-Year)

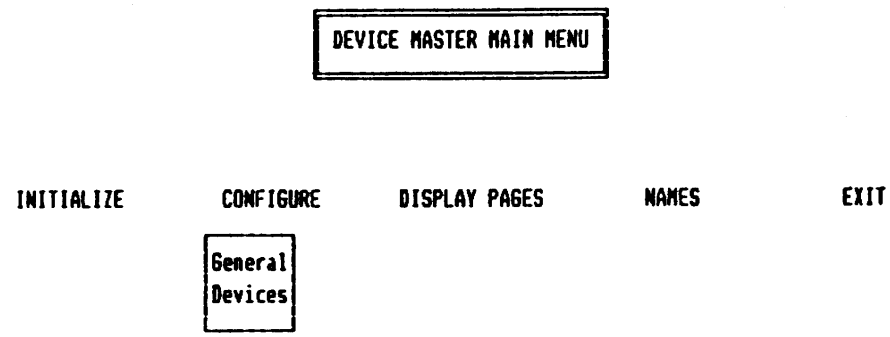


This screen is to confirm with the user before the DEVICE MASTER clears the memory.

Display the total sum of all data currently held in memory.

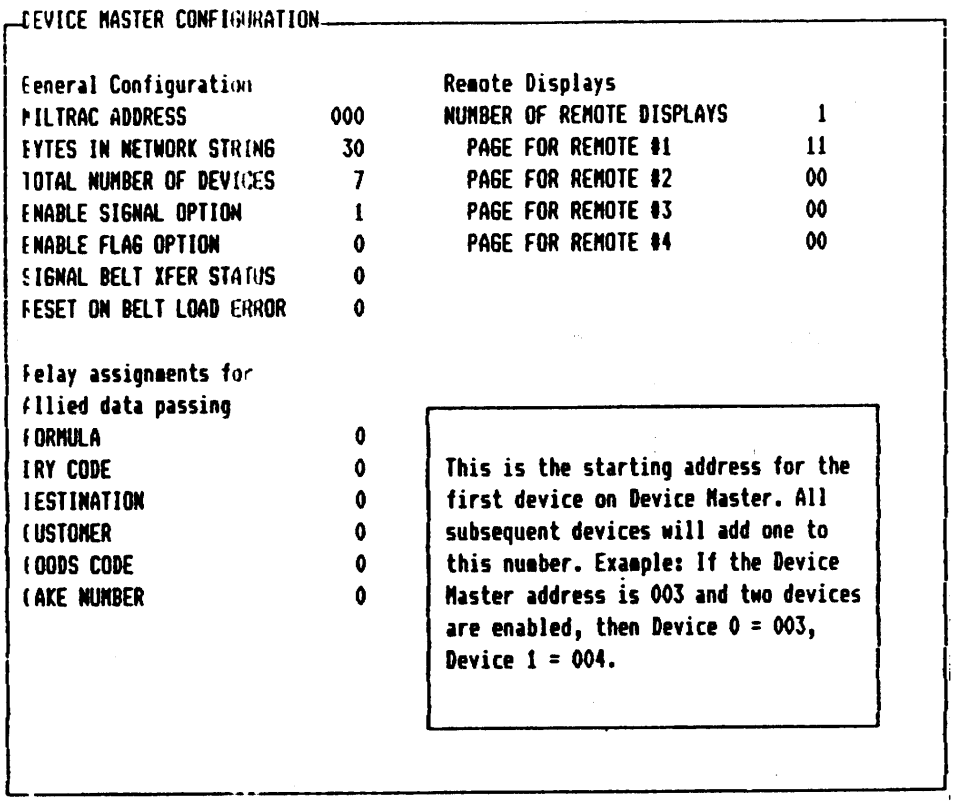
PROGRAMMING/CONFIGURE

PROGRAMMING/CONFIGURE



DEVICE MASTER Configuration Menu

Configure General:	To configure the DEVICE MASTER.
Devices:	To configure the devices controlled by the DEVICE MASTER.



DEVICE MASTER General Configuration:

MILTRAC Address:

This is the starting address for the first belt on the DEVICE MASTER. All subsequent devices will add one to this number. Example: If the DEVICE MASTER address is 003 and two belts are enabled, the Belt 0 = 003, Belt 1 = 004.

Bytes In Network String:

Enter number of bytes for Network string (24 or 30 bytes).

Total Number Of Devices:

Enter total number of devices controlled by the DEVICE MASTER (1-8).

Enable Signal Option:

This board supplies 2 signals per device: Load waiting and Goods different from last. If the device desires to discharge and cannot, the Load waiting signal will be enabled. If Goods on the device are different than the previous batch, the Goods different from last signal would be enabled (0=NO 1=YES).

Enable Flag Option:

In general, this is a "Have been allowed to load signal". It can be used to drop a target if a movable device is loading it (0=NO 1=YES).

Signal Belt Xfer Status:

This option enables a board that provides a signal for each device to say "Finished discharging' (0=NO 1=YES).

Reset On Belt Load Error:

If desired, this option will allow the DEVICE MASTER to reset a loading error automatically (0=NO 1=YES).

Allied Data Relay Assignments: (Total no more than 16 relays):

Formula	--->	Enter number of relays assigned for Formula to pass to allied device.
Dry Code	--->	Enter number of relays assigned for Dry code to pass to allied device.
Destination	--->	Enter number of relays assigned for Destination to pass to allied device.
Customer	--->	Enter number of relays assigned for Customer to pass to allied device.
Goods Code	--->	Enter number of relays assigned for Goods code to pass to allied device.
Cake Number	--->	Enter number of relays assigned for Cake number to pass to allied device.

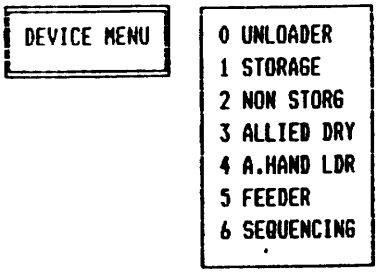
Number Of Remote Displays:

Enter the number of remote monitors connected to the DEVICE MASTER. If your system has only the main monitor, the number is 0. DEVICE MASTER supports a maximum of 4 monitors.

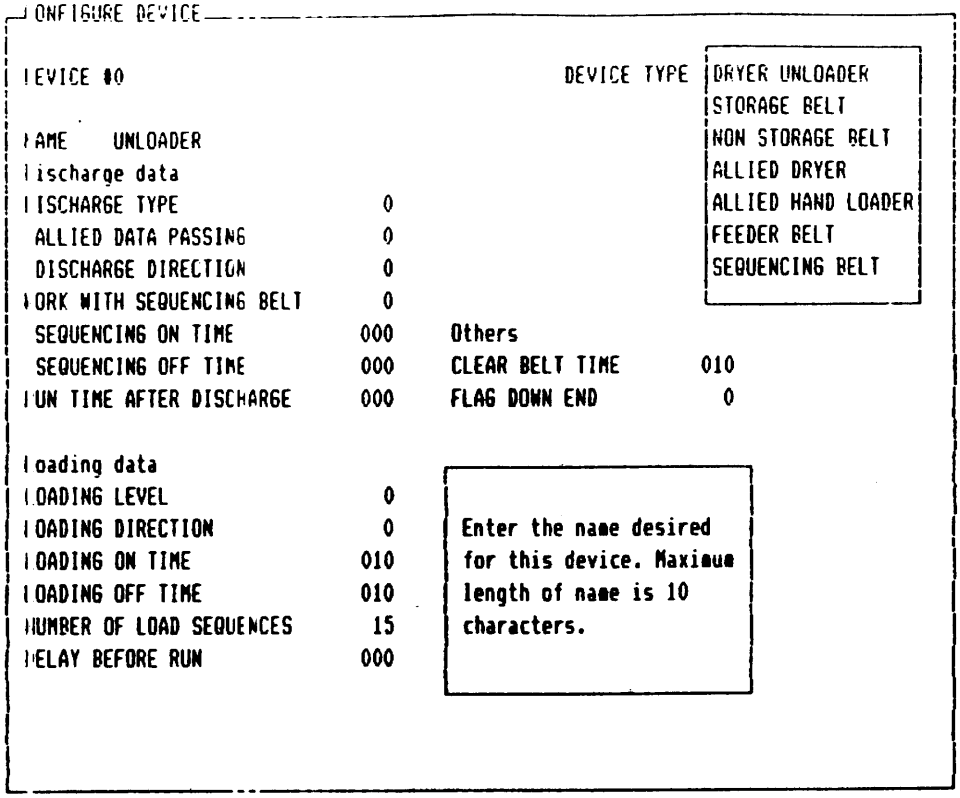
Page For Remote #?:

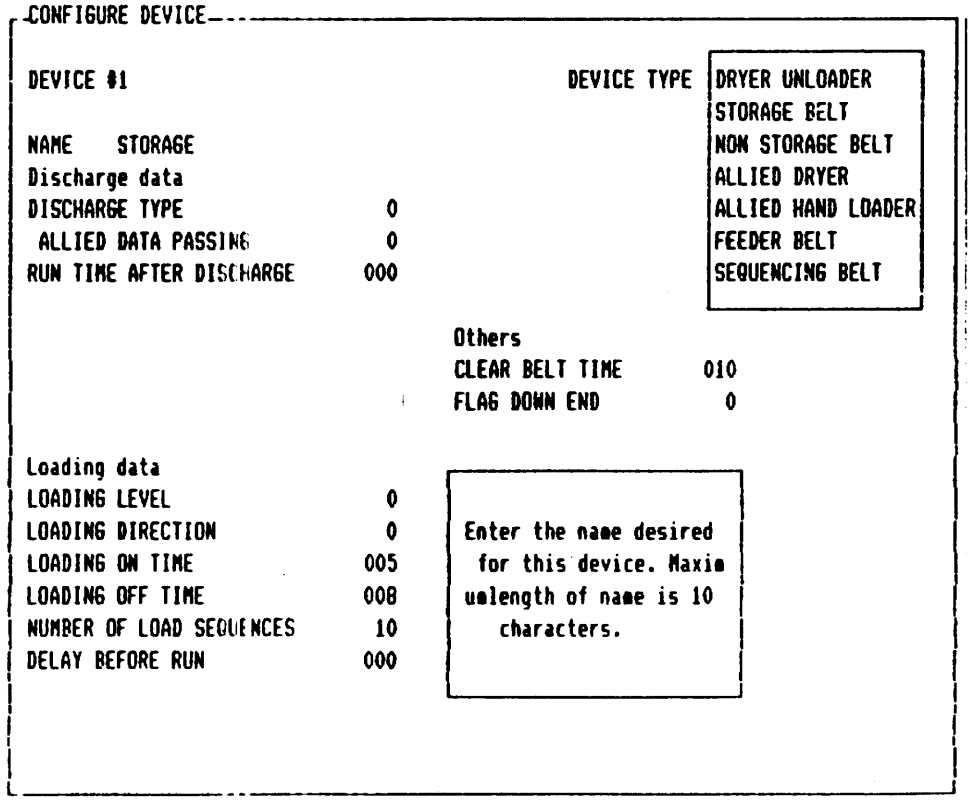
Enter the page number to display on this monitor.

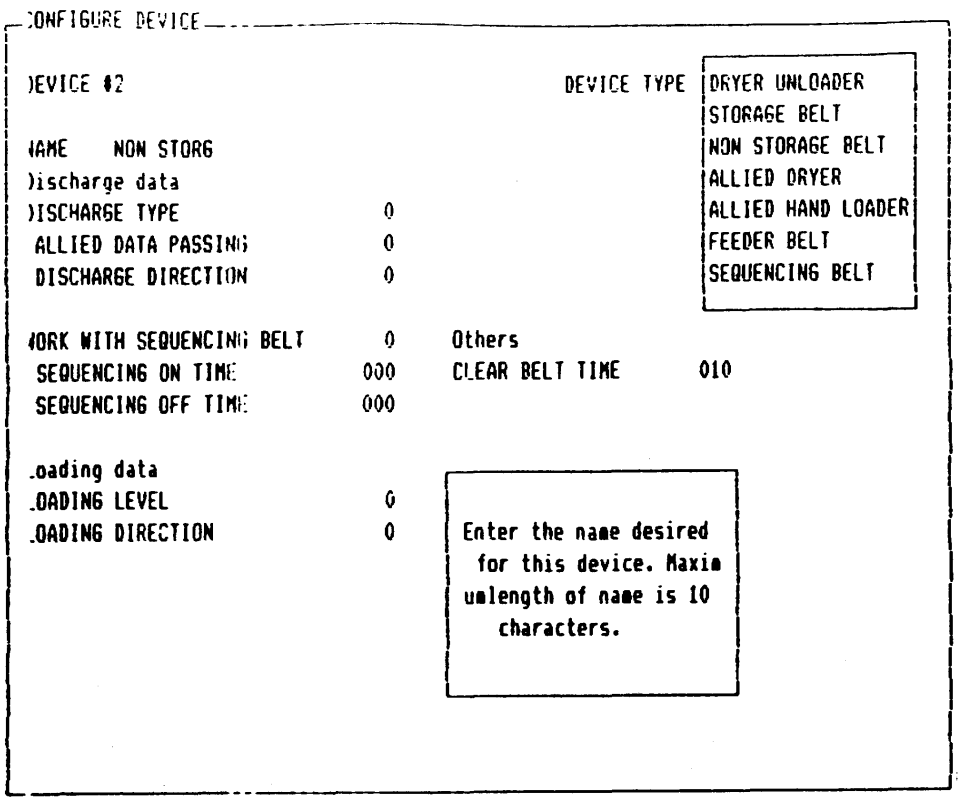
10 = Data page
11 = Status page
12 = Input page

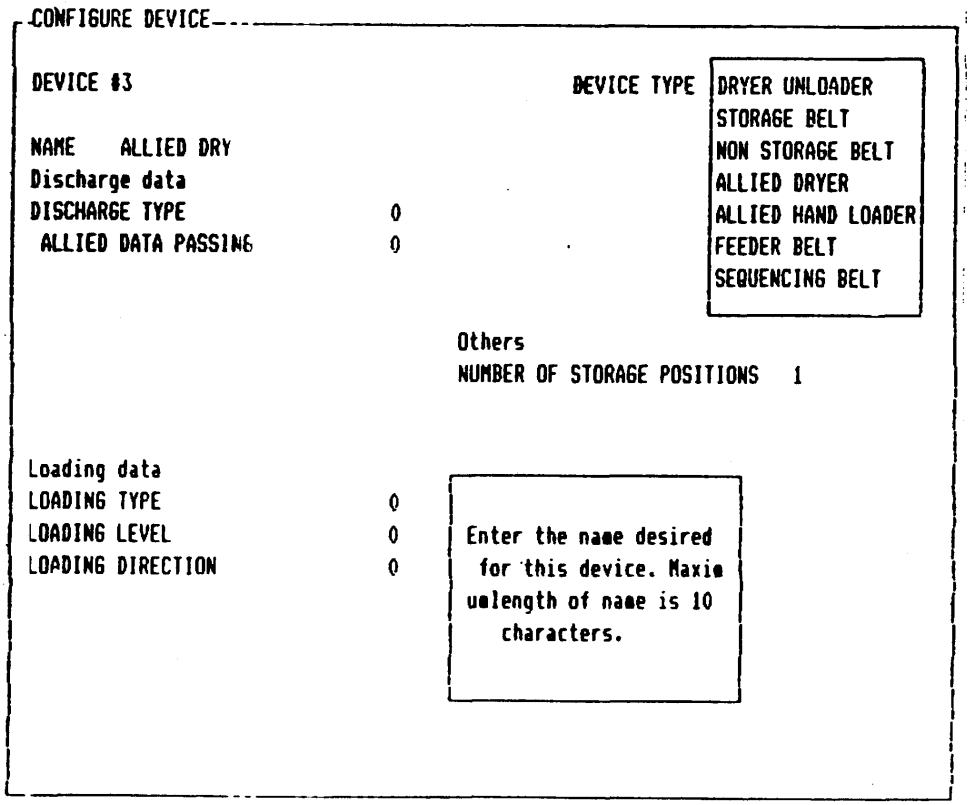


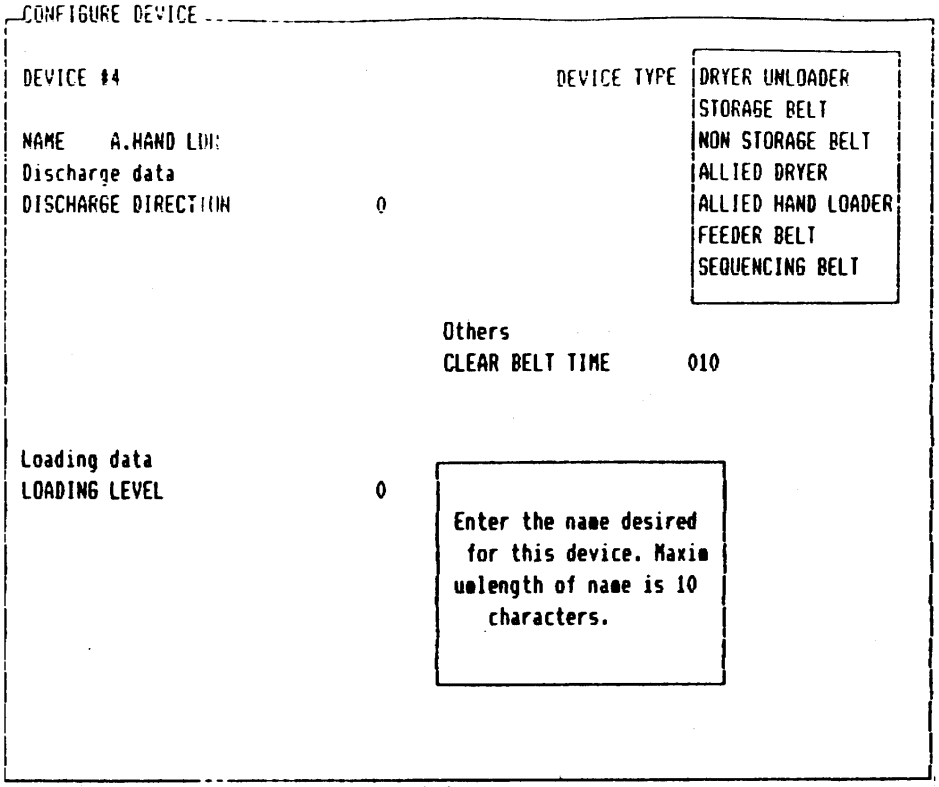
This is a belt device menu which lists the name of all the devices which exist in the DEVICE MASTER and allows the user to select a particular device to configure.

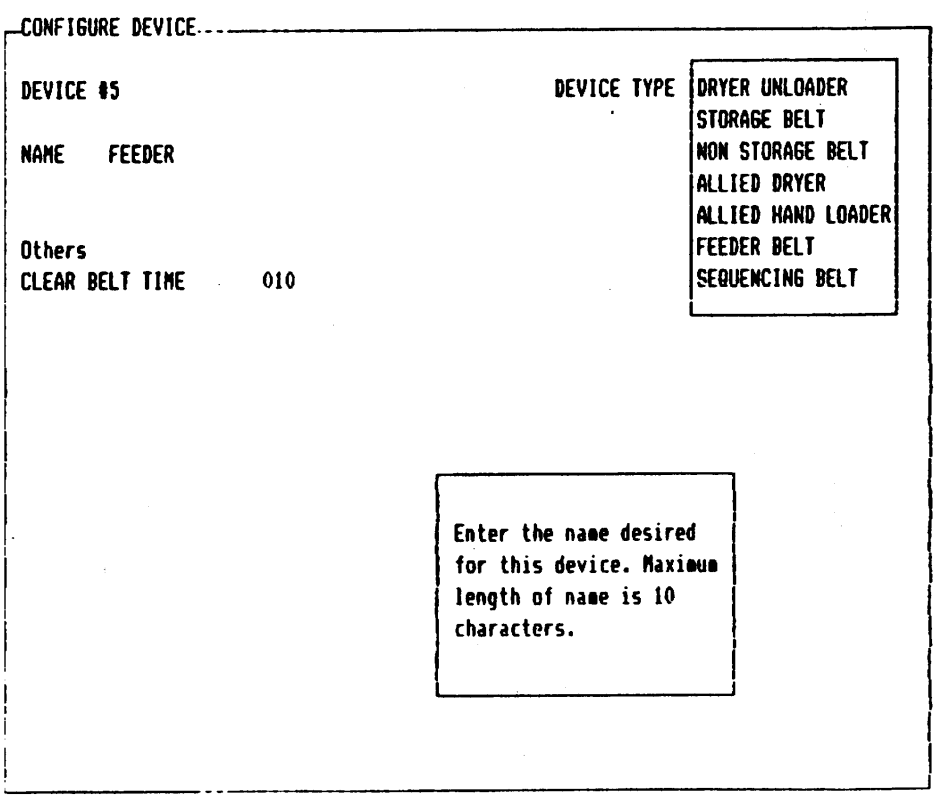

ONFIGURE DEVICE
EVICE #0
DEVICE TYPE
DRYER UNLOADER
STORAGE BELT
NON STORAGE BELT
ALLIED DRYER
ALLIED HAND LOADER
FEEDER BELT
SEQUENCING BELT
AME UNLOADER
ischarge data
ISCHARGE TYPE 0
ALLIED DATA PASSING 0
DISCHARGE DIRECTION 0
ORK WITH SEQUENCING BELT 0
SEQUENCING ON TIME 000
SEQUENCING OFF TIME 000
UN TIME AFTER DISCHARGE 000
Others
CLEAR BELT TIME 010
FLAG DOWN END 0
oading data
OADING LEVEL 0
OADING DIRECTION 0
OADING ON TIME 010
OADING OFF TIME 010
UMBER OF LOAD SEQUENCES 15
ELAY BEFORE RUN 000
Enter the name desired for this device. Maximum length of name is 10 characters.

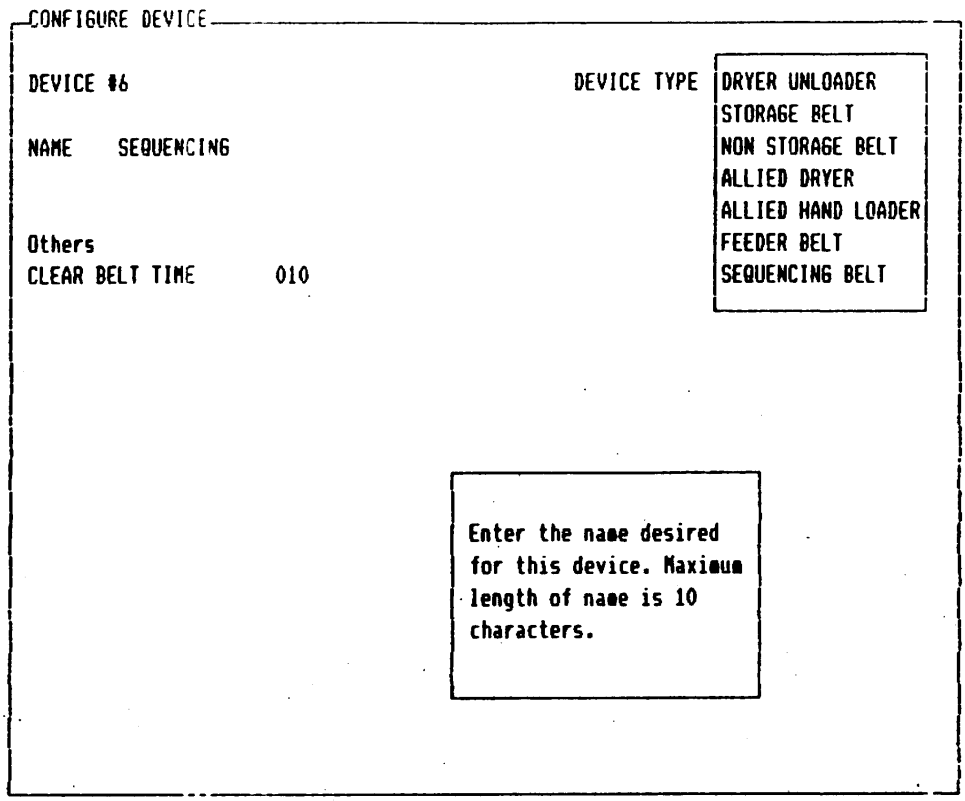

CONFIGURE DEVICE
DEVICE #1
DEVICE TYPE
DRYER UNLOADER
STORAGE BELT
NON STORAGE BELT
ALLIED DRYER
ALLIED HAND LOADER
FEEDER BELT
SEQUENCING BELT
NAME STORAGE
Discharge data
DISCHARGE TYPE 0
ALLIED DATA PASSING 0
RUN TIME AFTER DISCHARGE 000
Others
CLEAR BELT TIME 010
FLAG DOWN END 0
Loading data
LOADING LEVEL 0
LOADING DIRECTION 0
LOADING ON TIME 005
LOADING OFF TIME 008
NUMBER OF LOAD SEQUENCES 10
DELAY BEFORE RUN 000
Enter the name desired for this device. Maximum length of name is 10 characters.


CONFIGURE DEVICE
)EVICE #2
DEVICE TYPE
DRYER UNLOADER
STORAGE BELT
NON STORAGE BELT
ALLIED DRYER
ALLIED HAND LOADER
FEEDER BELT
SEQUENCING BELT
AME NON STORG
)ischarge data
)ISCHARGE TYPE 0
ALLIED DATA PASSING 0
DISCHARGE DIRECTION 0
ORK WITH SEQUENCING BELT 0
Others
SEQUENCING ON TIME 000
CLEAR BELT TIME 010
SEQUENCING OFF TIME 000
oading data
OADING LEVEL 0
OADING DIRECTION 0
Enter the name desired for this device. Maxim ulength of name is 10 characters.


CONFIGURE DEVICE
DEVICE #3
DEVICE TYPE
DRYER UNLOADER
STORAGE BELT
NON STORAGE BELT
ALLIED DRYER
ALLIED HAND LOADER
FEEDER BELT
SEQUENCING BELT
NAME ALLIED DRY
Discharge data
DISCHARGE TYPE 0
ALLIED DATA PASSING 0
Others
NUMBER OF STORAGE POSITIONS 1
Loading data
LOADING TYPE 0
LOADING LEVEL 0
LOADING DIRECTION 0
Enter the name desired for this device. Maxim ulength of name is 10 characters.


CONFIGURE DEVICE
DEVICE #4
DEVICE TYPE
DRYER UNLOADER
STORAGE BELT
NON STORAGE BELT
ALLIED DRYER
ALLIED HAND LOADER
FEEDER BELT
SEQUENCING BELT
NAME A.HAND LDR
Discharge data
DISCHARGE DIRECTION 0
Others
CLEAR BELT TIME 010
Loading data
LOADING LEVEL 0
Enter the name desired for this device. Maximum length of name is 10 characters.


CONFIGURE DEVICE
DEVICE #5
DEVICE TYPE
DRYER UNLOADER
STORAGE BELT
NON STORAGE BELT
ALLIED DRYER
ALLIED HAND LOADER
FEEDER BELT
SEQUENCING BELT
NAME FEEDER
Others
CLEAR BELT TIME 010
Enter the name desired for this device. Maximum length of name is 10 characters.



Device Configuration:

Device Name: Enter the name desired for this device. Maximum length of name is 10 characters.

Discharge Type: Enter how this device will discharge:
0 = to a MILTRAC device.
1 = to an Allied device.

Allied Data Passing: Enter a 0 if NOT Allied data passing. Otherwise, enter a 1.

Discharge Direction: Enter a 0 for Forward, a 1 for Backward.

Run Time After Discharge: If this time is set to zero, then the device will run "Clear Belt Time". If a time other than zero is entered, the Belt will decrement this time while the eye is clear. If the eye is blocked before the time is zeroed, the timer will be reset (0-255 secs).

Work With Sequencing Belt: If this belt discharges in conjunction with a Sequencing belt in the system, enter a 1. Otherwise, enter a 0.

Sequencing On Time: Enter the time desired to have this device running after the Sequencing eye is blocked (0-255 seconds).

Sequencing Off Time: Enter the time desired to have this device stop after the Sequencing eye is cleared (0-255 seconds).

Loading Type: Enter how this device will load:
0 = from a MILTRAC device.
1 = from an Allied device.

Loading Level: Enter receive level for the device (0-7).

Loading Direction: Enter a 0 for Forward, enter a 1 for Backward.

Loading On Time: Enter the jog ON time (0-255 seconds).

Loading Off Time: Enter the jog OFF time (0-255 seconds).

Number Of Load Sequences: Enter number of jogging sequences desired. The belt can have a jogging sequence to space out the goods without bunching (0-255 seconds).

Delay Before Run:

Enter the desired delay time before running the device. This allows the goods to be bunched together (not spread out). This is useful when a belt is loading a shuttle (0-255 seconds).

Clear Belt Time:

This time should be set to completely clear the belt (0-255 seconds).

Number Of Storage Positions:

Enter the maximum number of storage positions for this device.

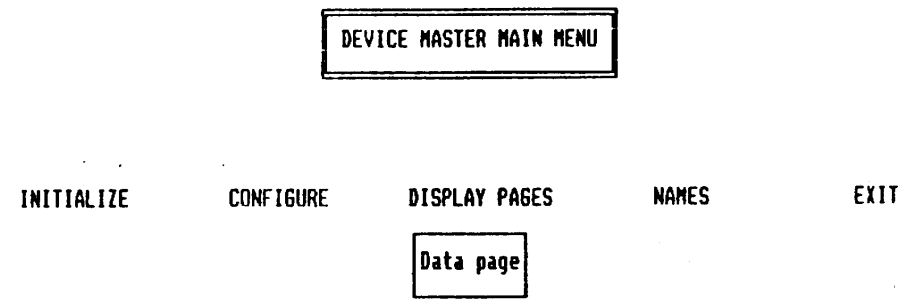
Flag Down End:

If FLAG DOWN OPTION is enabled, then specify which end it will drop the target:

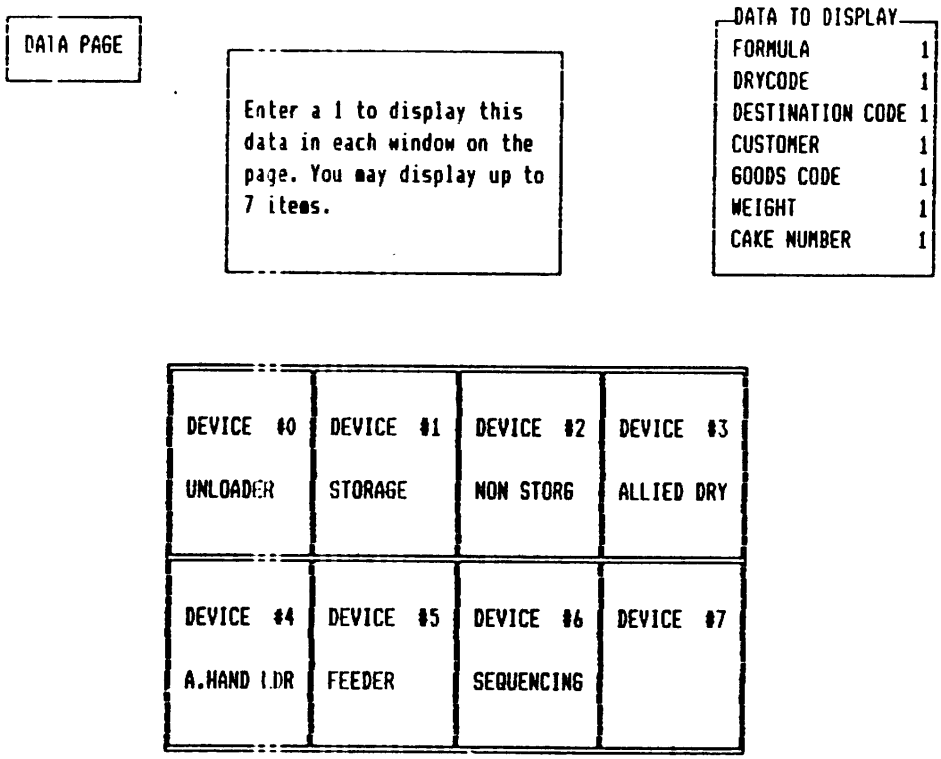
0 = Load end.
1 = Discharge end.

PROGRAMMING/DATA PAGE

PROGRAMMING/DATA PAGE



This menu is to set up run time data display page.

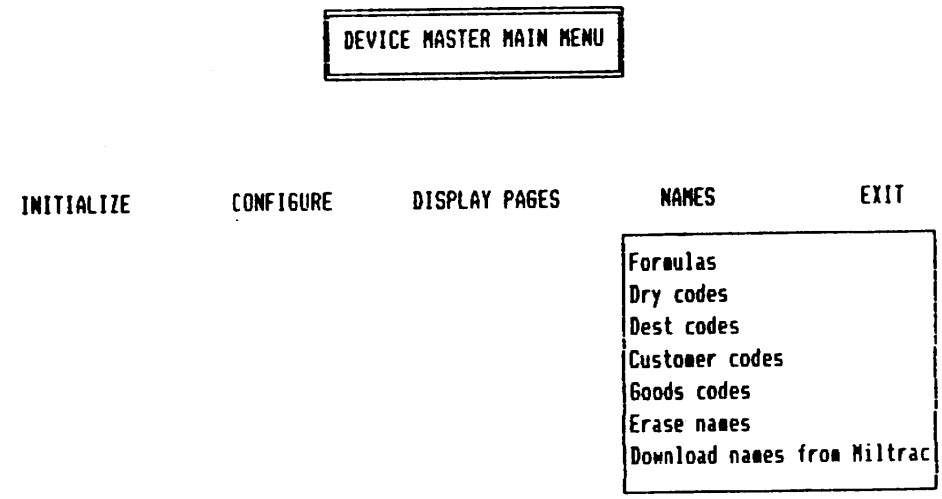


First, enter the type of data the user desires to display on the Data page at run time. The user can select up to 7 types of data to display in the Data page.

Secondly, enter the device number in the appropriate window which the user desires to display data in the Data page at run time.

PROGRAMMING/NAMES

PROGRAMMING/NAMES



Programming Name Menu

Formulas: To program all formulas names.

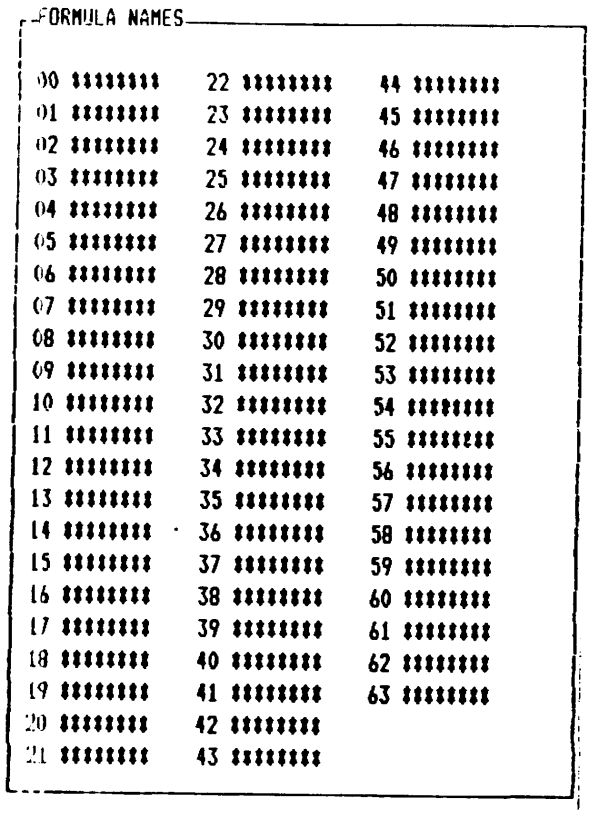
Dry Codes: To program all dry codes names.

Dest Codes: To program all destinations names.

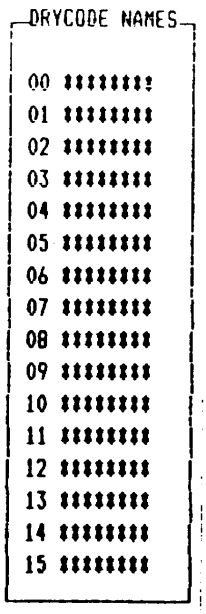
Customer Codes: To program all customer codes names.

Goods Codes: To program all goods codes names.

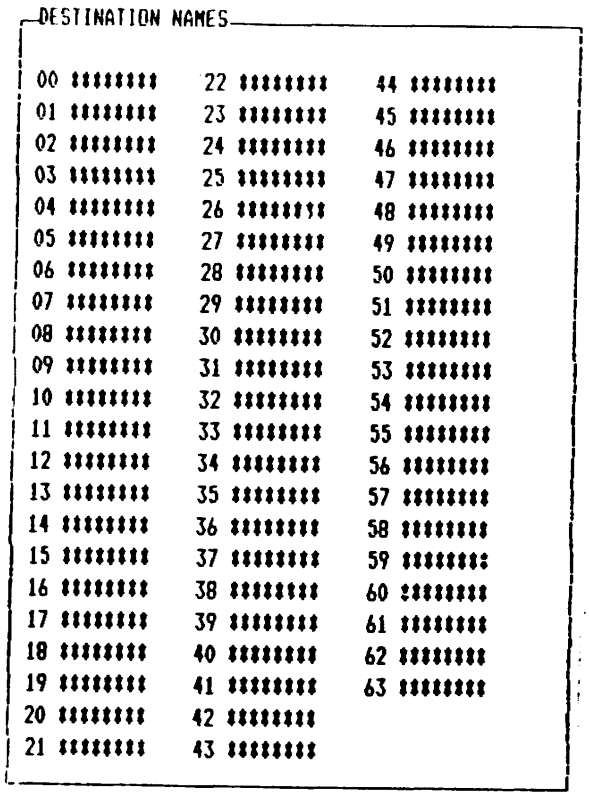
Erase Names:	To erase all the names currently used in the DEVICE MASTER.
Download Names From MILTRAC:	To copy the names programmed in MILTRAC.



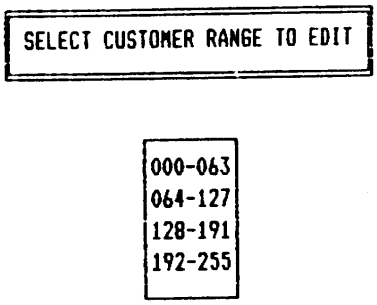
This screen is to program all 64 formula names. Each formula name can have up to 8 characters.



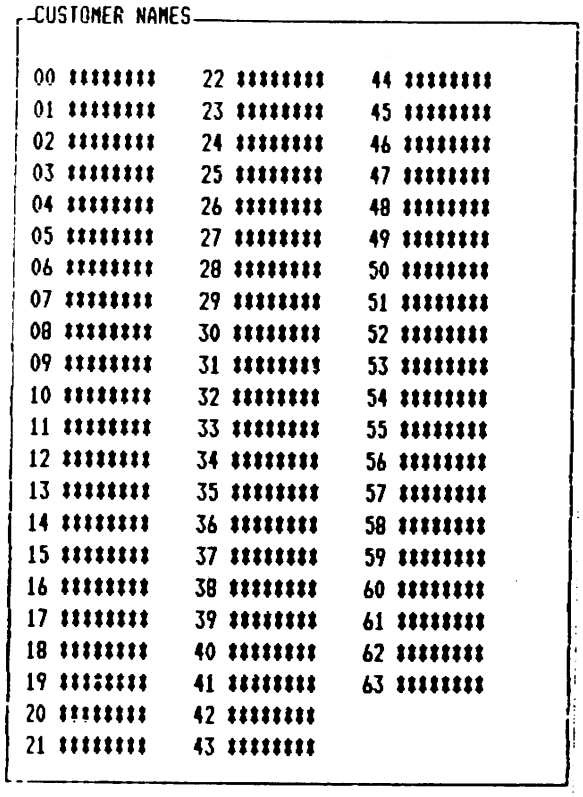
This screen is to program all 16 dry code names. Each dry code name can have up to 8 characters.



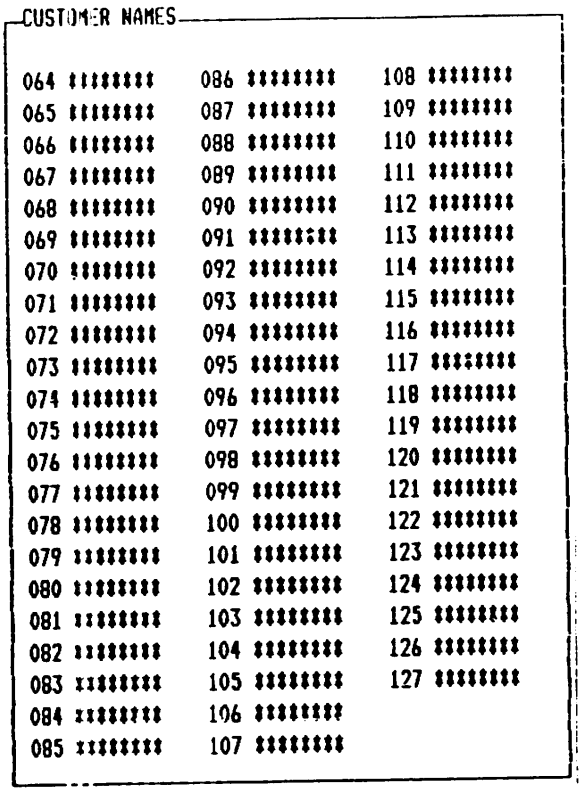
This screen is to program all 64 destination names. Each destination name can have up to 8 characters.



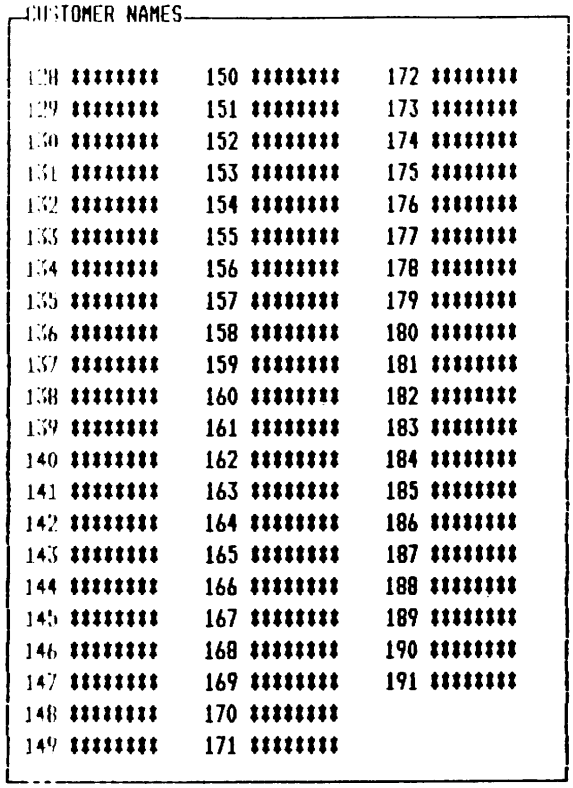
This screen shows a sub menu which allows the user to select the range of Customer names which he wishes to program.



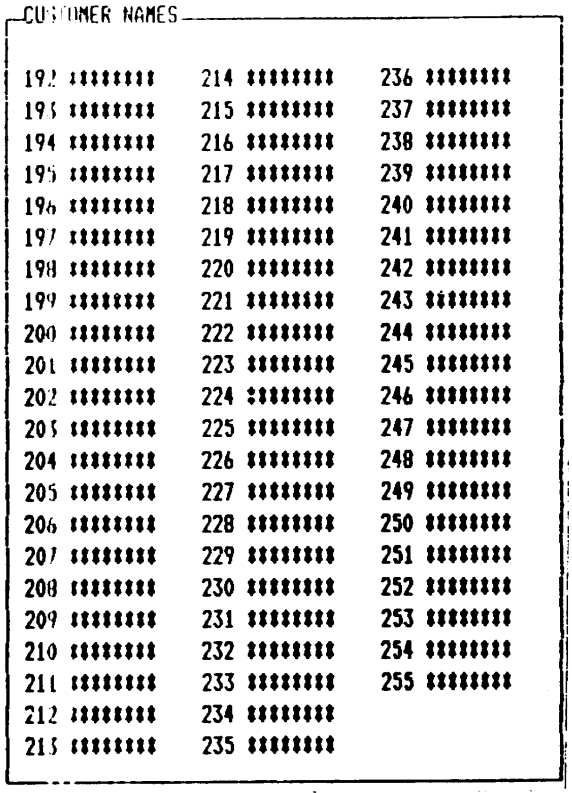
This screen is to program Customer names 0 through 63. Each customer name can have up to 8 characters.



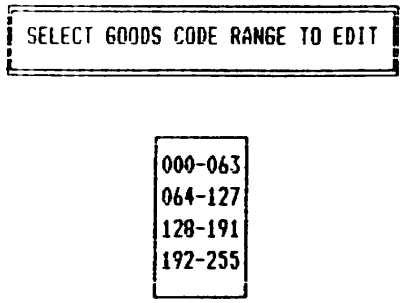
This screen is to program Customer names 64 through 127. Each customer name can have up to 8 characters.



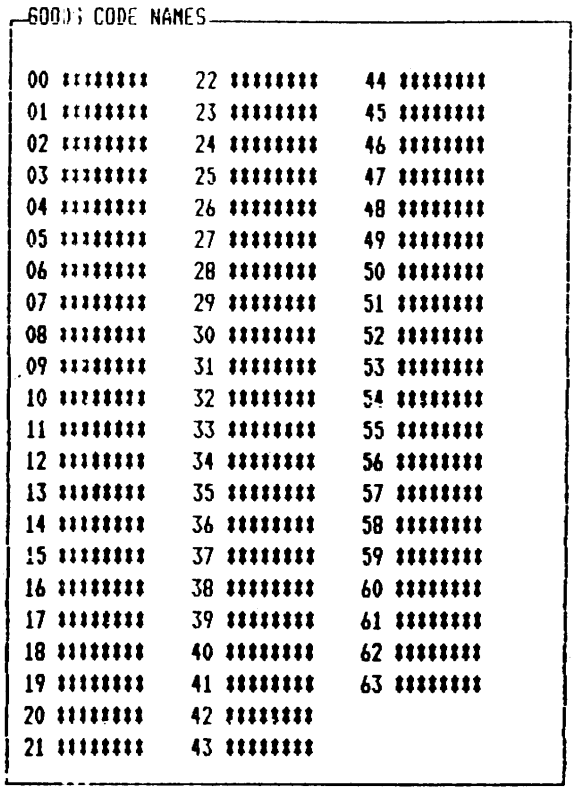
This screen is to program Customer names 128 through 191. Each customer name can have up to 8 characters.



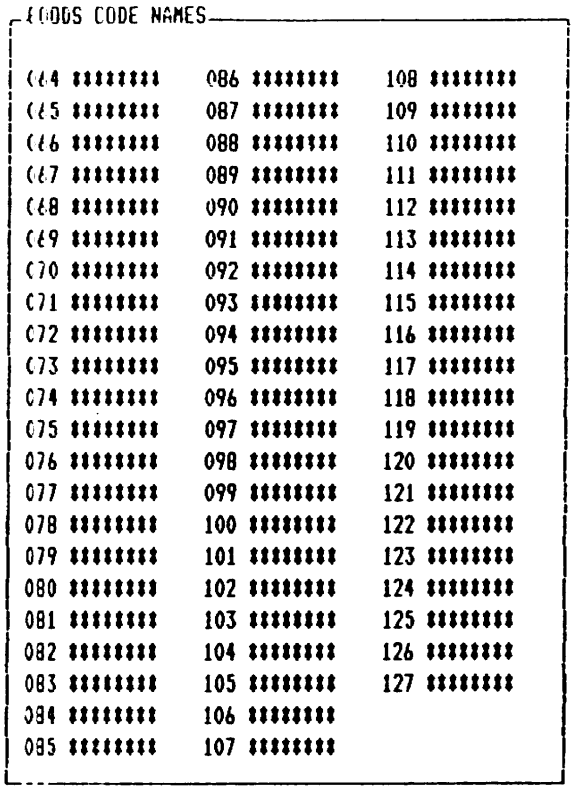
This screen is to program Customer names 192 through 255. Each customer name can have up to 8 characters.



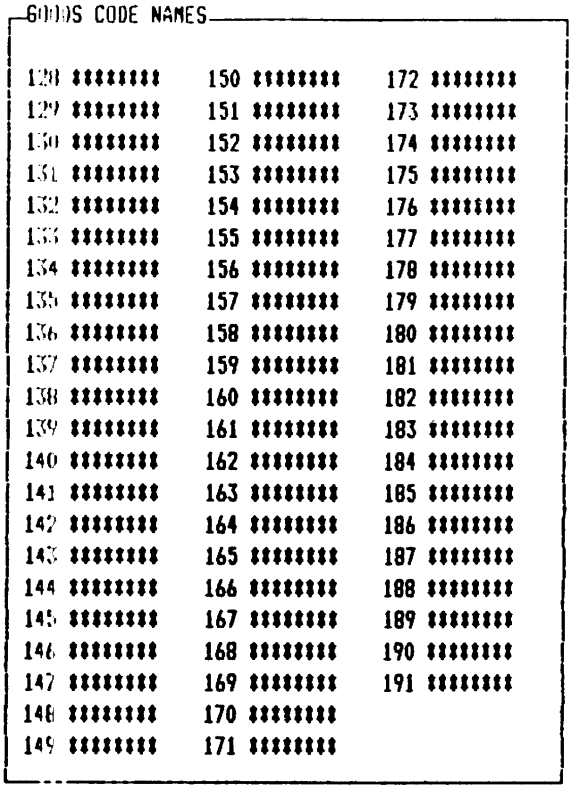
This screen shows a sub menu which allows the user to select the range of Goods code names which he wishes to program.



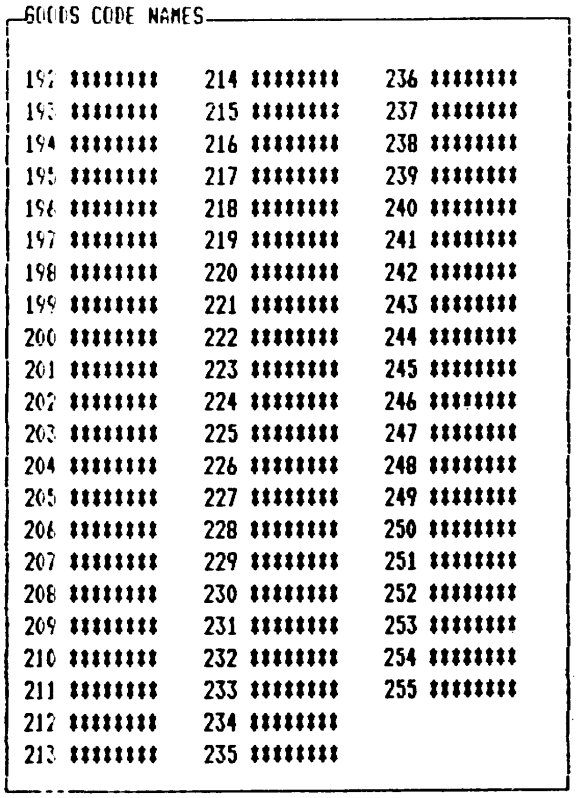
This screen is to program Goods code names 0 through 63. Each goods code name can have up to 8 characters.



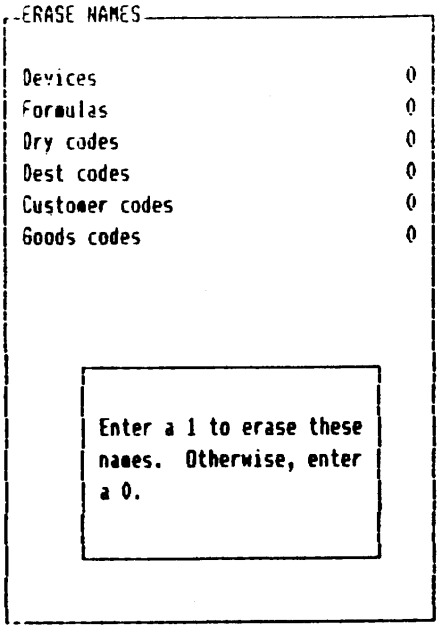
This screen is to program Goods code names 64 through 127. Each goods code name can have up to 8 characters.



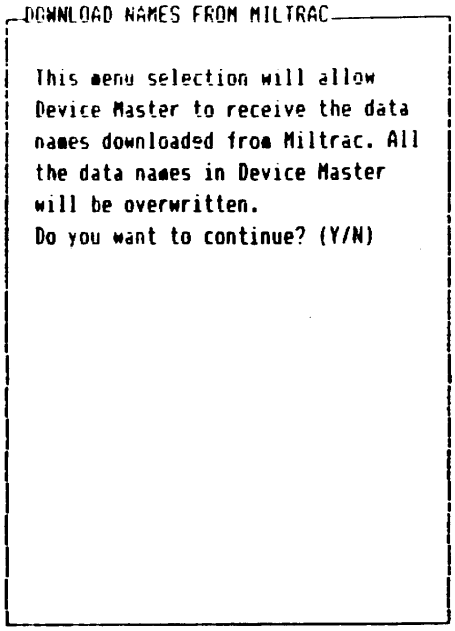
This screen is to program Goods code names 128 through 191. Each goods code name can have up to 8 characters.



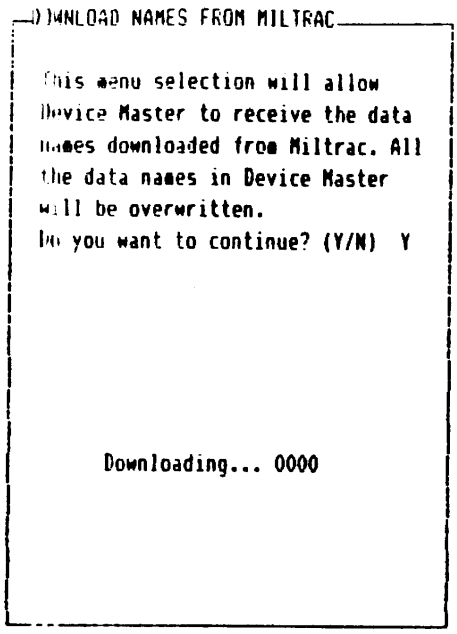
This screen is to program Goods code names 192 through 255. Each goods code name can have up to 8 characters.



This is the erase names screen. Enter a 1 for the names which the user wishes to erase. Otherwise, enter a 0.



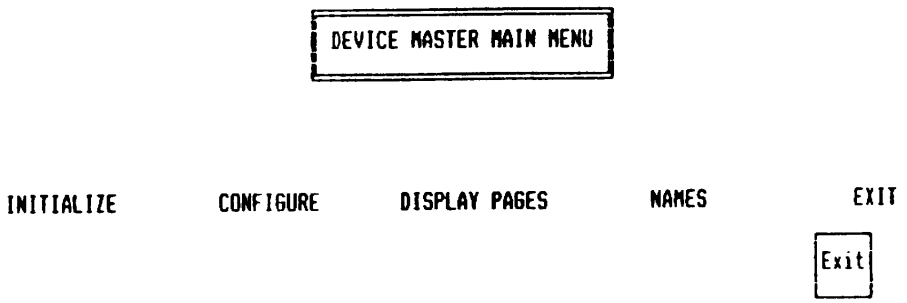
This screen is to confirm with the user before the DEVICE MASTER starts to download the names from MILTRAC.



This screen shows the memory locations where names are being downloaded from MILTRAC.

PROGRAMMING/EXIT

PROGRAMMING/EXIT



Exit Menu

Exit: To leave programming menu.

This screen instructs the user to turn the program key to run position so the DEVICE MASTER can proceed the run mode.

OPERATION/INITIALIZE

OPERATION/INITIALIZE

```
INITIALIZE  01234567
STATE       0110011
```

This screen appears when the DEVICE MASTER is in initialization mode. The number on the top line (0-7) shows the Device number. The numbers below it show the status of the device's run forward output (0 = OFF 1 = ON).

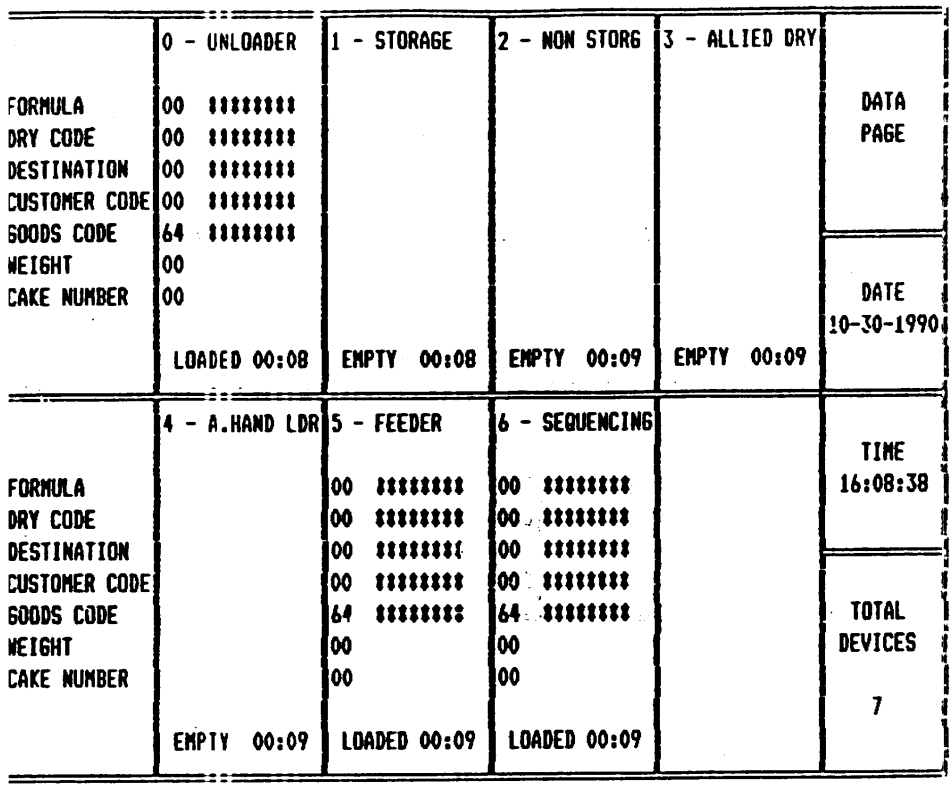
```
IS UNLOADER
LOADED? 0=NO 1=YES 1

FORMULA       = 000
DRY CODE      = 000
DESTINATION   = 000
CUSTOMER CODE = 000
GOODS CODE    = 000
WEIGHT        = 000
CAKE NUMBER   = 000
```

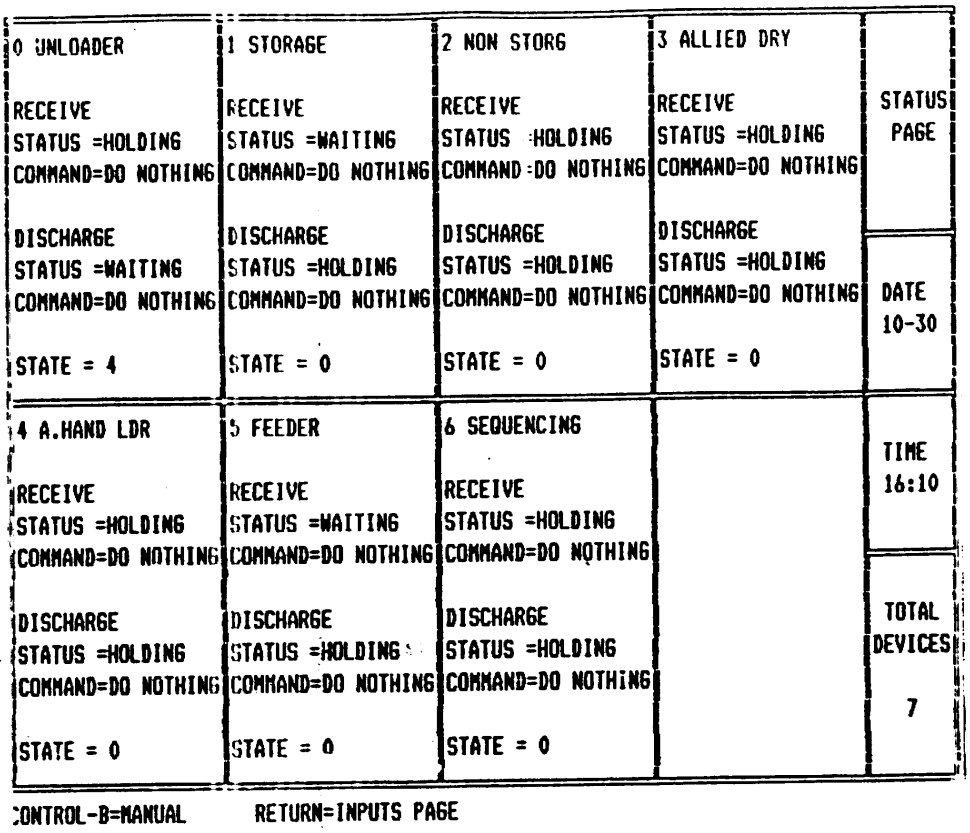
This screen allows the user to enter the data after the DEVICE MASTER initializes

OPERATION/RUN PAGE

OPERATION/RUN PAGE



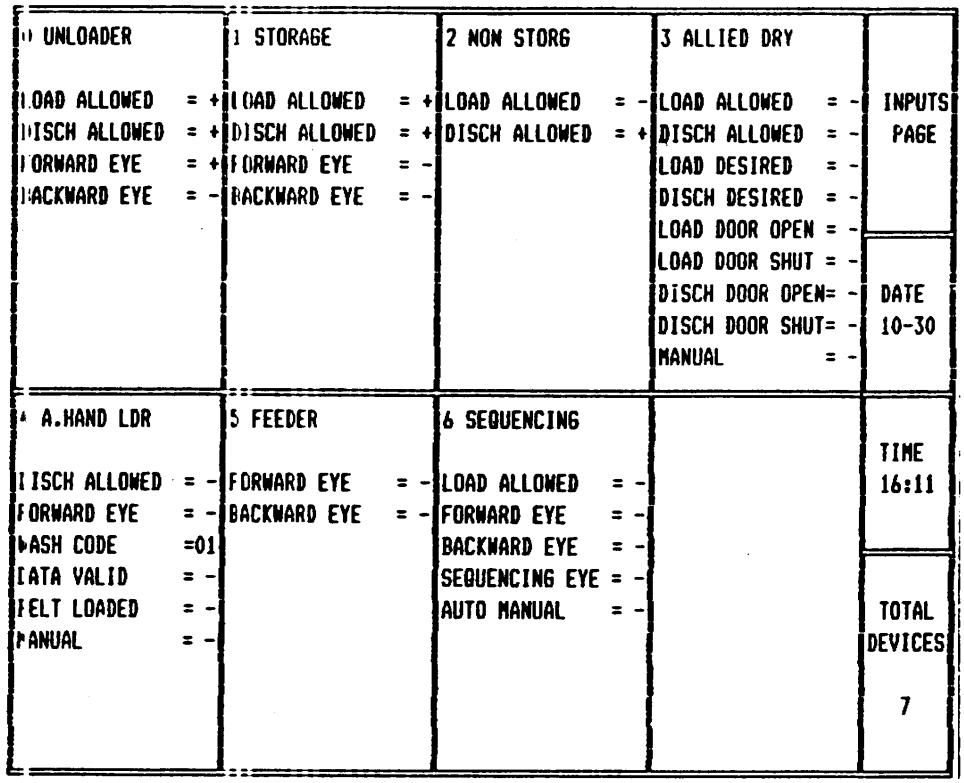
This screen is the Data page at run time. The two left top and bottom windows show the meaning of the data. The remaining windows show the name and the data of the configured device. The bottom line shows the key instructions.



This screen is the Status page at run time. Each window shows the name, receive and transfer statuses of the DEVICE MASTER, receive and transfer commands from MILTRAC, receive and transfer levels. The bottom line shows the key instructions.

OPERATION/INPUTS

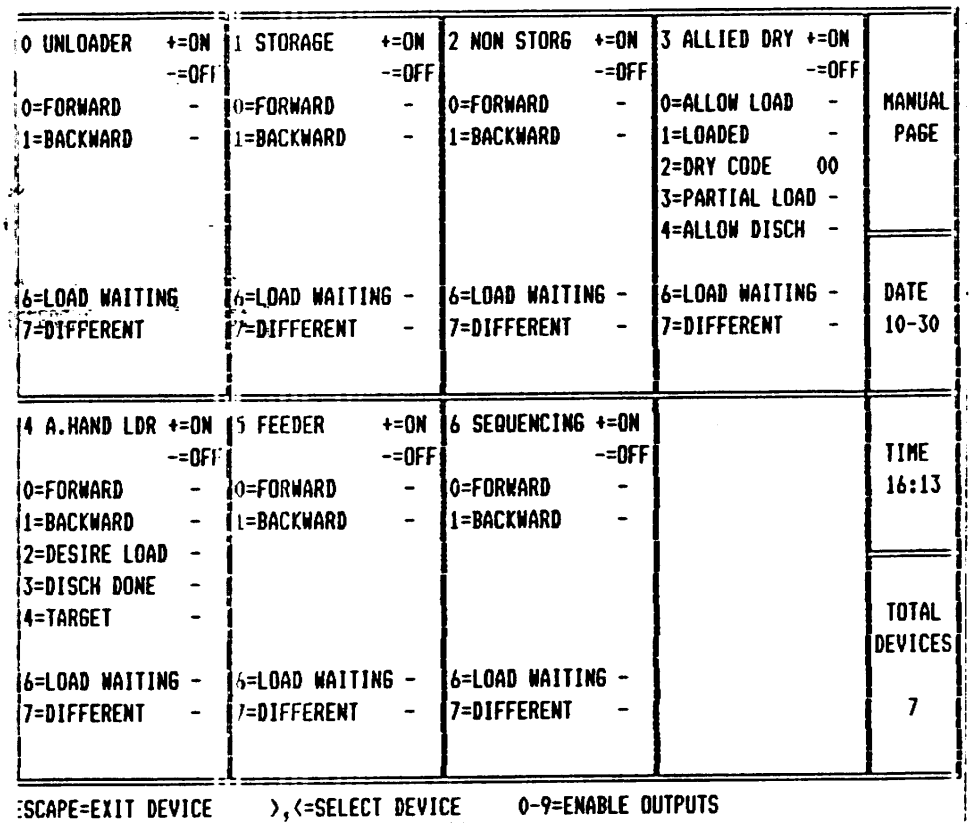
OPERATION/INPUTS



This screen is the Input page. This page shows statuses of all the inputs of the DEVICE MASTER (- = Input is not made. + = Input is made). The bottom line shows the key instructions.

OPERATION/OUTPUTS

OPERATION/OUTPUTS



This screen is the DEVICE MASTER Auto Manual screen. The Auto Manual mode in the DEVICE MASTER allows the user to enable and disable one individual output at a time. The bottom line shows the key instructions of how to exit or turn on an output.

Memory Download Box Applications

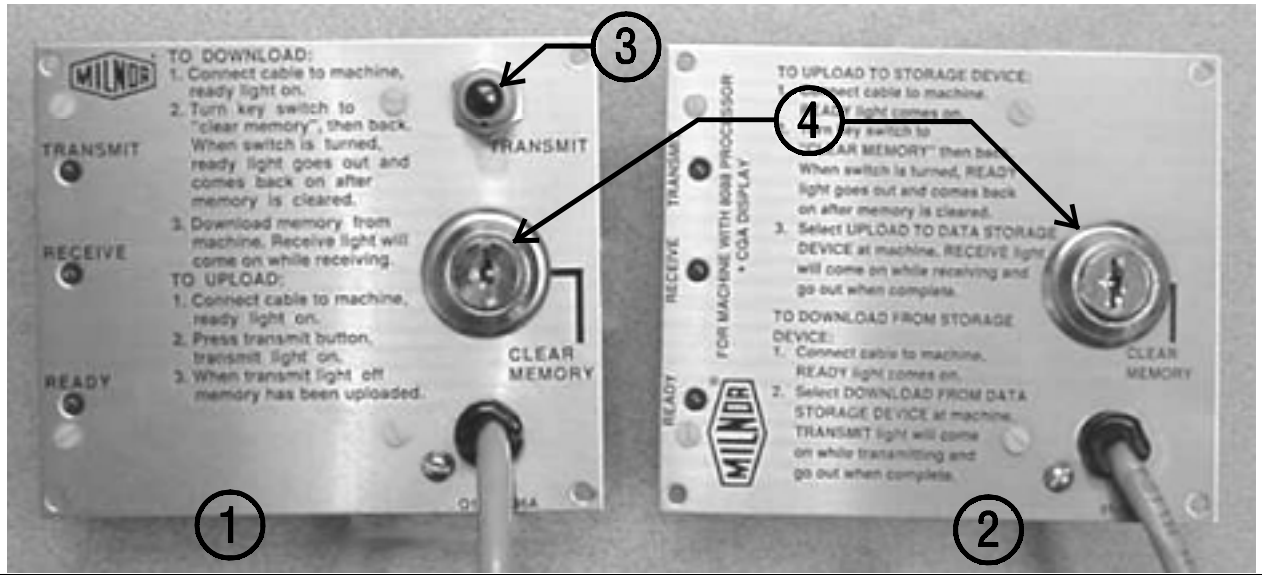
Document..... BICUDC01
Specified Date..... 20010807
As-of Date..... 20010807
Access Date..... 20010807

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

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

Figure 1: Download Box Identification

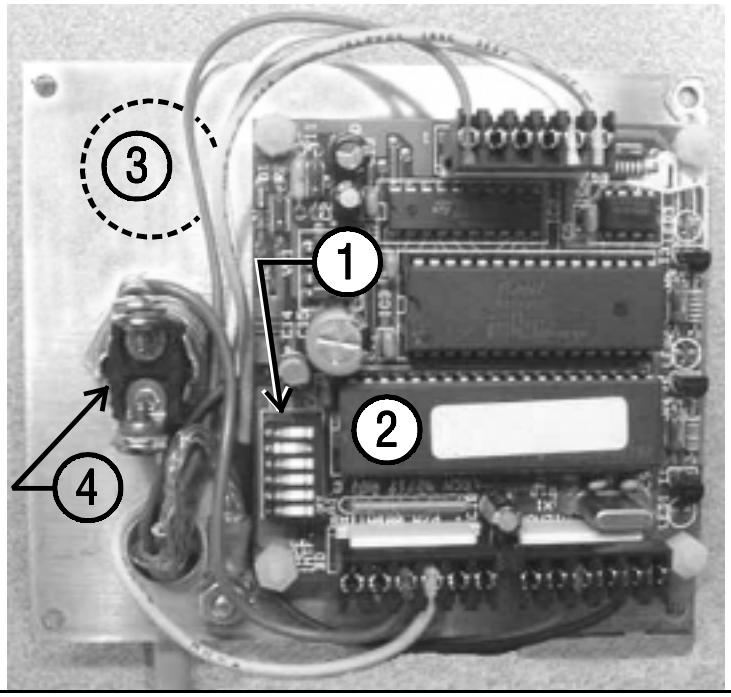
Faceplate Comparison



Legend

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

Figure 2: Rear View of Circuit Board

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

Supplement 1

Interpreting the DIP Switch Settings

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

A. All switch positions are OFF.

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

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

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

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

Table 1: DIP Switch Positions

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

Processor Board	Software Version	DIP Switch Setting
Uses Memory Download Box WITHOUT Transmit Button		
Miltron Controller for CBW System		
8088	All	A
80186	All	B
Miltrac		
8088	All	A
80186	All	B
Milrail Rail Controller		
8088	All	A
80186	All	B
Device Master		
8085	All	not supported
8088	All	not supported
80186	94000-94017	not supported
	94018	B
	20000-present	B
Linear Costo Master		
8085	All	not supported
8088	All	not supported
80186	94000-94011	not supported
	20000-present	B

Key:

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

— End of BICUDC01 —

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

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

How To Change EPROMs

⚠ WARNING ⚠

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

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

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

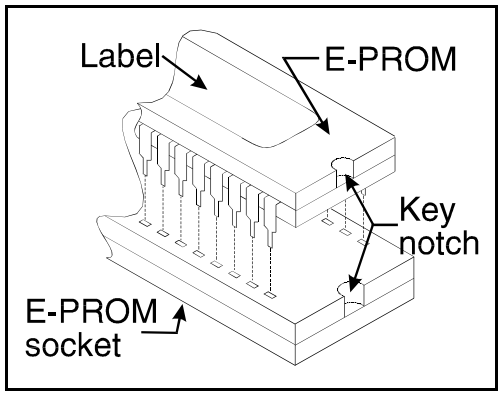
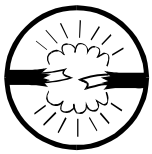


FIGURE 1 (MSSM0217AE)
Properly Seating the EPROM

⚠ CAUTION ⚠



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

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

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

Verifying Proper EPROM Installation—After installing new EPROMs, apply power to the machine and turn the machine *on*. If the EPROMs are properly installed, the display will continue with the normal display sequence when powering up. If the display is blank or appears unusual, turn the machine *off* at once and check the orientation of the EPROMs.

B
C

Location of EPROMs on Processor Board

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

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

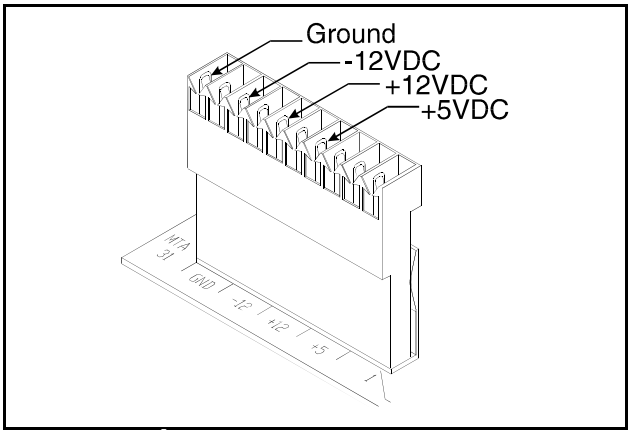


FIGURE 2 (MSSM0217AE)
MTA-31 on 8085 Processor Board
(wires not shown for clarity)

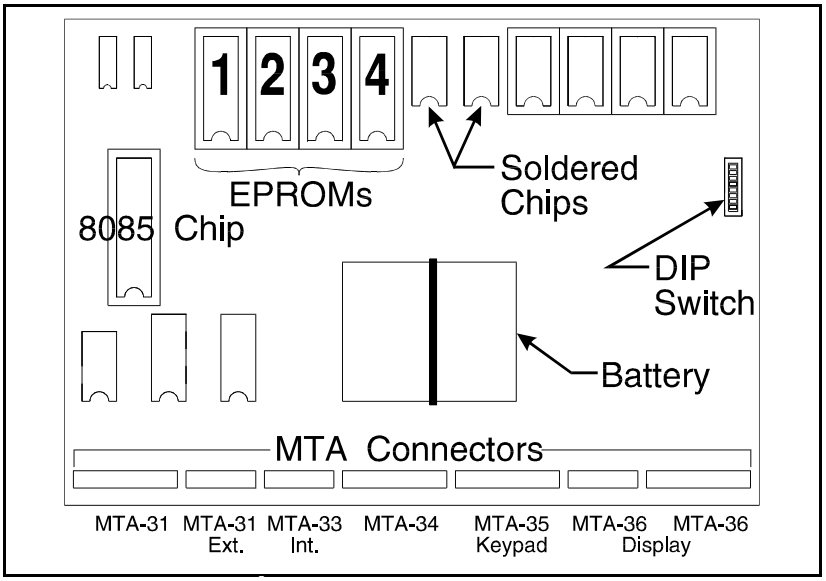


FIGURE 3 (MSSM0217AE)
8085 Processor Board (NOT Coin Machine)

H

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

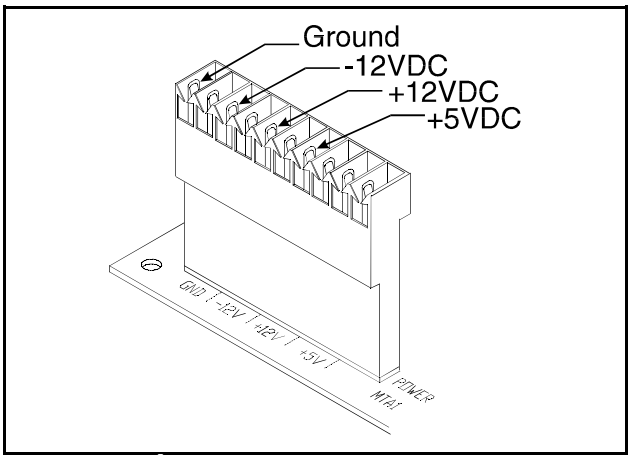


FIGURE 4 (MSSM0217AE)
MTA-1 in 8085 Coin Machine
(wires not shown for clarity)

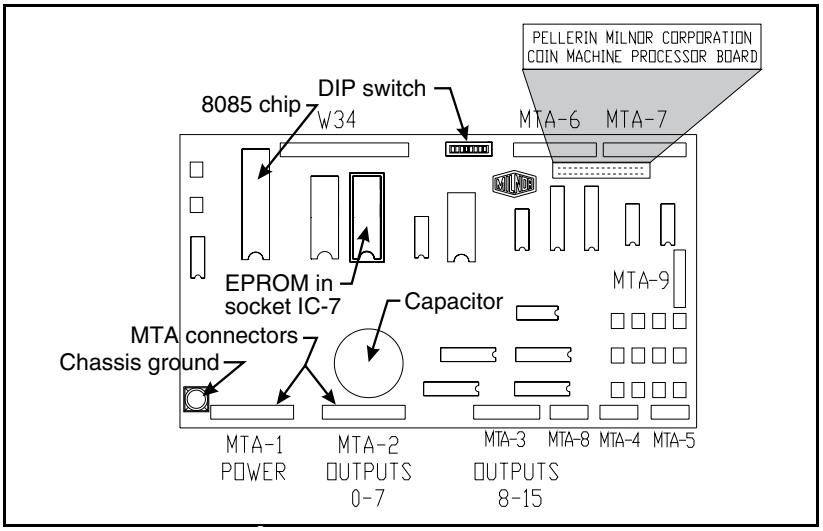


FIGURE 5 (MSSM0217AE)
8085 Coin Machine Processor Board

B
C

8088 Processor Boards *Without Memory Expansion Board*—See the table of EPROM locations (below) and FIGURE 7. If the set consists of only one EPROM, install it in socket A of FIGURE 7. If two EPROMs comprise the set, install EPROM #2 in socket A and EPROM #1 in socket B. **Always install highest numbered EPROM in socket A.** If the set consists of more than two EPROMs, a Memory Expansion Board must be present in the machine along with the processor board.

8088 Processor Boards *With Memory Expansion Board*—See the table of EPROM locations below and FIGURE 7. If the EPROM set consists of three or more EPROMs, install the two highest numbered EPROMs (e.g., EPROMs #3 and #4 of a four-chip set) *on the processor board*, with the highest numbered E-PROM (EPROM #4 of a four-chip set) in socket A, and the EPROM with the second highest number (EPROM #3 of a four-chip set) in socket B. *Install the remaining EPROM(s) on the Memory Expansion Board* with the highest numbered of the remaining EPROMs (e.g., EPROM #2 of a four-chip set) in socket IC-1 on the Memory Expansion Board and EPROM #1 in socket IC-2.

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

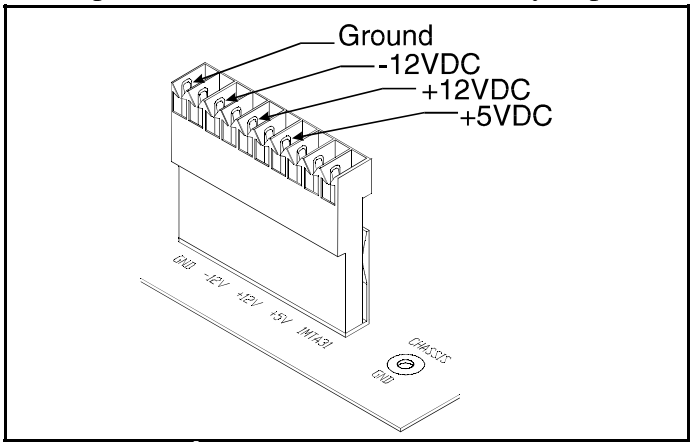


FIGURE 6 (MSSM0217AE)
1MTA-31 on 8088 Board (wires not shown for clarity)

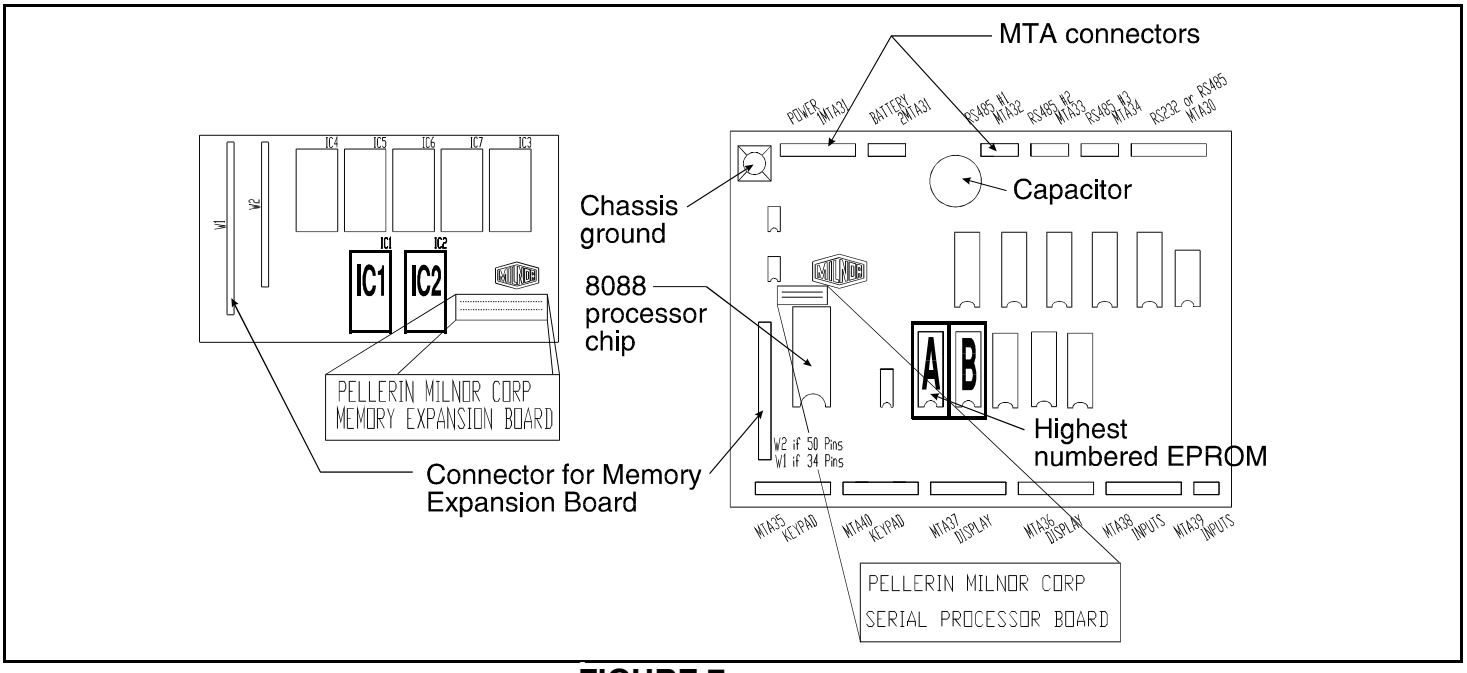


FIGURE 7 (MSSM0217AE)
8088 Processor Board and Optional Memory Expansion Board

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

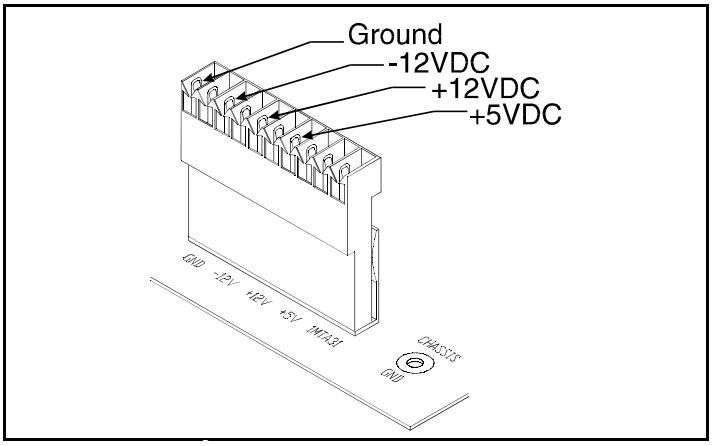


FIGURE 8 (MSSM0217AE)
1MTA-31 on 80186 Board (wires not shown for clarity)

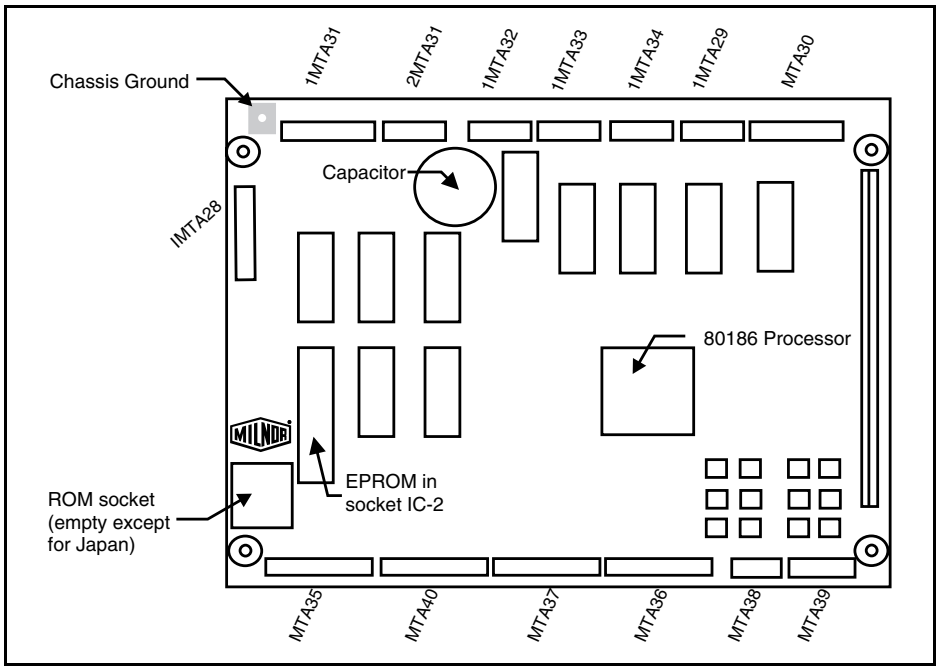


FIGURE 9 (MSSM0217AE)
80186 Processor Board

NOTICE

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

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

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

BMP970004/97071

THE HARDWARE IN SERIAL-TYPE MICROPROCESSORS

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 includes all the components described in this section.**

The Microprocessor Components

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

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

2. Keyswitch—Selects run/program modes. The key may be removed only in *run*. **Never leave the key accessible to unauthorized personnel.**

3. Display—Depending upon the model/type, the display may be either liquid crystal, fluorescent, or CRT. The different displays are not interchangeable.

4a. Power Supply (NOT for CBW® System)—Converts control circuit AC voltage to +12VDC, -12VDC, and +5VDC for the CPU board. On dryers and some other machines, a second, identical power supply performs the same function for all the peripheral boards, which are mounted in an enclosure separate from the CPU.

A minimum 14AWG ground wire must be connected between the grounds on the CPU and the peripheral board(s). This ground is installed at the factory when both enclosures are mounted on the same machine, as in washer-extractors. The ground wire must be provided during installation when the CPU enclosure and its associated peripheral board enclosures are remote from one another as in dryers. F

Although the +12VDC and -12VDC are not adjustable, the +5VDC for the CPU is very sensitive. The power supply must be adjusted most accurately, **so the actual voltage *at the CPU board* is between 4.95VDC and 5.1VDC as measured by an accurate digital voltmeter.** J

4b. Power Supply (CBW® System Only)—The Milnor® CBW® System utilizes two discrete power supplies to convert control circuit AC voltage to +12 VDC, -12 VDC, and +5VDC for the CPU board and peripheral boards. D

One power supply (ESPS) is a 40-watt power supply located in the Miltron cabinet. It powers the peripheral boards in the Miltron cabinet, including the optional load cell interface board and A/D board for a weighing conveyor, the CPU board and the memory expansion board, and the monitor interface board.

Although the +12VDC and -12VDC are not adjustable, the +5VDC for the CPU is very sensitive. The power supply must be adjusted accurately, **so the actual voltage *at the CPU board* is between 4.95VDC and 5.1VDC as measured by an accurate digital voltmeter.** J

The second power supply (PSO) is a 120-watt power supply which provides +12VDC, -12VDC, and +5VDC to the peripheral boards located on the tunnel. This power supply provides for the adjustment of the +12VDC voltage, the -12VDC voltage, and the +5VDC voltage. If these voltages require adjustment, set the +5VDC to provide no less than +4.8VDC at the module electric box farthest from the power supply, as measured by an accurate digital voltmeter. If necessary, adjust the +12VDC to 12.00VDC and the -12VDC to -12.00VDC as measured by an accurate digital voltmeter.

G If the +5VDC at the peripheral board nearest PSO is at least +5.25VDC when the voltage at the peripheral board farthest from PSO is +4.8VDC or less, suspect loose MTA connections or inadequate wiring somewhere between the nearest and farthest peripheral boards.

5. CPU (Processor) Board—The Central Processing Unit (CPU) 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 contains E-PROMs programmed by the Milnor® factory with fixed instructions (software) that determine how the machine functions. Depending upon machine model/type, the CPU chip can be either an Intel 8085 or an Intel 8088.

Although the E-PROMs do not require battery backup, the CPU board utilizes a battery which normally assures that the user-programmable memory will be retained for two to three months without external power. See below and "IMPORTANT OWNER/USER INFORMATION . . ." (see Table of Contents).

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

7. Battery—Provides memory retention backup when power is *off*. The battery is mounted directly on 8085 CPU boards, and mounted separately for 8088 CPU boards. A capacitor on the 8088 CPU board provides enough power
D to retain memory for several hours after the battery has been disconnected. Once fully charged (see "IMPORTANT
G OWNER/USER INFORMATION . . ."), the battery backup is reliable for 90 days with no power applied.

8. Opto-Isolator Board—Optically isolates inputs to the CPU for electronic noise immunity. Opto-Isolators are incorporated into the 8088 CPU board; thus this separate board is only required for 8085 CPUs.

9. I/O Board—16/8 input-output 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 CPU. 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.**

H **Standard I/O board—**Used in all devices requiring I/O boards except those listed below.
High-speed I/O board—Used only in the following devices and configurations: E6N, J6N, and T6N washer-extractors equipped and configured for ***both*** **variable basket speed and electronic balancing**; Milrail configured for high-speed boards; and all configurations of the M7E centrifugal extractor.

10. Output Board—A 16-output board contains 16 output relays, the same type as those described above.

11. A/D Board (Analog to Digital Convertor)—Converts analog voltage signals, such as temperature, to a digital signal that can be utilized by the CPU. Up to a maximum of eight A/D channels may be provided
D on a single board. Although seemingly identical, the A/D boards used to sense air temperature in the dryer, water
G temperature in washer-extractors and dye 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*.**

D **12. D/A Board (Digital to Analog Convertor)**—Converts digital signals from the processor to an analog voltage between 0 and 5VDC (e.g., provides the analog signal to the dryer gas valve position actuator and dye machine steam position actuator).

13. CRT Board—Receives display instructions from the processor and generates the signals to the CRT to create the desired displays; used in controllers such as the Miltron and Miltrac controllers and Device Master systems.

⚠ CAUTION ⚠ G

The CRT board can be plugged in backwards, even though the cabinet/bracketry makes this difficult to do and labeling on the parent board states the proper orientation. Use care to orient the board properly, otherwise microprocessor components may burn out.

14. Resistor Boards—Although seemingly identical, resistor boards are quite different. **The different types are clearly marked with different part numbers, which are mentioned in the wiring diagram set and *are not interchangeable.***

a. For Temperature-Sensing System—Used with A/D board in washer-extractors and Dye-Extractors® as part of temperature-sensing system; not required on continuous batch washers because necessary circuitry is included on other (standard) CBW® printed circuit boards.

b. For Gas Valve—Used with D/A board in temperature control circuit of gas dryers; converts 0-5VDC to 4-20 milliamperes for modulating gas valve.

c. For Steam Valve—Used with D/A board in temperature control circuit of older steam dryer models; converts 0-5VDC to 4-20 milliamperes for modulating steam valve. See "4-20MA Output Board" in this section. D

15. Signal Conditioner for Thermocouple—Amplifies the output from a thermocouple so an A/D board can use the signal.

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

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

Thermistor temperature probes—A temperature-sensitive resistor whose resistance changes with respect to temperature; uses include washer-extractors, textile machines, and continuous batch washers.
Thermocouple temperature probes—A connection of dissimilar metals which produces a voltage with respect to its temperature; uses include dryers.

18. Weigh Scale Interface Board—Regarding machine logic, this is located between the load cell of the weighing conveyor (CONWA) and the weighing conveyor A/D board. It interprets data from the conveyor load cell to the A/D board.

19. 4-20MA Output Board—Used on newer dye machines and steam dryers with temperature control. See "Resistor Boards/c. For Steam Valve" in this section. D

The Serial Communications Port

All Milnor® serial microprocessors have a serial port with a nine-pin receptacle and plug to pass data to other devices via one of several special serial cables to *Download* or to *Print data* when their software supports these functions (e.g., see programming information). For more information on the various separate serial cables required for these functions, see external serial link cable information in this manual (see Table of Contents), if applicable. F

Which Boards Are Used in Various Devices

Board / Device	8088 CPU	I/O	OUTPUT	A/D	D/A	CRT	Opto-Isolator	Temp Sensing Resistor	Gas Valve Resistor	Steam Valve 4-20MA	Signal Conditioner	Rotation Safety	Weigh Scale Interface
COSHA	1	2[1]	—	—	—	—	—	—	—	—	—	—	—
COBUC	1	2[1]	—[1]	—	—	—	—	—	—	—	—	—	—
DEVICE MASTER	1	2[1]	—[1]	—	—	1	—	—	—	—	—	—	—
DRYER	1	1[1]	1	1[4]	1[2]	—	—	—	1[2]	—[2]	1	1	—
DYE	1	2	2	1[4]	1	—	—	1	—	1	—	—	—
LINEAR COSTA	1	1[1]	—	—	—	—	—	—	—	—	—	—	—
LINK MASTER	1	—	—	—	—	—	—	—	—	—	—	—	—
MILTRAC	1	—	—	—	—	1	—	—	—	—	—	—	—
PRESS	1	2[1]	1[1]	1	—	—	—	—	—	—	—	—	—
EXTRACTOR	1	1[1]	1[1]	—	—	—	—	—	—	—	—	—	—
VERTSTO	1	2	—	—	—	1	—	—	—	—	—	—	—
W/E (MARK I)	NOTE 7	1[1]	1[1]	1[3,4]	—[1]	—	1	1	—	—	—	—	—
W/E (MARK II)	1	1[1]	1[1]	1[3,4]	—[1]	—	—	1	—	—	—	—	—
CBW® System	1	2+1 per module	—[1]	1 per 8[4] modules 1,5,6	—	1	—	—	—	—	—	—	1[5]

1. Boards can be added for options

2. For gas dryers and steam dryers with temperature control

3. For washer-extractors with temperature option

4. Although seemingly identical, the A/D boards for sensing air temperature in dryers, water temperature in washer-extractors and dye machines, water temperature in tunnels and weight for weighing conveyors are all different.**The different types have different part numbers, are clearly marked, and are not interchangeable.**

5. Required for CBW® system with weighing conveyor

6. Required for Reuse/Cooldown and/or Overhead Fill tanks

7. The Mark I washer-extractor control used an 8085 CPU

NOTE: Additional boards may be required for certain other options.

DIP Switches and How To Set Them

Every peripheral board has eight DIP switches which establish the address of each board so it may communicate serially with its own CPU, as though on a "party line," while sending and receiving only its own messages. In a battery of machines, the DIP switch settings are identical for each identical peripheral board in each identical machine (e.g., each first I/O board (I/O-1) in each washer-extractor has the identical DIP switch setting). When a CPU must communicate with a higher level control (e.g., when all dryers communicate with the Milnet® system), the higher level control must know the address of each CPU. For 8085 CPUs, a board-mounted DIP switch performs this function; however, for the 8088 CPU, the higher level control knows the address of each CPU 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).

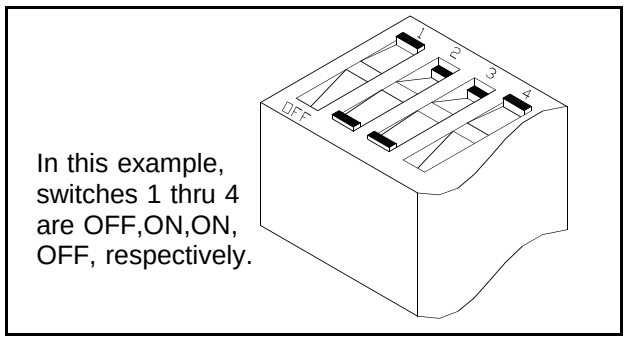


FIGURE 1 (MSFDA401DE)
DIP Switch ON/OFF Positions

DIP Switch Settings

Board / Device	A/D	D/A	I/O–1	I/O–2	I/O–3	I/O–4	Output–1	Output–2	Output–3
COSHA	—	—	2–8 ON 1 OFF	1, 3–8 ON 2 OFF	3–8 ON 1,2 OFF	1,2,4–8 ON 3 OFF	—	—	—
COBUC	—	—	2–8 ON 1 OFF	1, 3–8 ON 2 OFF	3–8 ON 1,2 OFF	1,2,4–8 ON 3 OFF	2–4, 6–8 ON 1,5 OFF	1,3,4,6–8 ON 2,5 OFF	3,4,6–8 ON 1,2,5 OFF
DEVICE MASTER	—	—	2–8 ON 1 OFF	1, 3–8 ON 2 OFF	3–8 ON 1,2 OFF	—	2–4, 6–8 ON 1,5 OFF	1,3,4, 6–8 ON 2,5 OFF	3,4, 6–8 ON 1,2,5 OFF
DRYER	2–5, 7, 8, ON 1,6, OFF	2–4,7,8 ON 1,5,6 OFF	2–8 ON 1 OFF	1, 3–8 ON 2 OFF	—	—	2–4, 6–8 ON 1,5 OFF	—	—
DYE-EXTRACTOR®	2–5,7,8 ON 1,6 OFF	2–4,7,8 ON 1,5,6 OFF	2–8 ON 1 OFF	1, 3–8 ON 2 OFF	—	—	2–4,6–8 ON 1,5 OFF	1,3,4,6–8 ON 2,5 OFF	3,4,6–8 ON 1,2,5 OFF
LINEAR COSTA	—	—	2–8 ON 1 OFF	1,3–8 ON 2 OFF	—	—	—	—	—
PRESS	2–5,7,8 ON 1,6 OFF	—	2–8 1 OFF	1,3–8 ON 2 OFF	3–8 ON 1,2 OFF	1,2,4–8 ON 3 OFF	2–4,6–8 ON 1,5 OFF	1,3,4,6–8 ON 2,5 OFF	—
CENTRI-FUGAL EXTRACTOR	—	—	2-8 ON 1 OFF	1, 3-8 ON 2 OFF	3-8 ON 1,2 OFF	—	2-4,6-8 ON 1,5 OFF	1,3,4, 6-8 ON 2,5 OFF	—
VERTSTO	—	—	2–8 ON 1 OFF	1,3–8 ON 2 OFF	—	—	—	—	—
WASHER-EXTRACTOR	2–5,7,8 ON 1,6 OFF	2–4,7–8 ON 1,5,6 OFF	2–8 ON 1 OFF	1,3–8 ON 2 OFF	—	—	2–4,6–8 ON 1,5 OFF	1,3,4,6–8 ON 2,5 OFF	—
CBW® System	See schematics for DIP switch positions on Continuous Batch Washer and the MILTRON controller.								
		Shaded cells denote options.							

THE HARDWARE IN SERIAL-TYPE MICROPROCESSORS FOR MARK IV AND V MACHINES C

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 includes all the components described in this section.**

The Microprocessor Components

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

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

2. Keyswitch—Selects run/program modes. The key may be removed only in *run*. **Never leave the key accessible to unauthorized personnel.**

3. Display—Depending upon the model/type, the display may be either liquid crystal, fluorescent, or CRT. The different displays are not interchangeable.

4a. Power Supply (NOT for CBW® System)—Converts control circuit AC voltage to +12VDC, -12VDC, and +5VDC for the CPU board. On dryers and some other machines, a second, identical power supply performs the same function for all the peripheral boards, which are mounted in an enclosure separate from the CPU.

A minimum 14AWG ground wire must be connected between the grounds on the CPU and the peripheral board(s). This ground is installed at the factory when both enclosures are mounted on the same machine, as in washer-extractors. The ground wire must be provided during installation when the CPU enclosure and its associated peripheral board enclosures are remote from one another as in dryers.

Although the +12VDC and -12VDC are not adjustable, the +5VDC for the CPU is very sensitive. The power supply must be adjusted most accurately, **so the actual voltage *at the CPU board* is between 4.95VDC and 5.1VDC as measured by an accurate digital voltmeter.** B

4b. Power Supply (CBW® System Only)—The Milnor® CBW® System utilizes two discrete power supplies to convert control circuit AC voltage to +12 VDC, -12 VDC, and +5VDC for the CPU board and peripheral boards.

One power supply (ESPS) is a 40-watt power supply located in the Miltron cabinet. It powers the peripheral boards in the Miltron cabinet, including the optional load cell interface board and A/D board for a weighing conveyor, the CPU board and the memory expansion board, and the monitor interface board.

Although the +12VDC and -12VDC are not adjustable, the +5VDC for the CPU is very sensitive. The power supply must be adjusted accurately, **so the actual voltage *at the CPU board* is between 4.95VDC and 5.1VDC as measured by an accurate digital voltmeter.** B

The second power supply (PSO) is a 120-watt power supply which provides +12VDC, -12VDC, and +5VDC to the peripheral boards located on the tunnel. This power supply provides for the adjustment of the +12VDC voltage, the -12VDC voltage, and the +5VDC voltage. If these voltages require adjustment, set the +5VDC to provide no less than +4.8VDC at the module electric box farthest from the power supply, as measured by an accurate digital voltmeter. If necessary, adjust the +12VDC to 12.00VDC and the -12VDC to -12.00VDC as measured by an accurate digital voltmeter.

If the +5VDC at the peripheral board nearest PSO is at least +5.25VDC when the voltage at the peripheral board farthest from PSO is +4.8VDC or less, suspect loose MTA connections or inadequate wiring somewhere between the nearest and farthest peripheral boards.

5. CPU (Processor) Board—The Central Processing Unit (CPU) 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 contains EPROMs programmed by the Milnor® factory with fixed instructions (software) that determine how the machine functions. Depending upon machine model/type, the CPU chip can be an Intel 8085, an Intel 8088, or an Intel 80186.

Although the EPROMs do not require battery backup, the CPU board utilizes a battery which normally assures that the user-programmable memory will be retained for two to three months without external power. See below and "IMPORTANT OWNER/USER INFORMATION . . ." (see Table of Contents).

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

7. Battery—Provides memory retention backup when power is *off*. The battery is mounted directly on 8085 CPU boards, and mounted separately for 8088 and 80186 CPU boards. A capacitor on the 8088 and 80186 CPU board provides enough power to retain memory for several hours after the battery has been disconnected. Once fully charged (see "IMPORTANT OWNER/USER INFORMATION . . ."), the battery backup is reliable for 90 days with no power applied.

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

9. I/O Board—16/8 input-output 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 CPU. 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. One light blinks when the board is sending signals. 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 oututs is made. This board has two rotary dials which must be adjusted to set the board's address (see "Rotary Switches and How to Set Them" in this section). This board also has convenient test points that can be used to test voltage to the board.

Standard I/O board—Used in all devices requiring I/O boards except those listed below.
High-speed I/O board—Used only in the following devices and configurations: E6N, J6N, and T6N washer-extractors equipped and configured for ***both*** **variable basket speed and electronic balancing**; Milrail configured for high-speed boards; and all configurations of the M7E centrifugal extractor.

10. Output Board—A 24-output board contains 24 output relays, the same board and relays as described above.

11. A/D Board (Analog to Digital Convertor)—Converts analog voltage signals, such as temperature, to a digital signal that can be utilized by the CPU. Up to a maximum of eight A/D channels may be provided on a single board. Although seemingly identical, the A/D 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*.**

This board has one status light. This light blinks when the board is communicating. This board has two rotary dials which must be adjusted to set the board's address (see "Rotary Switches and How to Set Them"). This board also has convenient test points that can be used to test voltage to the board.

12. D/A Board (Digital to Analog Convertor)—Converts digital signals from the processor to an analog voltage 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. This light blinks when the board is communicating. This board has two rotary dials which must be adjusted to set the board's address (see "Rotary Switches and How to Set Them"). This board also has convenient test points that can be used to test voltage to the board.

13. CRT Board—Receives display instructions from the processor and generates the signals to the CRT to create the desired displays; used in controllers such as the Miltron and Miltrac controllers and Device Master systems.

⚠ CAUTION ⚠

The CRT board can be plugged in backwards, even though the cabinet/bracketry makes this difficult to do and labeling on the parent board states the proper orientation. Use care to orient the board properly, otherwise microprocessor components may burn out.

14. Resistor Boards—Although seemingly identical, resistor boards are quite different. **The different types are clearly marked with different part numbers, which are mentioned in the wiring diagram set and *are not interchangeable.***

a. **For Temperature-Sensing System**—Used with A/D board in washer-extractors and Dye-Extractors® as part of temperature-sensing system; not required on continuous batch washers because necessary circuitry is included on other (standard) CBW® printed circuit boards.
b. **For Gas Valve**—Used with D/A board in temperature control circuit of gas dryers; converts 0-5VDC to 4-20 milliamperes for modulating gas valve.
c. **For Steam Valve**—Used with D/A board in temperature control circuit of older steam dryer models; converts 0-5VDC to 4-20 milliamperes for modulating steam valve. See "4-20MA Output Board" in this section.

15. Signal Conditioner for Thermocouple—Amplifies the output from a thermocouple so an A/D board can use the signal.

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

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

Thermistor temperature probes—A temperature-sensitive resistor whose resistance changes with respect to temperature; uses include washer-extractors, textile machines, and continuous batch washers.
Thermocouple temperature probes—A connection of dissimilar metals which produces a voltage with respect to its temperature; uses include dryers.

18. Weigh Scale Interface Board—Regarding machine logic, this is located between the load cell of the weighing conveyor (CONWA) and the weighing conveyor A/D board. It interprets data from the conveyor load cell to the A/D board.

19. 4-20MA Output Board—Used on newer textile machines and steam dryers with temperature control. See "Resistor Boards/c. For Steam Valve" in this section.

20. 8 Out/16 In Chemical Flow Meter Board—This board is used with the metered chemical injection option on textile machines. Eight outputs and eight counters are respectively 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 of counting pulses of 0 to 5 VDC 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 12 VDC at a frequency up to 150 Hz.

The Serial Communications Port

All Milnor® serial microprocessors have a serial port with a nine-pin receptacle and plug to pass data to other devices via one of several special serial cables to *Download* or to *Print data* when their software supports these functions (e.g., see programming information). For more information on the various separate serial cables required for these functions, see external serial link cable information in this manual (see Table of Contents), if applicable.

Which Boards Are Used in Various Devices

Board / Device	CPU	I/O	Output	A/D	D/A	CRT	Opto-Isolator	Temp Sensing Resistor	Gas Valve Resistor	Steam Valve 4-20MA	Signal Conditioner	Chem Flow Meter	Rotation Safety	Weigh Scale Interface
COSHA	1	2[1]	—	—	—	—	—	—	—	—	—	—	—	—
COBUC	1	2[1]	—[1]	—	—	—	—	—	—	—	—	—	—	—
DEVICE MASTER*	1	2[1]	—[1]	—	—	1	—	—	—	—	—	—	—	—
DRYER	1	2	1	1[4]	1[2]	—	—	—	1[2]	—[2]	1	—	1	—
TEXTILE*	1	1	2	1[4]	1	—	—	1	—	1	—	0[1]	—	—
LINEAR COSTA	1	1[1]	—	—	—	—	—	—	—	—	—	—	—	—
LINK MASTER	1	—	—	—	—	—	—	—	—	—	—	—	—	—
MILTRAC*	1	—	—	—	—	1	—	—	—	—	—	—	—	—
PRESS	1	2[1]	1[1]	1	—	—	—	—	—	—	—	—	—	—
EXTRACTOR	1	2	1[1]	—	—	—	—	—	—	—	—	—	—	—
VERTSTO	1	2	—	—	—	1	—	—	—	—	—	—	—	—
W/E (MARK I)	NOTE 7	1[1]	1[1]	1[3,4]	—[1]	—	1	1	—	—	—	—	—	—
W/E (MARK II)	1	1[1]	1[1]	1[3,4]	—[1]	—	—	1	—	—	—	—	—	—
CBW® System*	1	2+1 per module	—[1]	1 per 8[4] modules 1,5,6	—	1	—	—	—	—	—	—	—	1[5]

*80186 CPU

1. Boards can be added for options

2. For gas dryers and steam dryers with temperature control

3. For washer-extractors with temperature option

4. Although seemingly identical, the A/D boards for sensing air temperature in dryers, water temperature in washer-extractors and dye machines, water temperature in tunnels and weight for weighing conveyors are all different.**The different types have different part numbers, are clearly marked, and are not interchangeable.**

5. Required for CBW® system with weighing conveyor

6. Required for Reuse/Cooldown and/or Overhead Fill tanks

7. The Mark I washer-extractor control used an 8085 CPU

NOTE: Additional boards may be required for certain other options.

Rotary Switches and How To Set Them

The Input/Output board, the Output board, the A/D board, and the D/A board each have two rotary switches which establish the address for each board. This allows the boards to communicate serially with its own CPU, as though on a "party line," 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., each first I/O board (I/O-1) in each washer-extractor has the identical rotary switch setting). When a CPU must communicate with a higher level control (e.g., when all dryers communicate with the Milnet® system), the higher level control must know the address of each CPU. For 8088 CPUs, the high level control knows the address of each CPU 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).

Rotary Switch Settings

Board / Device	A/D		D/A		I/O-1		I/O-2		I/O-3		I/O-4		Output-1		Output-2		Output-3	
	SW2	SW1	SW2	SW1	SW2	SW1	SW2	SW1	SW2	SW1	SW2	SW1	SW2	SW1	SW2	SW1	SW2	SW1
COSHA					0	1	0	2	0	3	0	4						
COBUC					0	1	0	2	0	3	0	4						
Device Master					0	1	0	2	0	5			1	1	1	2	1	3
Dryer	2	1	3	1	0	1	0	2					1	1				
Textile	2	1	3	1	0	1	0	2					1	1	1	2	1	3
Linear Costo					0	1	0	2										
One-stage Press			3	1	0	1	0	2	0	3			1	1				
Two-stage Press	2	1			0	1	0	2	0	3	0	4	1	1	1	2		
Extractor					0	1	0	2	0	3	0	4	1	1	1	2		
Versto					0	1	0	2										
Washer-Extractor	2	1	3	1	0	1	0	2					1	1	1	2	1	3
CBW system	See schematics for rotary switch positions on Continuous Batch Washers and the MILTRON controller.																	
	Shaded cells represent optional boards.																	