

# Chapter 1: Functional Overview

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The *Functional Overview* chapter provides the user with the layout of the sorter machine's mechanical, electrical and computing hardware. This chapter also includes some definitions of terms, and a discussion of operational safety issues.

## **Chapter 1: Functional Overview - Contents**

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The *Functional Overview* chapter provides the user with the layout of the sorter machine's mechanical hardware, electrical controls, computer hardware and software, some terms and definitions, and sorter operational safety issues. The following areas are addressed:

- ◆ Machine Overview
  - ◆ Controls
  - ◆ Sections
- ◆ Safety

## Machine Overview

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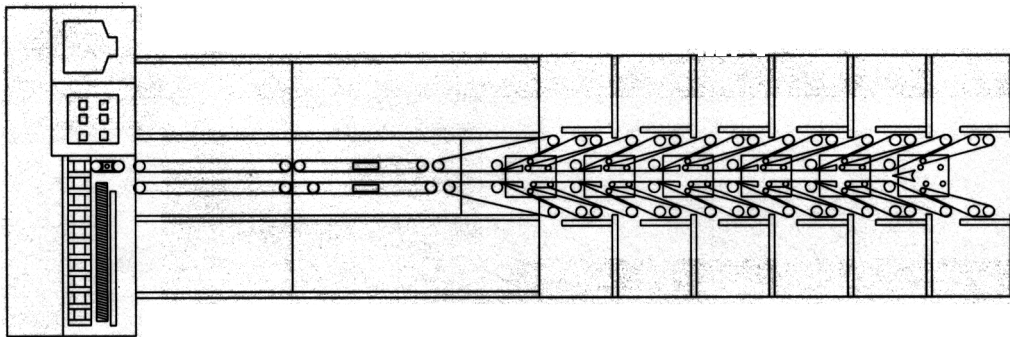


Figure: 1-1 Syste-Mail 2000 Sorter

The Docutronix Syste-Mail 2000 Sorter Machine consists of: Sorter Controls and Sorter Machine Sections.

**Sorter Controls** are divided into:

- ◆ Operator Controls
- ◆ Machine Controls

**Sorter Machine Sections** include:

- ◆ InFeed Section
- ◆ Mail Transport
  - ◆ BarCode Read Section
  - ◆ Cutter/Mail Opener Section
  - ◆ Pocket Section(s)

Refer to Figure 1-1 above, and the detailed description of each of these areas on the following pages.

## **Sorter Controls**

Controls are the electrical and computing components of the sorter that allow the operator to execute commands and thus cause the machine to function.

**Operator Controls** consist of the following components:

- ◆ Operator Control Panel
- ◆ SorterHost Computer
- ◆ Printer
- ◆ E-Stop Button(s)



Figure: 1-2 Operator Controls

### **Operator Control Panel**

The **Operator Control Panel** is located at the front left of the sorter. It contains the following switches, PushButtons and meters:

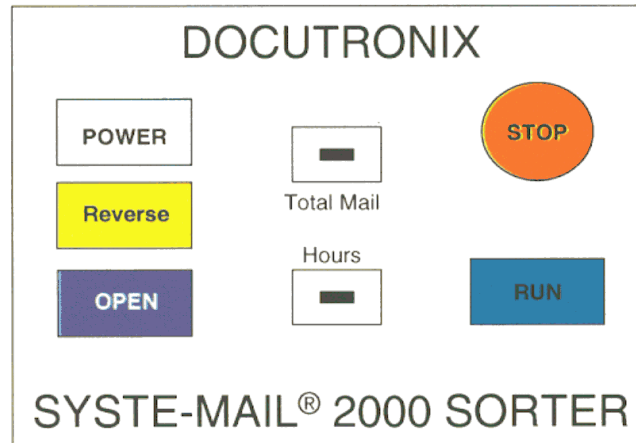


Figure: 1-3 Operator Control Panel

- |                |  |
|----------------|--|
| <b>Power</b>   | Lift the safety cover to access this button which toggles the control power of the sorter machine ON and OFF. The button is illuminated when the control power is ON. Be aware that this switch does not control all power within the sorter. The 3 $\phi$ power disconnect switch must be set to OFF and the UPSs must be switched OFF for all power within the sorter to be off. |
| <b>Reverse</b> | Reverses the InFeed Conveyor direction when running.   |
| <b>Open</b>    | Operates the mail opener/cutter motor. This operates only when the sorter is running. Illuminated with OPEN.   |
|                | Starts the transport and vacuum systems. Illuminated in RUN.   |
|                | Stops the transport and vacuum systems. The E-Stop buttons perform the same function and are located down the length of the sorter transport.  |
| <b>Total</b>   | Provides a rough count of all mail pieces fed through the sorter.  |
| <b>Hours</b>   | Indicates the total hours the transport has run.   |

The **SorterHost Computer** is a PC that is used to enter mail sorting parameters, produce reports, execute diagnostics and to control the sorter machine using the SorterHost software commonly referenced as the "Host Computer Interface" or "Operator Interface".

The operator completes all necessary tasks by using the touch screen, keyboard and mouse of the SorterHost computer and will not need to access the SorterController PC CPU unit.

The **Printer** is attached to the SorterHost Computer to produce hardcopy reports and listings.

The **E-Stop Button(s)** are emergency stop buttons used to stop the transport and vacuum systems of the sorter machine in case of an emergency. Several of these large red palm sized buttons are located down the length of the transport.

**Machine Controls** consist of the following components:

- ◆ SorterController Computer
- ◆ Electrical Control Enclosure
- ◆ UPS(s)
- ◆ Main Power Breaker

The **SorterController** computer is located behind a front panel of the sorter machine. This computer is the workhorse of sorter as it collects and passes data to and from the SorterHost computer, the Bar Code reader, the PocketBoards, while also controlling all of the signal Input/Output (I/O) functions in the front area of the machine during the sorting operation. It executes advanced diagnostics and communicates with the SorterHost computer during maintenance operation.

The **Electrical Control Enclosure** contains all of the High Voltage connections for the sorter. It is **UL** rated and located beneath the front InFeed section.

The **UPS(s)** (Uninterruptible Power Supply) is an emergency power supply for the computers. Should there be a power failure to the machine, the computers will continue to receive power for three minutes to allow for a clean shut down of the software programs. The UPS(s) are located beneath the machine panels. When the UPS(s) is on, the green indicator light of the on/off switch is illuminated. To turn off the UPS(s), switch the on/off switch located on the front of the UPS(s) to the off position indicated by the number zero.

The **Main Power Breaker** is located in the front of the machine, underneath the InFeed section. The Main Power Breaker is used to switch off all power to the sorter in an emergency situation or as part of a Maintenance function.

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➤Note: When the main power breaker is switched off, The UPS(s) may still provide 120 VAC to the computers, and power to the 5 Volt power supplies of the pocket boards.

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## **Sorter Machine Sections**

Sections include the following components:

- ◆ InFeed Section
- ◆ Transport Sections
  - ◆ BarCode Read Section
  - ◆ Mail Cutter/Opener Section
  - ◆ Mail Pocket Sections

Each of these components is described on the following pages.

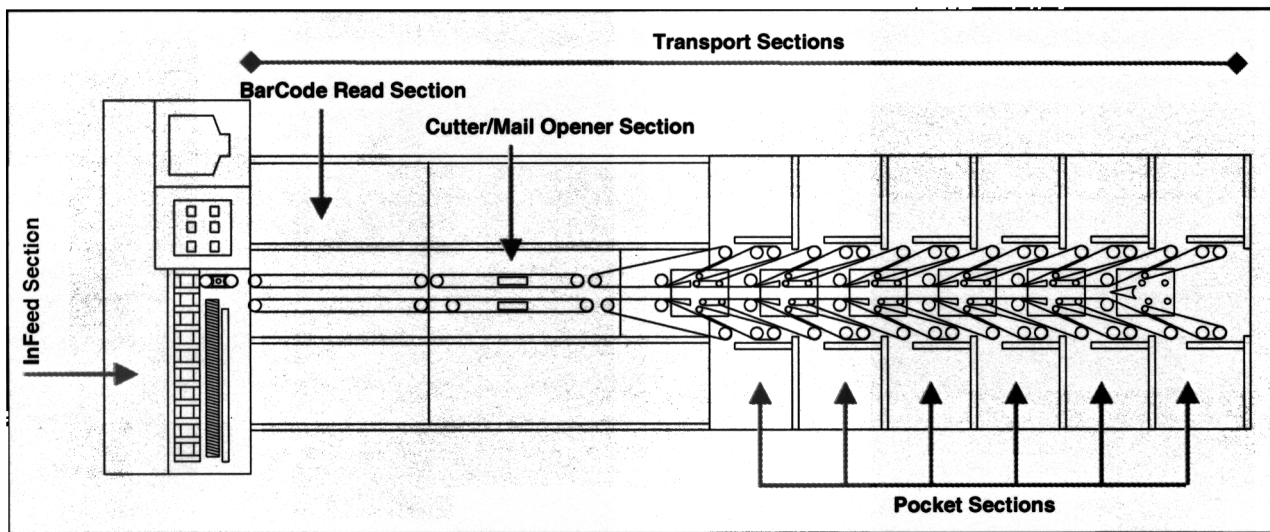


Figure: 1-4 Syste-Mail 2000 Sorter Components



### **InFeed Section**

The InFeed Section is comprised of the following components:

- ◆ InFeed Conveyor and Bails
- ◆ Back Stop
- ◆ Mail Jogger
- ◆ InFeed Direction Control Switch
- ◆ Pick-Off Vacuum and Belt

Mail to be processed is fed into the machine by placing it on the **InFeed Conveyor**, loosely packed between the conveyor **Bails**, and against the **Back Stop**.

The **Back Stop** helps to keep the mail aligned evenly as it travels on the InFeed Conveyor to improve uniform pick-off.

The **Mail Jogger** helps to separate and settle the mail as it travels on the InFeed Conveyor toward the Pick-Off Vacuum belt.

The **InFeed Direction Control Switch** prevents mail from jamming against the Pick-Off Vacuum belt. When pressure is applied against the InFeed Direction Control Switch, the InFeed Conveyor will reverse it's direction to release the pressure.

The **Pick-Off Vacuum** and **Pick-Off Belt** then carries the envelopes by vacuum suction and friction to the transport belting and the sorting process begins.

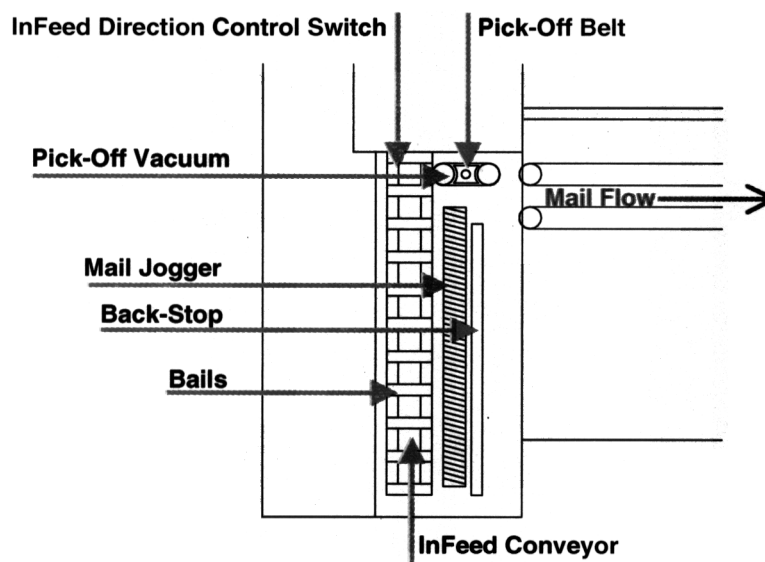


Figure: 1-5 InFeed Section

## **Transport Sections**

The Transport Sections are comprised of the BarCode Read, Mail Cutter/Opener and Pocket Sections.

### **BarCode Read Section**

The BarCode Read Section is comprised of the following components:

- ◆ Read Head (and related wiring/cables)
- ◆ Vertical Adjustment
- ◆ Two Horizontal Adjustments
- ◆ Read Head Tilt Adjustment

The **Read Head** is a device that scans the bar codes on the envelopes using laser light in a raster pattern, and transmits the bar code data to the SorterController. The SorterController, based on the SortPlan's BarCode information will decide what action to perform with that particular envelope.

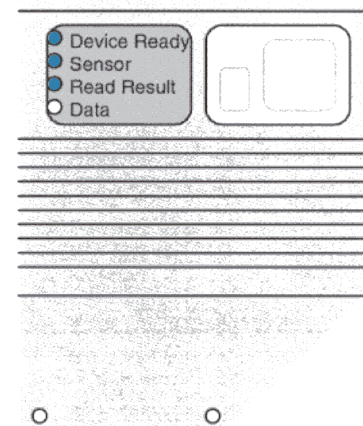


Figure: 1-6 BarCode Read Head

**Vertical Adjustment** allows the Read Head to be moved up or down (higher or lower) depending on the height of the envelopes and location of the bar code for a particular mail sort job. The visible Read Head scanning lines should align so that all of the bar code is illuminated. Refer to Chapter 3: *Sorter Operations* for detailed instructions on using the Vertical Adjustment.

The two **Horizontal Adjustments** allow the Read Head to be moved closer to or further from the transport centerline to provide better focus on the bar code, and closer or further away from the first Photo Electric Eye on the transport to adjust for variances in the mail piece's bar code window placement. Refer to Chapter 3: *Sorter Operations* for detailed instructions on using the Horizontal Adjustments.

The **Read Head Tilt Adjustment** allows the Read Head to be tilted on an angle for use with envelopes having plastic covered bar code windows (glassine). Refer to Chapter 3: *Sorter Operations* for detailed instructions on using the Tilt Adjustment.

### **Mail Cutter/Opener Section**

The Mail Cutter/Opener Section is comprised of the following components:

- ◆ Opener Cutter Wheel
- ◆ Opener Vacuum and Collection Tank
- ◆ Cutter Ramp

The **Mail Opener Cutter Wheel** is a sharp machine tool blade that will cut open envelopes as they pass through this section. Generally only a few thousandths of an inch (approximately .031") are removed from the bottom of the envelope.

➤ Note: The blades of the Cutter Wheel are extremely sharp. Do not place your fingers, or any foreign object on or near the Cutter Wheel at any time while it is running as this could cause personal injury and/or damage to the machine.

The **Opener Vacuum** removes the paper cuttings and dust to the **Collection Tank** located beneath this sorter section. The paper cuttings collection tank should be emptied periodically by maintenance personnel as prescribed in the Maintenance Manual. Follow the Daily Maintenance Procedures for clearing this area of debris as found in Chapter 3: *Sorter Operations*.

Depending on the SortPlan, some envelopes may be opened, while others are not. The **Cutter Ramp** is raised and lowered automatically to selectively open envelopes.

## **Pocket Sections**

The Pocket Sections are comprised of the following components:

- ◆ Pockets
- ◆ Spindles and Belts
- ◆ Diverter Gates
- ◆ Sender/Receiver Photoelectric Eyes (PE)
- ◆ Pocket Paddles
- ◆ Reflex Photoelectric Eyes (PE)
- ◆ Pocket Full Indicator Lights with Integrated Reset PushButtons (PB)
- ◆ Pocket Full Limit Switches (LS)

**Pockets** are the rectangular areas along the transport that collect the mail. Four consecutive pockets (such as numbers 1 through 4) comprise a pocket module. The sorter is constructed so that pocket modules can be added or removed so as to lengthen or shorten the sorter. The last group of four pockets, or the last pocket module differs from the rest in that the gate for the last even pocket is in a fixed position. This last pocket is the mechanical reject pocket, and the gate is always open.

**Diverter Gates** are also referred to as “flippers”. These triangular shaped components are located in pairs down the centerline of the mail transport between the transport belts. Gates flip from their center position when activated to divert mail to a particular pocket.

The Diverter Gate located in the Terminal Pocket is a solid triangle that is positioned off center to divert mail to the last pocket (mechanical reject pocket) of the transport.

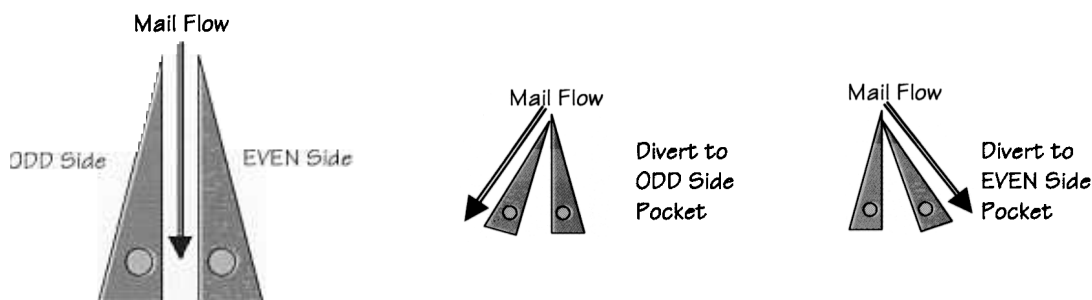


Figure: 1-7 Gates Open and Divert

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➤Note: Misaligned gates may cause mail jams. Refer to Chapter 4: *Troubleshooting* for additional information on gate alignment.

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**Sender/Receiver Photoelectric Eyes (PE's)** are located in pairs along the centerline of the transport between each pocket pair. A beam of red light is sent from one and received by the other fiber optic cable. When this beam of light is broken by a passing envelope, a message is transmitted to the SorterController or PocketBoard for appropriate processing.

**Spindles** are located throughout the pocket section. The transport **Belts** are wound around these spindles. There are two types of spindles: driven and idler. Driven spindles are rotated by an AC motor under the module causing the belts to move (spin) which advances the envelopes down the transport path. Idler spindles act simply as rollers. Once all of the motors are energized, the belts move and envelopes can travel down the transport to their designated pocket.

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➤ **Note:** Spindles that do not turn smoothly can cause wear on the belts by causing excess friction during rotation.

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**Reflex Photoelectric Eyes** are also known as the Pocket Empty PEs and are located in front of each pocket. They are triggered ON when the pocket has received the first mail piece, and they are triggered off when the pocket is empty of mail. The Pocket Empty PE works in control logic with the Pocket Full Indicator Light and Pocket Full Limit Switch when sweeping mail from pockets.

**Pocket Paddles** ensure that the mail collected in the pocket remains upright. Their resistance can be changed by adding or removing calibration weights from beneath the pocket. They also assist the operator in removing mail (sweeping) from the pocket.

**Pocket Full Indicator Lights** are located at the right outer edge of each pocket. During the sorting operation, once a pocket has been filled the Pocket Full Indicator Light is illuminated. These yellow lights contain the full pocket Integrated Reset PushButtons (PB). Once the Integrated Reset PushButton is depressed, and the mail is completely swept, the Pocket Full Indicator Light will turn off. The Reflex Photoelectric Eyes must detect the flat black surface of the paddle before it will communicate it's off-state to the SorterController, so that the Pocket Full Indicator Light will turn off.

**Pocket Full Limit Switches** are located at the end of the pocket on the right hand rail. When using SortPlans having "Fill-To-Full" settings, when a pocket is filling with mail and the paddle reaches the fully extended end of the pocket, the limit switch will be triggered. The SorterController will be

notified that this pocket is full and additional envelopes cannot be sent to it until it has been cleared by sweeping the mail and depressing the Reset PushButton of the Pocket Full Indicator Light. When using SortPlans having "Fill-To-Count" settings, if the limit switch is encountered and count was not achieved, mail is temporarily sent to the reject pocket until the switch is released.

## **Safety Issues**

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The Docutronix Syste-Mail 2000 is a machine consisting of numerous moving parts and high voltage electrical motors. Care on the part of the operator must be taken to ensure their physical safety. The operator must be aware of the hazards created by the mechanical moving parts of the machine.

### **Mechanical**

#### **Sorter**

The sorter contains exposed moving parts, sharp edges, and pinch-points. Care should be taken at all times when the sorter is running to avoid personal injury. Personnel operating the sorter should always visually check to see that these areas are clear before beginning.

- ◆ Moving parts
- ◆ Pinch points (places where fingers can get caught)
- ◆ Cutter wheel (Mail Opener saw)
- ◆ Moving belts on the transport
- ◆ Bails/jogger

#### **Workspace/Environment**

Maintaining a clean, clutter free and clear work space environment prevents walking/tripping hazards while working around a running sorter.

- ◆ Keep the area around the sorter free of walking hazards
- ◆ Maintain at least a three foot perimeter clear of any obstructions such as mail carts or mail material around the machine.
- ◆ Sweep the area clear of debris
- ◆ Do not place any obstructions within three feet of the sorter Machine.
- ◆ Avoid tripping hazards by maintaining at least three feet of clearance around the sorter.

## **Operator/Personnel**

Foreign objects can be caught in the sorter's moving parts and could cause personal injury and/or damage to the machine. The Operator must be aware of potential hazards from:

- ◆ Identification Badges
- ◆ Loose hair
- ◆ Loose clothing, such as:
  - Shirt sleeves
  - Ties or scarves
  - Shirt tails
  - Jackets
- ◆ Hanging jewelry

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➤ Safety Tip: To avoid personal injury and damage to the machinery place (tuck) ID badges inside a shirt or blouse pocket by using the clip to secure it in place and tuck the badge chain inside of clothing.

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## **Electrical**

All high voltage (208-240 VAC) lines are safely enclosed in the "Electrical Control Enclosure" and distribution panels. The Electrical Control Enclosure should never be opened by unauthorized or non-trained personnel. Reference the Maintenance Manual for further information.