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# Technical Reference—VERTSTO

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

# Please Read

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## 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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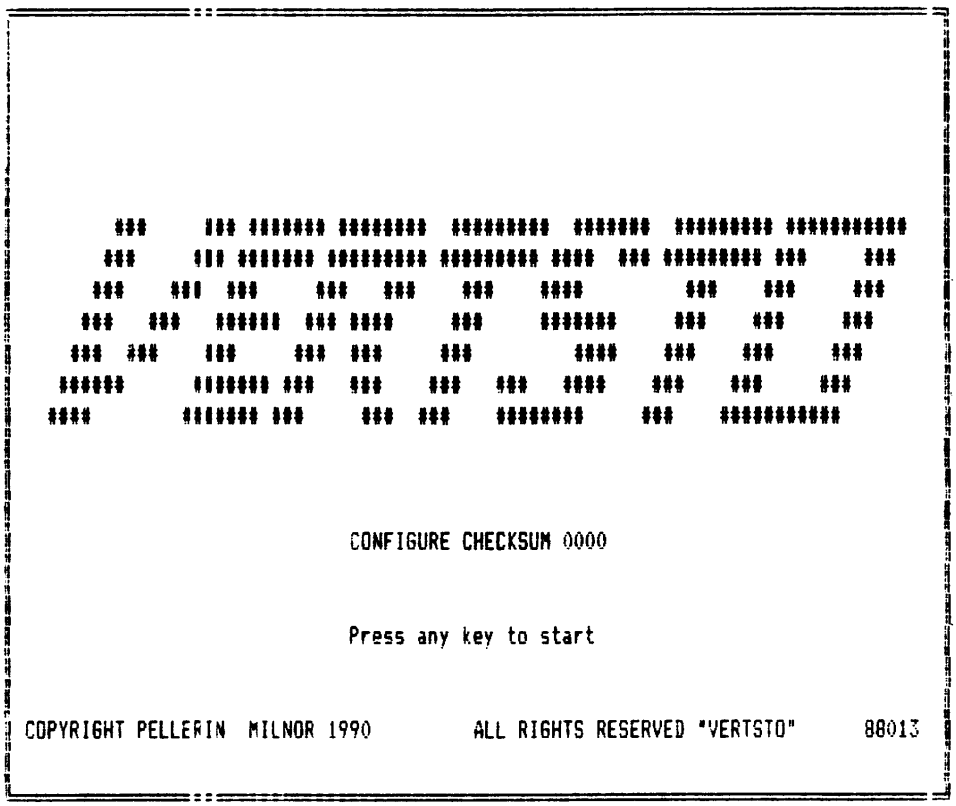
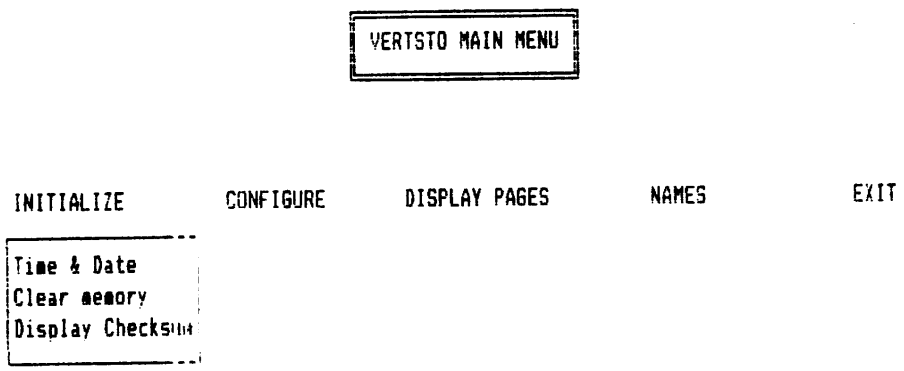



VERTSTC start screen, the number that appears in the bottom right corner is the software version number.

# PROGRAMMING/INITIALIZE

## MAIN MENU/INITIALIZE



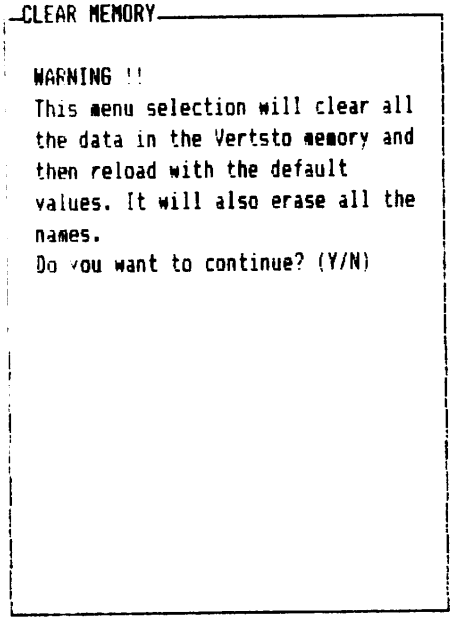

VERTSTC Initialization Menu

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

```
ENTER TIME 14:42
ENTER DATE 10/30/90
```

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

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

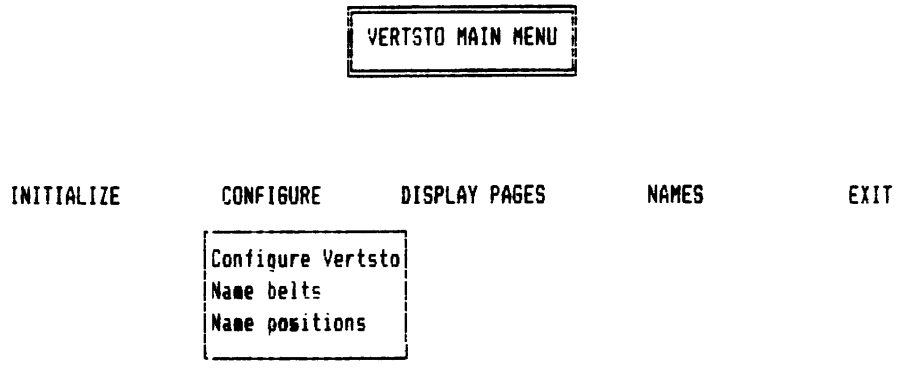



This screen is to confirm with the user before the VERTSTO clears the memory.


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

# PROGRAMMING/CONFIGURE

## MAIN MENU/CONFIGURE

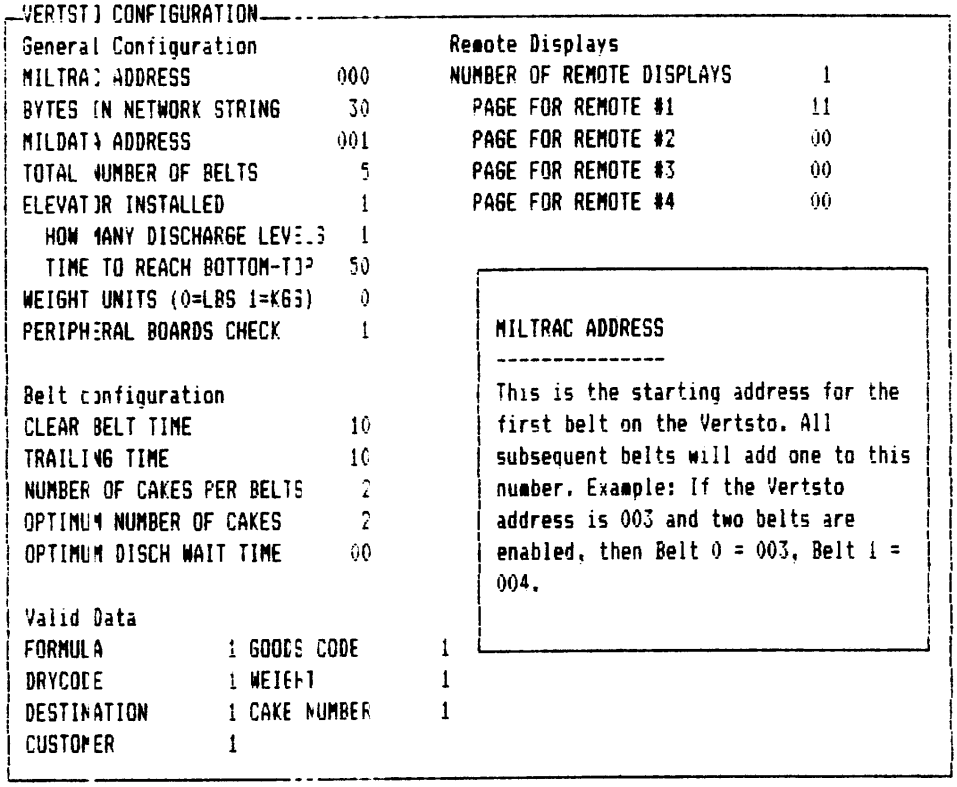



VERTSTC Configuration Menu

Configure VERTSTO: To configure the VERTSTO.

Name Belts: To name all the belts of the VERTSTO.

Name Positions: To name all the storage positions of the belts on the VERTSTO.




## VERTSTO Configuration:

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

**Bytes In Network String:** Enter number of bytes for Network string (24 or 30 bytes).

**MILDATA Address:** Enter the address you wish to assign to the VERTSTO for the MILDATA network (0-255).

| | |
|---|---|
| **Total Number of Belts:** | Enter total number of belts controlled by VERTSTO (1-8). |
| **Elevator Installed:** | Enter a 0 if the VERTSTO can NOT elevate. Otherwise, enter a 1. |
| **How Many Discharge Levels:** | Enter number of different levels which the VERTSTO will discharge the cakes (1-4). Example: If the VERTSTO discharges to 2 LCOSTAS which have different heights, then number of discharge levels is 2. |
| **Time To Reach Bottom-Top:** | Enter the time (in seconds) it takes for the VERTSTO to move from the bottom to the top (5-75). |
| **Weight Units (0=lbs 1=kgs):** | Enter the number (0 or 1) for the unit of measure appropriate to your country. |
| **Peripheral Test:** | Enter a 0 if peripheral boards check is NOT desired. Otherwise, enter a 1. |
| **Clear Belt Time:** | This time should be set to completely clear the belt (5-25 seconds). |
| **Number Of Cakes Per Belts:** | Enter number of storages on each belt (1-8). |
| **Trailing Time:** | Enter the time (in 10th sec) desired to stop the belt after the cake passes the load eye when loading (0-99). |
| **Optimum Number Of Cakes:** | Enter the optimum number of cakes for the belt to discharge (1-Number of cakes per belt). |
| **Optimum Disch Wait Time:** | Enter the time (in minutes) desired to discharge the cake(s) on the belt if optimum number of cakes is not met (0-99). |

**Valid Data:**

Enter a 0 if this type of data is not being passed in your system. Enter a 1 otherwise. This decision tells VERTSTO what data is actually valid in your system such that false data is not displayed.

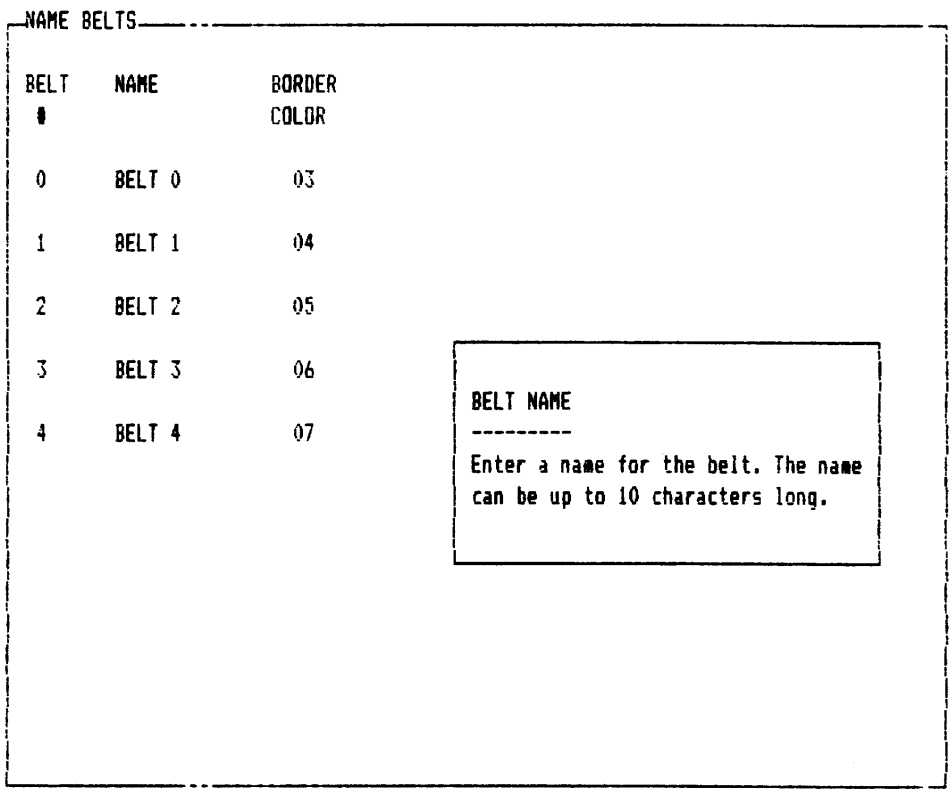
**Number of Remote Displays:**

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

**Page For Remote #?:**

Enter the page number to display on the appropriate monitor.

0 - 9 = Cake Pages 0 - 9
10 = Main Page
11 = State Page
12 = Monitor inputs
13 = Monitor outputs

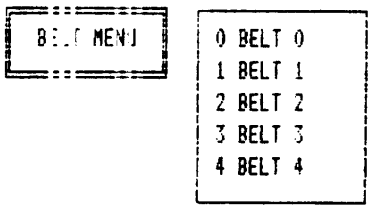



Enter belt names and belt border colors.

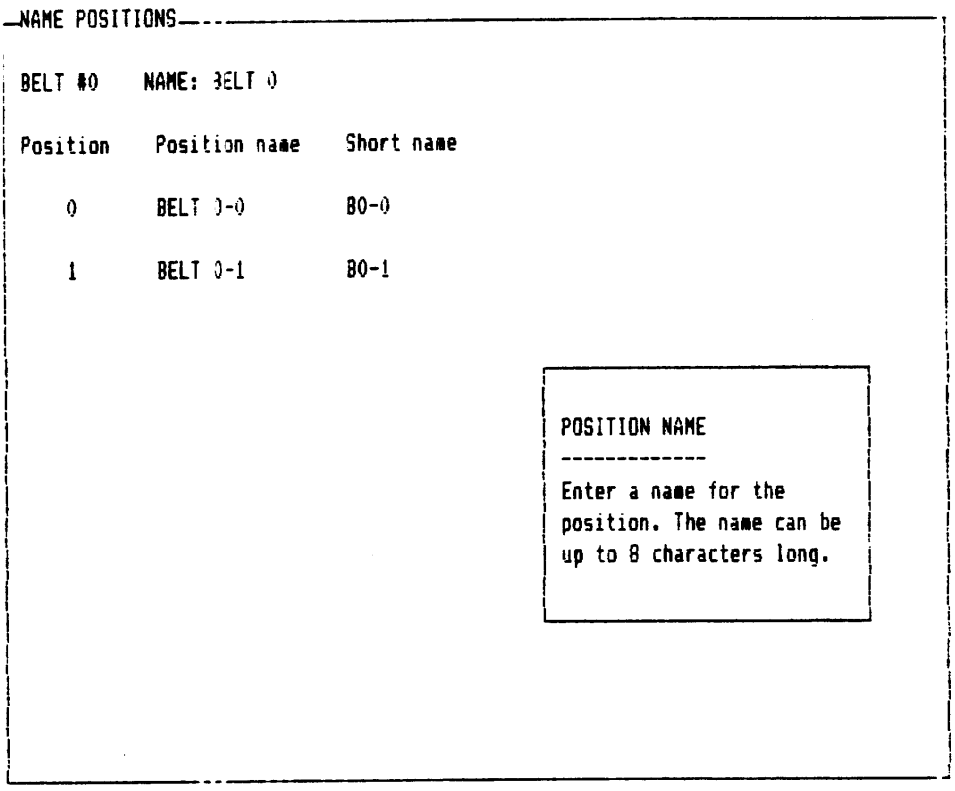
Belt Name: Enter a name for the belt. The name can be up to 10 characters long.

Border Color: Enter color for device border lines:

| | | |
|---|---|---|
| 01=Blue | 02=Green | 03=Cyan |
| 04=Red | 05=Magenta | 06=Brown |
| 07=Lt grey | 08=Dark grey | 09=Lt blue |
| 10=Lt green | 11=Lt cyan | 12=Lt red |
| 13=Lt magenta | 14=Yellow | 15=White |




This is a belt sub menu which lists the name of all the belts which exist in the VERTSTO and allows the user to select a particular belt to program its position names.



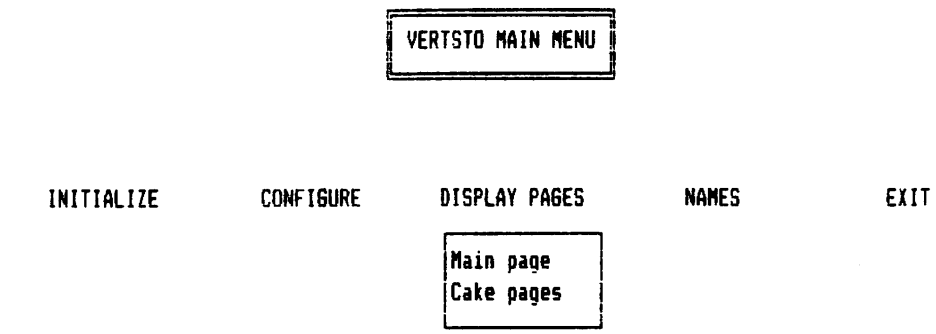

Enter the position names and position short names for the belt.

Position Name: Enter a name for the position. The name can be up to 8 characters long.

Position Short Name: Enter a SHORT name for the position. The name can be up to 4 characters long.

# PROGRAMMING/DISPLAY PAGES

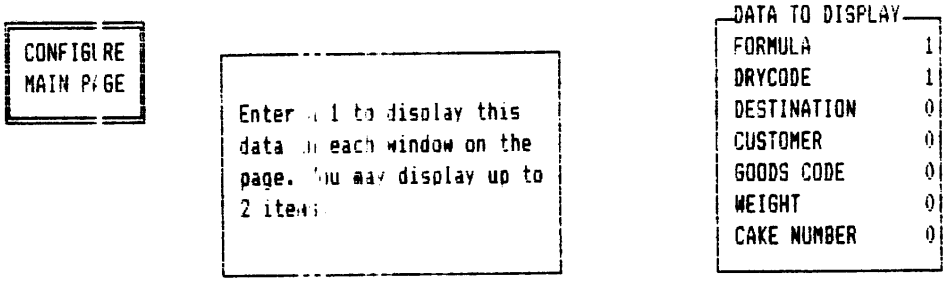
## MAIN MENU/DISPLAY PAGES



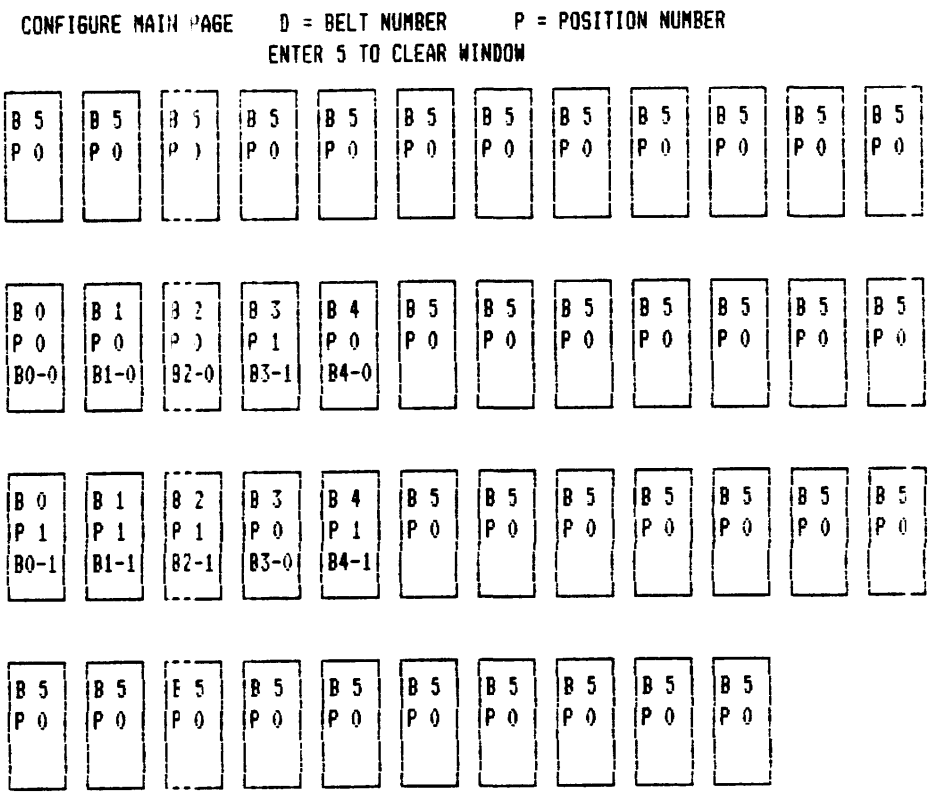

Set Up Run Time Display Menu

Main Page: To set up run time Main page display.

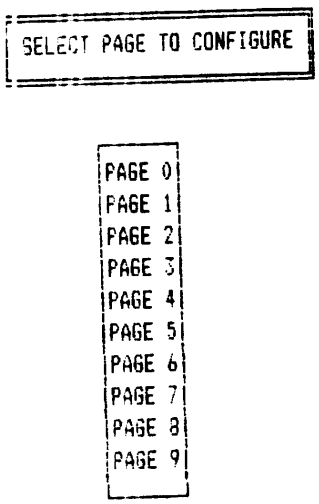
Cake Page: To set up run time Cake data page display.



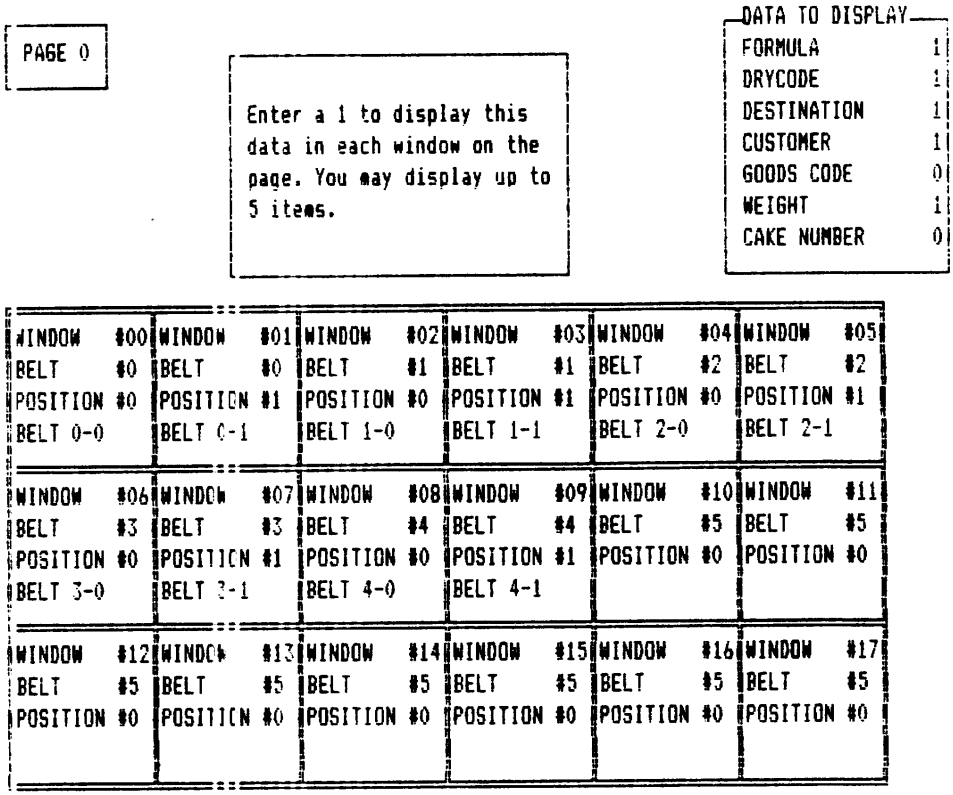

Enter the type of data the user desires to display on the Main page at run time. The user can select up to 2 types of data to display in the Main page.




Enter the belt and position number in the appropriate window which the user desires to display data in the Main page at run time.




This is a cake page sub menu which allows the user to select 1 out of 10 cake pages to set up the cake page run time display.

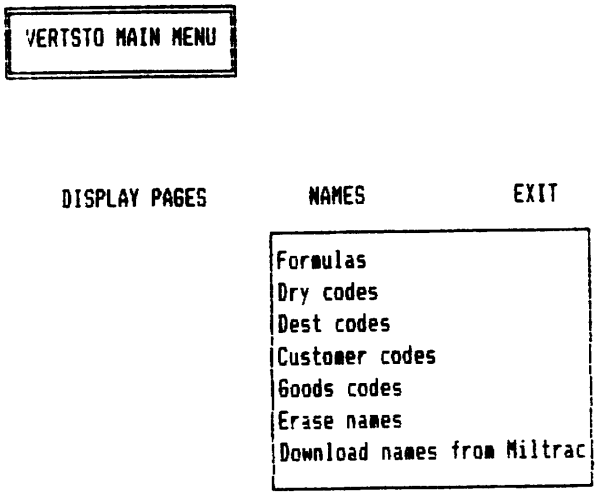



First, enter the type of data the user desires to display on the Cake page at run time. The user can select up to 5 types of data to display in the Cake page.

Secondly, enter the belt and position number in the appropriate window which the user desires to display data in the Cake page at run time.

# PROGRAMMING/NAMES

## MAIN MENU/NAMES




Programming Name Menu

**Formulas:** To program all formulas names.

**Dry Codes:** To program all dry codes names.

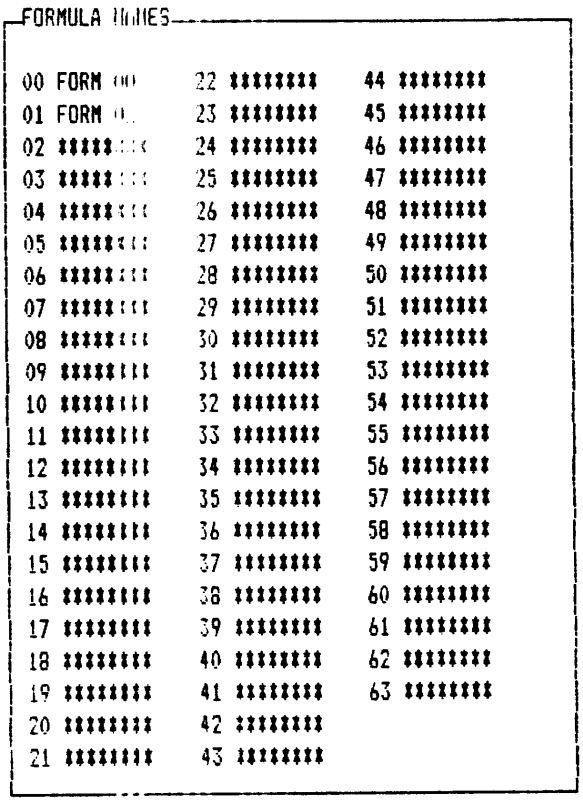
**Dest Codes:** To program all destination names.

**Customer Codes:** To program all customer code names.

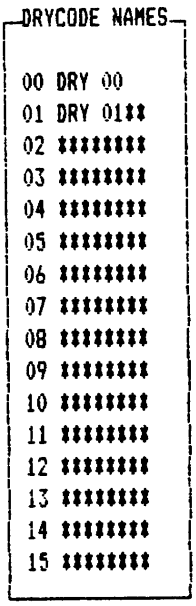
**Goods Codes:** To program all goods codes names.

**Erase Names:** To erase all the names currently used in the VERTSTO.

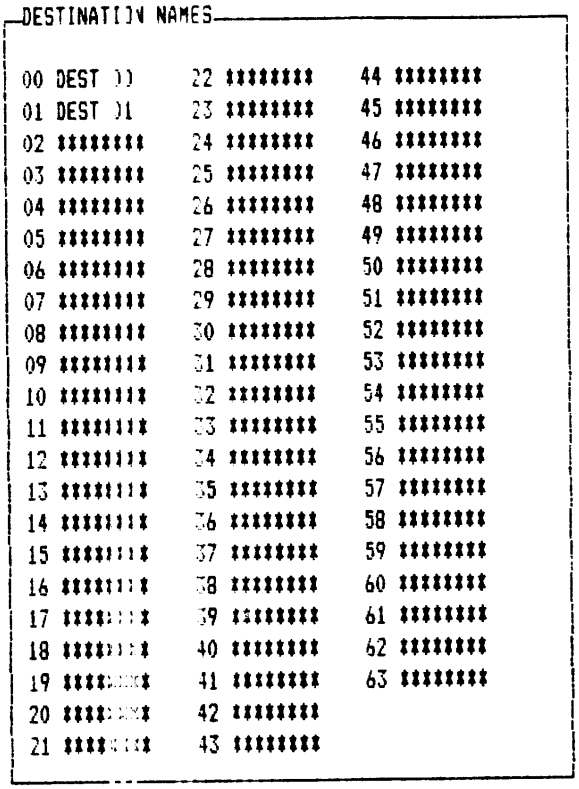
**Download Names From MILTRAC:** To copy the names programmed in MILTRAC.



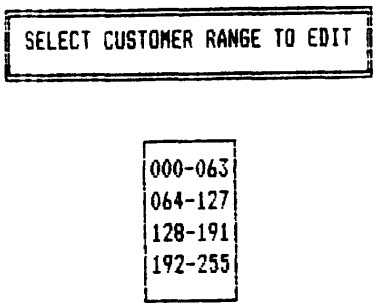

This screen is to program all 64 formula names. Each formula name can have up to 8 characters.



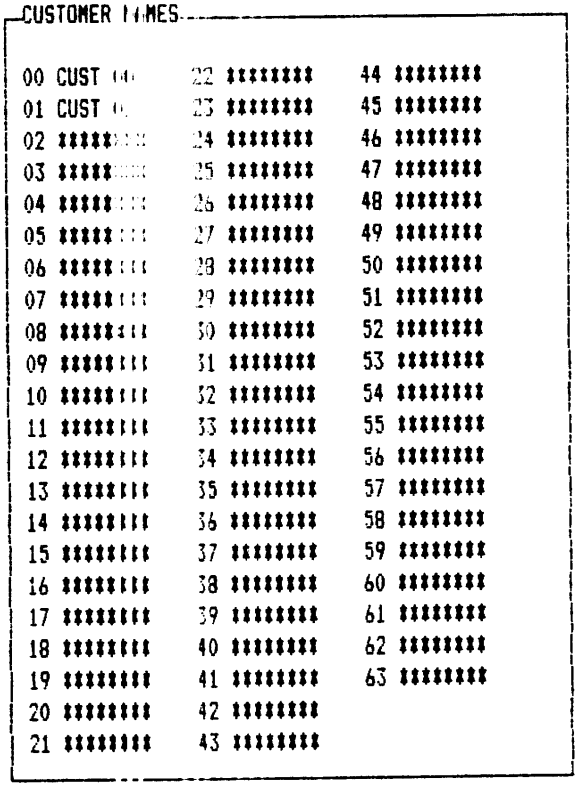

This screen is to program all 16 dry code names. Each dry code name can have up to 8 characters.



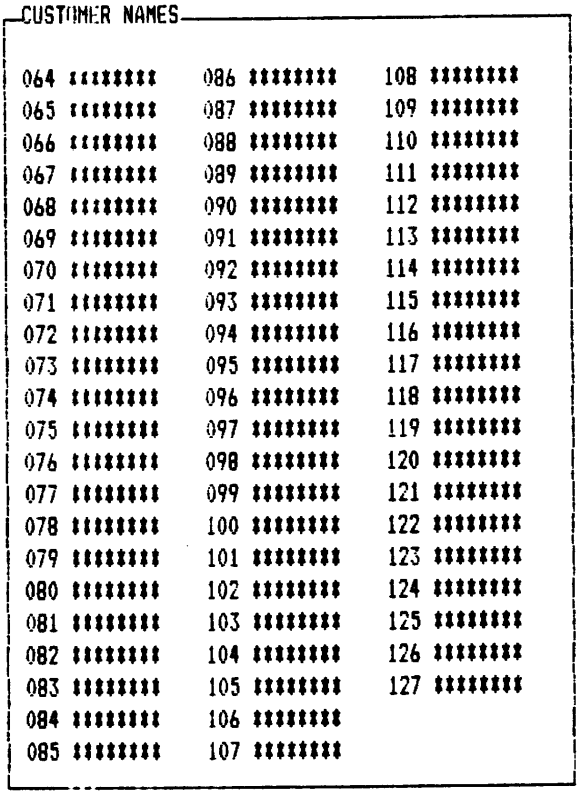

This screen is to program all 64 destination names. Each destination name can have up to 8 characters.



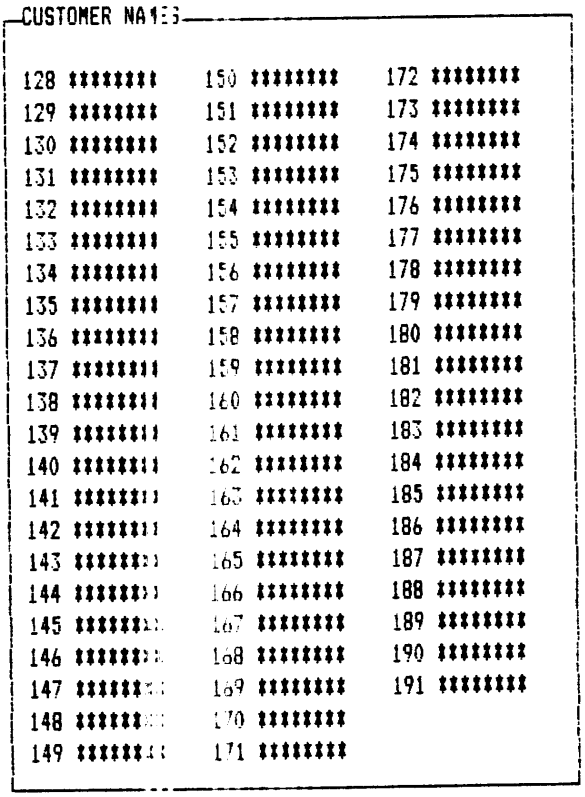

This screen shows a sub menu which allows the user to select the range of Customer names which he wishes to program.



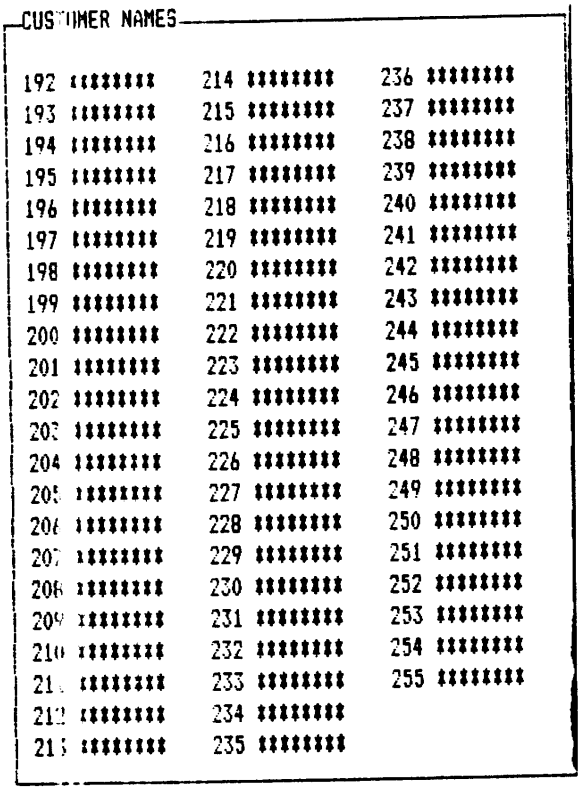

This screen is to program Customer names 0 through 63. Each customer name can have up to 8 characters



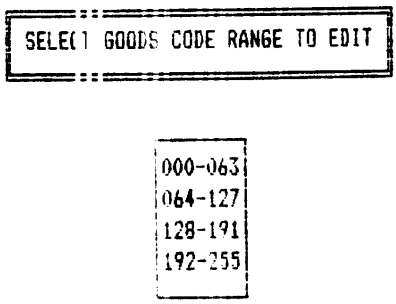

This screen is to program Customer names 64 through 127. Each customer name can have up to 8 characters.



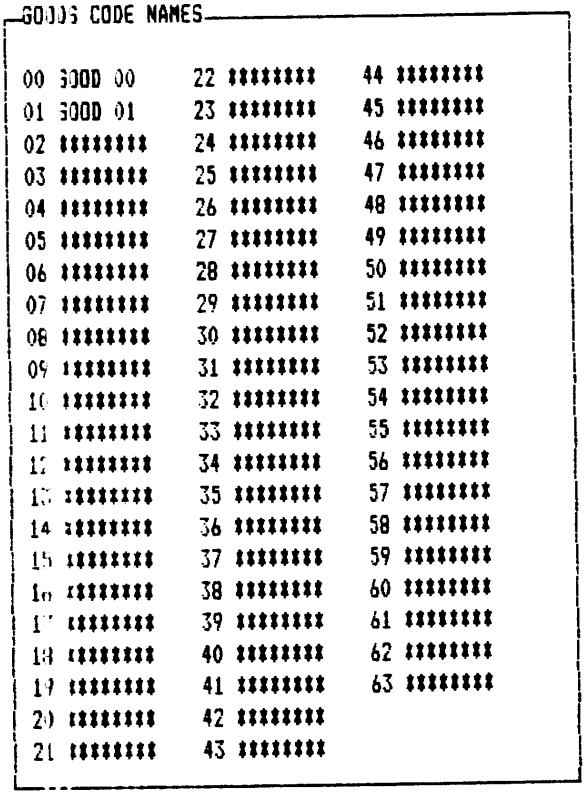

This screen is to program Customer names 128 through 191. Each customer name can have up to 8 characters.



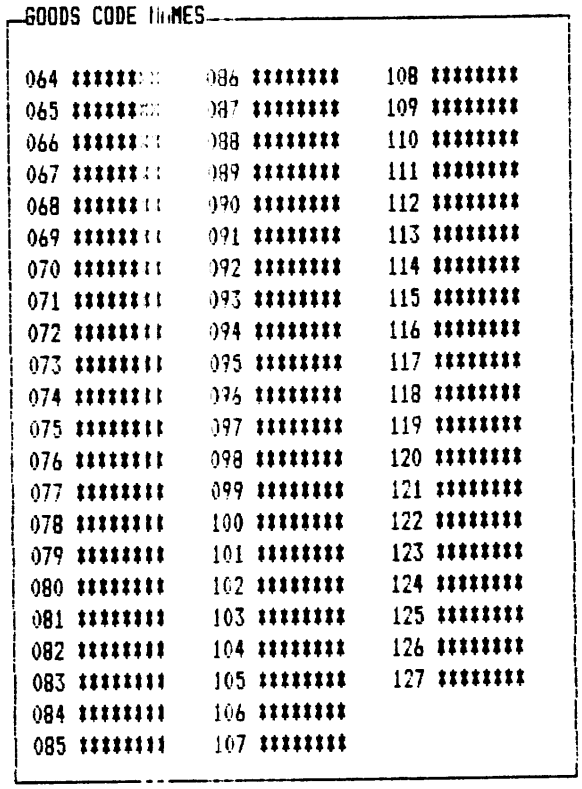

This screen is to program Customer names 192 through 255. Each customer name can have up to 8 characters.



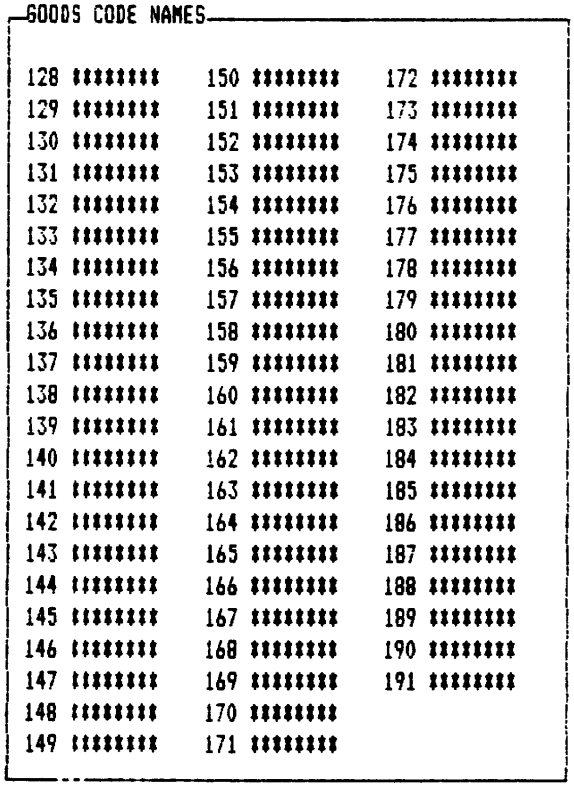

This screen shows a sub menu which allows the user to select the range of Goods code names which he wishes to program.



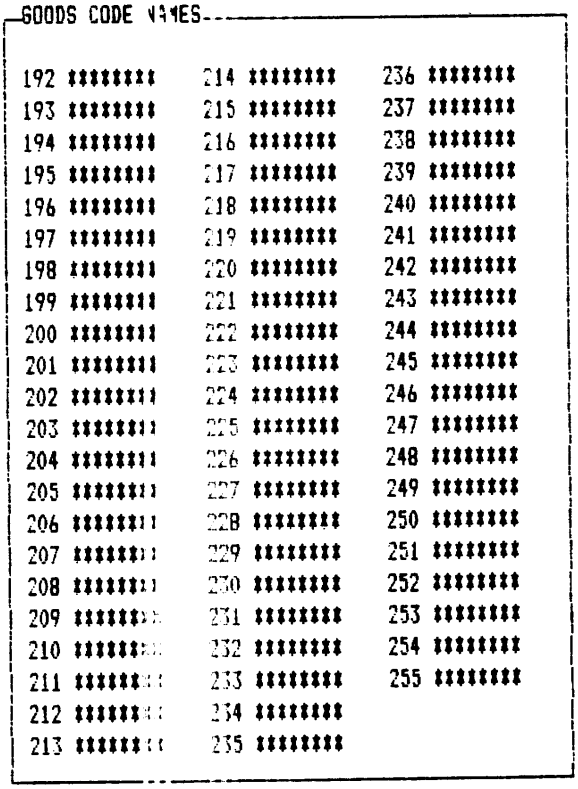

This screen is to program Goods code names 0 through 63. Each goods code name can have up to 8 characters.



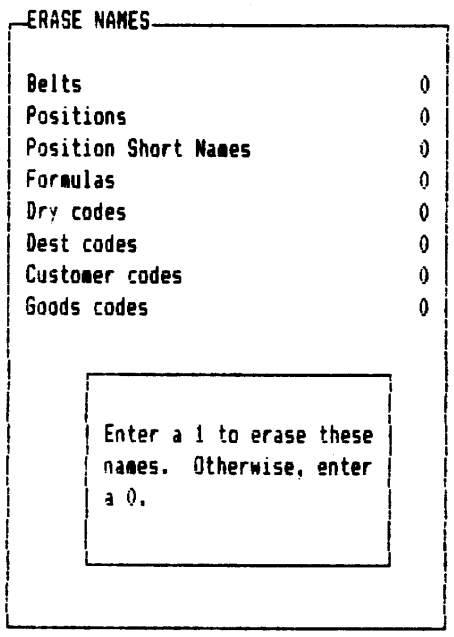

This screen is to program Goods code names 64 through 127. Each goods code name can have up to 8 characters.



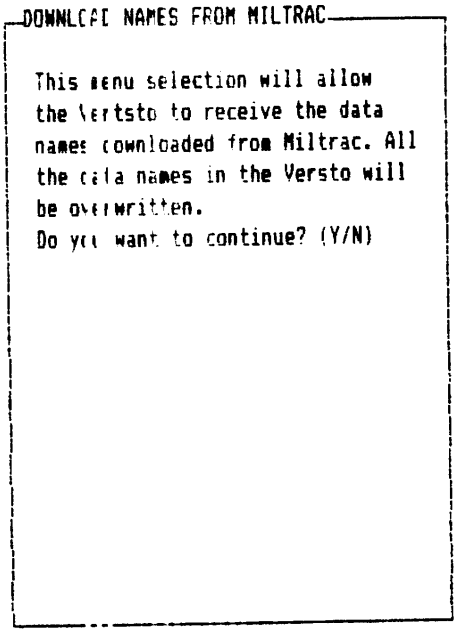

This screen is to program Goods code names 128 through 191. Each goods code name can have up to 8 characters.



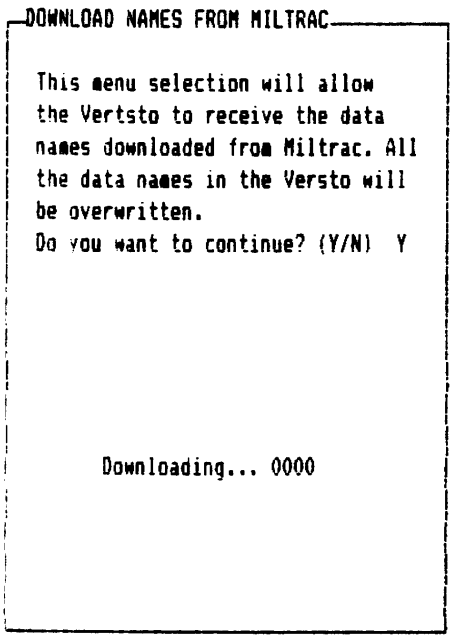

This screen is to program Goods code names 192 through 255. Each goods code name can have up to 8 characters.




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



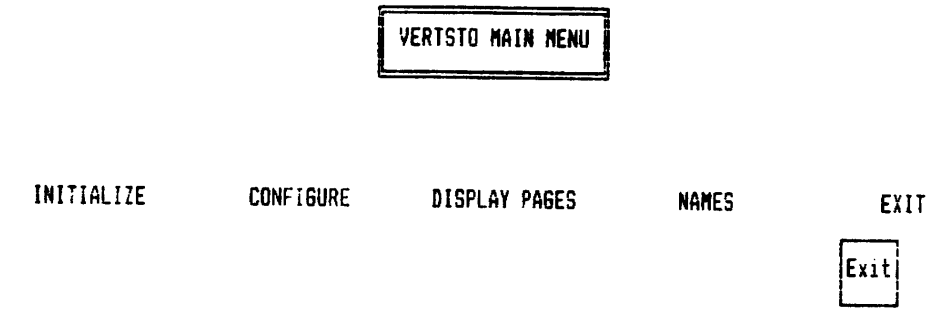

This screen is to confirm with the user before the VERTSTO starts to download the names from MILTRAC.




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

# PROGRAMMING/EXIT

## MAIN MENU/EXIT

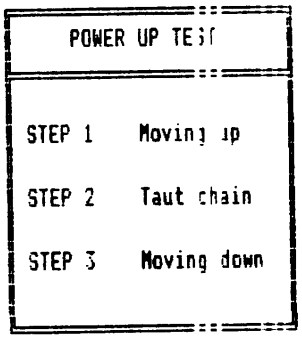


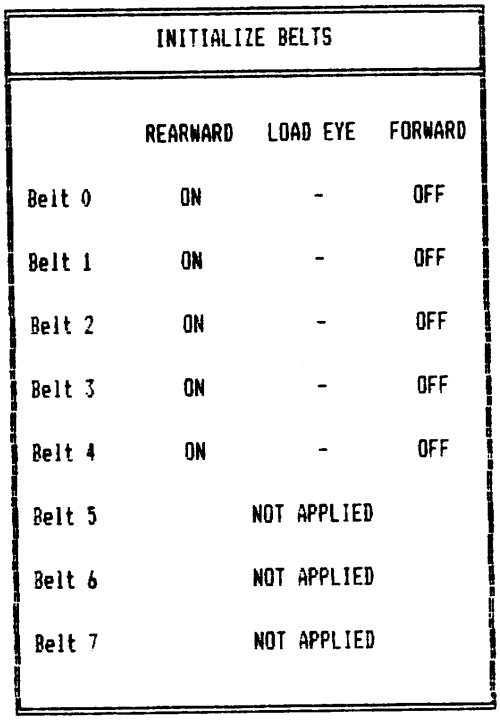

Exit Menu

Exit: To leave programming menu.

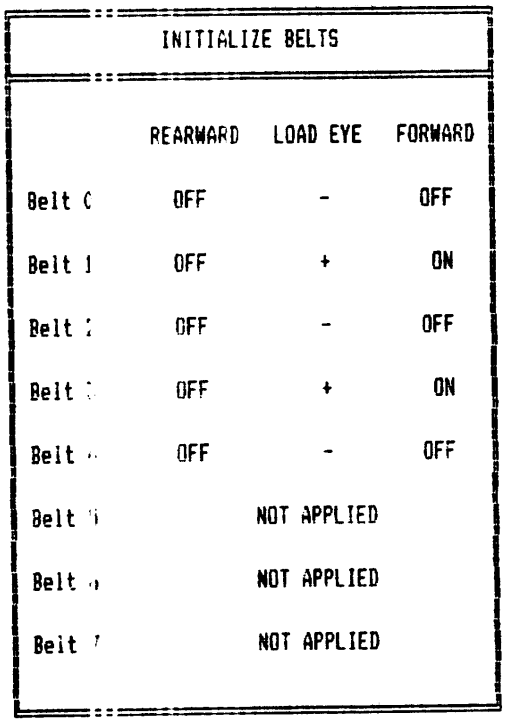
## OPERATION/INITIALIZE


This screen is to inform the user that the VERTSTO is in Bare manual mode (Contact Auto is not made).

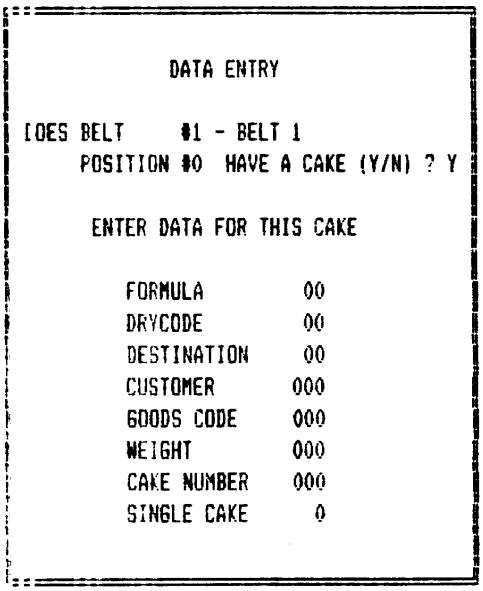



This screen appears when you power up the VERTSTO. The small window shows the actions being taken to test the Taut chain and Slack contacts of the VERSTO. The larger window shows the actions being taken to initialize all the belts on the VERTSTO (ON =Output is enable. OFF = Output is disabled. - = Input is not made. + = Input is made).



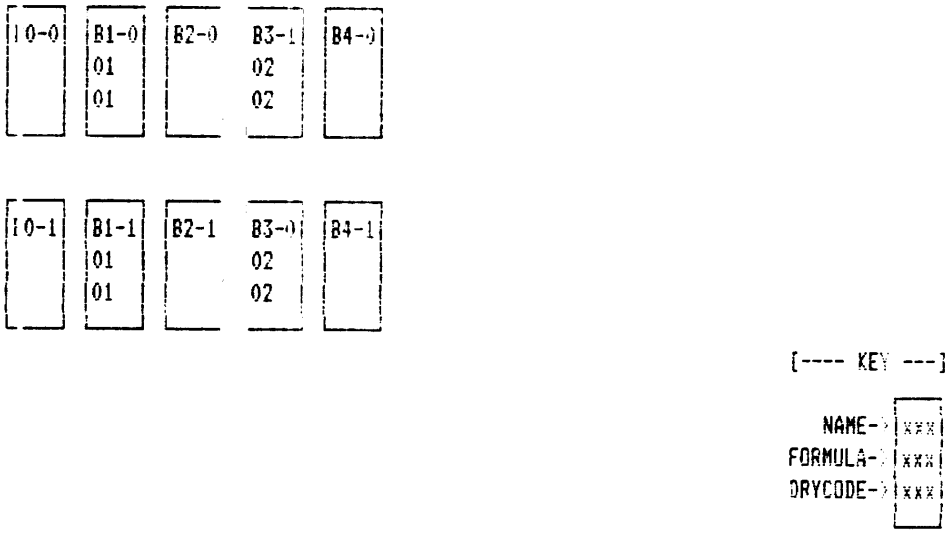

This screen appears when the VERTSTO initializes its belts (ON =Output is enabled. OFF =Output is disabled. - = Input is not made. + = Input is made).




This screen allows the user to enter the data after the VERTSTO initializes.

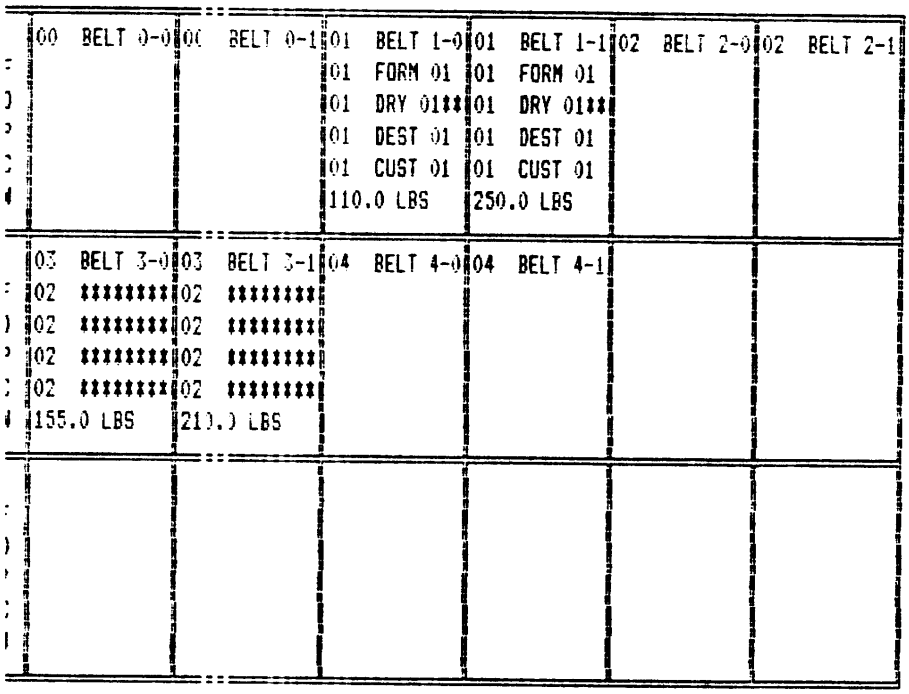
# OPERATION/MAIN PAGE

## MAIN PAGE

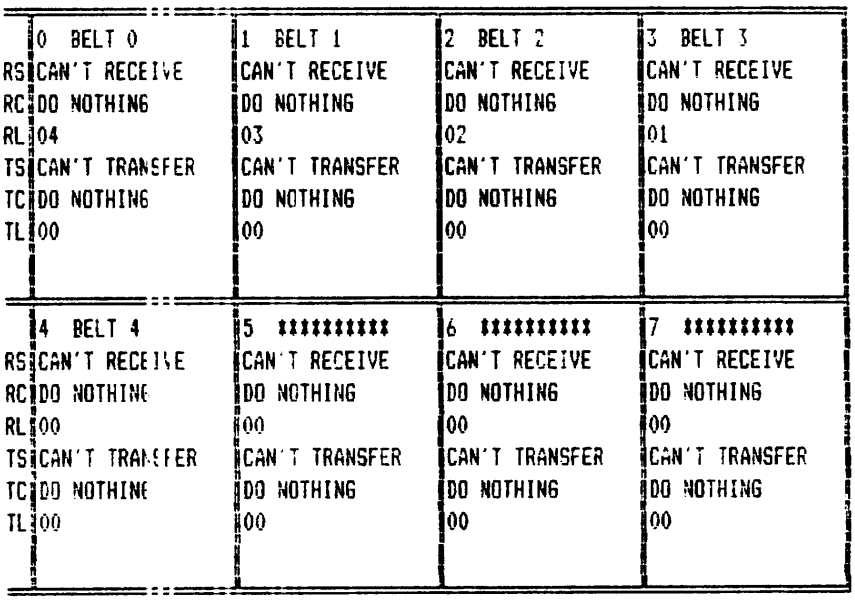



This screen is the Main page at run time. Each window shows the name and the data of the configured position. The bottom line shows the key instructions. The line right above it shows the page title, date, time and the action being taken by the VERTSTO.

## CAKE PAGE




This screen is the Cake page at run time. Each window shows the name and the data of the configured position. The bottom line shows the key instructions. The line right above it shows the page title, date, time, and the action being taken by the VERTSTO.

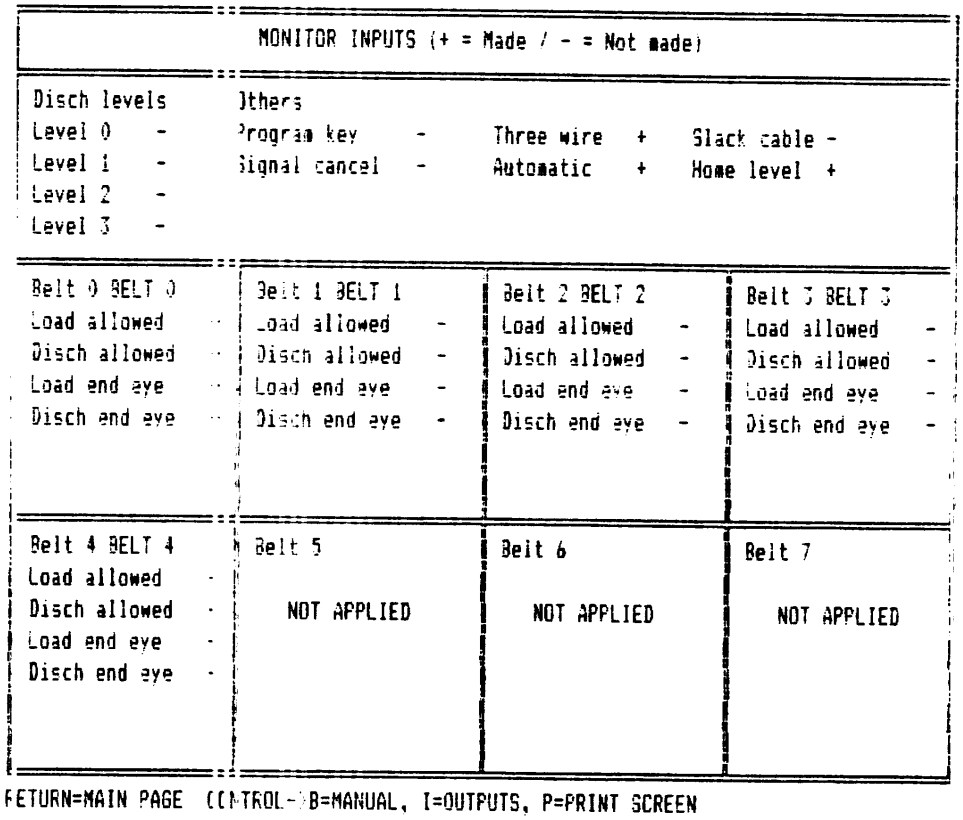



STATE PAGE - DATE 10/31 - TIME 08:28:04 RETURNING HOME
RETURN=MAIN PAGE CONTROL-> B=MANUAL, I=INPUTS, O=OUTPUTS SPACE BAR=More

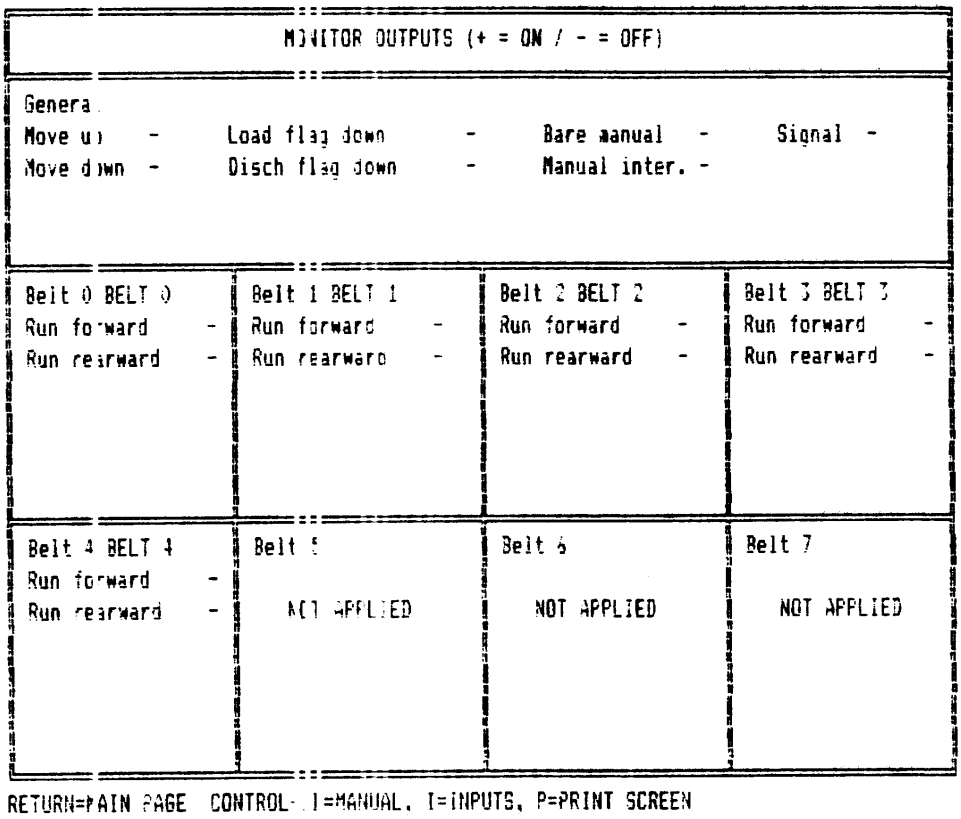
This screen is the Status page at run time. Each window shows the name, receive and transfer statuses of the VERTSTO, receive and transfer commands from MILTRAC, receive and transfer levels. The bottom line shows the key instructions. The line right above it shows the page title, date, time, and the action being taken by the VERTSTO.

# OPERATION/INPUTS-OUTPUTS

## MONITOR INPUTS/OUTPUTS



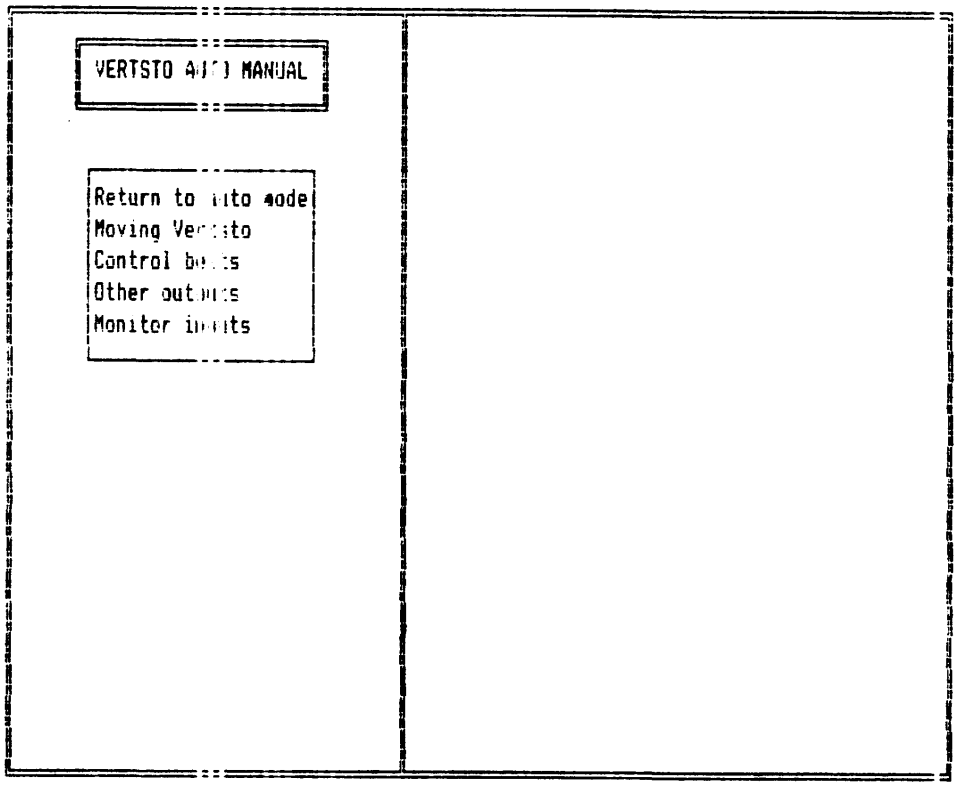

This screen is the Input page. This page shows statuses of all the inputs of the VERTISTO (- = Input is not made. + = Input is made). The bottom line shows the key instructions.



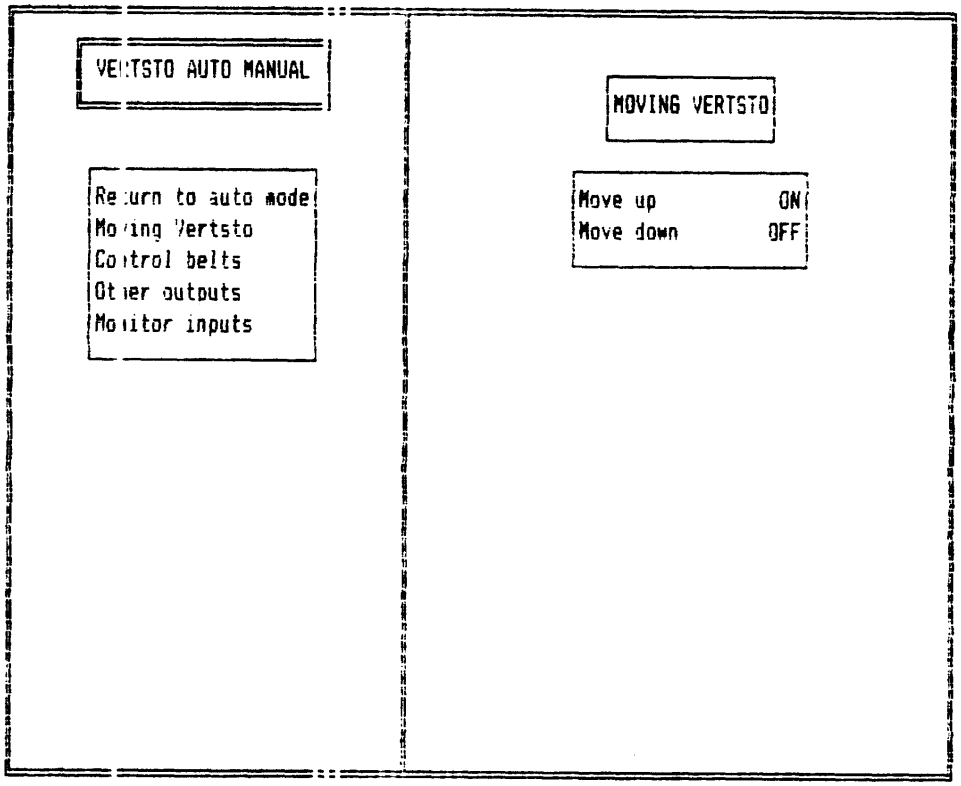

This screen is the Output page. This page shows statuses of all the outputs of the VERTSTO. (+ = Output is enabled. - = Output is disabled). The bottom line shows the key instructions.

# OPERATION/MANUAL

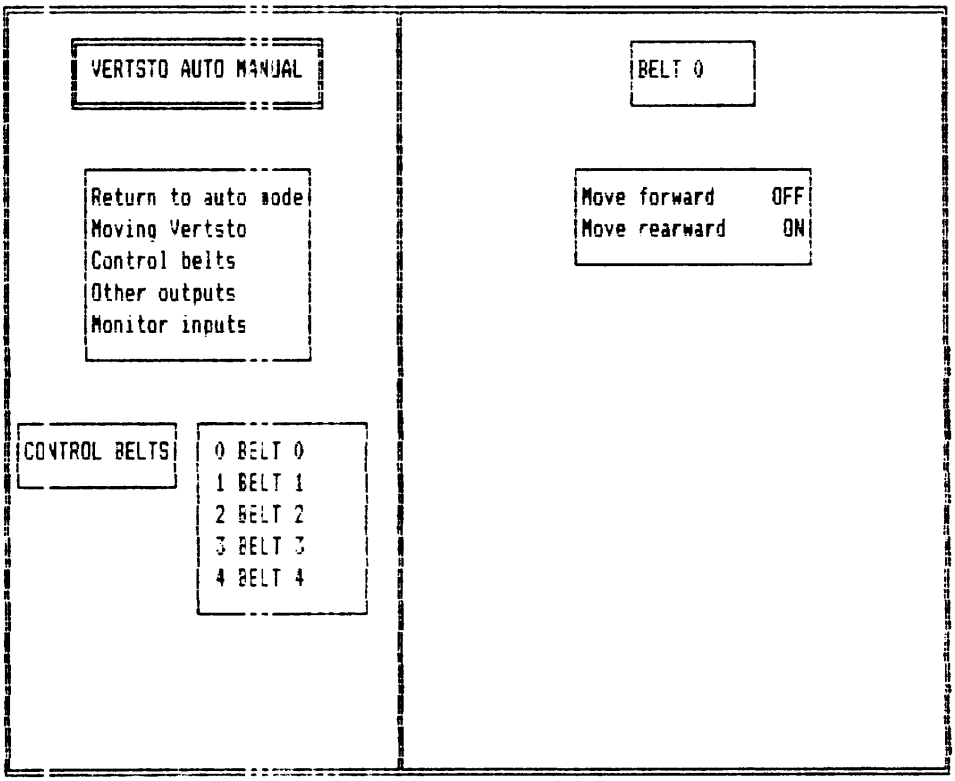
## MANUAL OPERATION



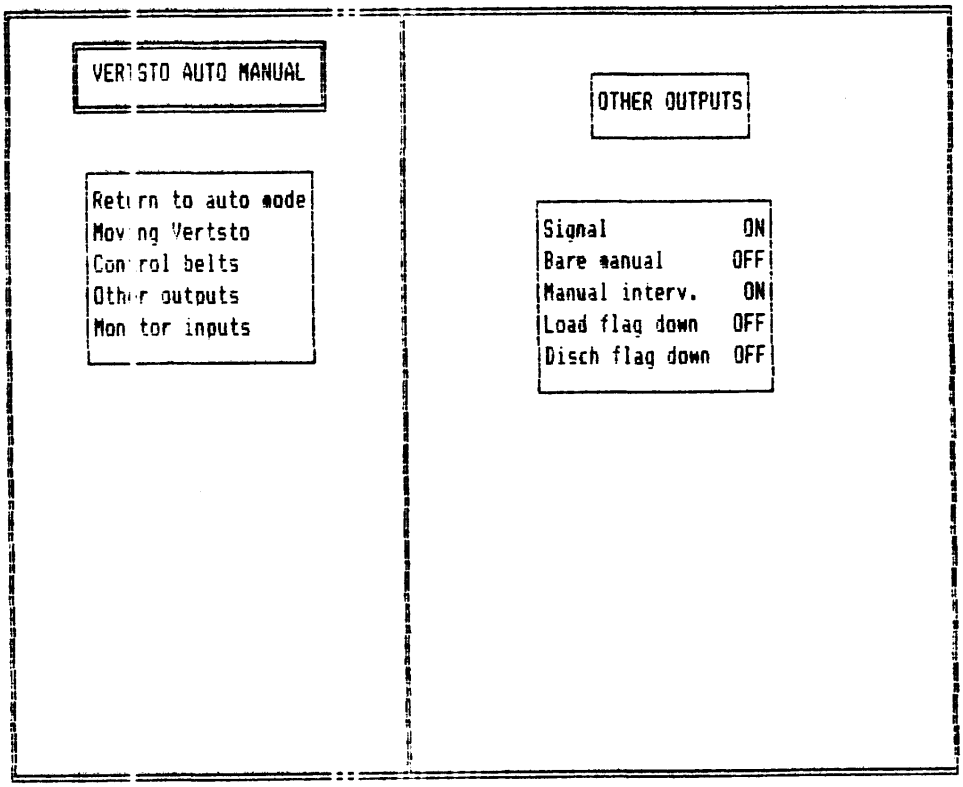

This screen is the VERTSTO Auto Manual screen. The Auto Manual mode in the VERTSTO allows the user to enable and disable one individual output at a time. The window below the title is a sub menu in Auto Manual mode which allows the user to select the type of outputs to enable.




This screen shows the Auto Manual mode in which the Moving VERTSTO sub menu is selected.




This screen shows the Auto Manual mode in which the Control belts sub menu, belt #0 is selected.




This screen shows the Auto Manual mode in which the Other outputs sub menu is selected.

# 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.

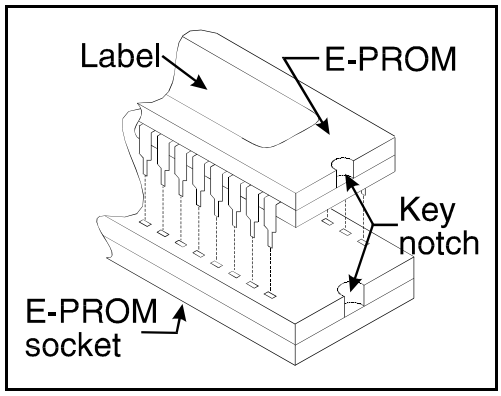
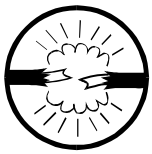



**FIGURE 1** (MSSM0217AE)
**Properly Seating the EPROM**

**⚠ 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.

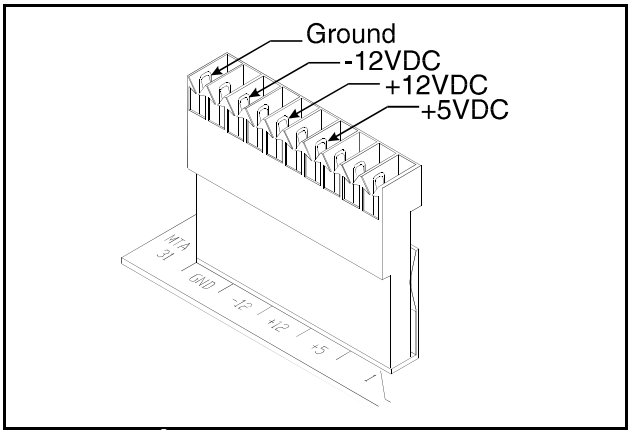



**FIGURE 2** (MSSM0217AE)
**MTA-31 on 8085 Processor Board**
(wires not shown for clarity)

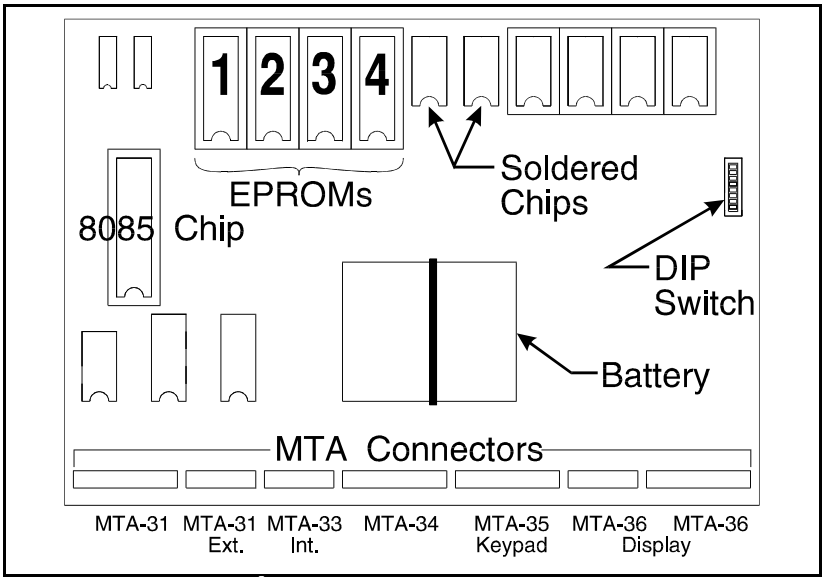



**FIGURE 3** (MSSM0217AE)
**8085 Processor Board (NOT Coin Machine)**

H

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

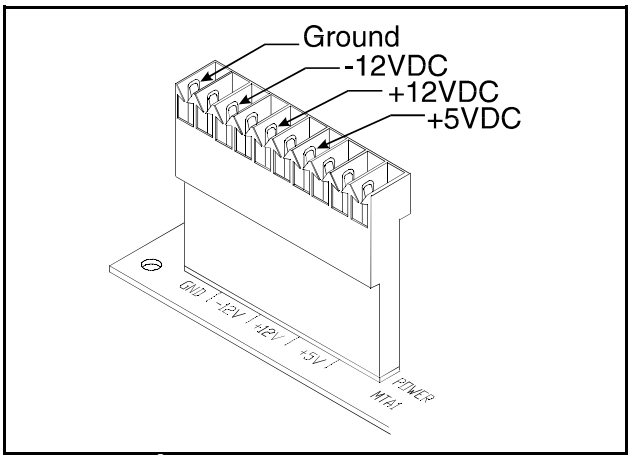



**FIGURE 4** (MSSM0217AE)
**MTA-1 in 8085 Coin Machine**
(wires not shown for clarity)

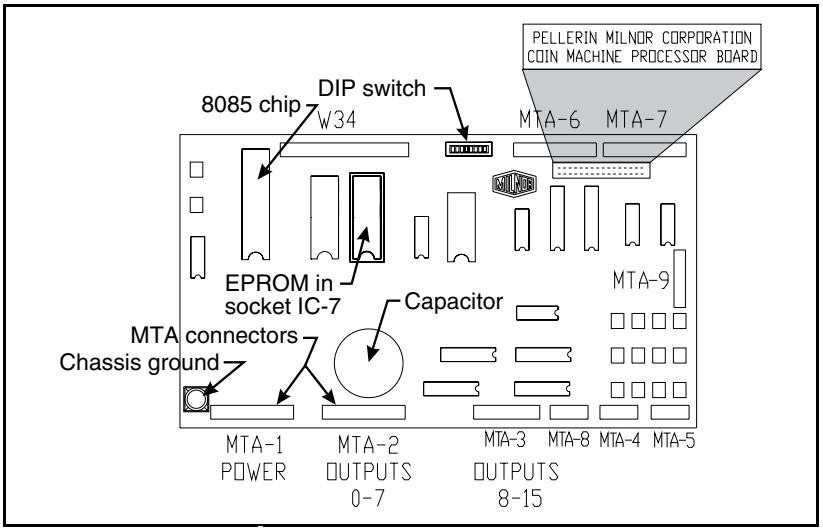



**FIGURE 5** (MSSM0217AE)
**8085 Coin Machine Processor Board**

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 | — | — | — |

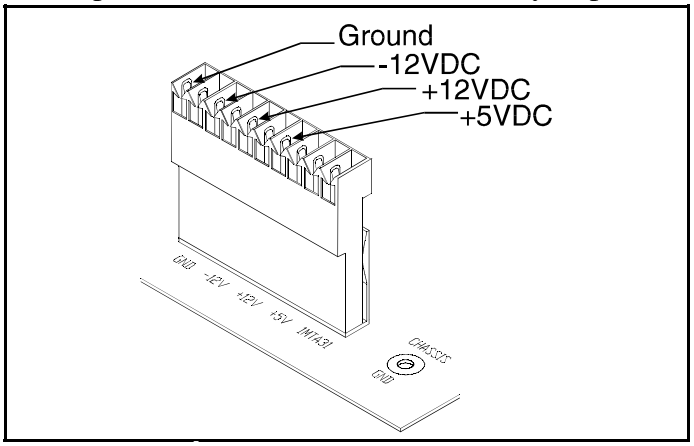



**FIGURE 6** (MSSM0217AE)
**1MTA-31 on 8088 Board** (wires not shown for clarity)

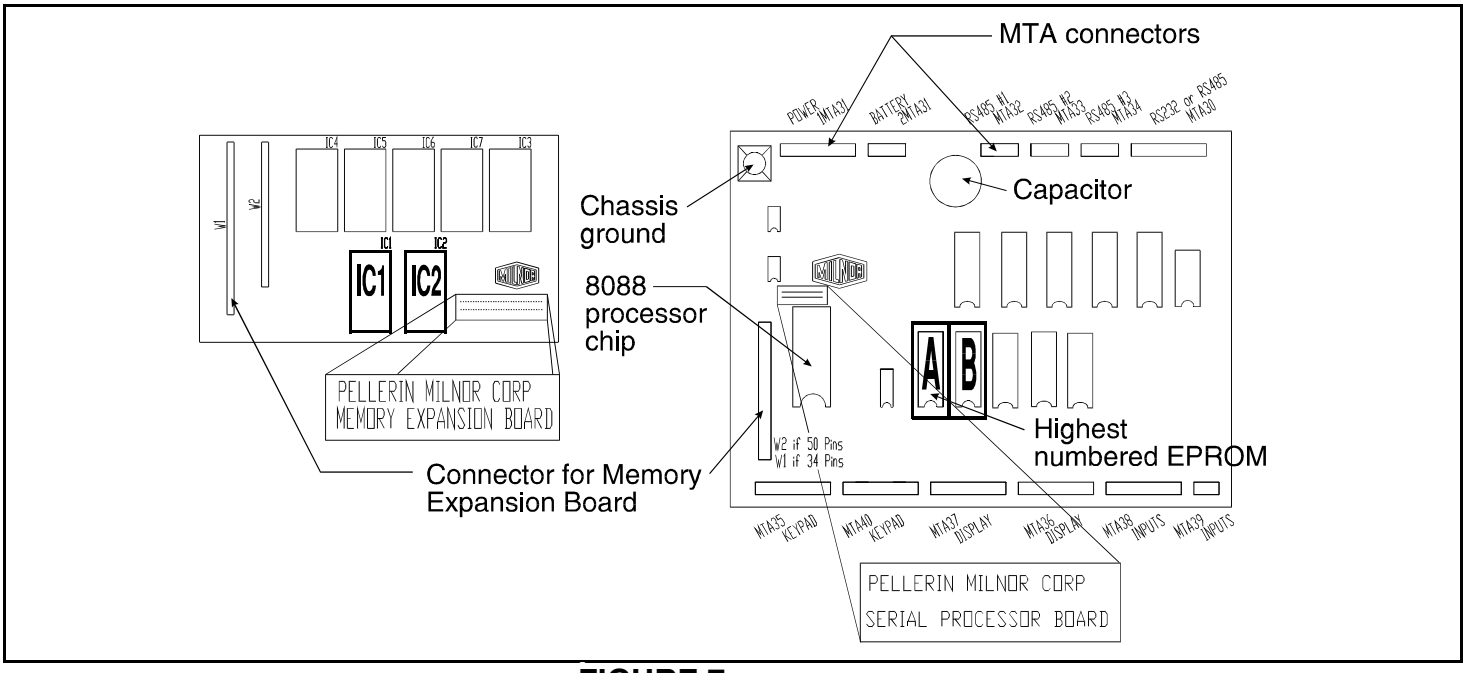



**FIGURE 7** (MSSM0217AE)
**8088 Processor Board and Optional Memory Expansion Board**

**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.

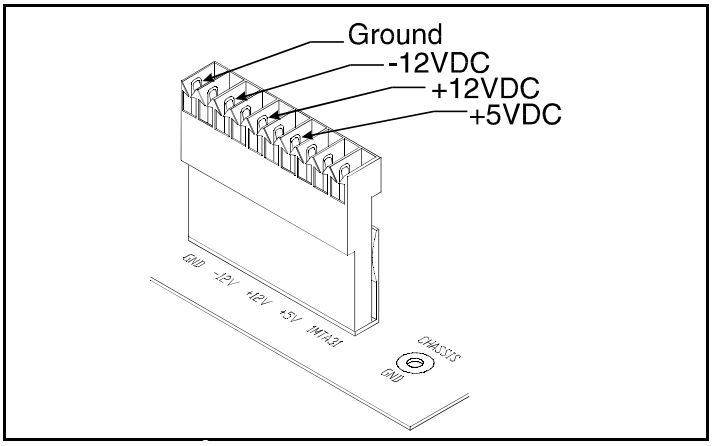



**FIGURE 8** (MSSM0217AE)
**1MTA-31 on 80186 Board** (wires not shown for clarity)

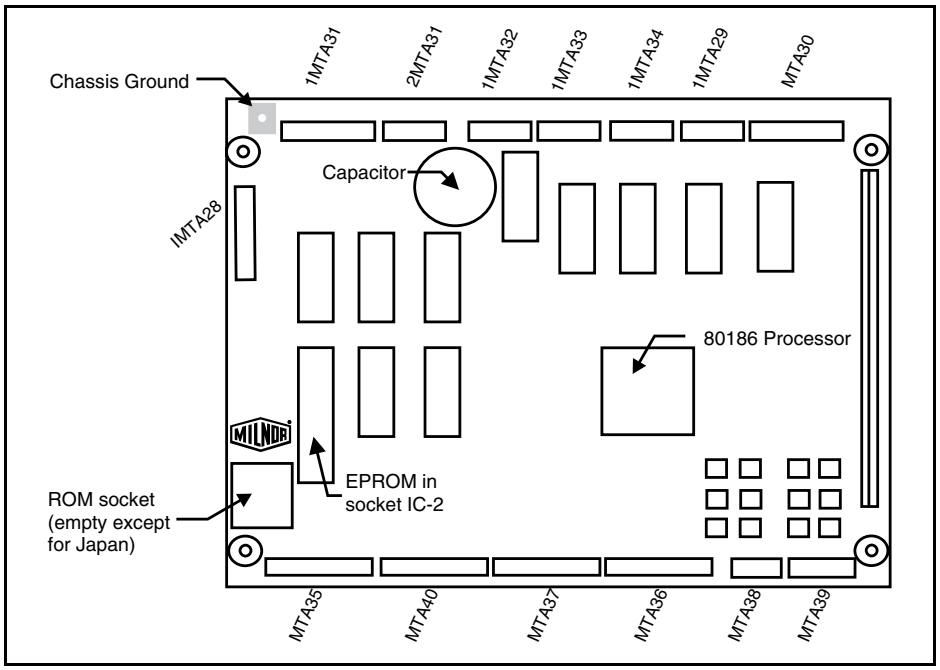



**FIGURE 9** (MSSM0217AE)
**80186 Processor Board**

# THE EXTERNAL SERIAL LINK CABLES AND HOW TO CONSTRUCT THEM

## General

Only three wires (two signal wires plus a ground, referred to in this section as a *serial link*) are required to transfer data from one Milnor® device to another. However, because the two optional serial communicating functions (*Download* and *Print Data*, but not interconnected networks such as Milnet®/Miltrac or Mildata® systems) are conducted through a single external DIN-type, 9-pin connector, different *serial links* will be required for the two functions; it may be necessary to temporarily disconnect one plug from the connector and insert another to access the other optional function. *Non-optional* serial communications (as between Mildata® networks and a bank of washer-extractors, or as between Milnet®/Miltrac systems and the press, shuttle, and dryers in a CBW® system) are hard-wired internally either at the factory or during system installation. Thus, except for some field retrofit situations, these network systems generally do not use the external connector mentioned above.

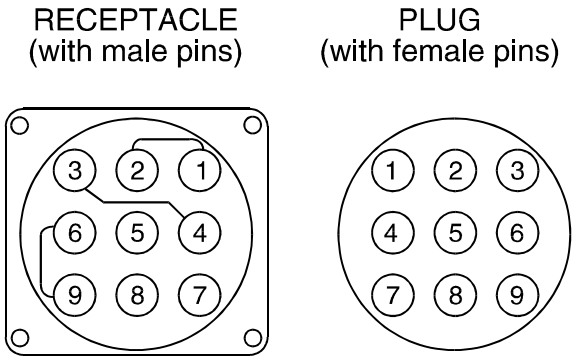
In Mildata® systems, the functions of *Download* and *Print Data* are usually performed at the Mildata® PC itself, but each washer-extractor (and certain other machines if their software supports it) can also *Download* or *Print Data* via its external connector.

**⚠ CAUTION ⚠**

**If *Download* or *Print Data* is performed from serial downloader-to-machine or machine-to-machine with machines in a Milnet®/Miltrac or Mildata® network system, *ALL* energized machines on the network will receive the downloaded data. Turn *off* power to any machines to which you do not wish to *Download*.**

# Pin Identification

Pin locations looking at the **wire entry side** of the female RECEPTACLE (i.e., from inside the enclosure). The female RECEPTACLE always has male pins. Ordinarily, all wires entering this RECEPTACLE are inserted at the factory. Pins 1+2, 3+4, and 6+9 on the RECEPTACLE have been connected together at the factory as shown.




Pin locations looking at the **wire entry side** of the male PLUG. The male PLUG always has female pins. The wires entering this PLUG are inserted by others when the Serial Link cables are fabricated in the field, and by the factory if for a SERIAL DOWNLOADER interface.

**FIGURE 1** (MSSM0227AE)
**Pin Locations in the External Serial Link Connector**

## Pin Assignments in the External Connector

| PIN NUMBER | FUNCTION | WIRES ON RECEPTACLE INSIDE ELECTRICAL ENCLOSURE | |
|---|---|---|---|
| | | Number | Color |
| 1+2 | SERIAL LOW | DLL | BLUE and BLACK |
| 3+4 | SERIAL HIGH | DLH | BLUE and RED |
| 5 | CLEAR TO SEND | CTS | BLUE and ORANGE |
| 6+9 | ELECTRONIC GROUND | 2G | BLUE and WHITE |
| 7 | TRANSMIT DATA | TXD | BLUE and ORANGE |
| 8 | +5DC | V1 | BLUE |

**⚠ CAUTION ⚠**

**AVOID EQUIPMENT DAMAGE—Never connect pin 8 between any machines or to the printer. This pin conducts +5VDC from the machine's power supply. Pin 8 is used only to power the SERIAL DOWNLOADER INTERFACE. If pin 8 is connected to any pin in the connector or the printer or any other machine, the two volt sources will clash and burn up expensive electronic components in both machines.**

# How To Construct (Wire) the Serial Link Cables

**The Type of Cable Wire To Use**—Use 18AWG four-conductor shielded cable. **Connect the shield to the ground at one end only.** See the various drawings below.

**⚠ CAUTION ⚠**

**AVOID EQUIPMENT DAMAGE—Never connect pin 8 between any machines or to the printer. This pin conducts +5VDC from the machine's power supply. Pin 8 is used only to power the SERIAL DOWNLOADER INTERFACE. If pin 8 is connected to any pin in the connector or the printer or any other machine, the two volt sources will clash and burn up expensive electronic components in both machines.**

## To Download From Machine-to (from)-Serial Downloader

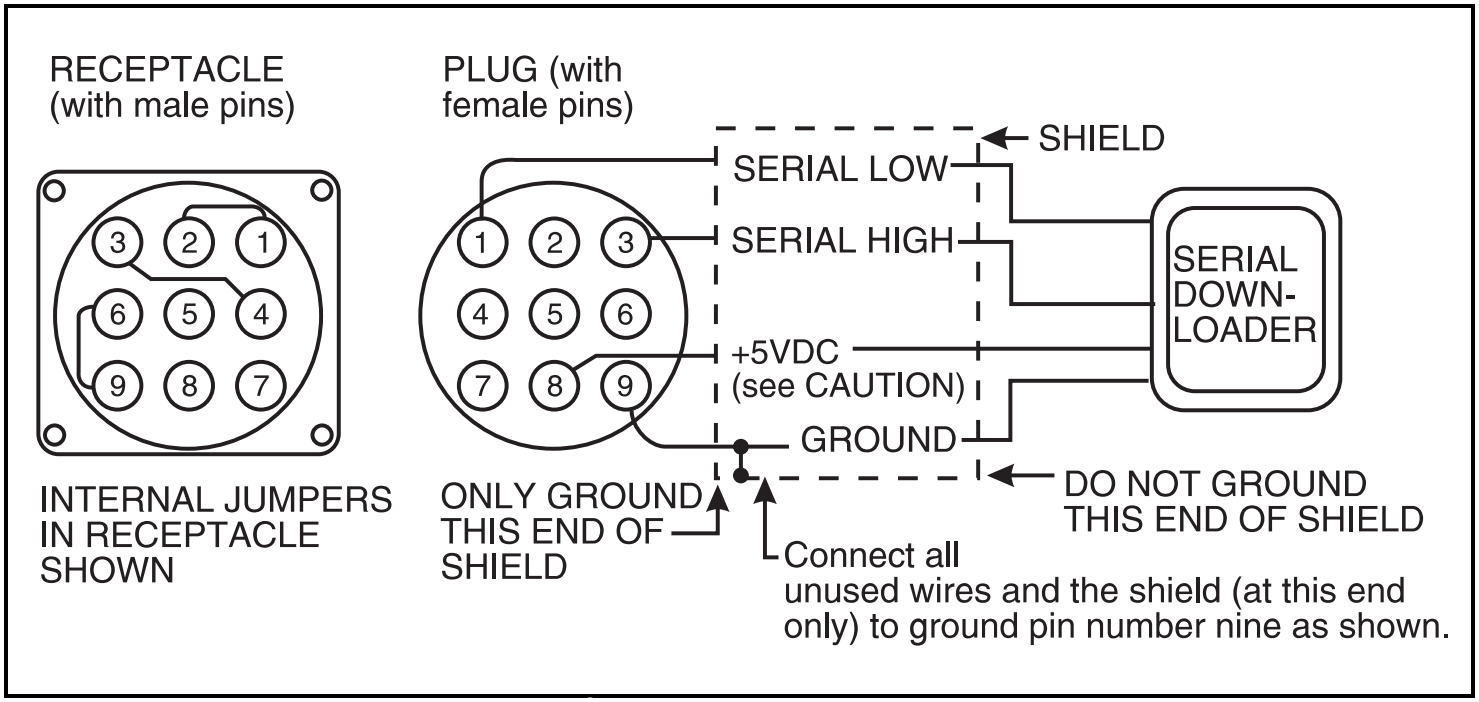



**FIGURE 2** (MSSM0227AE)
**Connections for Downloading Machine-to (from)-Serial Downloader**

**To Download From Machine-to-Machine(s)**—FIGURE 3 illustrates how to construct a daisy chain serial link cable to download data from one machine to several others simultaneously. It is best to program one (MASTER) machine (or to DOWNLOAD using SERIAL DOWNLOADER-TO-MACHINE if the data is already stored in the downloader) and then to use a serial link to program the remainder from that MASTER. Any machine on the serial link can be the MASTER.

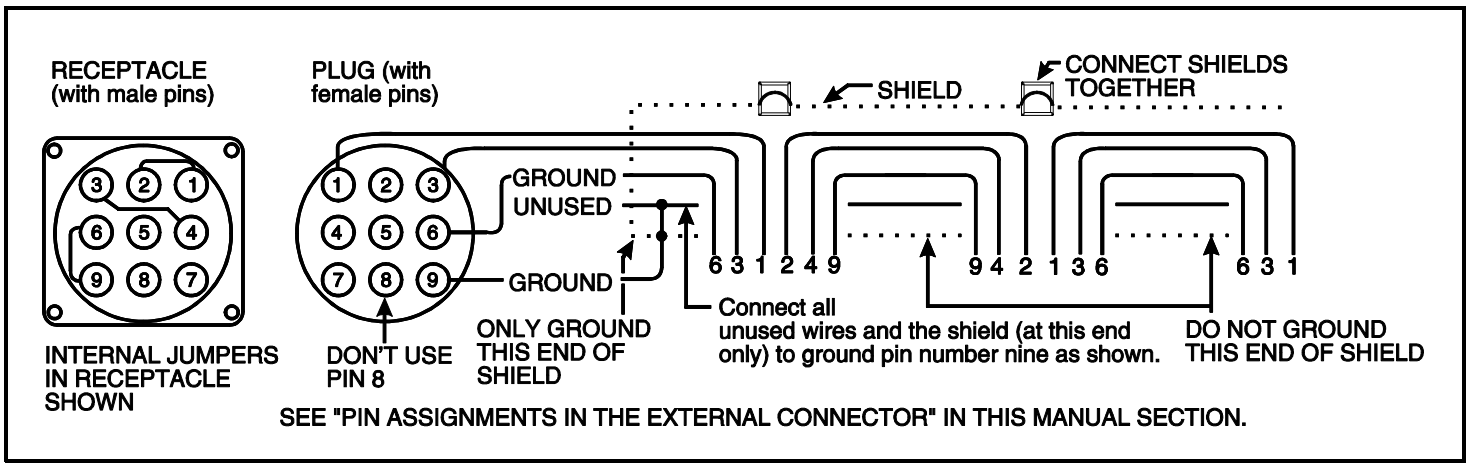



**FIGURE 3** (MSSM0227AE)
**Connections for Downloading From Machine-to-Machine(s)**

**For Print Data**—The connections shown in FIGURE 4 are made at the factory if the factory furnishes the printer, or by whomever provides the printer. Where applicable, see the appropriate programming section in this manual for an explanation of the Print Data feature (see Table of Contents).

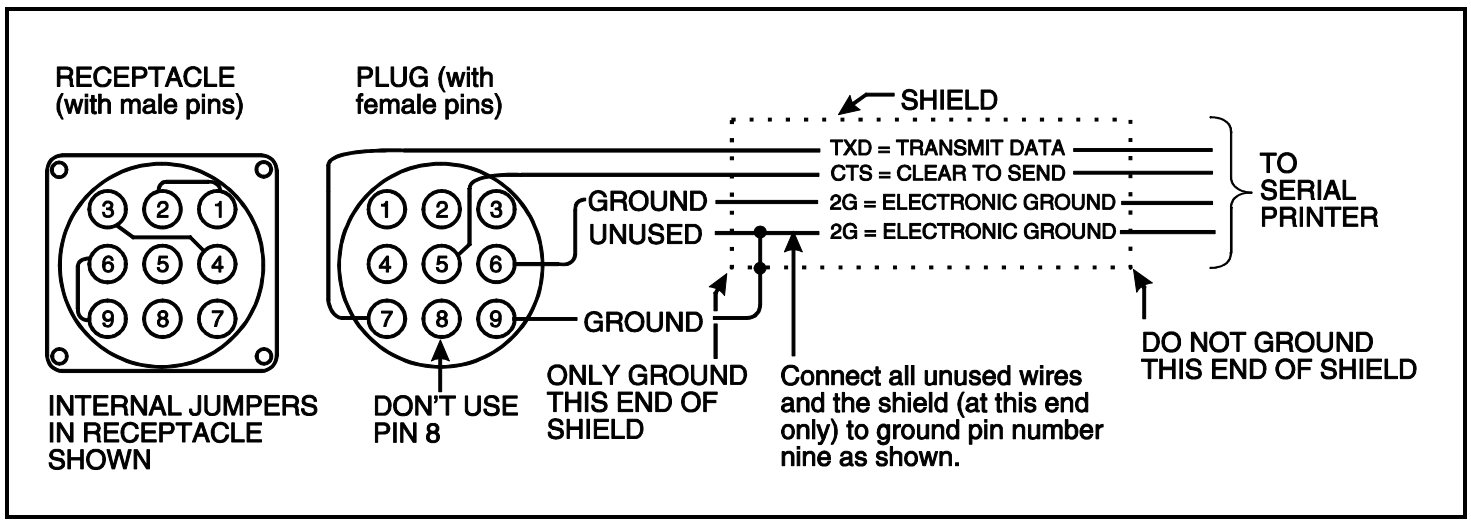



**FIGURE 4** (MSSM0227AE)
**Machine-to-Printer Connections**

# 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).

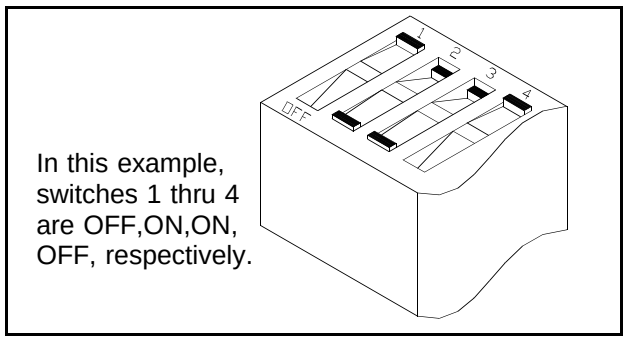



**FIGURE 1** (MSFDA401DE)
**DIP Switch ON/OFF Positions**

## 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. | | | | | | | | | | | | | | | | | |