FINISHER-F1/ SADDLE FINISHER-F2

SERVICE MANUAL

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 FINISHER-F1/SADDLE FINISHER-F2 REV. 0 JULY 2000 PRINTED IN JAPAN (IMPRIME AU JAPON)

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INTRODUCTION

This Service Manual contains basic data and figures for the Finisher-F1/Saddle Finisher-F2 needed to service the machine in the field.

This manual comprises the following chapters:

Chapter 1	“General Description” introduces the finisher’s features, specifications, and names of parts, and shows how to operate the finisher.
Chapter 2	“Finisher Unit Basic Operation” discusses the principles of operation used for the finisher mechanical and electrical systems. It also explains the timing at which these systems are operated.
Chapter 3	“Saddle Finisher Unit Basic Operation” discusses the principles of operation used for the saddle stitcher unit’s mechanical and electrical systems. It also explains the timing at which these systems are operated.
Chapter 4	“Puncher (option) Unit Basic Operation” discusses the principles of operation used for the puncher unit’s mechanical and electrical systems. It also explains the timing at which these systems are operated.
Chapter 5	“Mechanical System” discusses how the finisher is constructed mechanically, and shows how it may be disassembled/assembled and adjusted.
Chapter 6	“Maintenance and Inspection” provides tables of periodically replaced parts and consumables and durables, together with a scheduled servicing chart.
Chapter 7	“Troubleshooting” shows how to troubleshoot possible faults and gives electrical parts arrangement diagrams, LED/check pin diagrams by PCB, and self diagnosis tables.

“Appendix” contains diagrams showing tables of signals, overall circuit diagrams and tables of solvents/oils.

Descriptions regarding installation are not mentioned in this Service Manual as the Finisher-F1/Saddle Finisher-F2’s packing boxes contain Installation Procedures.

The descriptions in this Service Manual are subject to change without notice for product improvement or other purposes, and major changes will be communicated in the form of Service Information bulletins.

All service persons are expected to have a good understanding of the contents of this Service Manual and all relevant Service Information bulletins, and be able to identify and isolate faults in the machine.

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CHAPTER 1 GENERAL DESCRIPTION

CHAPTER 2 FINISHER UNIT BASIC OPERATION

CHAPTER 3 SADDLE STITCHER UNIT BASIC OPERATION

CHAPTER 4 PUNCHER UNIT (OPTION) BASIC OPERATION

CHAPTER 5 MECHANICAL CONSTRUCTION

CHAPTER 6 MAINTENANCE AND INSPECTION

CHAPTER 7 TROUBLESHOOTING

APPENDIX

CHAPTER 1

GENERAL DESCRIPTION

I. FEATURES

1. Accommodates large quantities of sheets

- Normally, the finisher holds a stack of sheets 147 mm in height in its two bins (small-size paper: equivalent to 1000 sheets)/74 mm in height (large-size paper: equivalent to 500 sheets)

2. Has high paper transportation performance

- The finisher is capable of handling papers between 64 and 200 gm/m^2.

3. Offers a job offset function

- The finisher has a job offset function for sorting non-stapled stacks of copies.

4. Offers four types of auto stapling

- The finisher offers a choice of four stapling modes (1-point stapling at rear, diagonal stapling at front, diagonal stapling at rear, 2-point stapling).

5. Uses a buffer roller

- The use of a buffer roller enables the finisher to accept copies without interruption from the host machine even during stapling or offset operation.

6. Has a saddle stitch function (Saddle Finisher-F2)

- The finisher can staple along the center of paper and fold it in two (up to 15 sheets).

7. Offers a punch function (option)

- The use of the puncher unit enables the finisher to punch sheets for binders before they are output. (The puncher unit is capable of handling papers between 64 and 200 gm/m^2. It cannot handle special paper, postcards and transparencies.)

II. SPECIFICATIONS

A. Specifications

1. Finisher Unit

<table>
<tr><th>Item</th><th colspan="3">Description</th></tr>
<tr><td>Stacking method</td><td colspan="3">Trays 1 and 2: by lifting tray</td></tr>
<tr><td>Stacking orientation</td><td colspan="3">Face-down
Face-up</td></tr>
<tr><td>Stacking size</td><td colspan="3">AB: A3, A4, A4R, A5, A5R, B4, B5, B5R, postcard
Inch: 279 × 432 mm (11″ × 17″), LGL, LTR, LTRR, STMT, STMTR</td></tr>
<tr><td>Paper weight</td><td colspan="3">64 to 200 g/m²</td></tr>
<tr><td>Bins</td><td colspan="3">Trays 1 and 2</td></tr>
<tr><td>Modes</td><td colspan="3">Non-sort: trays 1 and 2
Sort: trays 1 and 2
Staple: trays 1 and 2</td></tr>
<tr><td rowspan="4">Stacking capacity</td><td rowspan="2">Non staple sort</td><td>Small-size (Note 1)</td><td>Tray 1: 147 mm/5.79 in high (1000 sheets) (Note 2)
Tray 2: 147 mm/5.79 in high (1000 sheets) (Note 2)</td></tr>
<tr><td>Large-size (Note 1)</td><td>Tray 1: 74 mm/2.91 in high (500 sheets)
Tray 2: 74 mm/2.91 in high (500 sheets)</td></tr>
<tr><td rowspan="2">Staple sort</td><td>Small-size (Note 1)</td><td>Tray 1: 110 mm high/30 sets (750 sheets) (Note 2)
: 4.33 in high/30 sets (750 sheets) (Note 2)
Tray 2: 110 mm high/30 sets (750 sheets) (Note 2)
: 4.33 in high/30 sets (750 sheets) (Note 2)</td></tr>
<tr><td>Large-size (Note 1)</td><td>Tray 1: 74 mm high/30 sets (500 sheets)
: 2.91 in high/30 sets (500 sheets)
Tray 2: 74 mm high/30 sets (500 sheets)
: 2.91 in high/30 sets (500 sheets)</td></tr>
<tr><td>Size mixing</td><td colspan="3">Size mixing: 44 mm or less (300 sheets)
Stapling: 22 mm or less (150 sheets/30 sets)</td></tr>
<tr><td>Stacking mixing</td><td colspan="3">Face-down/face-up</td></tr>
</table>

Notes:
1. Approximate when computed with reference to 80 g/m² paper.
2. Alignment may not be correct if 750 or more small-size sheets are stacked.
3. The accuracy of the stack height is ± 7 mm/0.28 in.

Table 1-201

Item	Description		
Stapling	By rotating cam		
Stapling position	See Figure 1-201.		
Stapling capacity	Small-size	50 sheets	Equivalent of 80 g/m^2 paper Including two sheets of thick stock (covers).
	Large-size	30 sheets	
Staple supply	Special staple cartridge (5000 staples)		
Staples	Special (staple-E1)		
Staple detection	Provided		
Manual stapling	Not provided		
Stapling size	1-point diagonal stapling (diagonal)	Front	A3, B4, A4, A4R, B5, 279 × 432 mm (11″ × 17″), LGL, LTR, LTRR
		Rear	A3, B4, A4, B5, 279 × 432 mm (11″ × 17″), LTR
	1-point	Rear	A4R, LTRR, LGL
	2-point	A3, B4, A4, B5, 279 × 432 mm (11″ × 17″), LTR	
Paper detection	Provided		
Control panel	Not provided		
Display	Not provided		
Dimensions	669 (744.5) × 661 × 1013 mm/26.34 (29.31) × 26.02 × 39.88 in (W (with Puncher Unit attached) x D x H; including saddle stitcher unit)		
Weight	Finisher-F1: 28 kg/61.73 lb Saddle finisher-F2: 46 kg/101.41 lb Puncher unit (option): 5.3 kg/11.68 lb		
Power supply	From host machine (24 VDC)		
Maximum power consumption	170 W or less		
Serial number	XCJxxxxx (Finisher-F1)		

Table 1-202

Reference:

The term “small-size” stands for A4, A5, A5R, B5, postcard, LTR, STMT, STMTR, while the term “large-size” stands for A3, B4, A4R, B5R, LTRR, 279 × 432 mm (11″ × 17″), LGL.

Stapling Positions (finisher unit)

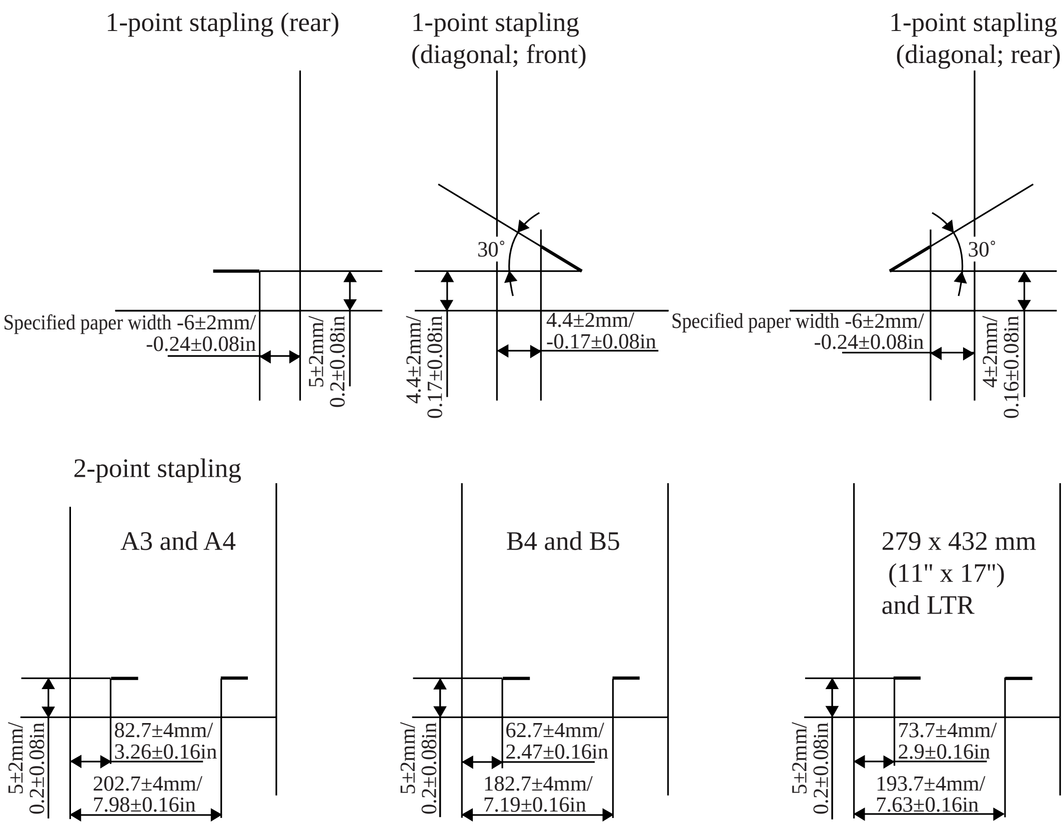


Figure 1-201

2. Saddle Stitcher Unit

Item	Description	
Stapling method	Center binding (double folding)	
Folding position	See Figure 1-202.	
Paper size	A3, B4, A4R, 297mm × 432mm (11″ × 17″), LTRR	
Capacity	W/binding: 1 sheet W/out binding: 2 to 15 sheets (including single cover page)	
Paper weight	64 to 80 g/m^2 (cover page up to 200 g/m^2) (Note 1)	
Stacking capacity	10 sets (stack of 11 to 15 sheets), 15 sets (stack of 6 to 10 sheets), 25 sets (stack of 5 sheets or less)	
Stapling	Stapling position	2 points (center distribution; fixed interval)
	Staple accommodation	2000 staples
	Staple supply	Special cartridge
	Staples	Special staples (Staple-D1)
	Staple detection	Provided
	Manual stapling	Not provided
Folding	Folding method	Roller contact
	Folding mode	Double folding
	Folding position	Paper center
	Position adjustment	Provided
Power supply	From finisher unit (24 V line × 2)	
Power consumption	160 W or less	
Serial number	XCKxxxxx (Saddle Finisher-F2)	

Note1: Special paper, postcards, transparencies, reproducibles, label paper and hole-punched paper cannot be handled.

Table 1-203

Staple and Folding Position (saddle finisher unit)

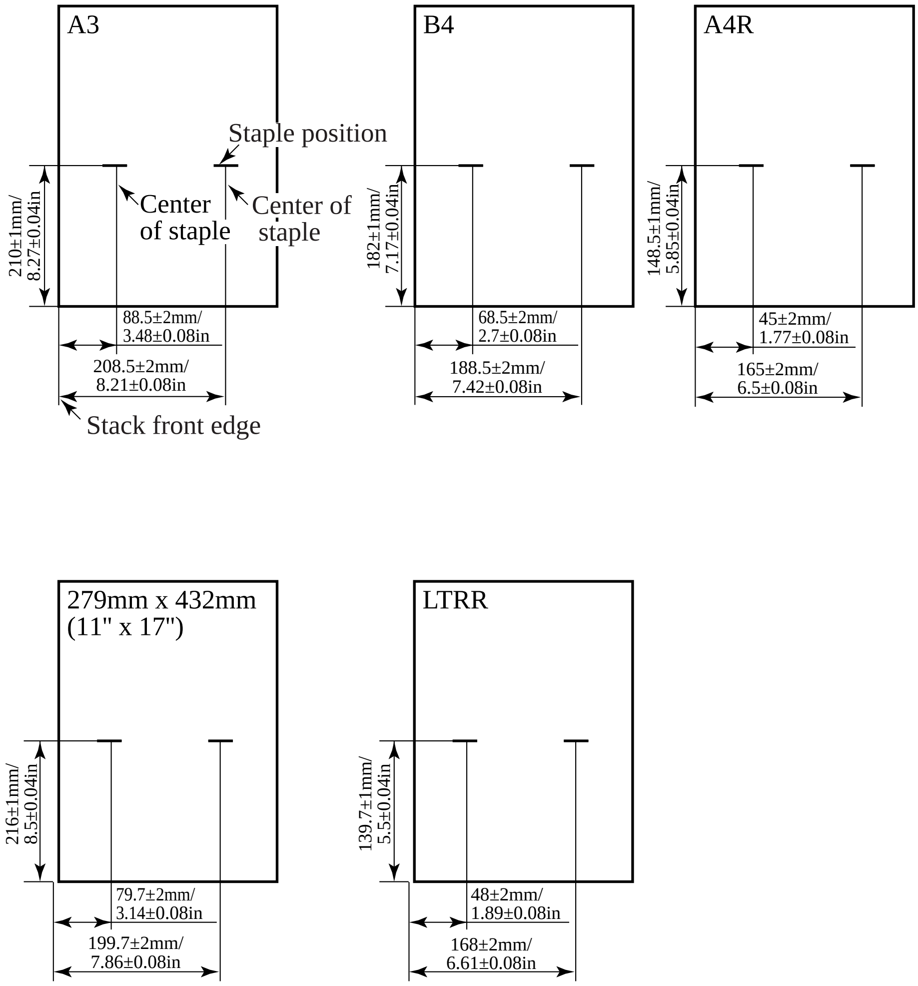


Figure 1-202

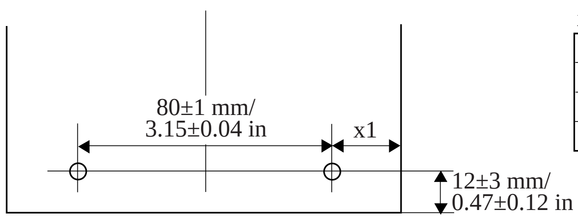
3. Puncher Unit (Option)

Item	Description
Punching method	Sequential punching
Paper size	2 holes (puncher unit-A1): A3, A4, A4R, B4, B5, B5R 2 or 3 holes (puncher unit-B1): 2 holes/LGL, LTRR 3 holes/279mm × 432mm (11″ × 17″), LTR 4 holes (puncher unit-C1/D1): A3, A4
Paper weight	64 to 200 g/m² (Note 1)
Punched hole diameter	2 holes (puncher unit-A1): 6.5mm 2 or 3 holes (puncher unit-B1): 2 holes/8.0mm 2 holes/0.31in 3 holes/8.0mm 3 holes/0.31in 4 holes (puncher unit-C1/D1): 6.5mm
Punched scrap capacity	2 holes (puncher unit-A1): 10,000 sheets or more 2 or 3 holes (puncher unit-B1): 2 holes/3,000 sheets or more (80 g/m² or 3 holes/3,000 sheets or more equivalent) 4 holes (puncher unit-C1/D1): 5,000 sheets or more
Power supply	From finisher unit (24 VDC)
Power consumption	120 W or less
Serial number	XCLxxxxx (Puncher Unit-A1) XCMxxxxx (Puncher Unit-B1) XCNxxxxx (Puncher Unit-C1) XCPxxxxx (Puncher Unit-D1)

Note1: Transparencies, reproducibles, label paper, postcards and hole-punched paper cannot be handled.

Hole position (Puncher Unit)

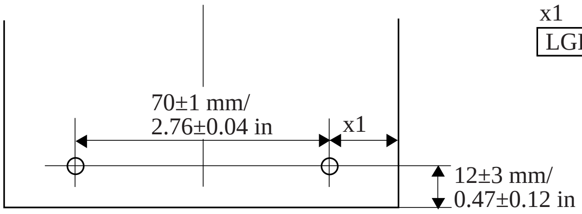
[1] 2 holes (Puncher Unit-A1)



x1

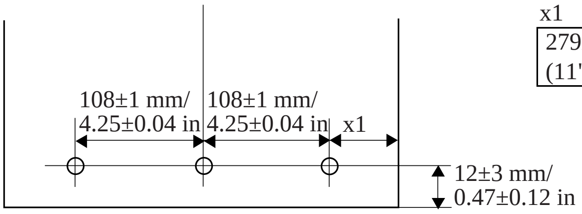
A3/A4	108.5±3 mm/4.27±0.12 in
B5/B4	88.5±3 mm/3.48±0.12 in
A4R	65±3 mm/2.56±0.12 in
B5R	51±3 mm/2.01±0.12 in

[2] 2 or 3 holes (Puncher Unit-B1)



x1

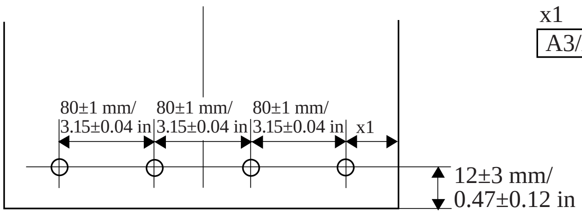
LGL/LTRR	73±3 mm/2.87±0.12 in



x1

279mm x 432mm (11"×17")/LTR	31.5±3 mm/1.24±0.12 in

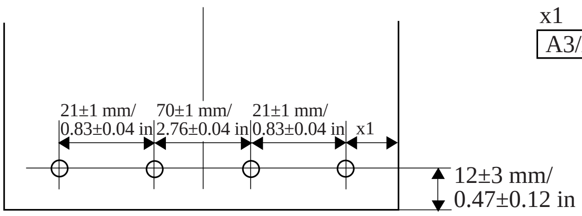
[3] 4 holes (Puncher Unit-C1)



x1

A3/A4	28.5±3 mm/1.12±0.12 in

[4] 4 holes (Puncher Unit-D1)



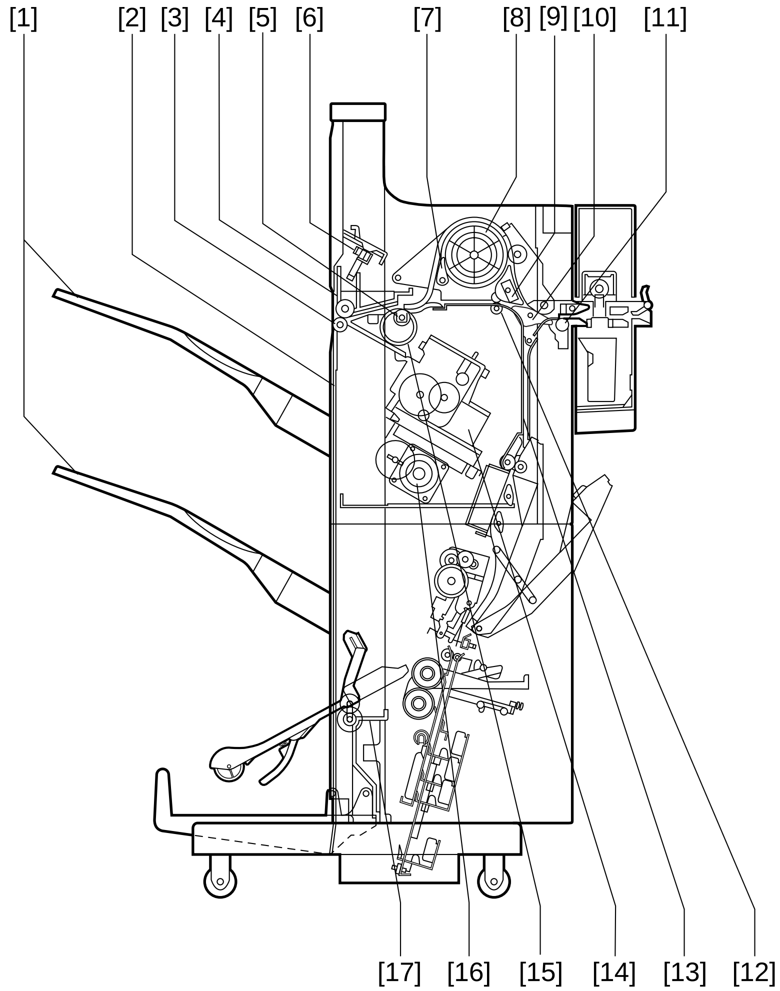
x1

A3/A4	92.5±3 mm/3.64±0.12 in

Specifications are subject to change without notice.

B. Cross Section

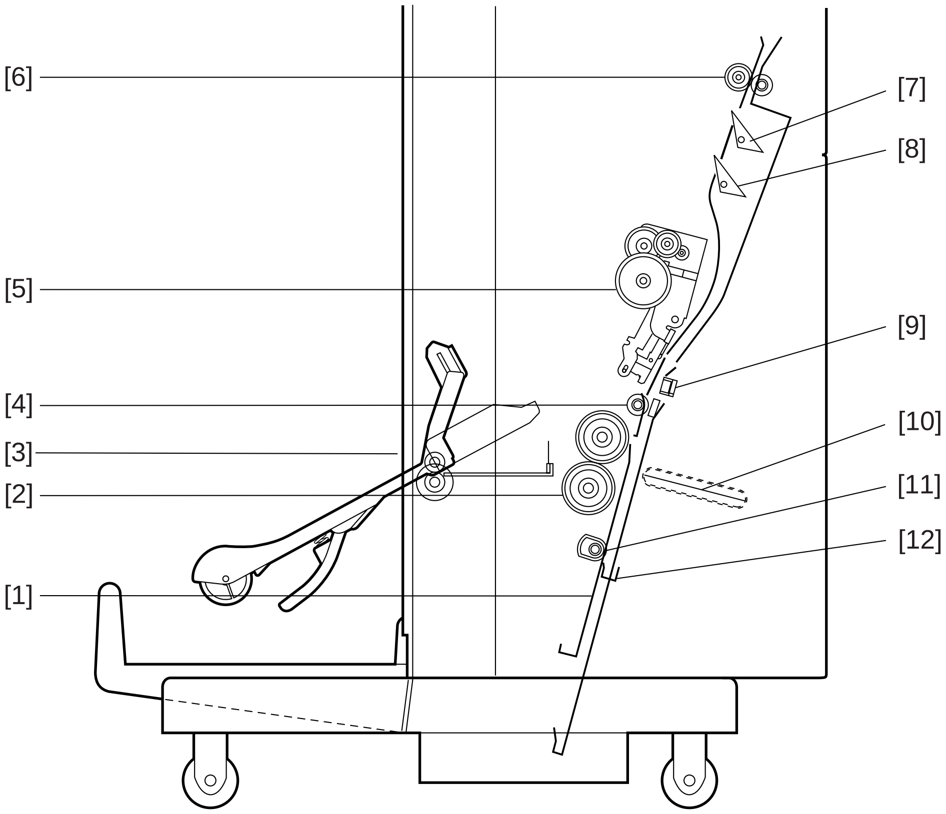
1. Finisher Unit



[1] Tray 1/2
[2] Shutter
[3] Delivery roller
[4] Swing guide
[5] Feed roller 2
[6] Height sensor
[7] Wrap flapper
[8] Buffer roller
[9] Buffer inlet flapper
[10] Saddle stitcher flapper
[11] Inlet feed roller
[12] Feed roller 1
[13] Vertical path
[14] Stapler
[15] Feed belt
[16] Tray lift motor
[17] Saddle stitcher unit
(Saddle Finisher-F2)

Figure 1-204

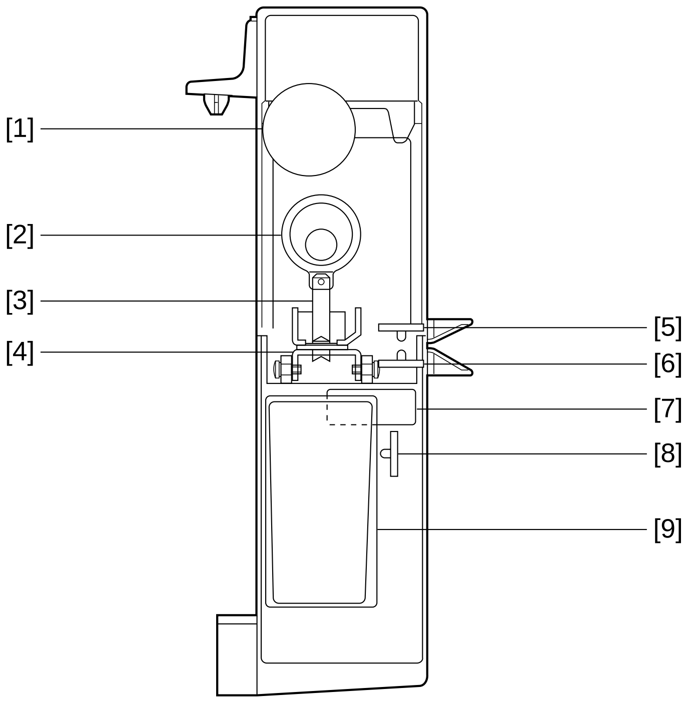
2. Saddle Stitcher Unit



[1]	Guide plate	[7]	No.1 flapper
[2]	Paper folding roller	[8]	No. 2 flapper
[3]	Delivery guide plate	[9]	Stitcher mount
[4]	Holding roller	[10]	Paper pushing plate
[5]	Stitcher (front, rear)	[11]	Crescent roller
[6]	Inlet roller	[12]	Paper positioning plate

Figure 1-205

3. Puncher Unit (option)



[1] Punch motor
[2] Cam
[3] Hole puncher (Punch blade)
[4] Die
[5] Photosensor PCB
[6] LED PCB
[7] Horizontal registration motor
[8] Scrap full detector PCB unit
[9] Punched scrap container

Figure 1-206

III. Using the Machine

A. Removing Paper Jams from the Finisher Unit

If the host machine indicates the finisher paper jam message, perform the following to remove the jam.

Note, however, that paper jams at the paper feed inlet on the finisher unit can be removed by opening the front cover of the host machine as the Finisher-F1 is fixed to the host machine.

1) Holding the finisher unit as shown, move it to detach it from the host machine.

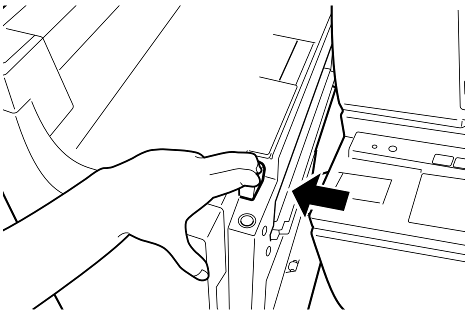


Figure 1-301

2) Remove any jam visible from the outside.

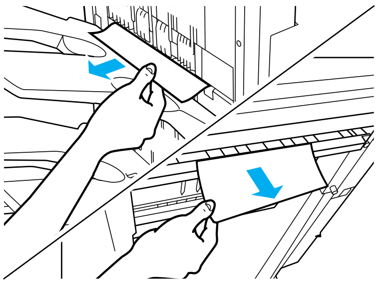


Figure 1-302

3) Open the upper cover, and check the inside of the finisher.

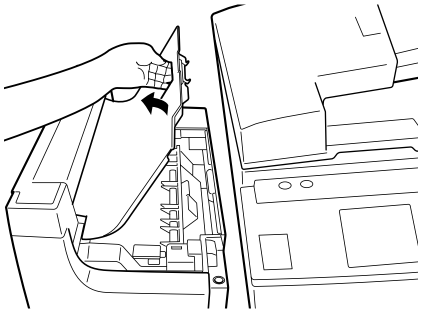


Figure 1-303

4) Lift the buffer roller cover, and remove the jam.

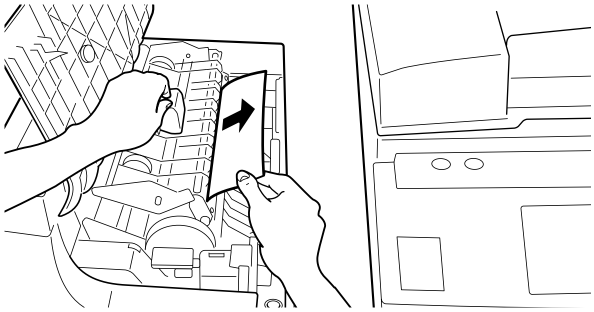


Figure 1-304

5) Lift the buffer roller, and remove the jam.

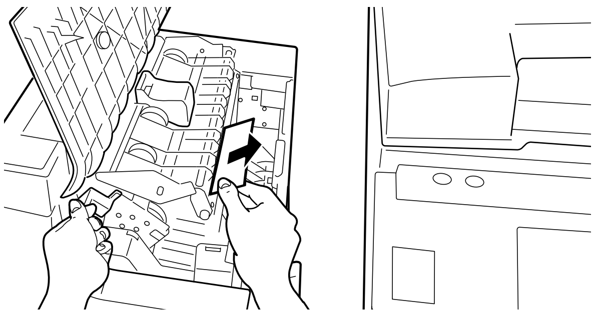


Figure 1-305

6) Return the buffer roller and the buffer roller cover to their original positions, and close the upper cover.

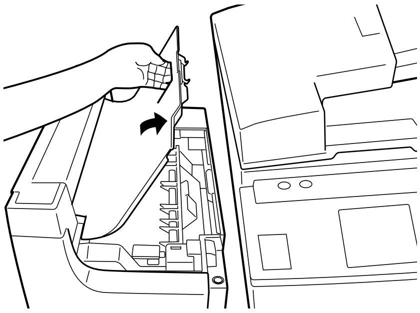


Figure 1-306

7) Connect the finisher to the host machine.

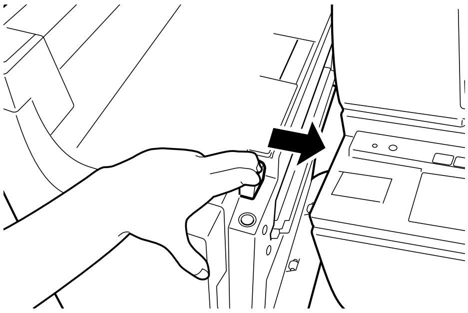


Figure 1-307

8) Operate as instructed on the display.

B. Supplying the Finisher Unit with Staples

If the host machine indicates the finisher unit staple supply message, perform the following to supply it with staples.

1) Open the front cover.

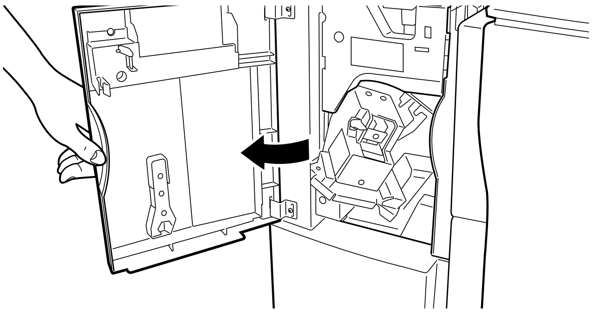


Figure 1-308

2) Shift down the green lever.

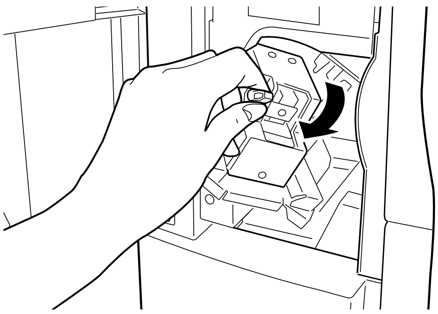


Figure 1-309

3) When the staple cartridge has slightly slid out, hold and pull it out.

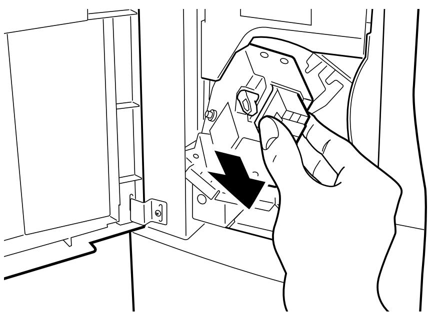


Figure 1-310

4) Hold the empty staple case on its sides, and slide it out.

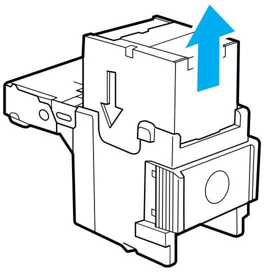


Figure 1-311

5) Set a new staple case.

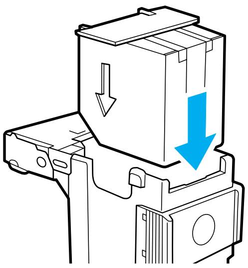


Figure 1-312

Reference:
You may set no more than one staple cartridge at a time.
Make sure that the new cartridge is one specifically designed for the finisher unit.

6) Pull the length of tape (used to hold the staples in place) straight out.

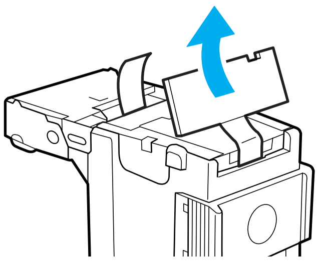


Figure 1-313

7) Push in the stapler unit until the green lever returns to its original position.

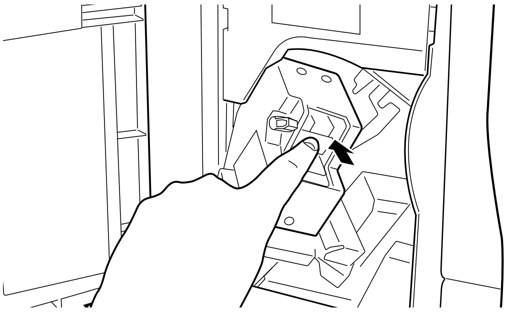


Figure 1-314

8) Check to make sure that the stapler has been locked in place, and close the front cover.

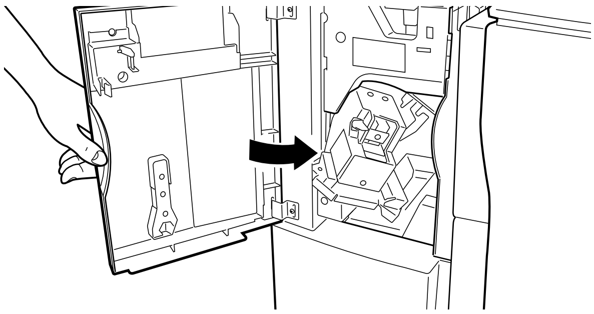


Figure 1-315

C. Removing Staple Jams from the Finisher Unit

If the host machine indicates the finisher unit staple jam message, perform the following to remove the jam.

1) Remove the stack waiting to be stapled from the delivery tray.

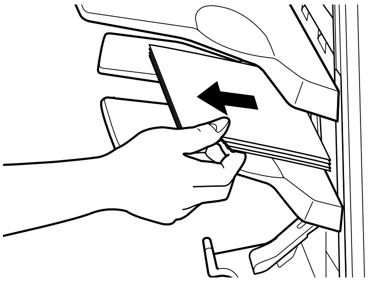


Figure 1-316

2) Open the front cover.

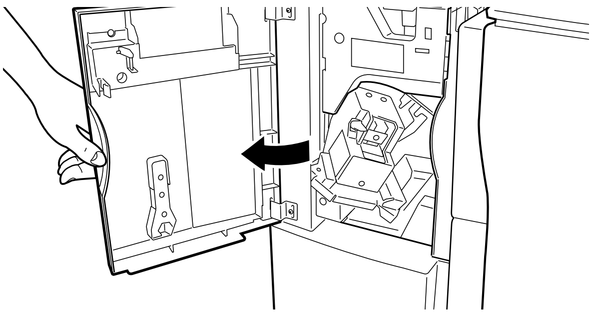


Figure 1-317

3) Shift down the green lever.

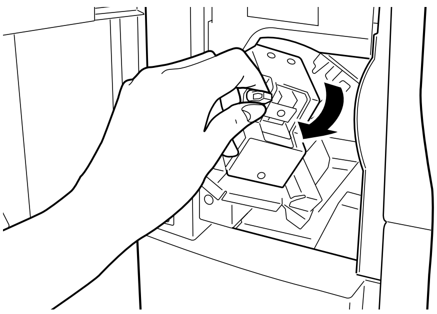


Figure 1-318

4) When the staple cartridge has slightly slid out, hold and pull it out.

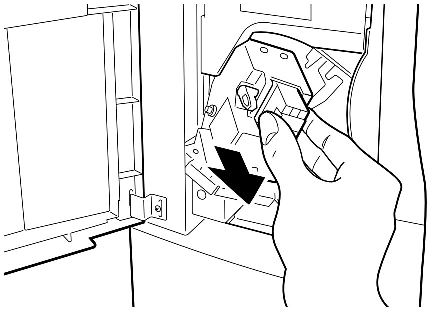


Figure 1-319

5) Shift down the tab on the staple cartridge.

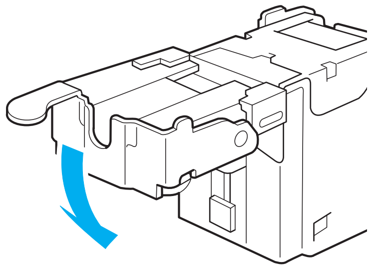


Figure 1-320

6) Remove all staples that have slid out of the staple case.

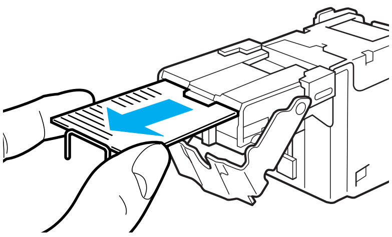


Figure 1-321

7) Return the tab on the staple cartridge to its original position.

8) Return the staple cartridge to its original position, and close the front cover.

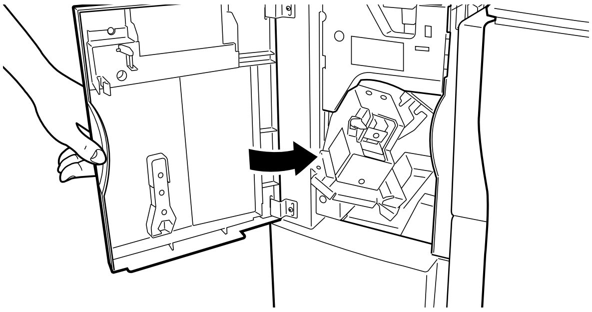


Figure 1-322

Reference

When the cover has been closed, the stapler unit will automatically execute idle punching several times to advance the staples.

D. Removing Paper Jams from the Saddle Stitcher Unit (Saddle Finisher-F2)

If the host machine indicates the saddle stitcher unit paper jam message, perform the following to remove the jam.

1) Holding the saddle stitcher unit as shown, move it to detach it from the host machine.

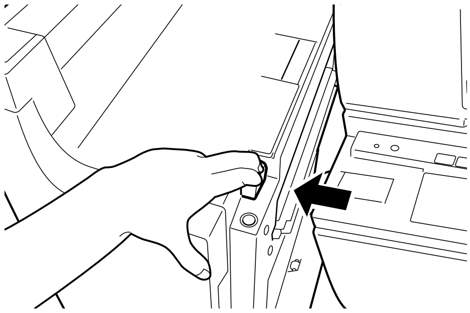


Figure 1-323

2) Open the front lower cover.

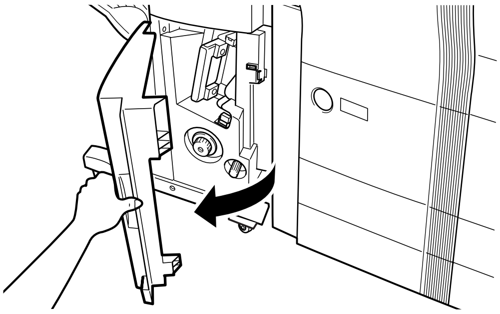


Figure 1-324

3) Turn the knob on the right side.

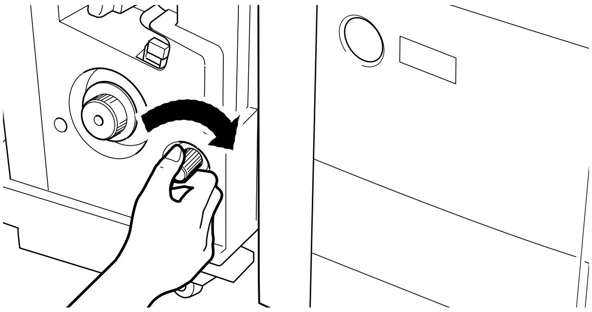


Figure 1-325

4) Turn the knob on the left side while pushing it in.

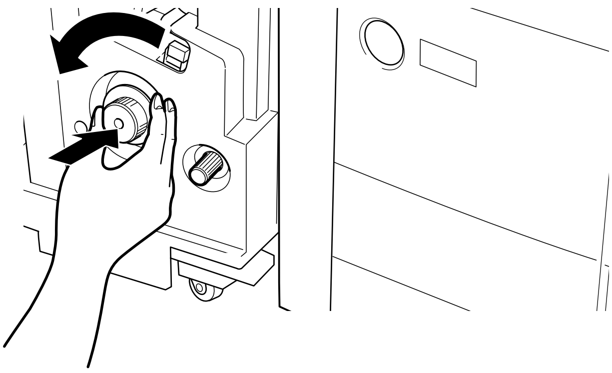


Figure 1-326

5) Remove the jam.

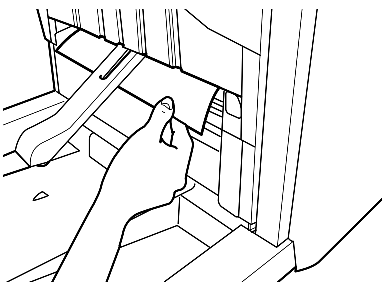


Figure 1-327

6) Open the inlet cover, and remove the jam.

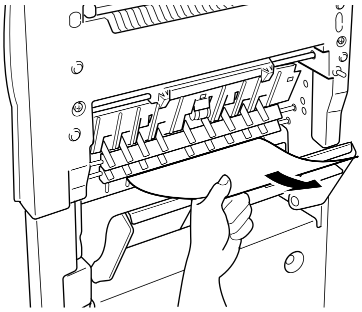


Figure 1-328

7) Close the front lower cover.

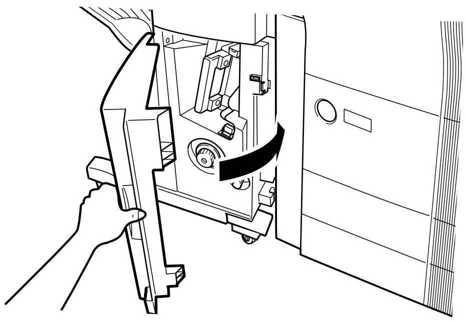


Figure 1-329

8) Connect the finisher unit.

9) Operate as instructed on the display.

E. Supplying the Saddle Stitcher Unit with Staples (Saddle Finisher-F2)

If the host machine indicates the saddle stitcher unit staple supply message, perform the following to supply it with staples.

1) Open the front lower cover.

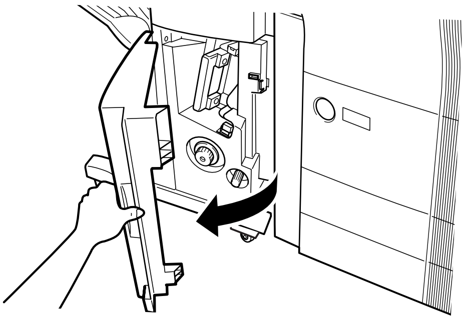


Figure 1-330

2) Slide out the stitcher unit.

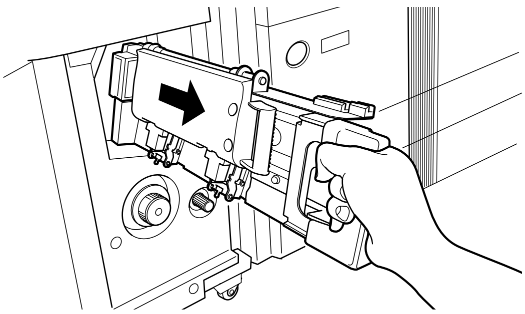


Figure 1-331

3) Pull the stitcher unit to the front once, and then shift it up.

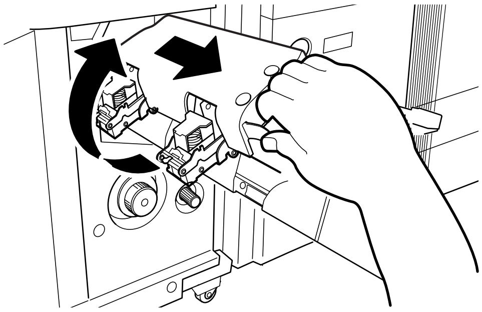


Figure 1-332

4) Hold the empty cartridge on its sides, and remove it.

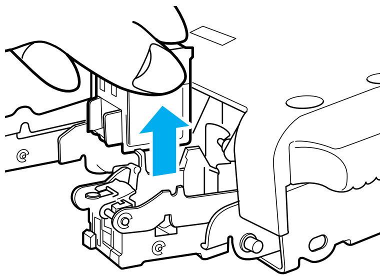


Figure 1-333

5) Set a new cartridge.

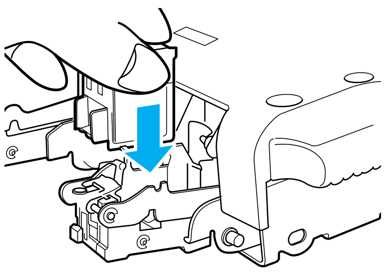


Figure 1-334

Reference

You must always replace both cartridges at the same time.

6) Pull the stitcher to the front once, and then return it to its original position.

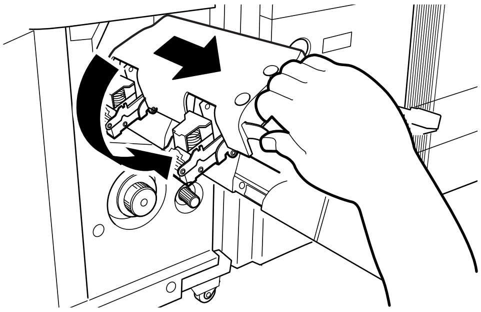


Figure 1-335

7) Push in the stitcher unit, and close the front cover.

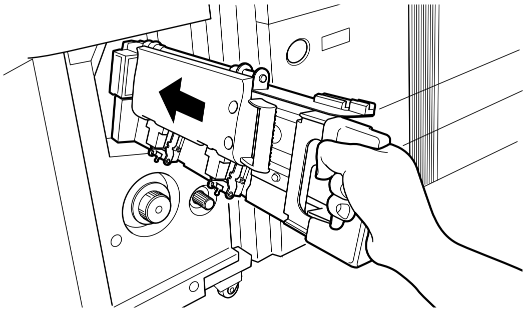


Figure 1-336

F. Removing Staple Jams from the Saddle Stitcher Unit (Saddle Finisher-F2)

If the host machine indicates the saddle stitcher unit staple jam message, perform the following to remove the jam.

1) Open the front lower cover.

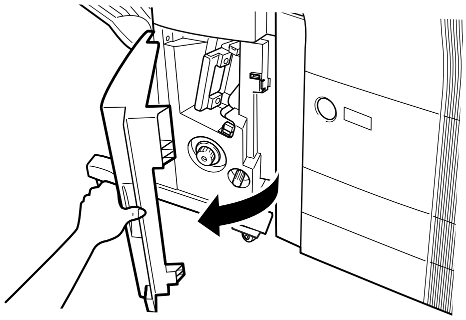


Figure 1-337

2) Slide out the stitcher unit.

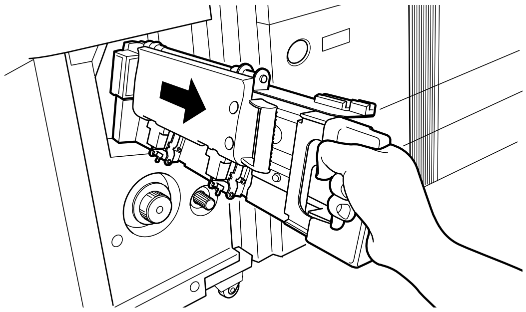


Figure 1-338

3) Pull the stapler of the stitcher unit to the front once, and then shift it up.

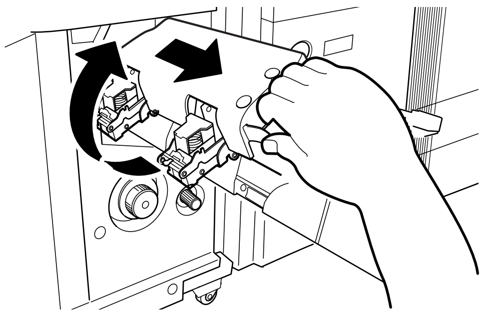


Figure 1-339

4) Hold the cartridge on its sides, and remove it.

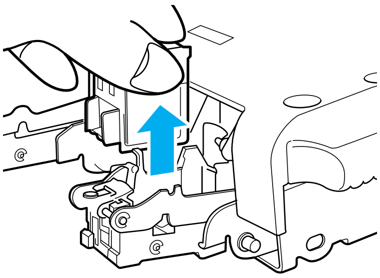


Figure 1-340

5) Push down on the area identified as A, and pull up the tab identified as B.

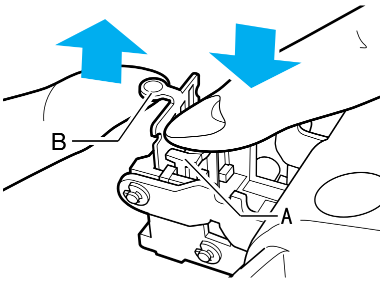


Figure 1-341

6) Remove the staple jam, and return the tab B to its original position.

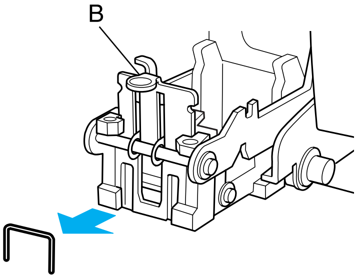


Figure 1-342

7) Return the cartridge to its original position.

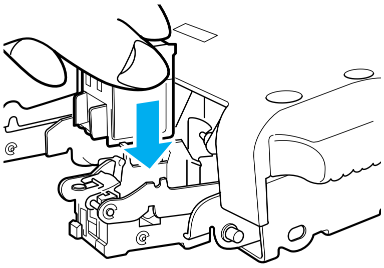


Figure 1-343

8) Pull the stitcher of the stitcher unit to the front once, and then return it to its original position.

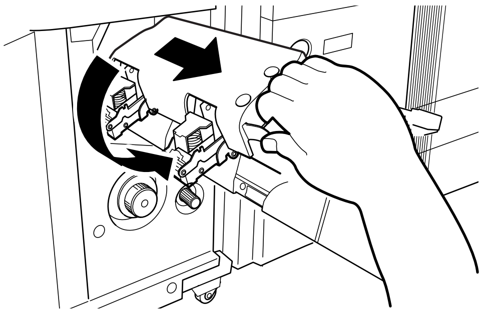


Figure 1-344

9) Push the stitcher unit back to its original position, and close the front lower cover.

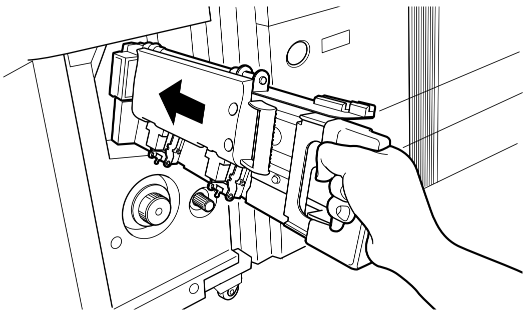


Figure 1-345

Reference

Whenever you have removed a staple jam, be sure to execute staple edging.

G. Removing Paper Jams from the Puncher Unit (option)

If the display indicates a paper jam on the puncher unit, perform the following to remove the jam:

1) Open the front cover of the puncher unit.

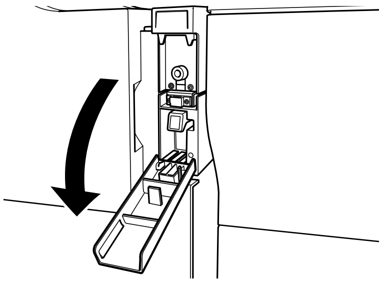


Figure 1-346

2) Align the triangle mark on the knob within the range marked by ▨.

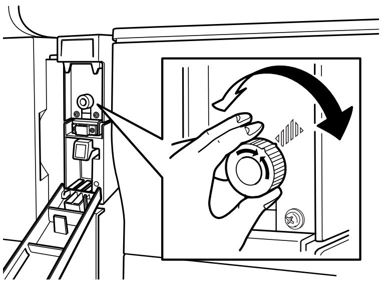


Figure 1-347

3) Close the front cover of the puncher unit.

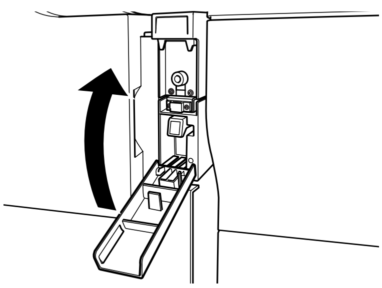


Figure 1-348

4) Open the top cover of the puncher unit.

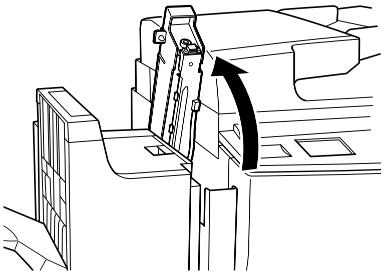


Figure 1-349

5) Remove the jam.

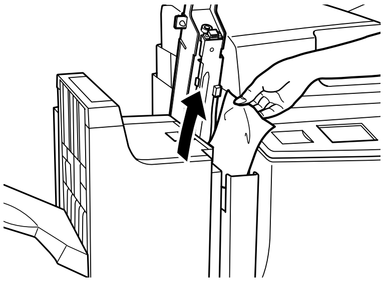


Figure 1-350

6) Close the top cover of the puncher unit.

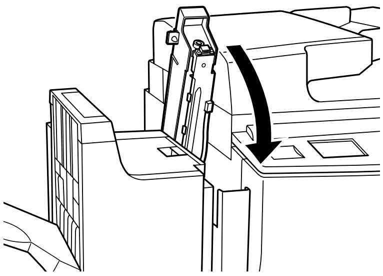


Figure 1-351

7) Operate as instructed on the display.

H. Removing Punched Scrap from the Puncher Unit (option)

If the display indicates a punched scrap full state on the puncher unit, perform the following to remove the punched scrap:

1) Open the front cover of the puncher unit.

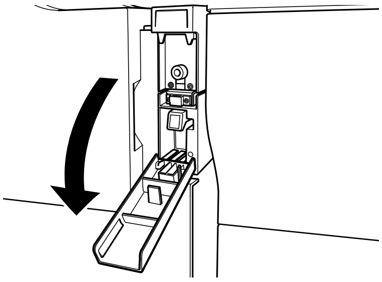


Figure 1-352

2) Slide out the punched scrap container.

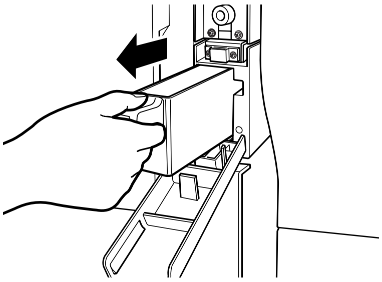


Figure 1-353

3) Discard the punched scrap.

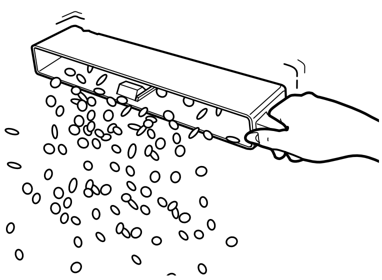


Figure 1-354

4) Return the punched scrap container to its original position.

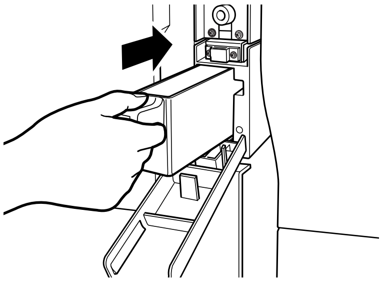


Figure 1-355

IV. MAINTENANCE BY THE USER

A. Maintenance by the User

As of June 2000

No.	Item	Timing
1	Replacing the staple cartridge (finisher unit)	When the appropriate indication is made on the host machine's display.
2	Replacing the staple cartridge (saddle stitcher unit)	

Caution:
The finisher unit and the saddle stitcher unit use different cartridge types. Be sure that the appropriate type is used for each.

Table 1-401

CHAPTER 2

FINISHER UNIT BASIC OPERATION

1. This chapter discusses the purpose and role of each of the finisher's functions, and the principles of operation used for the finisher mechanical and electrical systems. It also explains the timing at which these systems are operated.The ▬▬ symbol in drawings indicates transmission of mechanical drive, and signals marked by ⟶ together with the signal name indicates the flow of electrical signals.

2. In descriptions of digital circuits on the finisher, "1" indicates a high signal voltage level, while "0" indicates a low signal voltage level. Voltage values differ according to circuit.

   A microprocessor is used on the finisher. A description of microprocessor operation is omitted in this chapter as it is practically impossible to check internal operation of the microprocessor.

   Descriptions in this chapter also assume that PCBs will not be repaired at user sites. For this reason, descriptions of circuits on PCBs is limited to block diagrams. Two types of block diagrams are provided for separate functions: diagrams indicating details from sensors up to input sections of major PCBs, and diagrams indicating details from the output sections of major PCBs up the loads.

I. BASIC OPERATION

A. Outline

The finisher is designed to deliver copies arriving from its host machine, and its modes of delivery include simple stacking, job offset (Note), and staple.

All operations involved in these modes are controlled by the finisher controller PCB, according to the appropriate commands from the host machine.

In the case of the Saddle Finisher-F2, copies from the host machine may be routed to the saddle stitcher unit.

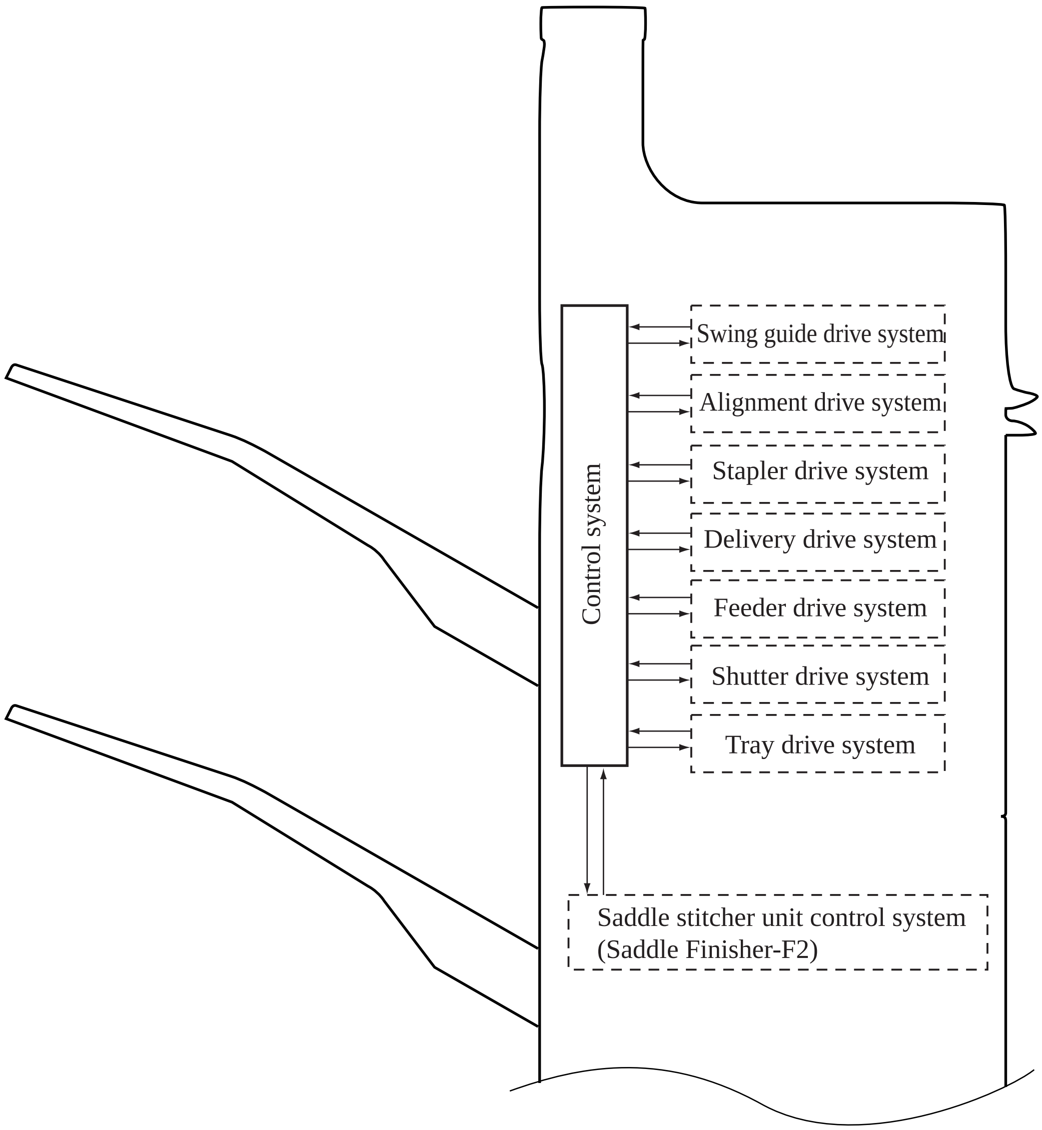


Figure 2-101

Note:
The term job offset refers to shifting each sorting job, separating a single stack into several stacks.

B. Outline of Electrical Circuitry

The finisher's sequence of operation is controlled by the finisher controller PCB. The finisher controller PCB is a 16-bit microprocessor (CPU), and is used for communication with the host machine (serial) in addition to controlling the finisher's sequence of operations.

The finisher controller PCB responds to the various commands coming from the host machine through a serial communications line to drive solenoids, motors, and other loads. In addition, it communicates the finisher's various states (information on sensors and switches) to the host machine through a serial communications circuit.

In the case of the Saddle Finisher-F2, the finisher controller PCB not only communicates with the saddle stitcher controller PCB but also communicates the saddle stitcher unit's various states (information on sensors and switches) to the host machine.

The ICs used on the finisher controller PCB are designed for the following:

- Q1 (CPU)
  Controls sequence of operations.
- Q2 (EP-ROM)
  Backs up adjustment values.
- Q7
  Contains sequence programs.
- Q8/Q89 (RAM)
  Backs up initial setting data.
- Q4 (communications IC)
  Communicates with the host machine and the saddle stitcher unit.
- Q14 (regulator IC)
  Generates 5V.

Figure 2-102 shows the flow of signals between the finisher and the options controller.

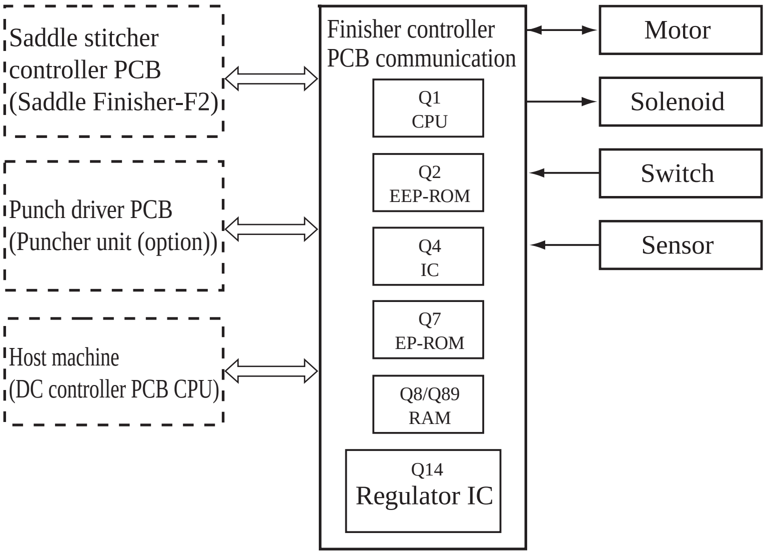

Saddle stitcher
controller PCB
(Saddle Finisher-F2)
Punch driver PCB
(Puncher unit (option))
Host machine
(DC controller PCB CPU)
Finisher controller
PCB communication
Q1
CPU
Q2
EEP-ROM
Q4
IC
Q7
EP-ROM
Q8/Q89
RAM
Q14
Regulator IC
Motor
Solenoid
Switch
Sensor

Figure 2-102

C. Inputs to and Outputs from the Finisher Controller PCB

1. Inputs to the Finisher Controller PCB

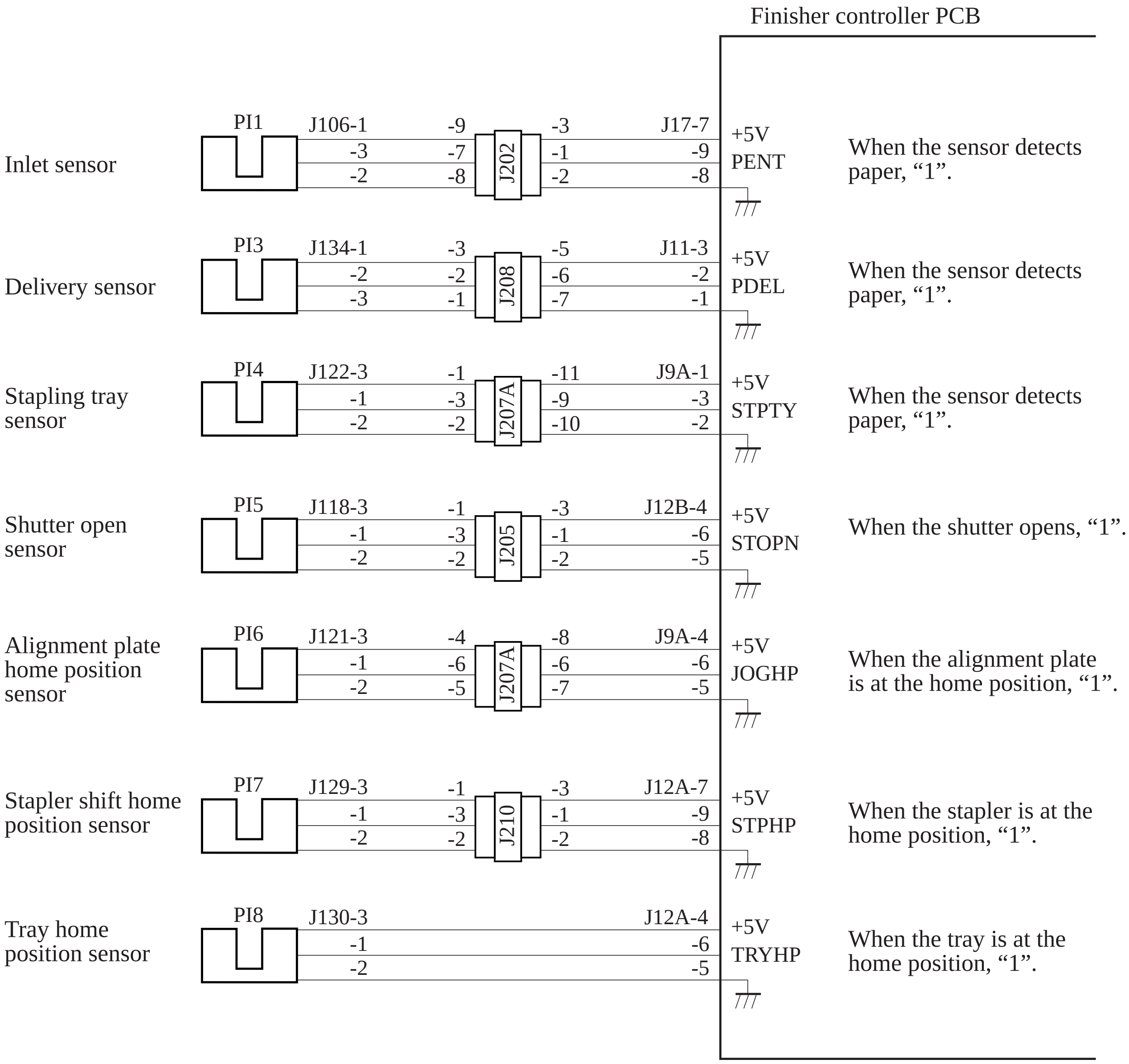


Figure 2-103

2. Inputs to the Finisher Controller PCB

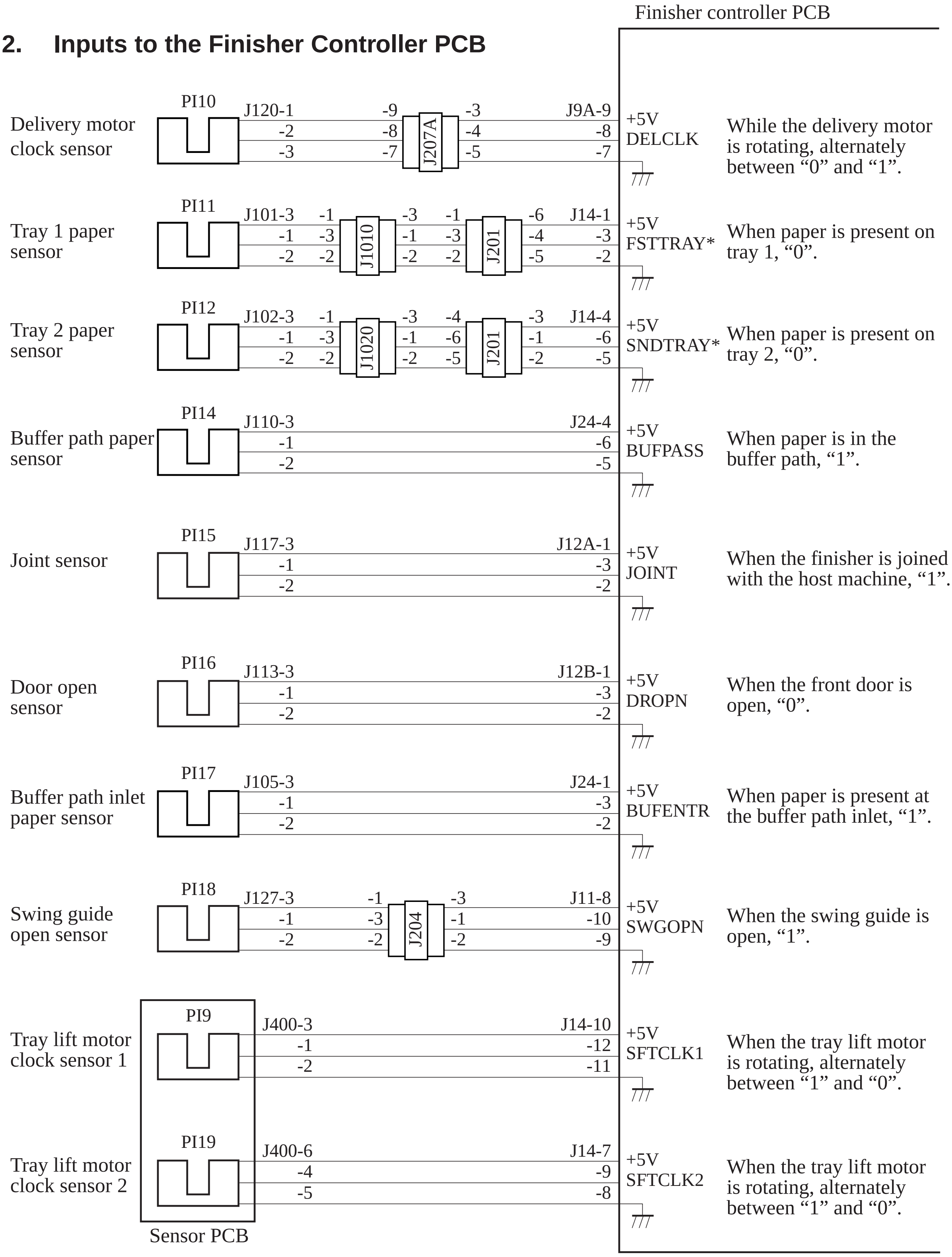


Figure 2-104

3. Inputs to the Finisher Controller PCB

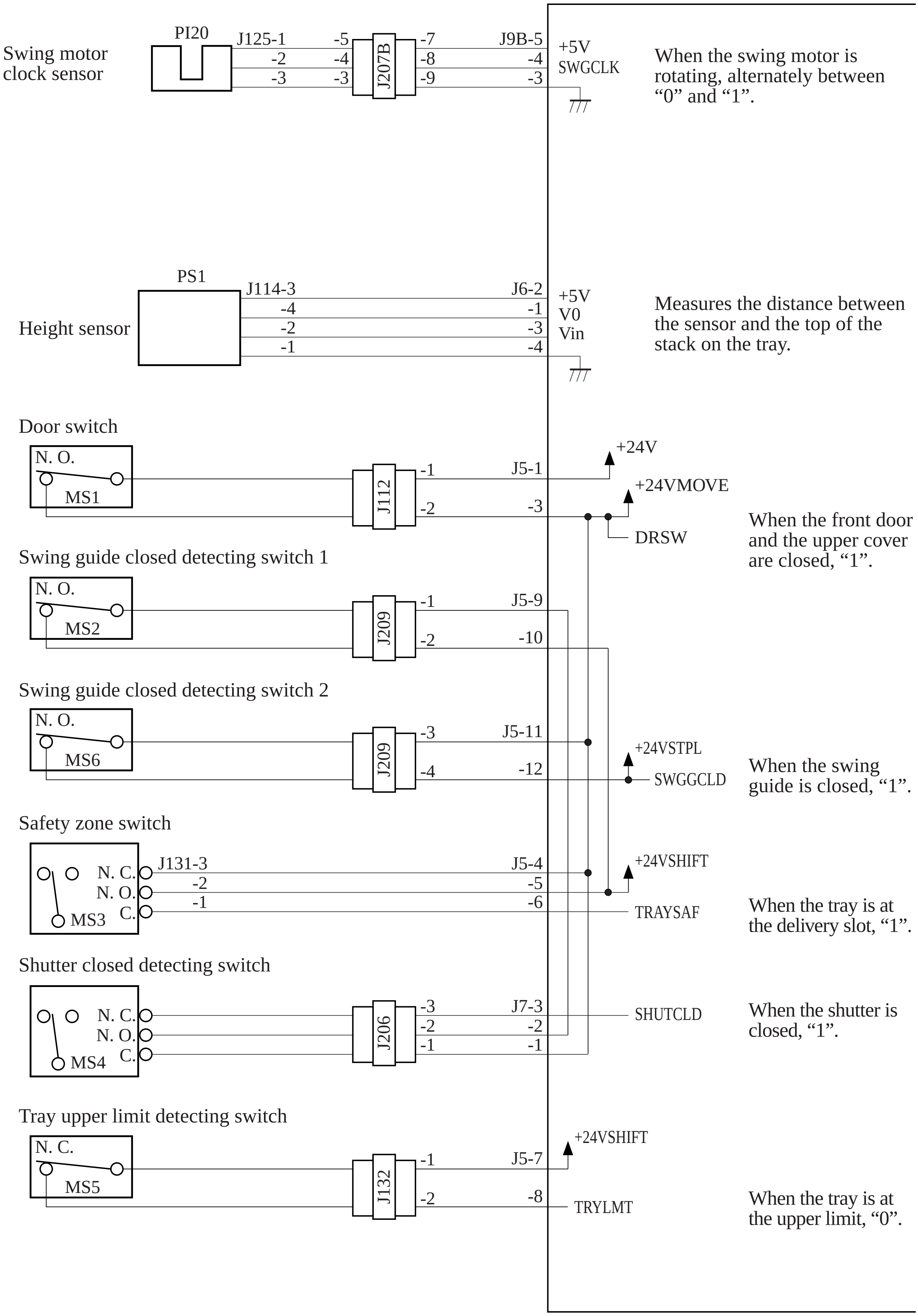


Figure 2-105

4. Inputs to and Outputs from the Finisher Controller PCB

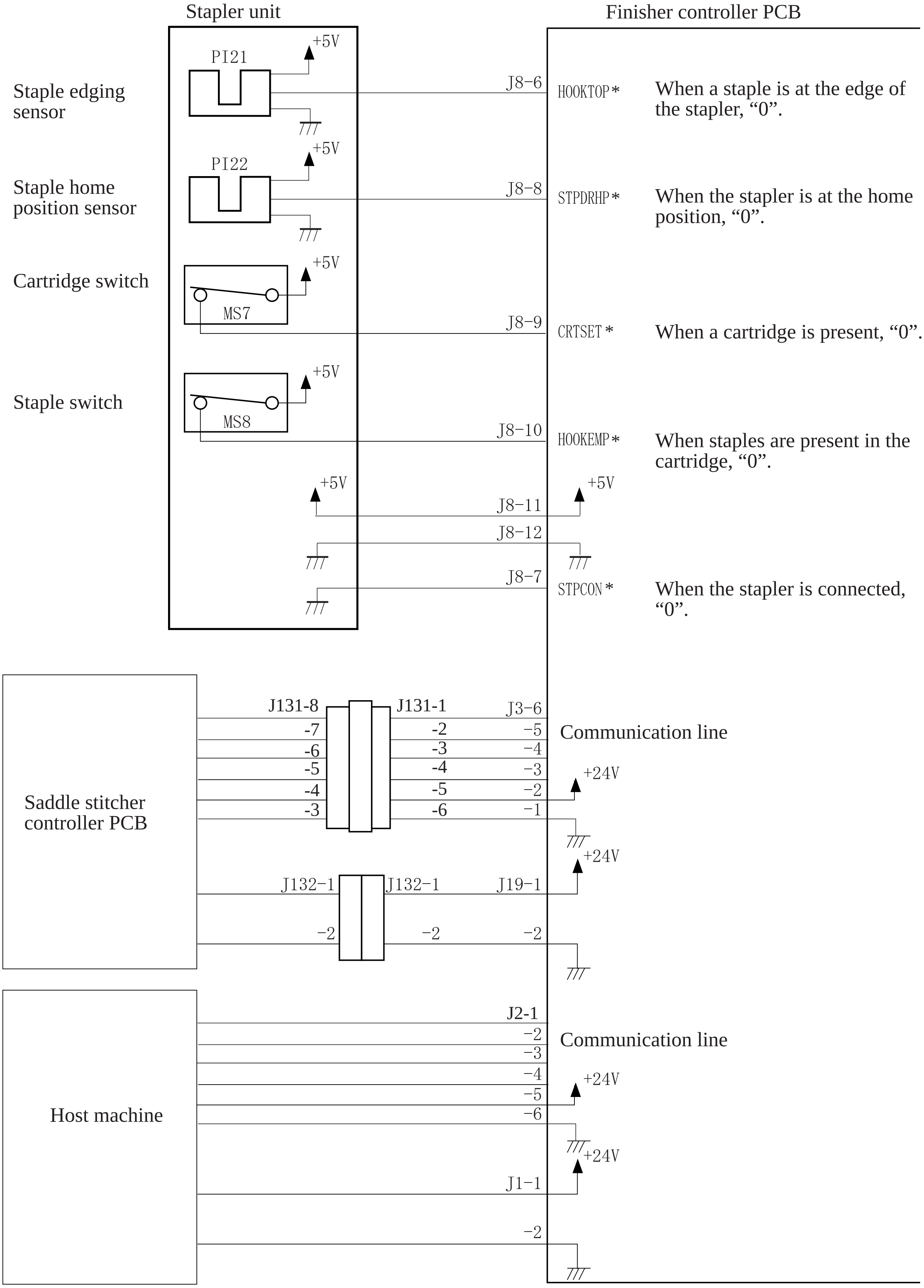


Figure 2-106

5. Outputs from the Finisher Controller PCB

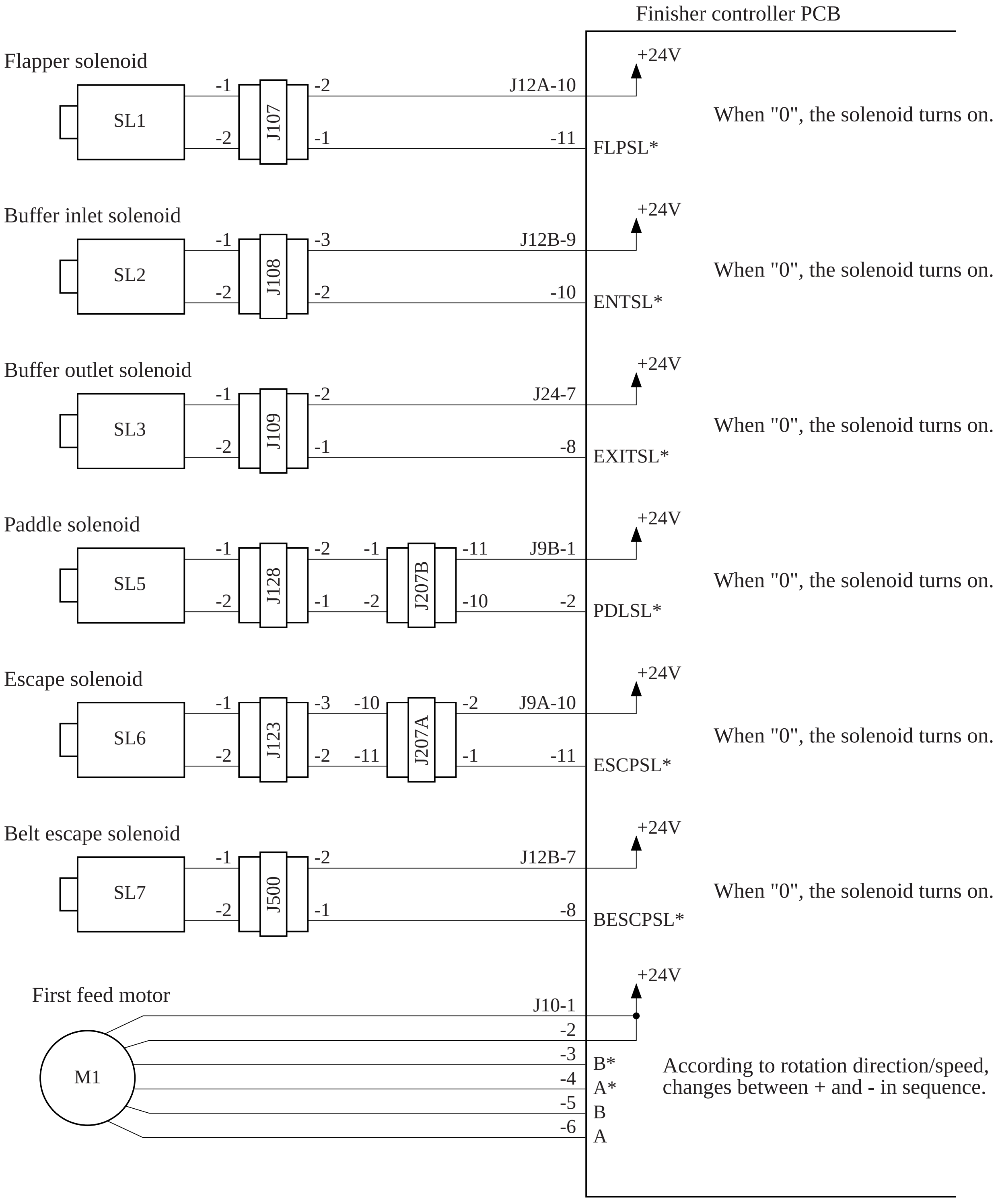


Figure 2-107

6. Outputs from the Finisher Controller PCB

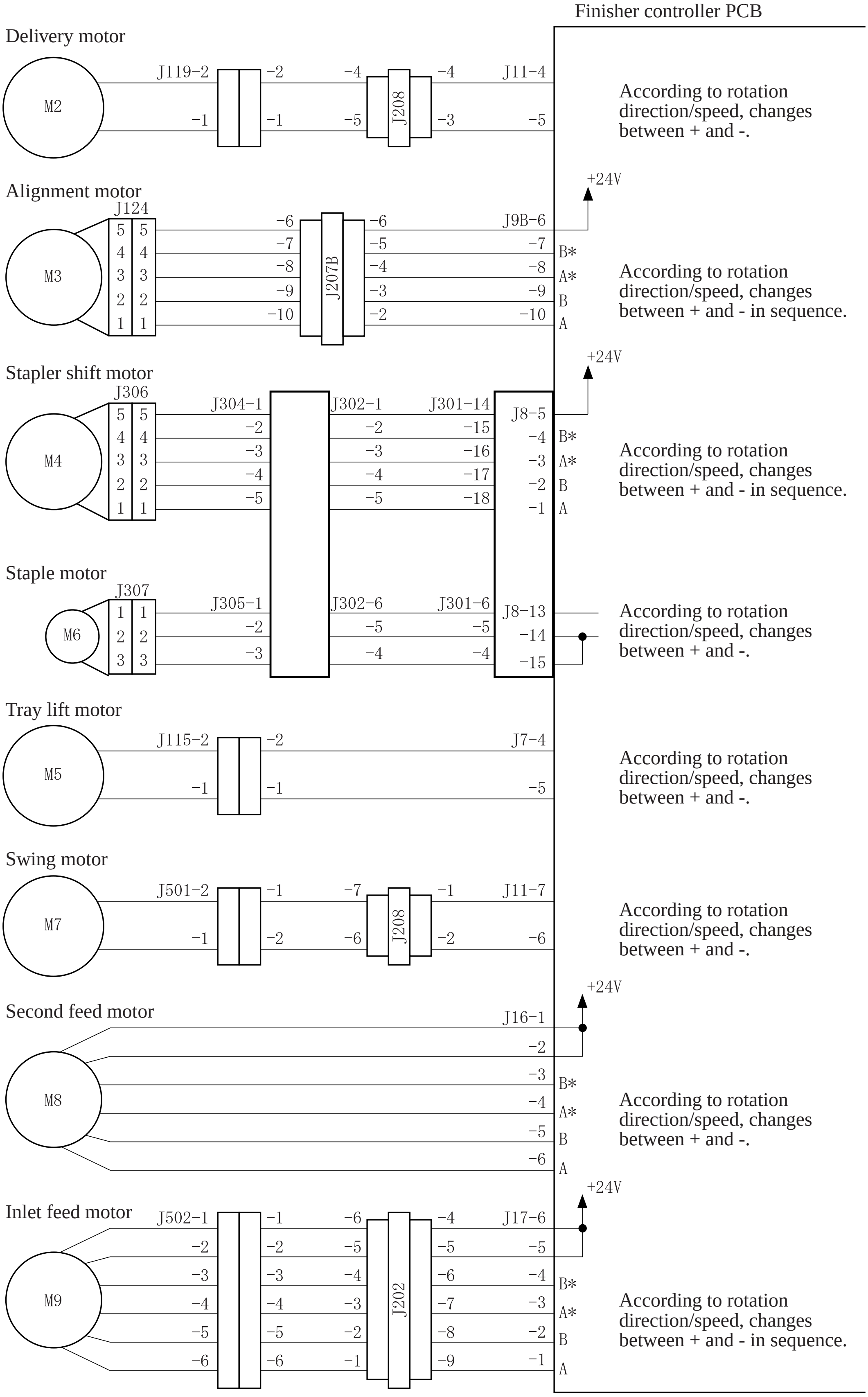


Figure 2-108

II. FEED/DRIVE SYSTEM

A. Outline

The finisher is designed to operate according to the commands from its host machine to deliver arriving copies to trays in the appropriate mode: simple stacking, job offset, stapling.

See Figure 2-201 for a diagram of the three modes of delivery (four for the Saddle Finisher-F2).

- Method of delivery
  - Normal delivery
    - Simple stacking
    - Job offset
    - Staple
      - Front diagonal
      - Rear 1-point
      - Rear diagonal
      - 2-point
  - Saddle stitch delivery (Saddle Finisher-F2 only)

Figure 2-201

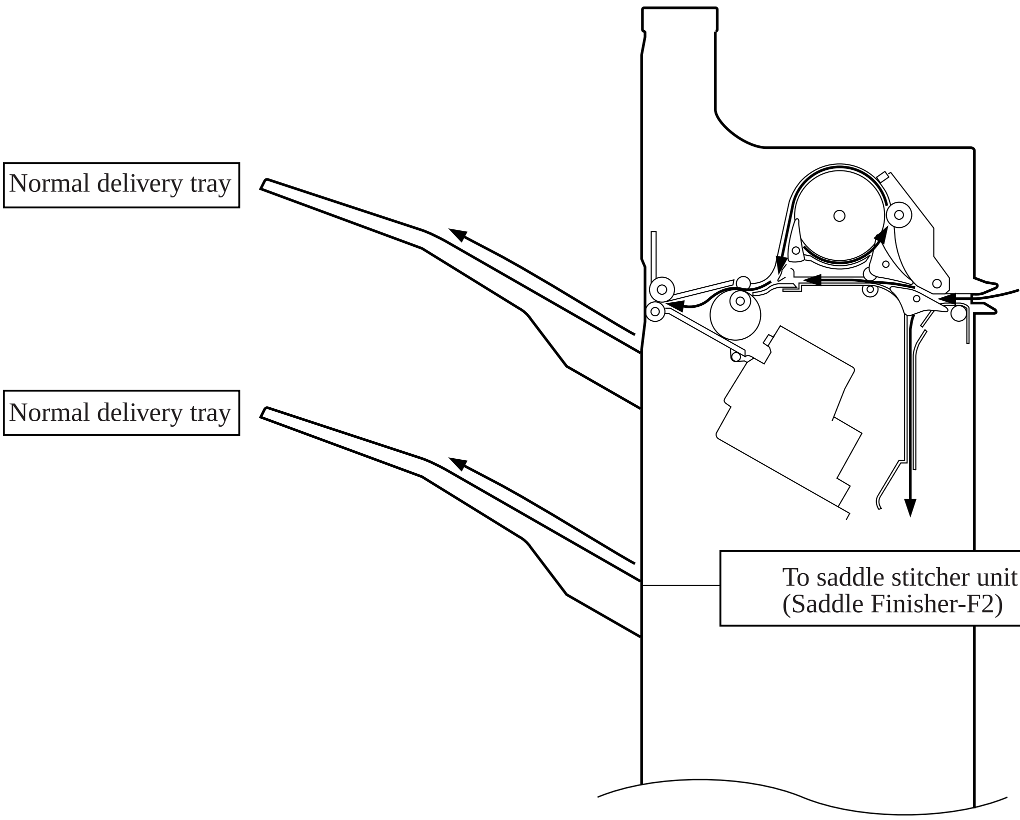


Figure 2-202

1. Normal Delivery

a. Simple Stacking

The finisher delivers copies directly to the tray.

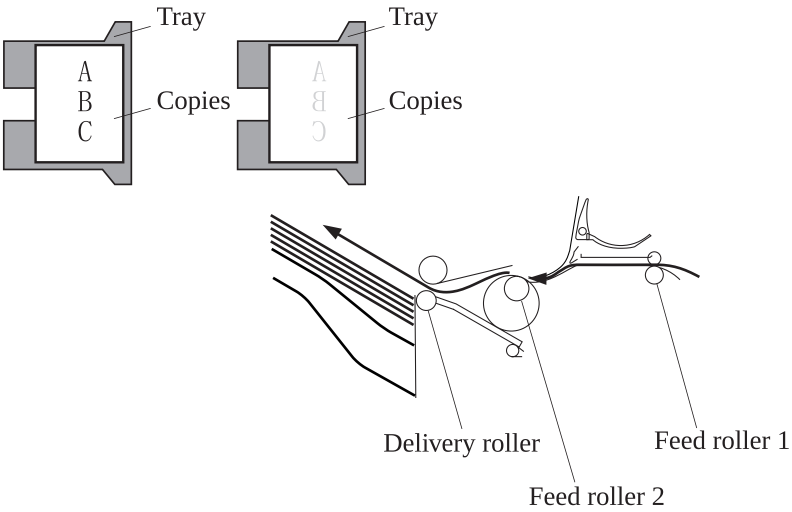


Figure 2-203

b. Job Offset

The finisher forwards all copies of each sort job to the stapling tray. The first sort job on the stapling tray is delivered with a shift to the front of about 30 mm, and the second sort job is delivered without being shifted. Whether the first copy or the last copy of a sort job should be shifted is determined by the host machine.

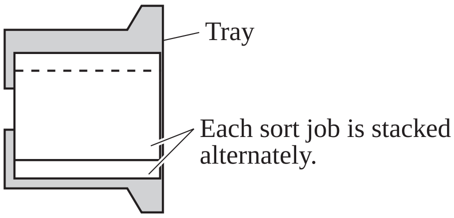


Figure 2-204

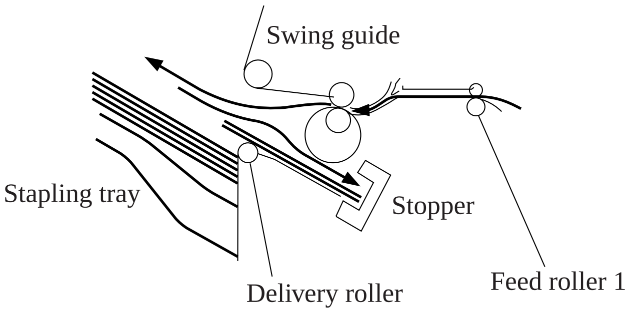


Figure 2-205

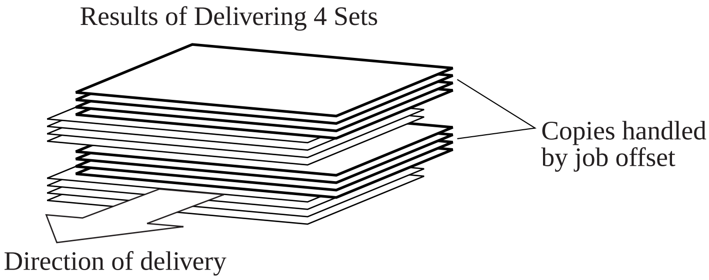


Figure 2-206

c. Stapling

The finisher stacks copies arriving from its host machine on the stapling tray. Then, it staples and delivers the copies to the appropriate tray.

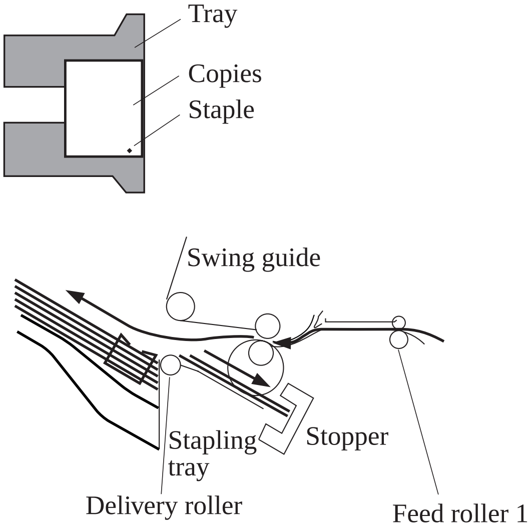


Figure 2-207

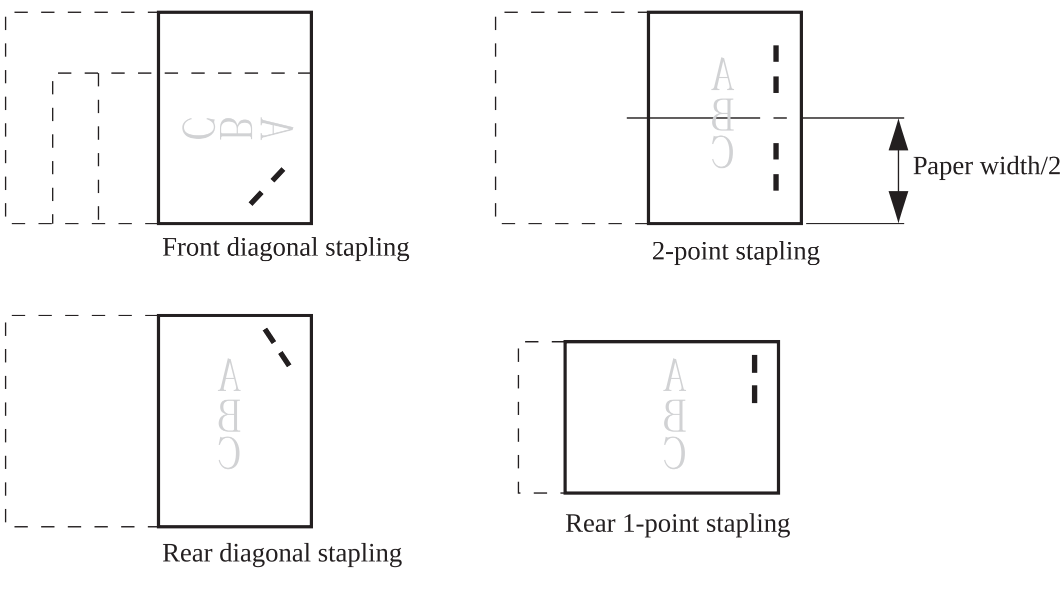


Figure 2-208

2. Saddle Stitch Delivery (Saddle Finisher-F2)

A copy arriving in the finisher from the host machine is routed to the saddle stitcher by the paper deflecting plate. The saddle stitcher executes stitching and saddling operations on the copy and then delivers it to the saddle stitcher tray.

For discussions of stacks in the saddle stitcher, see Chapter 3.

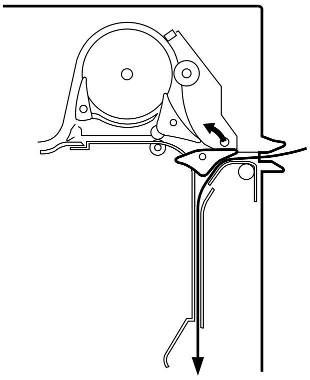


Figure 2-209

B. Type of Delivery Paths

The finisher has three different paper paths for delivery, each selected to suit paper size and delivery mode.

1. Straight Path

When stacking copies shown in Table 2-201, the copies pass under the buffer roller.

Copy size	Length or width 182 mm or less
Typical copy examples	A5, A5R, STMT, STMTR, postcard, thick stock

Table 2-201

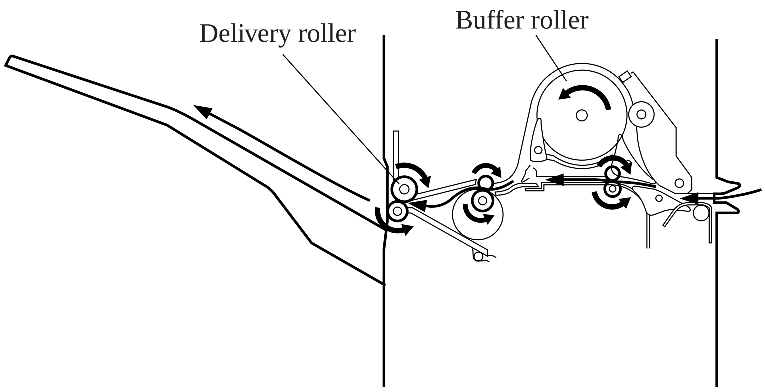


Figure 2-210

2. Buffer Paper Path 1

When stacking copies shown in Table 2-202, the copies pass over the buffer roller, increasing the distance between copies.

Copy size	Length and width 182 mm or more
Typical copy examples	A3, B4, A4, A4R, B5, B5R, 279mm × 432mm (11″ × 17″), LGL, LTR, LTRR, transparencies (excluding thick stock)

Table 2-202

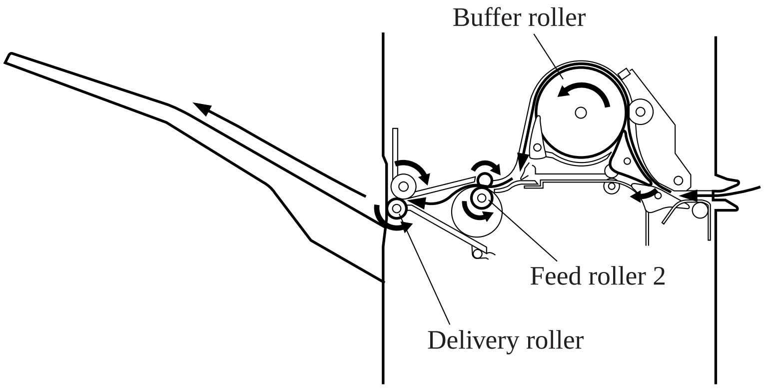


Figure 2-211

3. Buffer Paper Path 2

This is the paper path when copy sizes shown in Table 2-203 are stacked. A maximum of three copies (three originals or more in the staple mode) are wrapped round the buffer roller, during which job offset and stapling are performed on the stapling tray.

Copy size	Length 182 to 232mm, and width 182 to 297mm
Typical copy examples	A4, B5, LTR, (excluding transparencies and thick stock)

Table 2-203

The following shows paper delivery operation in the case of three originals in the staple mode.

1) The first copy is moved in the direction of the buffer roller.

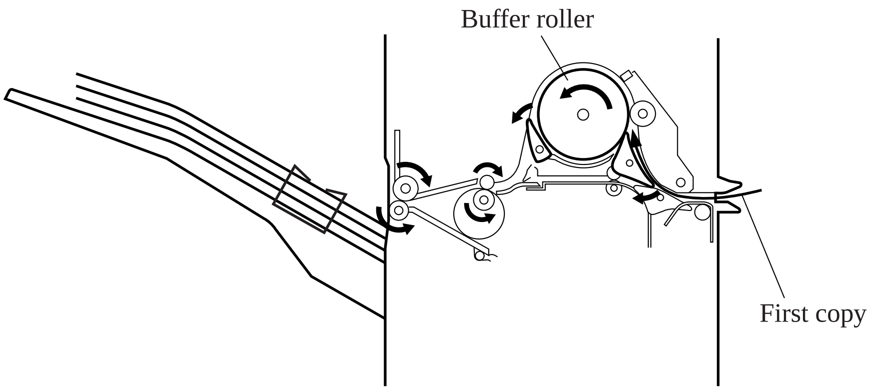


Figure 2-212

2) The first copy wraps around the buffer roller and, at the same time, the second copy arrives from the host machine.

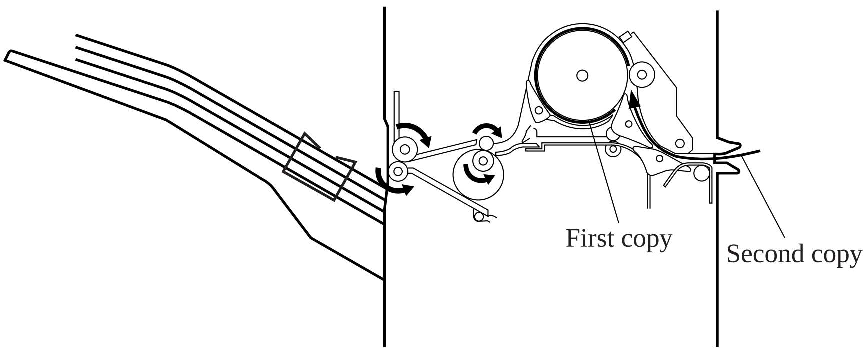


Figure 2-213

3) The second copy is laid over the first copy and, at the same time, the third copy arrives from the host machine.

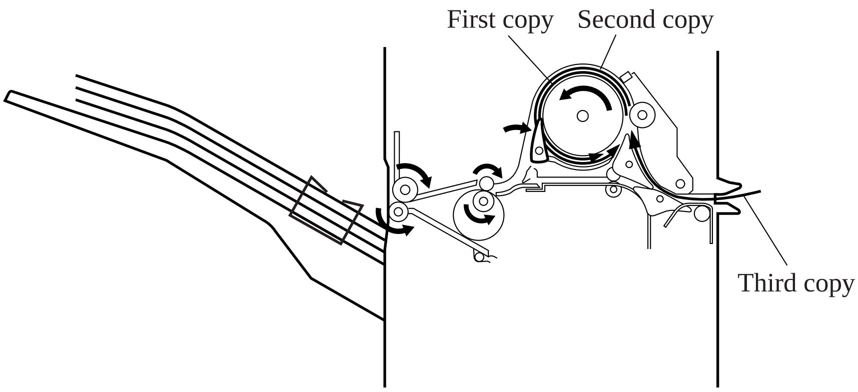


Figure 2-214

4) The first, second and third copies are simultaneously pulled into the stapling tray.

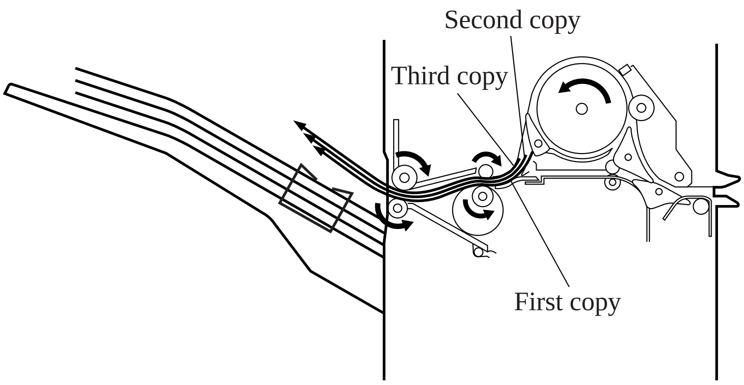


Figure 2-215

Cauiton:
The third copy as explained here is moved through buffer paper path 1. This fact is omitted from the discussion to avoid interrupting the sequence of operations.

C. Feeding and Delivering

1. Outline

The finisher moves copies arriving from the host machine to the delivery tray, stapling tray, or the saddle stitcher unit (Saddle Finisher-F2) according to the mode of delivery. On the stapling tray, the copies are subjected to job offset or stapling as instructed by the host machine.

The first feed motor (M1), second feed motor (M8) and inlet feed motor (M9) are stepping motors, and delivery motor (M2) is a DC motor. These motors are controlled by the microprocessor (CPU) on the finisher controller PCB, and rotate either clockwise or counterclockwise.

The paper paths are equipped with the following four sensors for detection of paper (arrival, passage):

- Inlet sensor (PI1)
- Delivery sensor (PI3)
- Stapling tray sensor (PI4)
- Buffer path paper sensor (PI14)

In addition, each delivery tray is equipped with a sensor designed to detect the presence/absence of paper on it.

- No.1 tray paper sensor (PI11)
- No.2 tray paper sensor (PI12)

If a copy fails to reach or move past each sensor within a specific period of time, the finisher controller PCB identifies the condition as a jam, and stops the ongoing operation, and at the same time, informs the host machine of the condition. When all doors are closed after the paper jam is removed, the buffer path inlet paper sensor (PI17) checks whether or not copies are being detected in addition to the above four sensors (inlet sensor, delivery sensor, stapling tray sensor and buffer path paper sensor). If the sensors detect a copy, the finisher unit judges that paper jams have not completely been removed, and sends the paper jam removal signal to the host machine again.

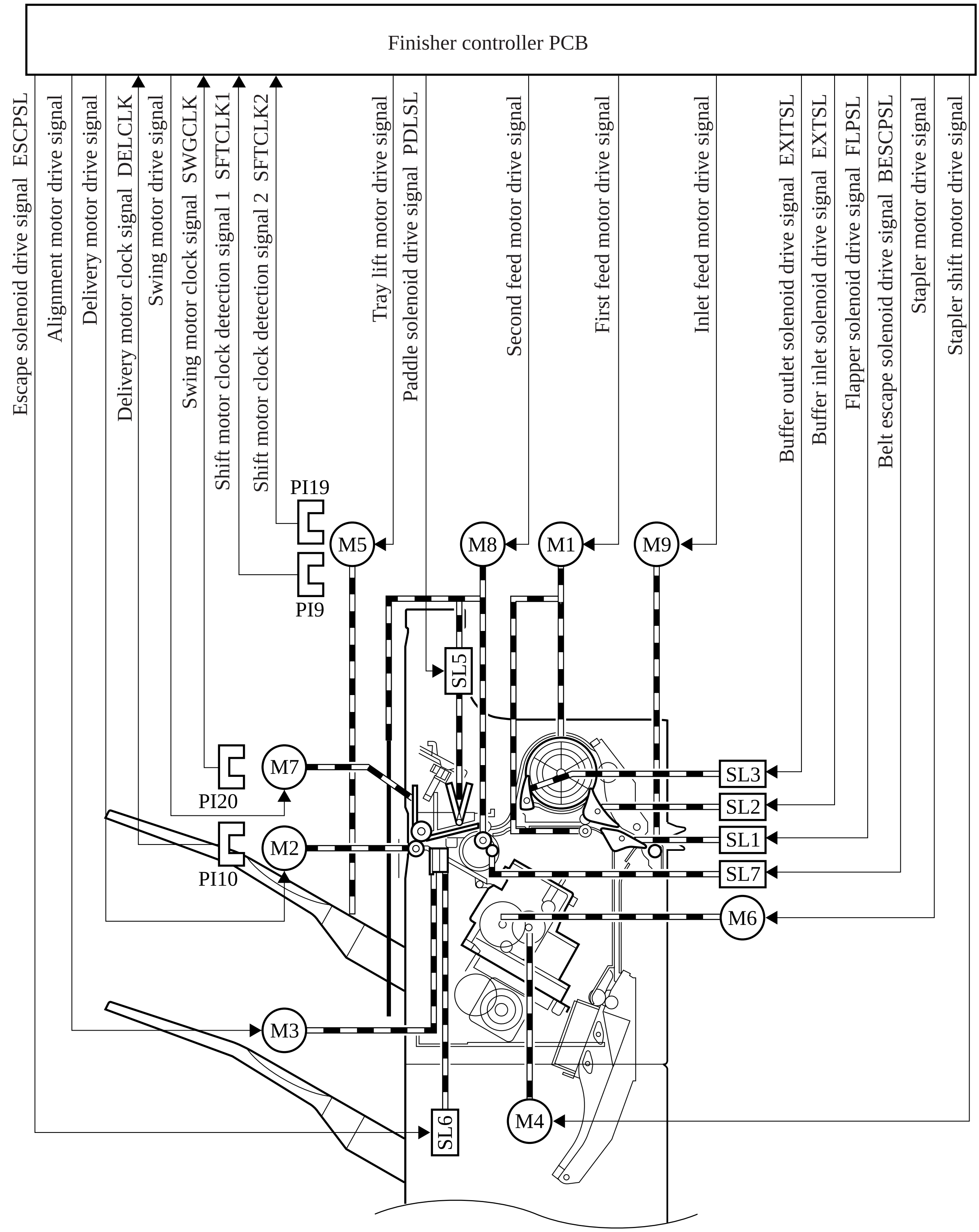

Finisher controller PCB
Escape solenoid drive signal ESCPSL
Alignment motor drive signal
Delivery motor drive signal
Delivery motor clock signal DELCLK
Swing motor drive signal
Swing motor clock signal SWGCLK
Shift motor clock detection signal 1 SFTCLK1
Shift motor clock detection signal 2 SFTCLK2
Tray lift motor drive signal
Paddle solenoid drive signal PDLSL
Second feed motor drive signal
First feed motor drive signal
Inlet feed motor drive signal
Buffer outlet solenoid drive signal EXITSL
Buffer inlet solenoid drive signal EXTSL
Flapper solenoid drive signal FLPSL
Belt escape solenoid drive signal BESCPSL
Stapler motor drive signal
Stapler shift motor drive signal
PI19
PI9
M5
M8
M1
M9
SL5
M7
PI20
M2
PI10
SL3
SL2
SL1
SL7
M6
M3
SL6
M4

Figure 2-216

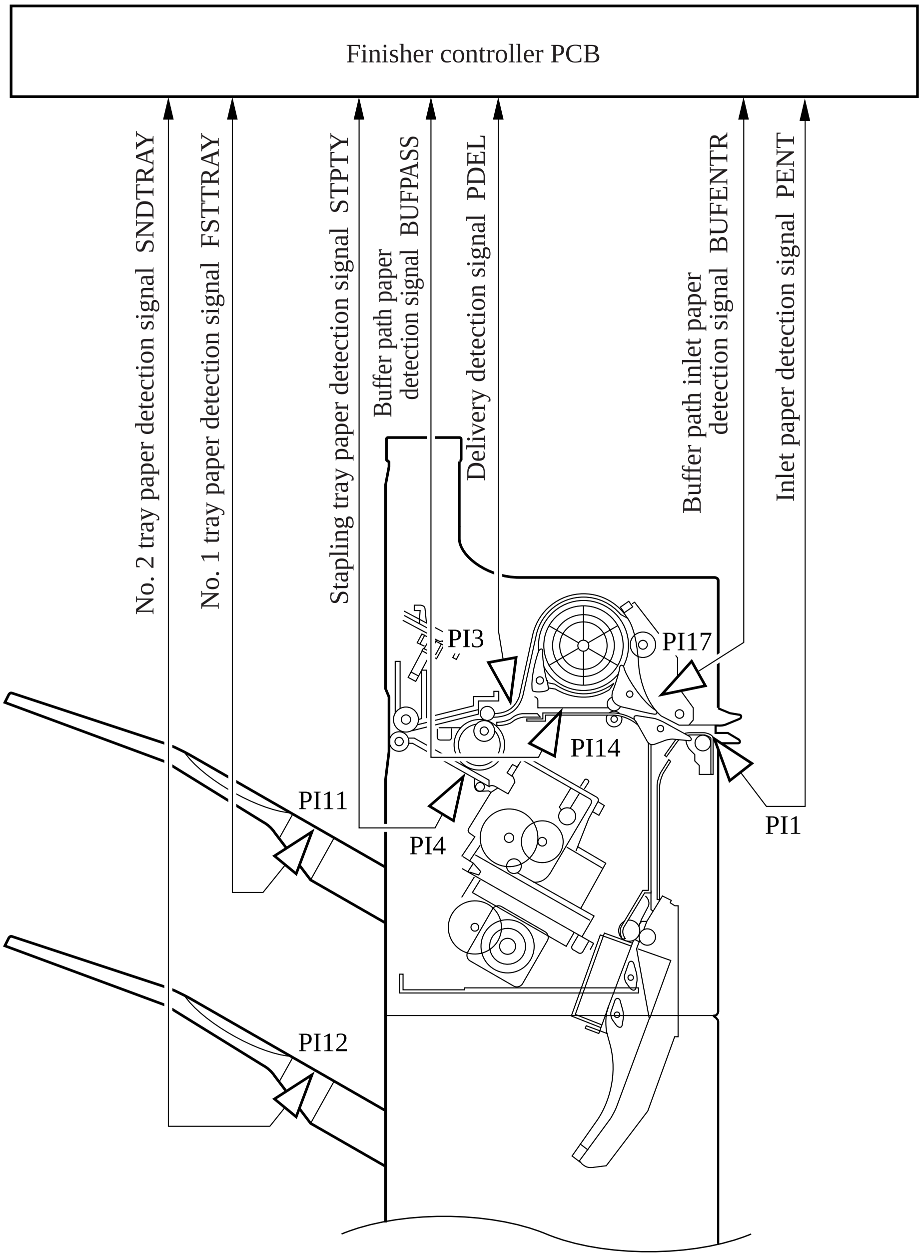

Finisher controller PCB
No. 2 tray paper detection signal SNDTRAY
No. 1 tray paper detection signal FSTTRAY
Stapling tray paper detection signal STPTY
Buffer path paper detection signal BUFPASS
Delivery detection signal PDEL
Buffer path inlet paper detection signal BUFENTR
Inlet paper detection signal PENT
PI3
PI17
PI14
PI11
PI4
PI1
PI12

Figure 2-217

D. Job Offset

1. Outline

In the job offset mode, sort jobs and entire copy groups are shifted to the front for delivery to the tray, and other copies are delivered to the tray without a shift.

The copies are shifted by the alignment plate. The alignment plate is checked by the alignment home position sensor (PI6) to find out whether it is at the home position.

The finisher controller PCB drives the alignment plate motor (M3) at power-on to return the alignment plate to its home position.

The finisher controller PCB stops the delivery motor (M2) when the trailing edge of the copy has moved past the feed roller 2. Then, the finisher controller PCB rotates the delivery motor counterclockwise, and drives the swing motor (M7). As a result, the drive of the delivery motor is transmitted to the swing guide to move up the guide. When the swing guide open detection sensor (PI18) detects the swing guide, the delivery motor stops, and the swing guide is held at the up position.

When the swing guide has moved up, the feed belts attached to the feed roller 2 move the copy to the stapling tray. The presence of paper on the stapling tray is monitored by the stapling tray paper sensor (PI4). (The first sheet is fed to the stapling tray while the swing guide is moving up.)

The finisher controller PCB drives the alignment motor (M3) in advance, and keeps the alignment plate in wait at a point 10 mm behind the trailing edge of a sheet. Whenever one sheet is moved to the stapling tray, each sheet is aligned, and when the fifth or last sheet in a sort job/group is fed to the stapling tray, the guide plate retaining solenoid (SL6) moves the guide plate away and under the stapling tray. From then on, the alignment motor shifts the sheets to the front by 30 mm.

When the copy has been shifted, the finisher controller PCB rotates the alignment motor counterclockwise to move the alignment plate to a point 10 mm behind the trailing edge of the sheet. This alignment operation is repeated until alignment of the fifth or last sheet in a sort job is completed. At this time, the swing guide is moved down and is closed, and the delivery motor rotates clockwise to deliver the sheet.

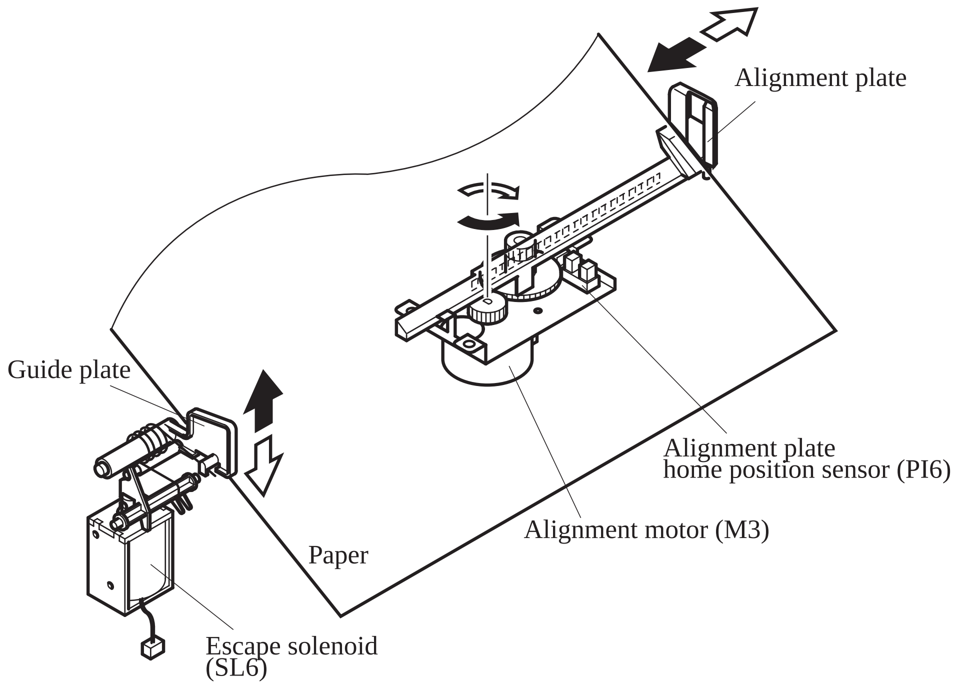


Figure 2-218

Sequence of Operation (job offset)

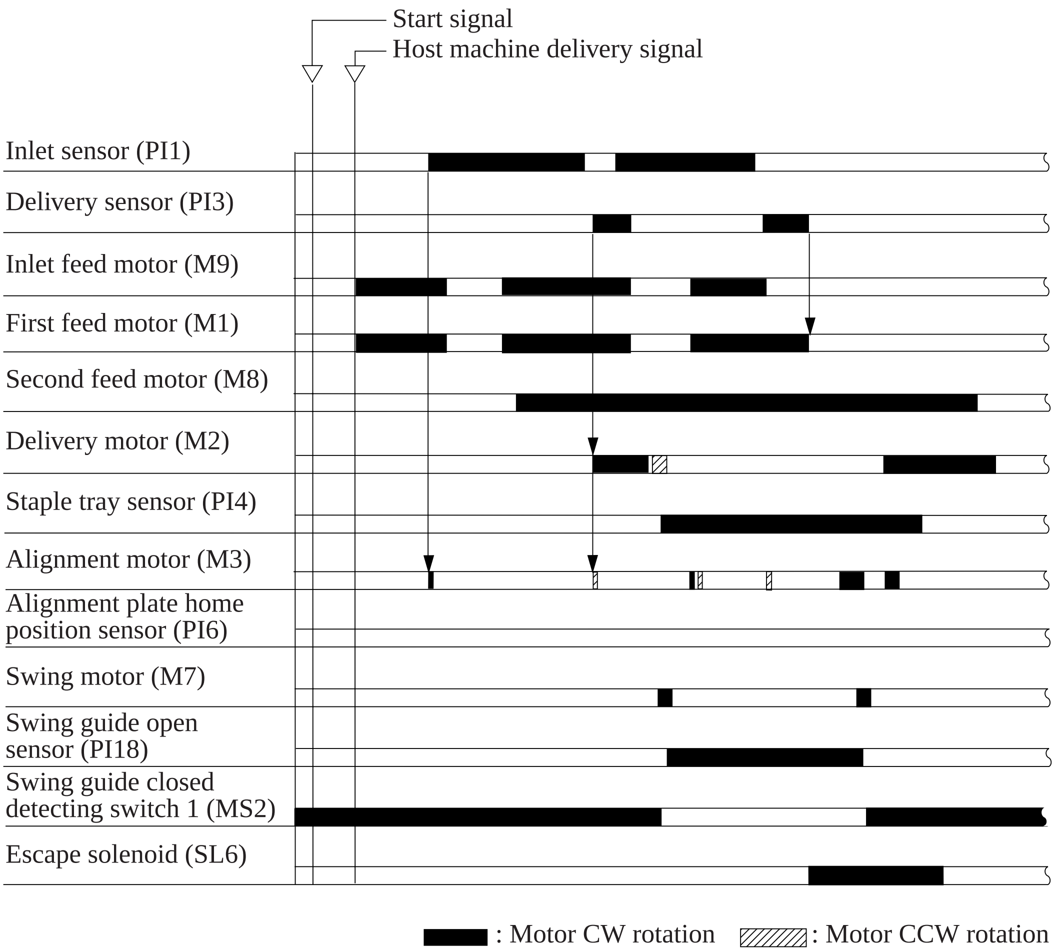


Figure 2-219

2. Flow of Job Offset Operations

1) The swing guide moves up and, at the same time, the feed belts move the sheet to the stapling tray.

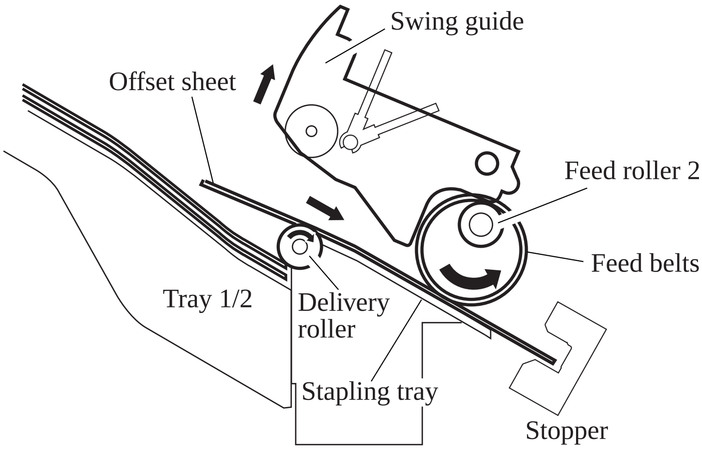


Figure 2-220

2) The alignment plate shifts the sheet to the front.

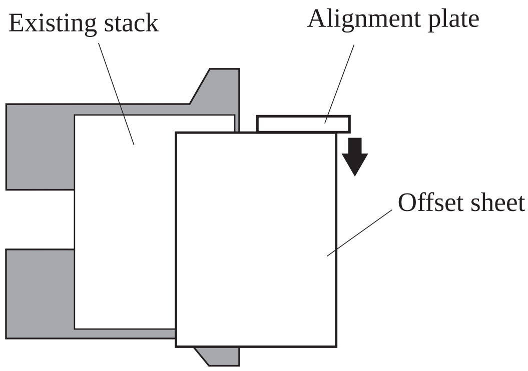


Figure 2-221

3) The swing guide moves down and, at the same time, the delivery roller delivers the sheet.

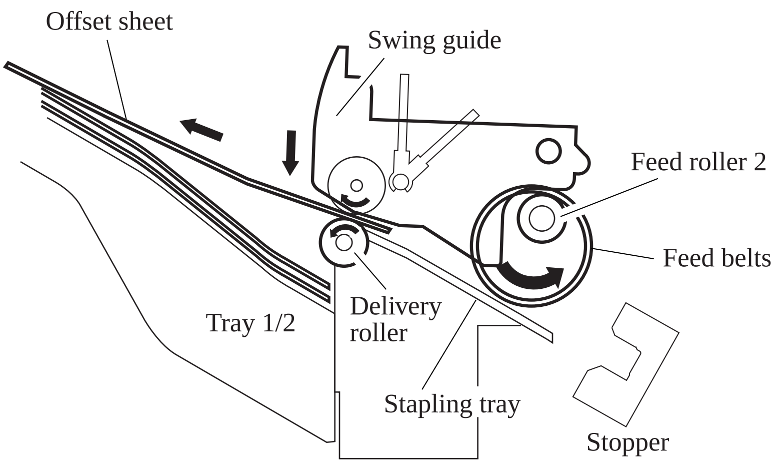


Figure 2-222

E. Staple Operation

1. Outline

The stapler unit staples a stack of as many sheets as specified.

The stapling position differs according to the selected staple mode and paper size.

The stapler unit is checked by the stapler shift home position sensor (PI7) to find out whether it is at the home position.

When starting operation after power-on, the finisher controller PCB drives the stapler shift motor (M4) to return the stapler unit to the home position. If the stapler is already at the home position, it is kept as it is in wait.

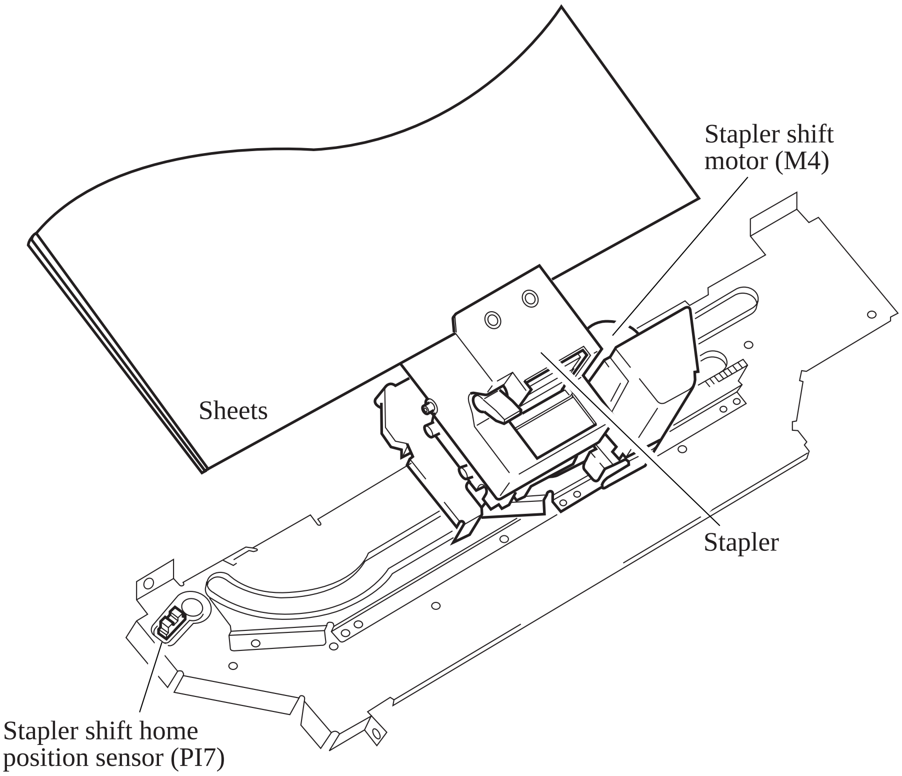


Figure 2-223

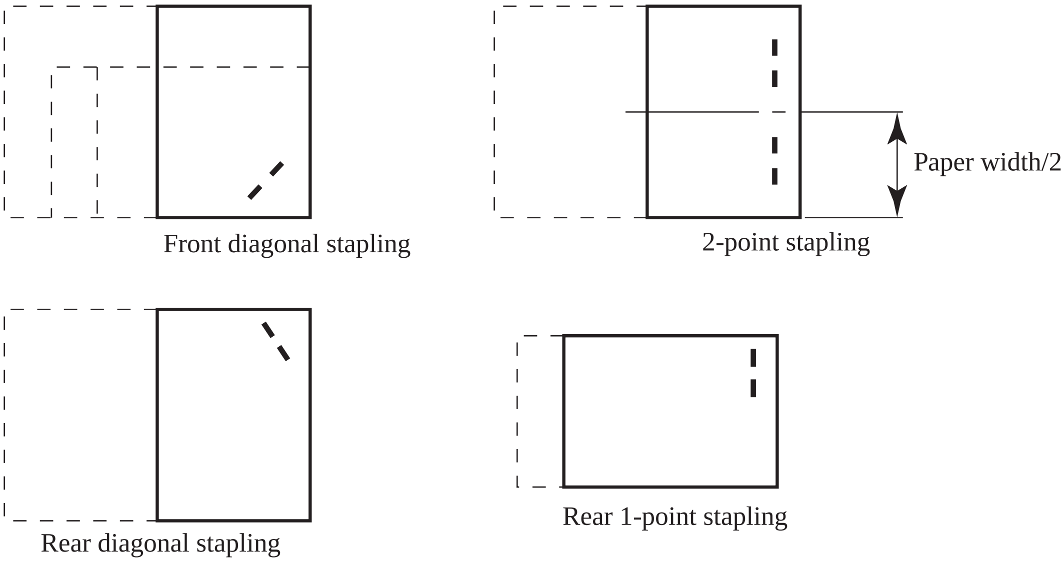

Front diagonal stapling
Paper width/2
2-point stapling
Rear diagonal stapling
Rear 1-point stapling

Figure 2-224

2. First Sheet

The finisher controller PCB stops the delivery motor (M2) as soon as the trailing edge of the first sheet has moved past the feed roller 2. Then, it rotates the delivery motor clockwise to switch the gear drive to the swing motor (M7), causing the swing guide to move up. When the swing guide open sensor (PI18) finds the swing guide at the up position, the swing motor stops, maintaining the swing guide at the up position.

When the swing guide has moved up, the feed belts of the feed roller 2 move the sheet to the stapling tray. (The first sheet is fed to the stapling tray while the swing guide is moving up.) The presence of paper on the stapling tray is detected by the stapling tray paper sensor (PI4).

The finisher controller PCB drives the alignment motor (M3) when the stapling tray paper sensor has detected paper to put sheets in order. The alignment plate is kept in wait in advance at a point 10 mm behind the trailing edge of the paper.

The swing guide is kept in wait at the up position until the last sheet is output onto the stapling tray.

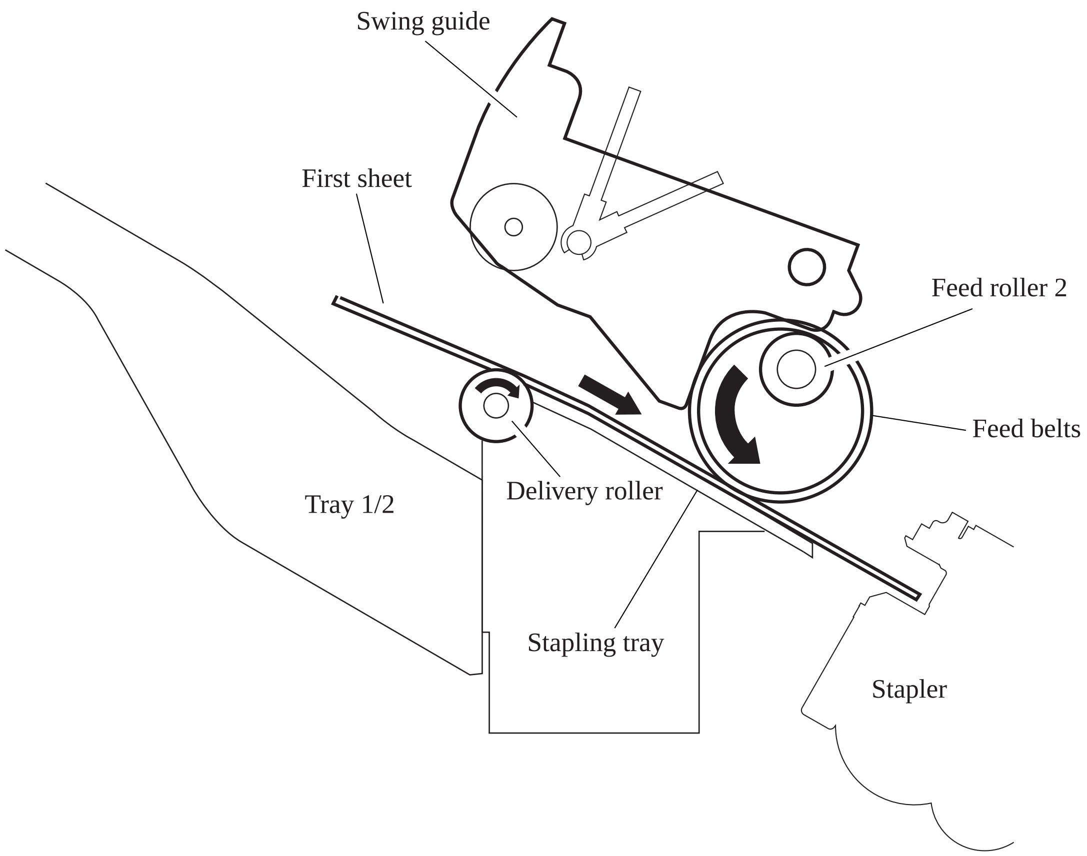


Figure 2-225

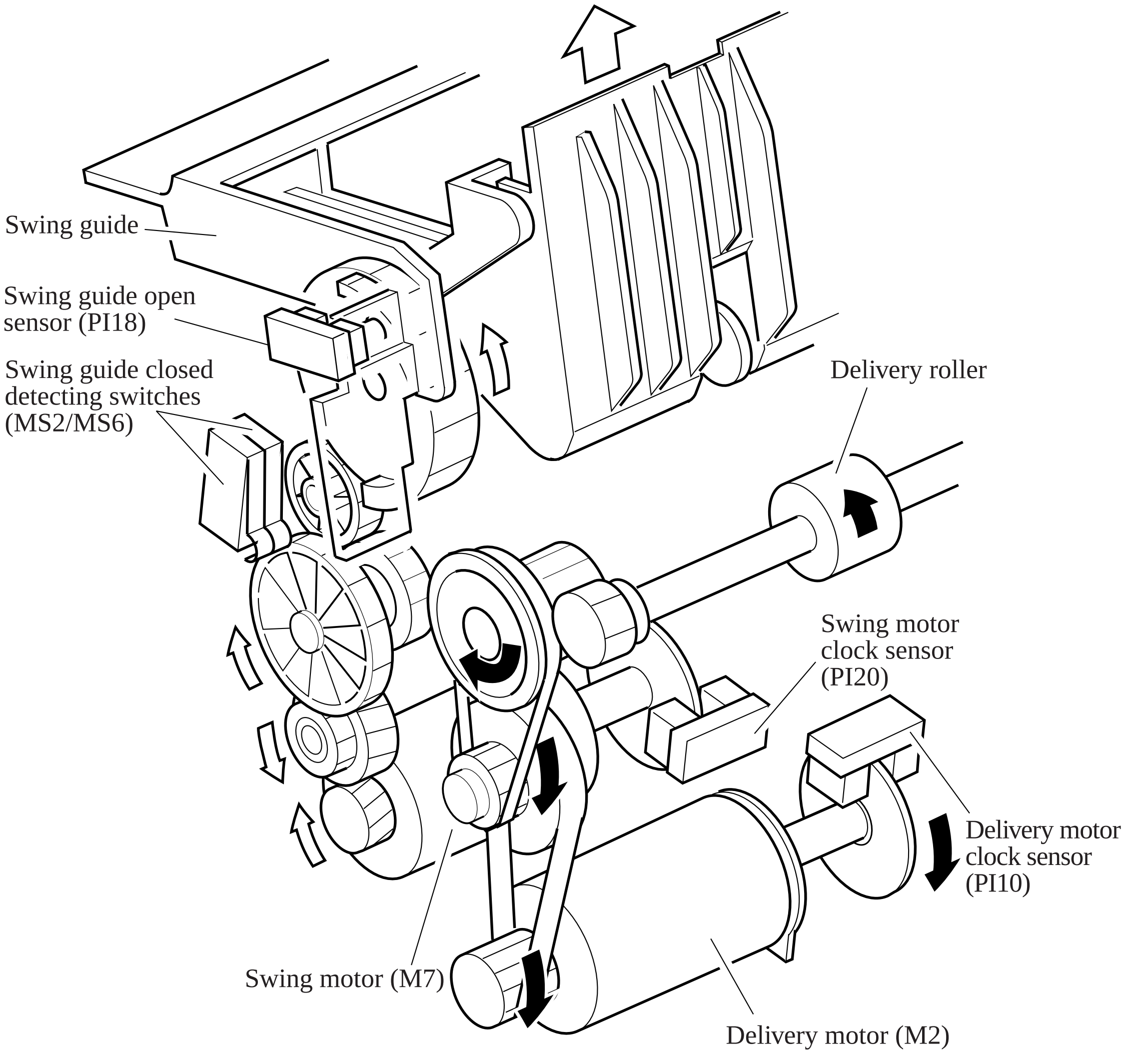

Swing guide
Swing guide open sensor (PI18)
Swing guide closed detecting switches (MS2/MS6)
Delivery roller
Swing motor clock sensor (PI20)
Delivery motor clock sensor (PI10)
Swing motor (M7)
Delivery motor (M2)

Figure 2-226

3. Second and Subsequent Sheets

The finisher controller PCB turns on the belt escape solenoid (SL7) before the trailing edge of the second and subsequent sheets have moved past the feed roller 2 to make the feed belt escape. This operation is performed to reduce the time it takes for the trailing edge of the paper to fall on the stapling tray, and to improve the product duty. The finisher controller PCB turns on the paddle solenoid (SL5) as soon as the trailing edge of the second and subsequent sheets have moved past the feed roller 2, causing the drive of the second feed motor (M8) to rotate the paddle. The sheets are pushed by the paddle and moved to the stapling tray. Almost simultaneously with the trailing edge of the sheet falling into the stapling tray, the belt escape solenoid turns off to return the feed belts that were in the escape position to its original position, and feed the sheet onto the stapling tray. When the sheet has been output onto the stapling tray, the finisher controller PCB rotates the alignment motor (M3) to put the sheets in order.

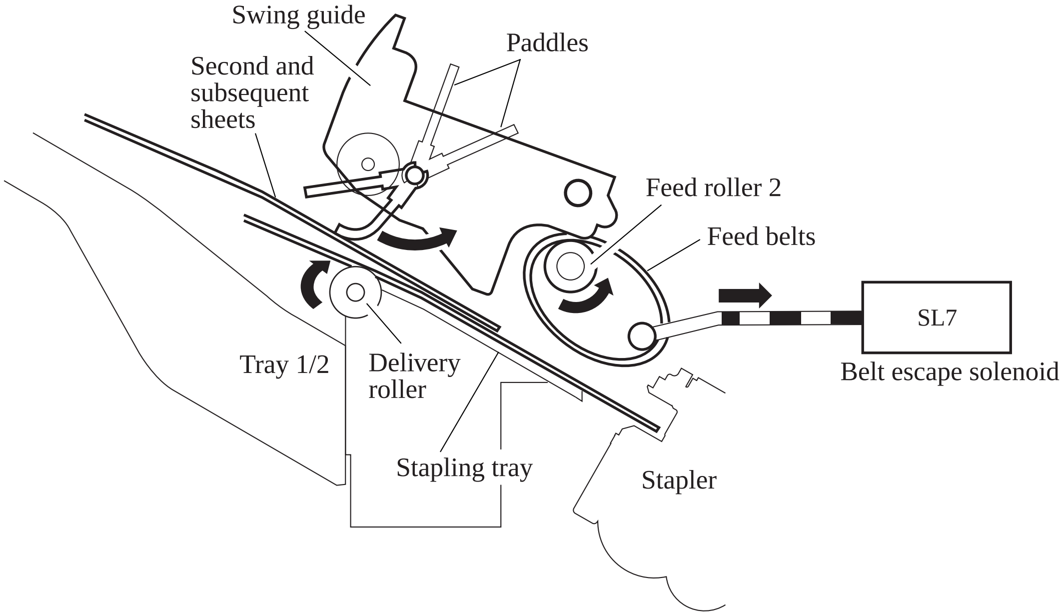


Figure 2-227

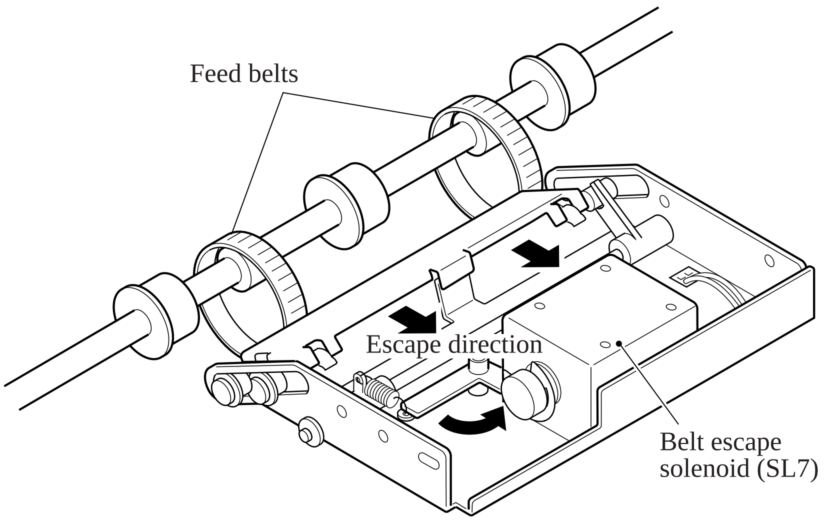


Figure 2-228

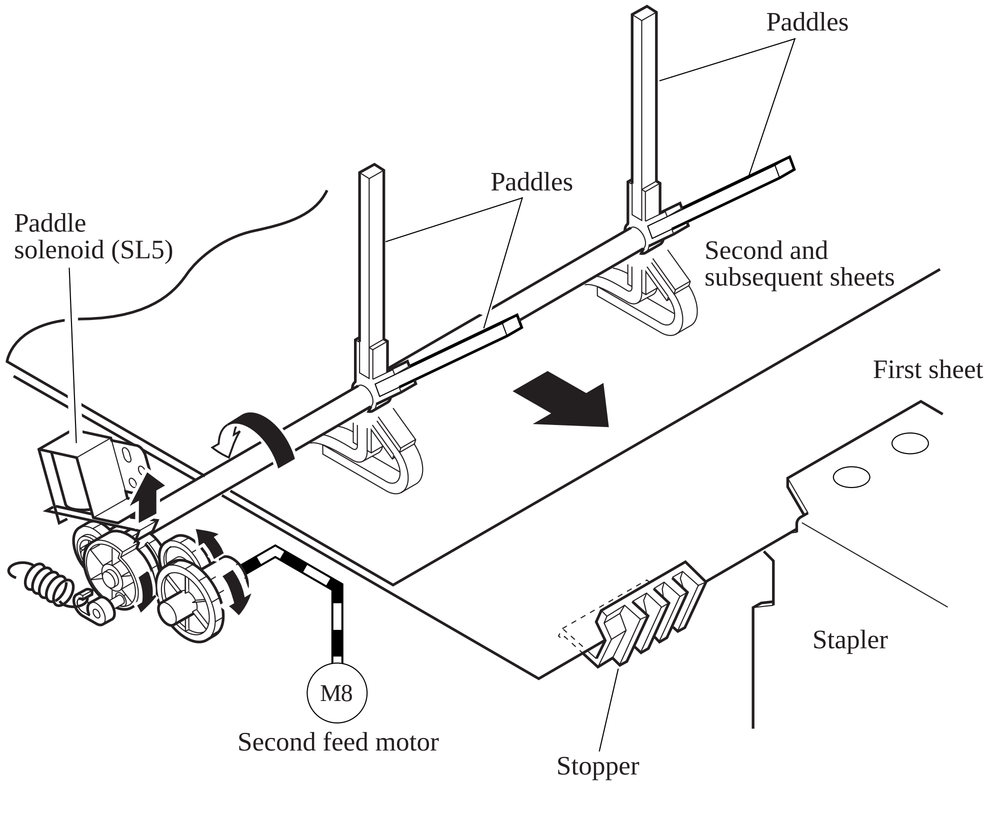


Figure 2-229

4. Last Sheet

When the last sheet has been put in order, the finisher controller PCB turns on the alignment motor (M3) to move the alignment plate to the alignment position (to butt the plate against the stack). Then, the finisher controller PCB rotates the swing motor (M7) counterclockwise to move down the swing guide.

The finisher controller PCB moves the stapler according to the staple mode for stapling.

From then on, it rotates the delivery motor (M2) clockwise to deliver the stack to the tray.

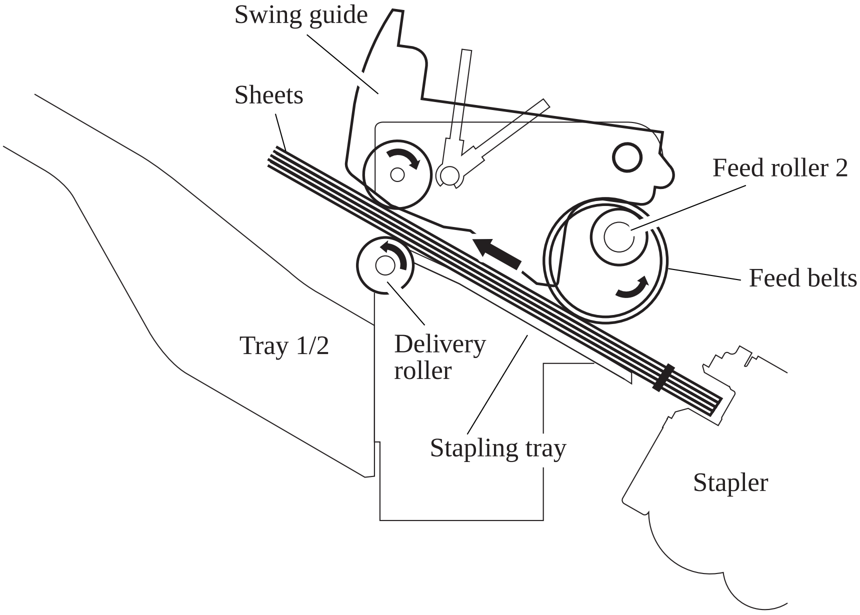


Figure 2-230

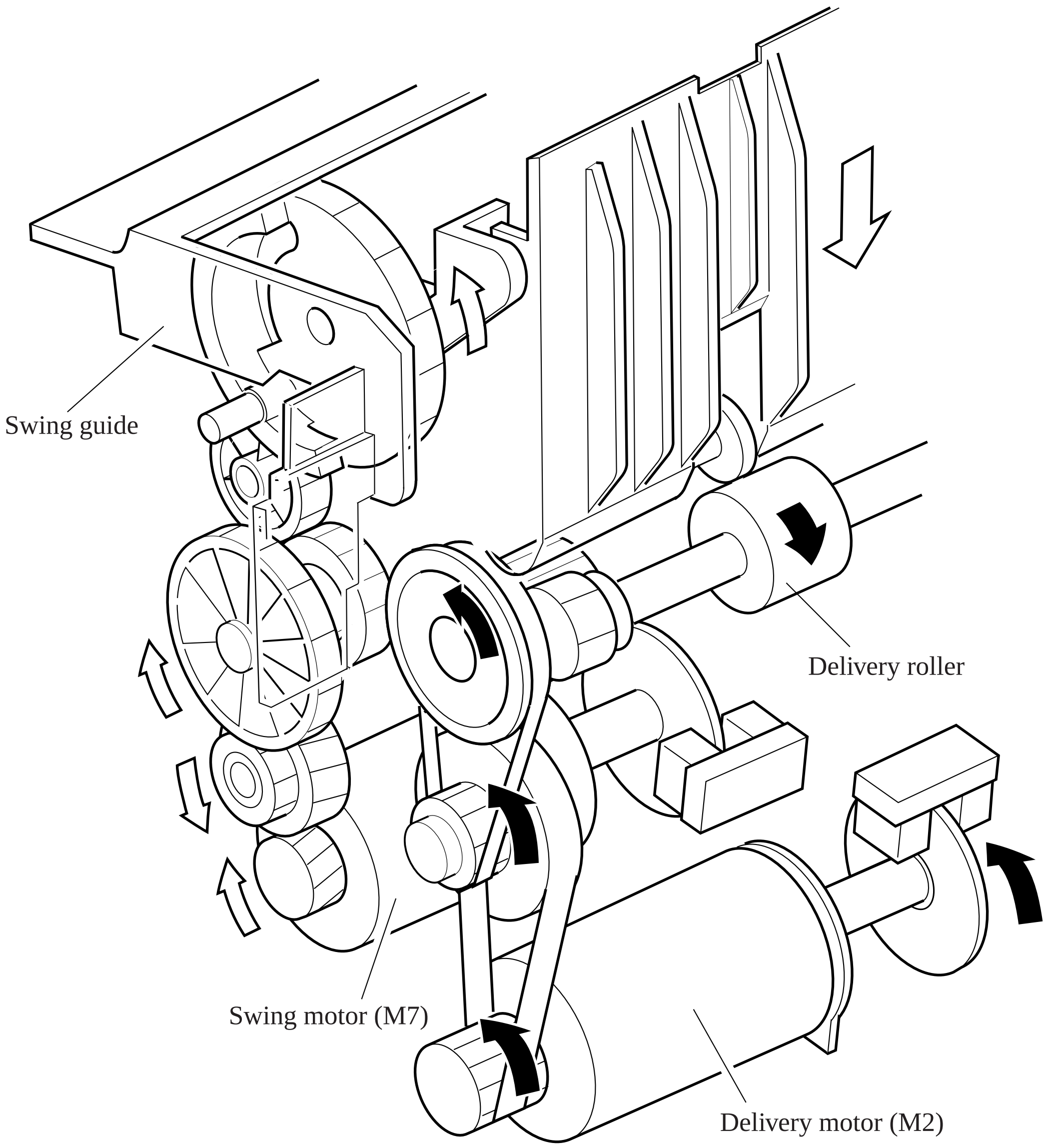

Swing guide
Delivery roller
Swing motor (M7)
Delivery motor (M2)

Figure 2-231

F. Stapler Unit

Stapling is executed by the stapler motor (M6). A single rotation of the cam by the motor results in one stapling operation.

The cam is checked by the stapling home position sensor (PI22) to find out whether it is at the home position.

The stapler motor is controlled by the microprocessor (Q1) on the finisher controller so that it is rotated clockwise or counterclockwise.

When the stapling home position sensor is off, the finisher controller PCB rotates the stapler motor clockwise until the sensor turns on so as to return the stapling cam to its initial state.

The presence/absence of the staple cartridge is detected by the staple cartridge switch (MS8). The presence/absence of staples inside the staple cartridge is detected by the staple detecting switch (MS9). The staple edge sensor (PI21) is used to find out whether a staple has been edged out to the end of the cartridge.

The finisher controller PCB does not drive the stapler motor (M6) unless the swing guide closed detecting switch 2 (MS6) is on (i.e., the swing guide is closed). This is to protect against injuries that could occur when a finger is stuck inside the stapler.

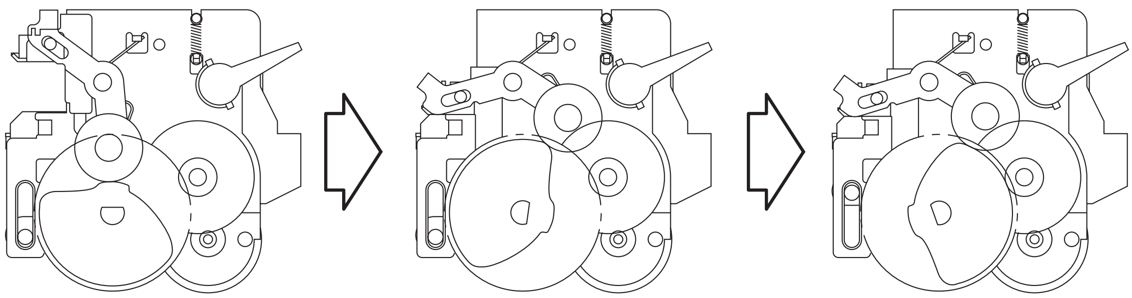


Figure 2-232

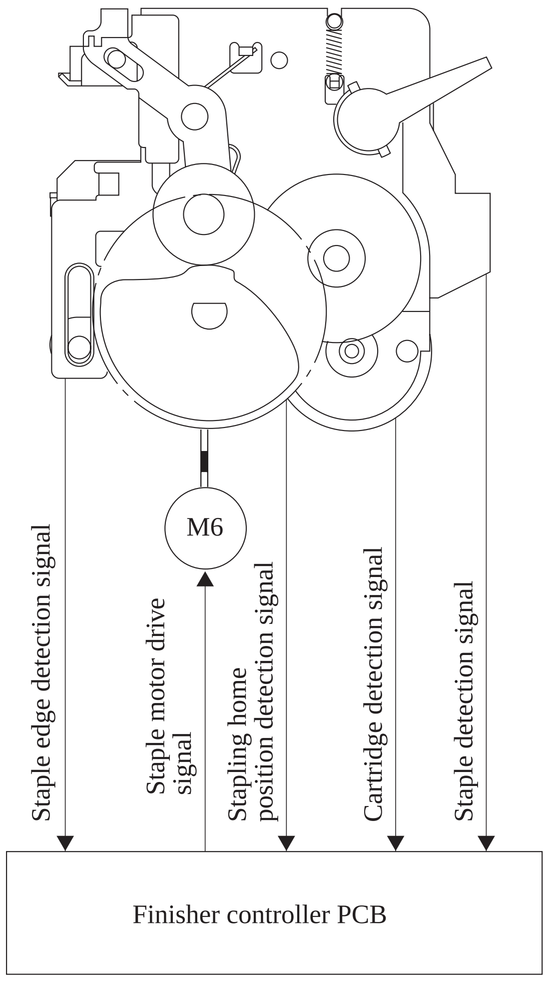


Figure 2-233

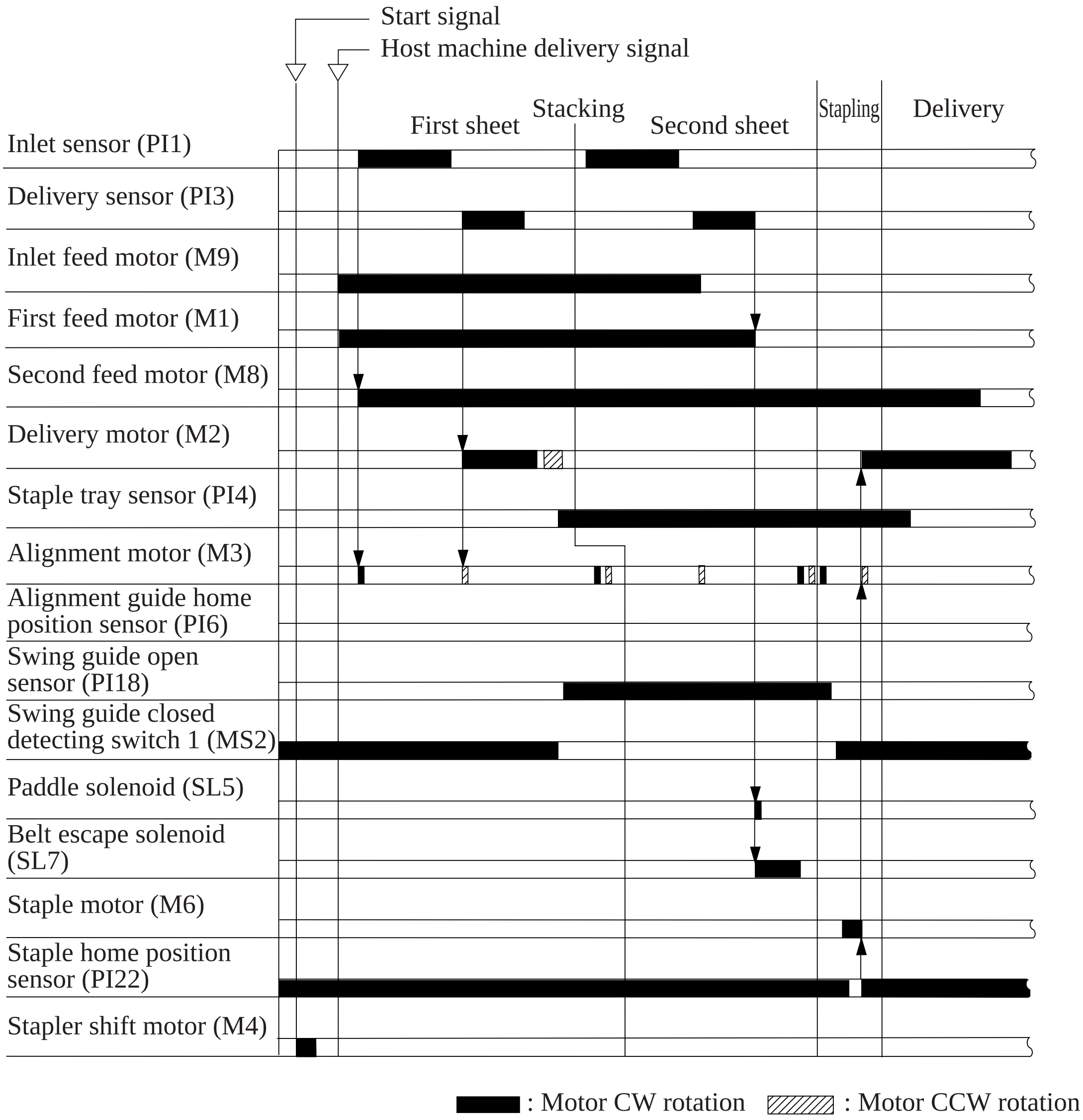

Start signal
Host machine delivery signal
First sheet
Stacking
Second sheet
Stapling
Delivery
Inlet sensor (PI1)
Delivery sensor (PI3)
Inlet feed motor (M9)
First feed motor (M1)
Second feed motor (M8)
Delivery motor (M2)
Staple tray sensor (PI4)
Alignment motor (M3)
Alignment guide home position sensor (PI6)
Swing guide open sensor (PI18)
Swing guide closed detecting switch 1 (MS2)
Paddle solenoid (SL5)
Belt escape solenoid (SL7)
Staple motor (M6)
Staple home position sensor (PI22)
Stapler shift motor (M4)
: Motor CW rotation
: Motor CCW rotation

Figure 2-234

5. Shifting the Stapler Unit

The stapler unit is moved by the stapler shift motor (M4). Its home position is detected by the stapler shift home position sensor (PI7). When the start signal arrives from the host machine, the stapler moves to the center of its movement range. This movement occurs regardless of the selected mode of delivery, as no specific mode is recognized at this point in time. When the command for stapling arrives from the host machine after the first sheet has reached the host machine pre-registration sensor, the stapler moves to the staple wait position to suit the appropriate stapling position and paper size.

See Figures 2-235 and later for an idea of the wait position according to the stapling mode.

a. Front Diagonal Stapling

The position is the same as the stapling position.

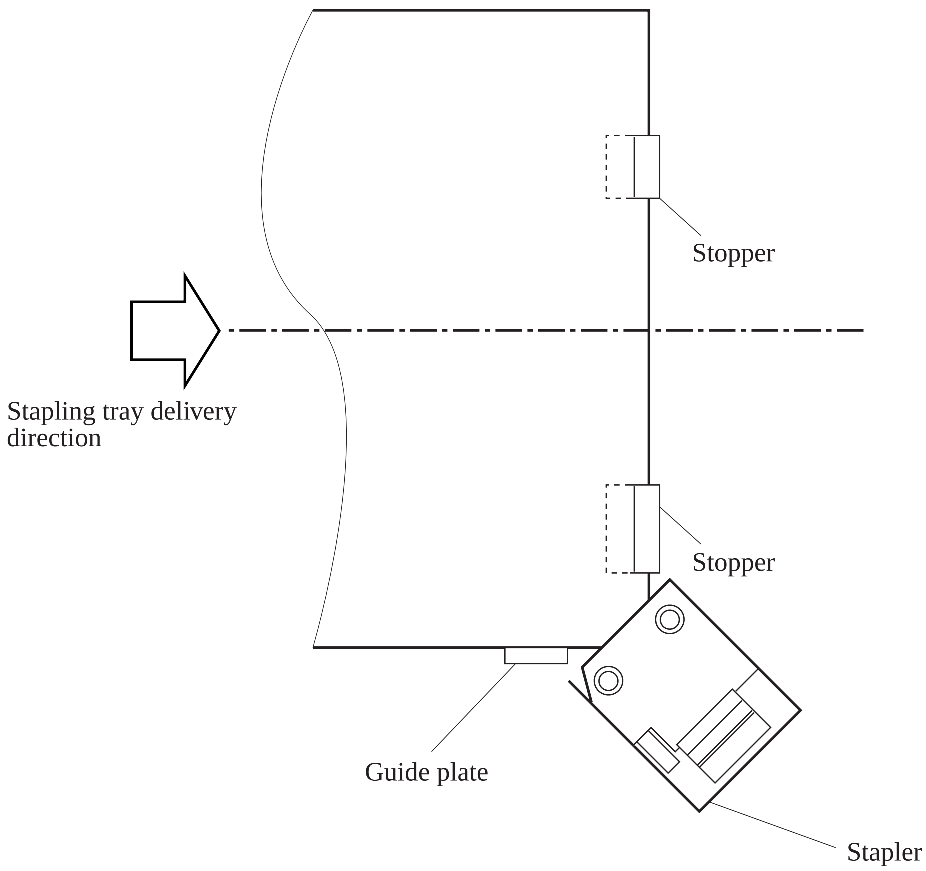


Figure 2-235

b. Rear 1-Point Stapling

The stapler is kept in wait at the center position. The stapler is moved to and from the stapling position for each stapling operation.

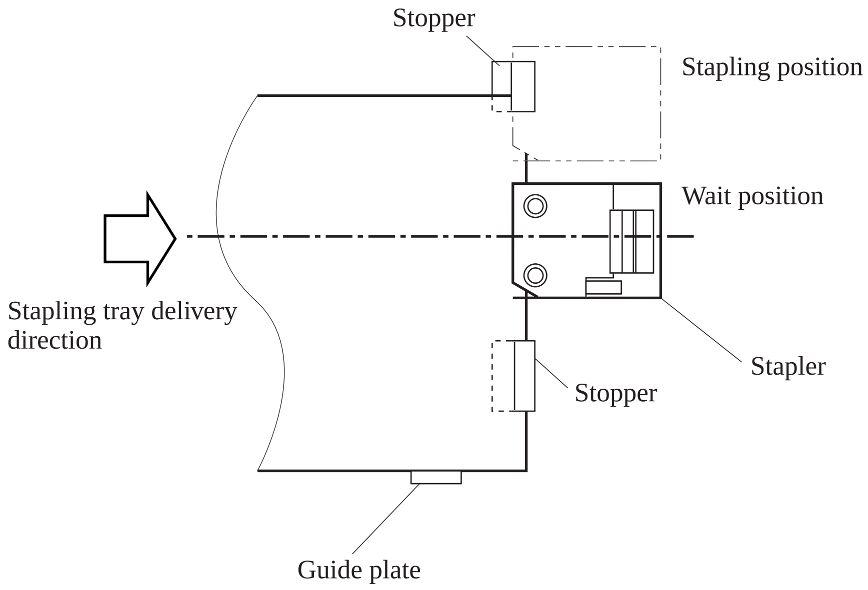


Figure 2-236

c. Rear Diagonal Stapling

For A4, LTR and B5 sizes, the stapler is kept in wait toward the rear away from the stapling position. The stapler is moved to and from the stapling position for each stapling operation.

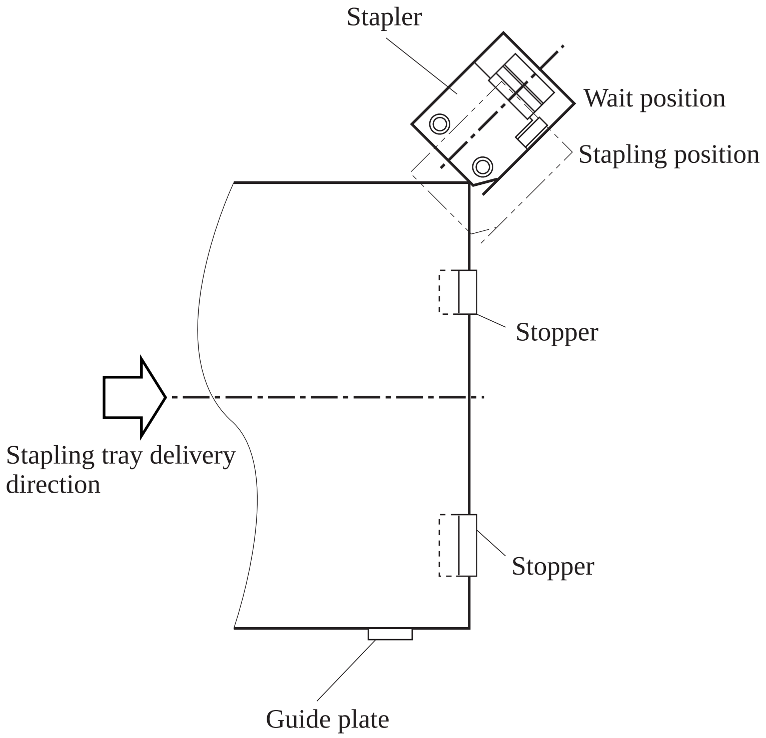


Figure 2-237

d. 2-Point Stapling

The stapler is kept in wait at the center of the paper. Stapling occurs at two points, first at the rear and then at the front.

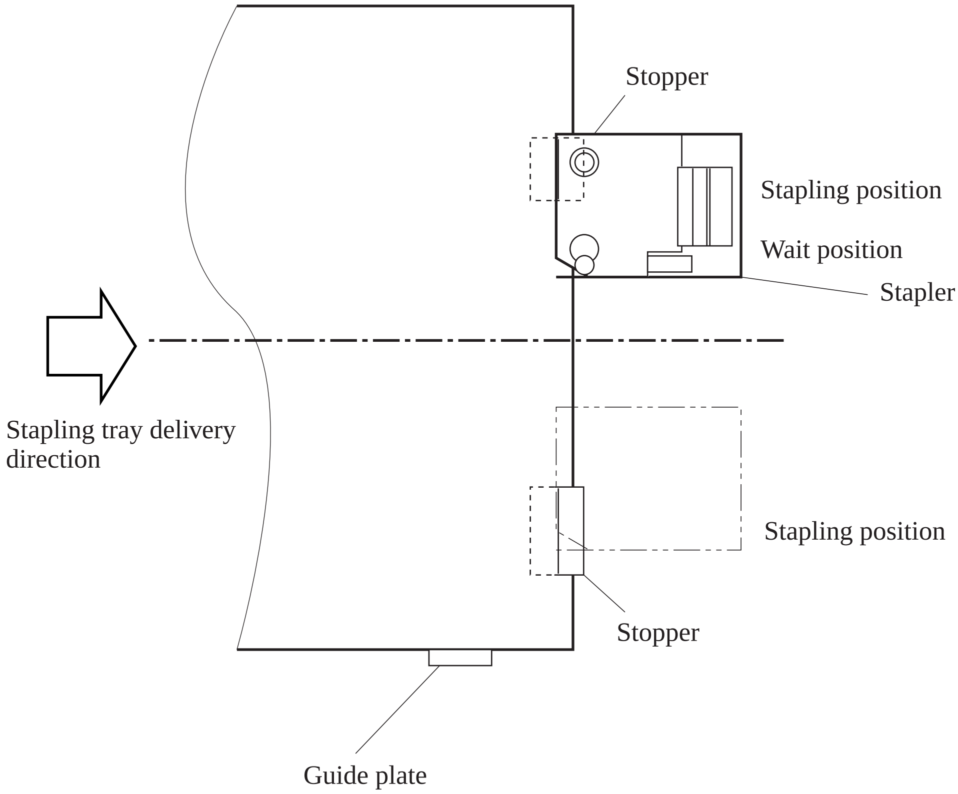


Figure 2-238

G. Tray Operation

The finisher has two delivery trays for normal delivery, each accepting sheets.

Each tray is moved up and down by the tray lift motor (M5).

The position of tray is identified with reference to the number of clock pulses of the tray lift motor clock sensor 1/2 (PI9/PI19) coming from the tray home position sensor (PI8). The finisher controller PCB finds out in which direction (up or down) the tray is moving based on combinations of pulses from the two clock sensors.

The finisher controller PCB drives the tray lift motor (M5) to return the tray to the home position at power-on. If the tray is already at the home position, it is kept in wait as it is.

The finisher controller PCB moves up and down the tray selected by the host machine so that it is positioned at the delivery slot.

The upper limit of the tray is detected by the tray upper limit detecting switch (MS5). The finisher controller PCB stops the drive (up) of the tray lift motor (M5) as soon as the tray upper limit detecting switch turns on.

The height of the stack on the tray is identified by the height sensor (PS1), which measures its distance from the top of the stack. The tray is moved down when the distance between the top of the stack and the delivery assembly drops to a specific measurement.

The finisher controller PCB cuts off the +24V power of the tray lift motor (M5) as soon as the safety zone detecting switch (MS3) turns on while the shutter and the swing guide are open, stopping the operation of the finisher.

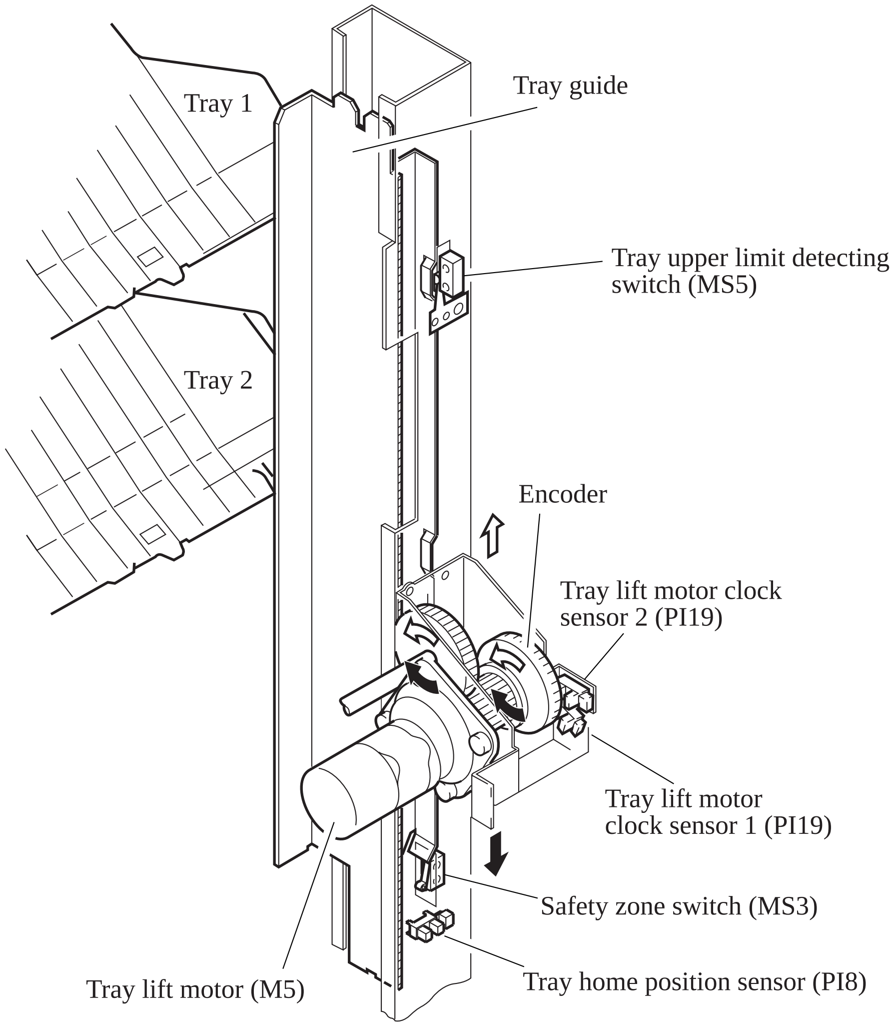

Tray 1
Tray guide
Tray upper limit detecting switch (MS5)
Tray 2
Encoder
Tray lift motor clock sensor 2 (PI19)
Tray lift motor clock sensor 1 (PI19)
Safety zone switch (MS3)
Tray home position sensor (PI8)
Tray lift motor (M5)

Figure 2-239

H. Detecting the Height of Stack on the Tray

1. Outline

The number of sheets delivered to the tray and the number of sets (number of stapling operations) are stored in memory by the finisher controller PCB. The height of the stack is checked by the height sensor (PS1). See Table 2-201 for the maximum loading capacity of each tray.

The finisher controller PCB stops operation when the conditions in Table 2-201 occur, informing the host machine that the tray is full.

Stacking mode / Tray	Non-staple sort			Staple sort		
	Small-size	Large-size	Mixed sizes	Small-size	Large-size	Mixed sizes
Tray 1	147 mm high (1000 sheets)	44 mm high (500 sheets)	44 mm high (300 sheets)	110 mm high (750 sheets/ 30 sets)	74 mm high (500 sheets/ 30 sets)	22 mm high (150 sheets/ 30 sets)
Tray 2	147 mm high (1000 sheets)	74 mm high (500 sheets)	44 mm high (300 sheets)	110 mm high (750 sheets/ 30 sets)	74 mm high (500 sheets/ 30 sets)	22 mm high (150 sheets/ 30 sets)

Notes: 1. The capacity for the non-staple sort mode is approximate and computed based on 80 g/m^2 paper.
2. Alignment for stacks containing 750 sheets or more is not guaranteed.
3. Stacking height precision is ±7 mm.

Table 2-201

Caution:
1. The term “small-size” stands for A4, LTR, and B5.
2. The term “large-size” stands for A3, A4R, B4, LGL, 279 × 432 mm (11″ × 17″), and LTRR.

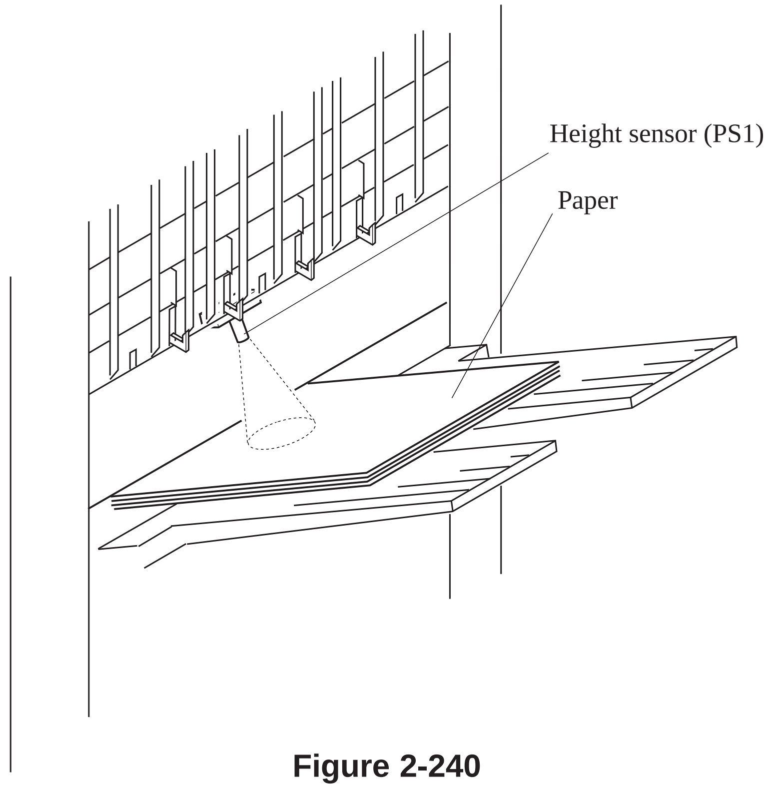


Figure 2-240

I. Shutter Operation

Before the tray on which sheets are output is shifted by the tray lift motor (M5) to another tray, the finisher controller PCB closes the shutter mounted on the delivery slot before moving the tray, preventing the existing stack on the tray by the delivery slot and intrusion of the hands.

The shutter moves up (to close) when the second feed motor (M8) rotates counterclockwise, and is held in position when the motor stops. When the second feed motor rotates counterclockwise once again, it moves down (to open) to enable delivery.

When the shutter is held at the up position, claws slide out of the swing guide to engage the back of the shutter. This way, the existing slack and the swing guide engage while the tray is moved, preventing the guide from opening. The claws slide in when the shutter is moved down to release the engagement.

The upward movement of the shutter is monitored by the shutter closed detecting switch (MS4), and the downward movement is monitored by the shutter open sensor (PI5).

See the following diagrams for how these operations take place.

1) The second feed motor rotates counterclockwise to move the shutter up.

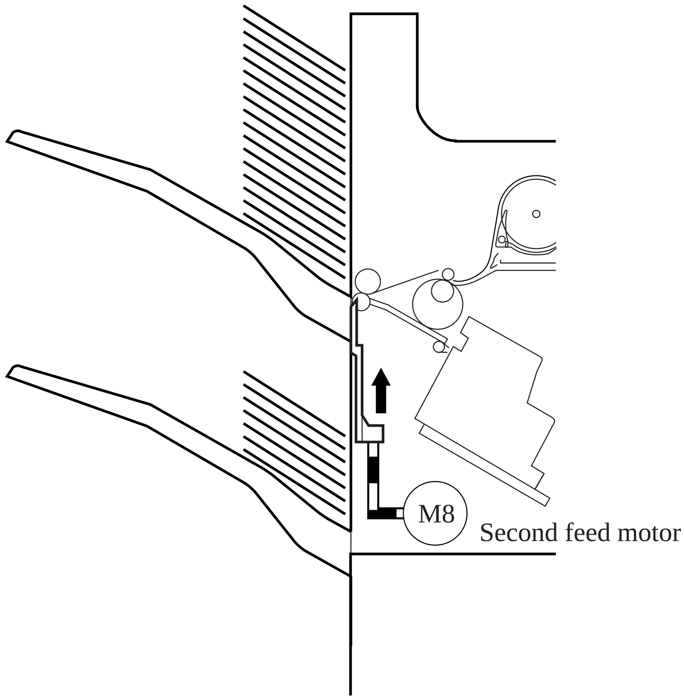


Figure 2-241

2) The tray lift motor rotates, and the new tray moves to the stacking lower limit. The distance of movement is detected by the tray lift motor clock sensor 1/2 (PI9/19).

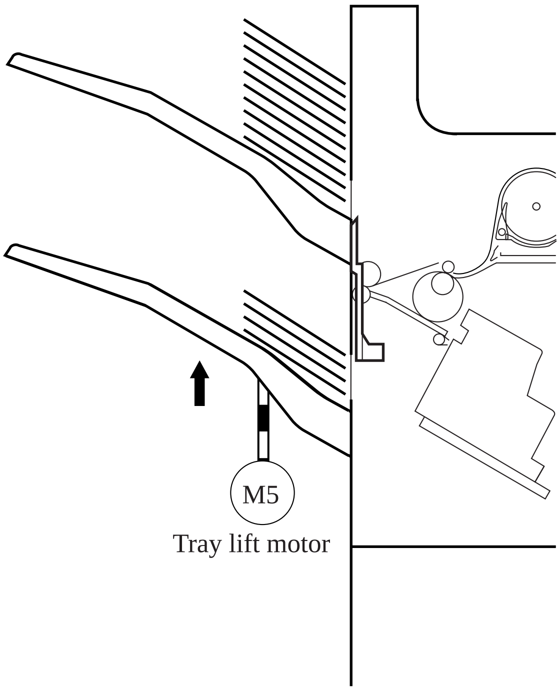


Figure 2-242

3) The second feed motor rotates counterclockwise, and the shutter moves down.

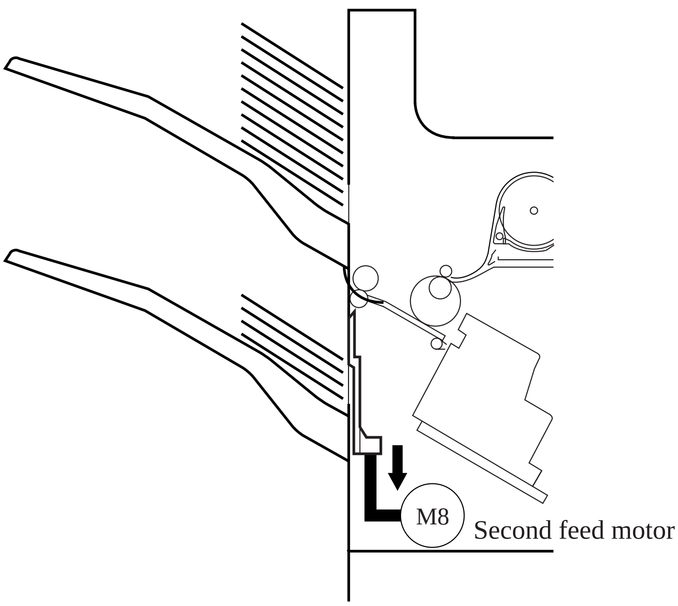


Figure 2-243

4) The tray lift motor rotates, and the tray moves to suit the height of the stack. The appropriate height in relation to the existing stack is checked by the height sensor (PS1).

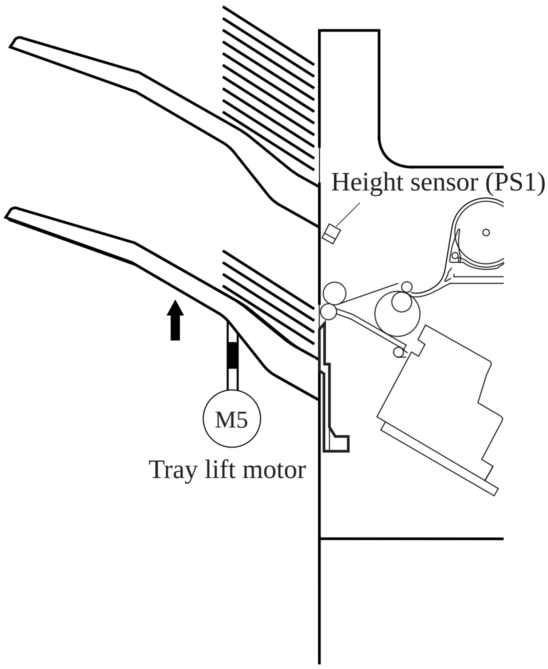


Figure 2-244

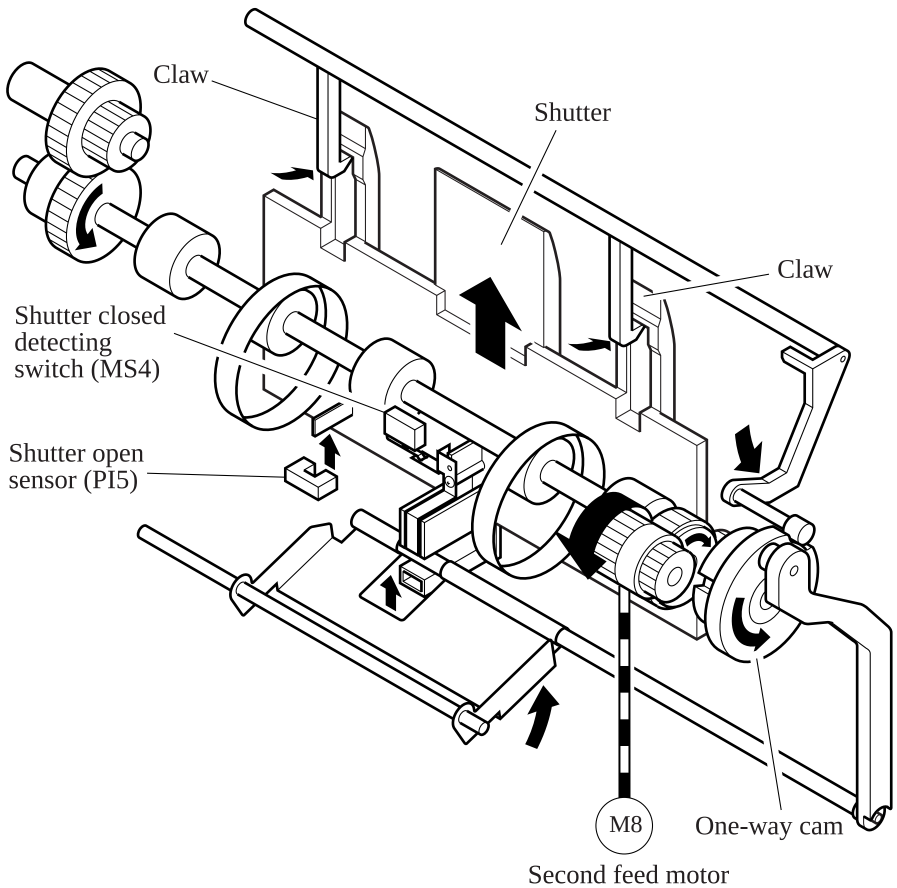


Figure 2-245

Sequence Operations (shutter drive)
Move from Tray 1 to Tray 2

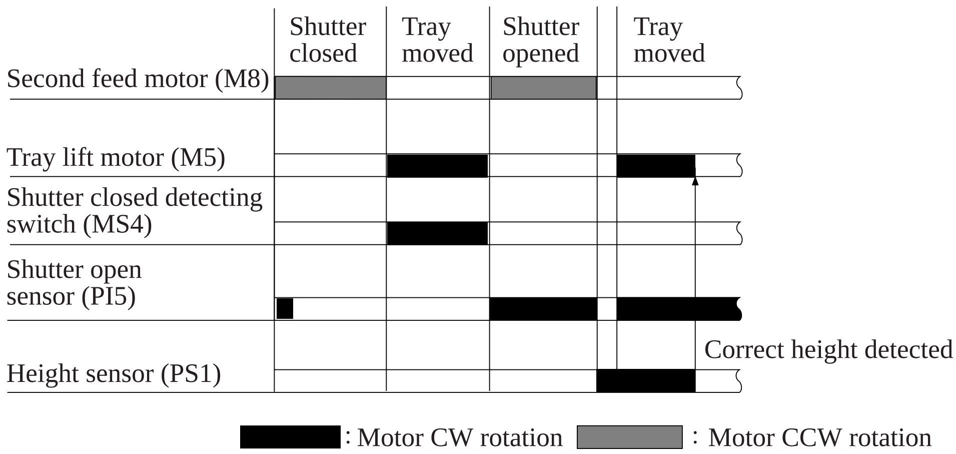


Figure 2-246

J. Buffer Path Operation

1. Outline

This machine is provided with a buffer paper path for continuously receiving paper from the host machine during stapling and job offset operation on the stapling tray. A maximum of three copies (three originals or more in the staple mode) are wrapped around the buffer roller. During this time, job offset and stapling are performed on the stapling tray.

The following shows operation on the buffer paper path.

1) When the first sheet arrives, the buffer inlet solenoid (SL2) remains off. The first sheet enters the buffer path.

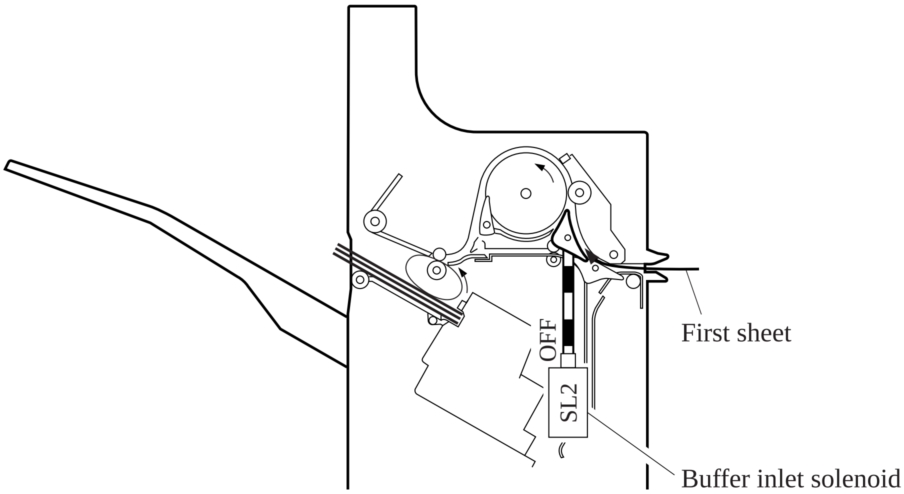


Figure 2-247

2) When the leading edge of the sheet has moved past the buffer path inlet paper sensor (PI17), the buffer outlet solenoid (SL3) turns on so as to cause the sheet to wrap around the buffer roller.

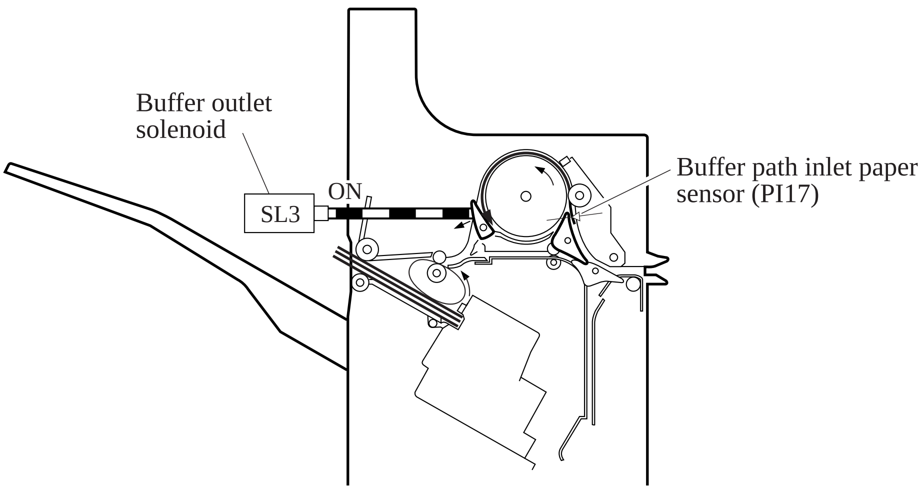


Figure 2-248

3) When the leading edge of the sheet has moved past the buffer path paper sensor (PI14), the buffer roller stops and waits for the second sheet.

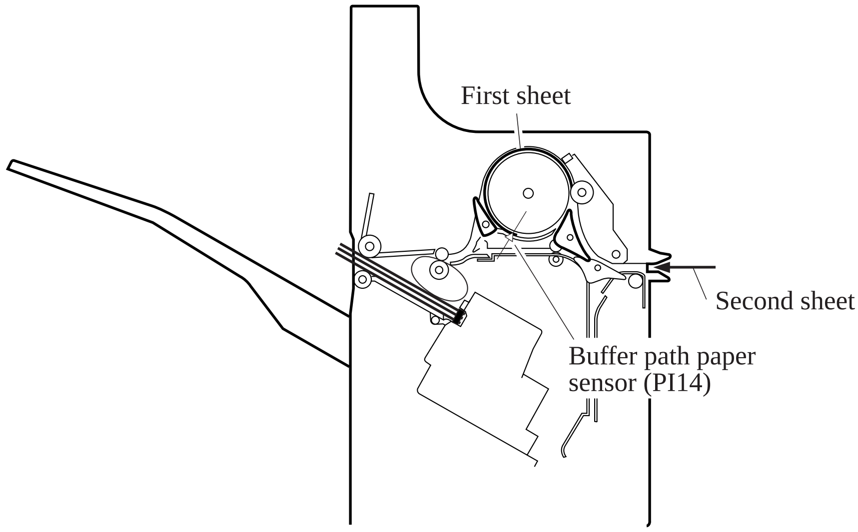


Figure 2-249

4) When the second sheet arrives and its leading edge reaches the inlet sensor (PI1), the buffer roller starts to operate once again.

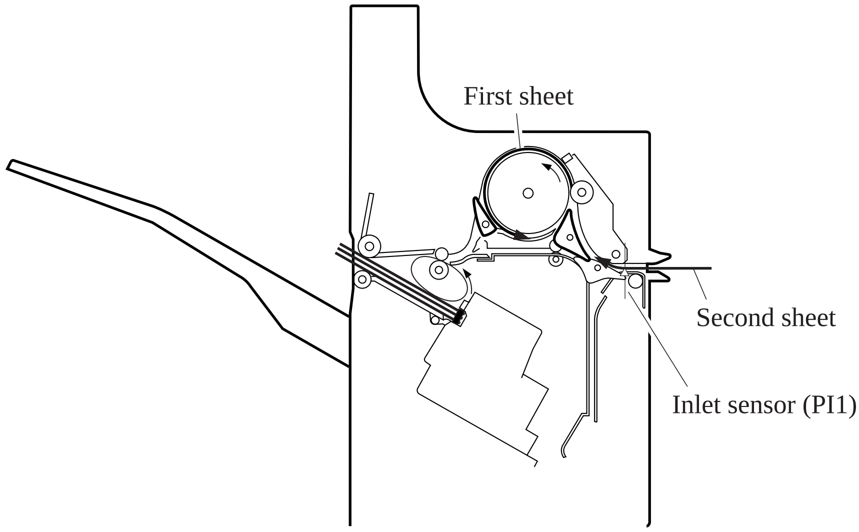


Figure 2-250

5) The buffer roller continues to rotate, and the second sheet overlaps the first sheet.

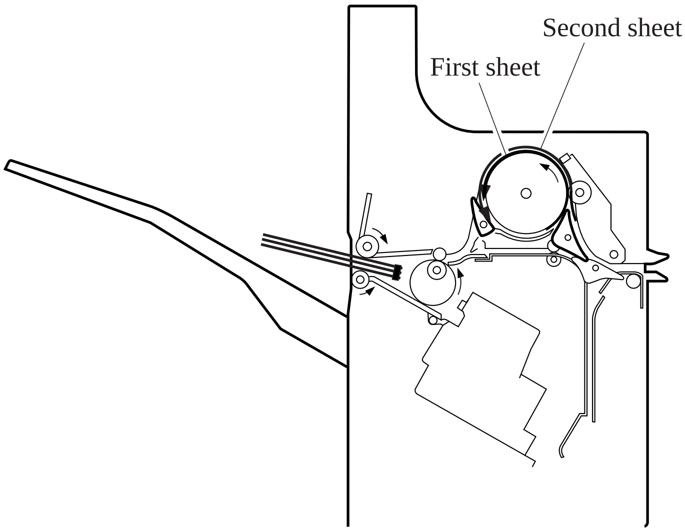


Figure 2-251

6) When the trailing edge of the second sheet has moved past the buffer path paper sensor (PI14), the buffer roller stops and waits for the third sheet.

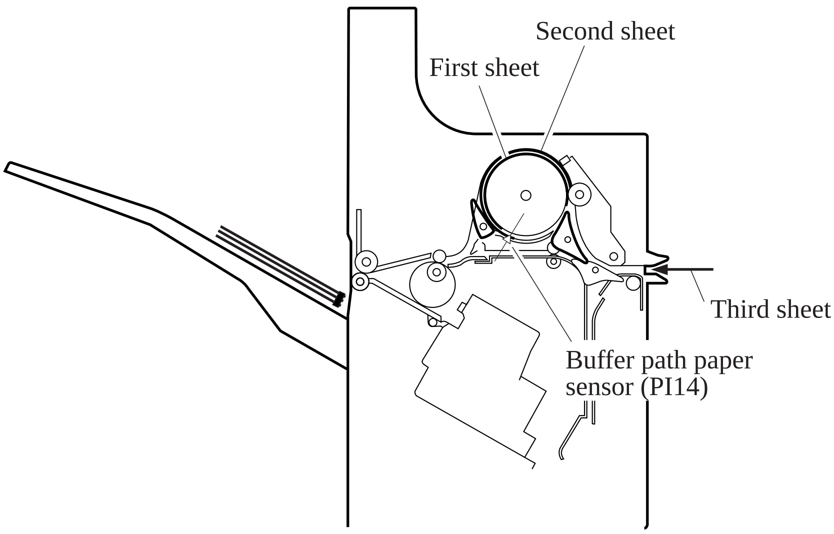


Figure 2-252

7) When the third sheet arrives and its leading edge reaches the inlet sensor (PI1), the buffer roller starts to operate once again.

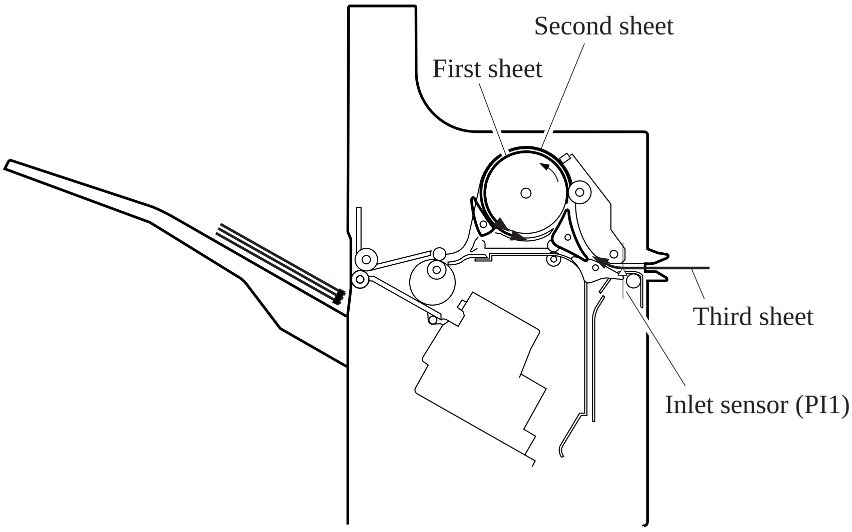


Figure 2-253

8) When the leading edge of the third sheet reaches the inlet sensor (PI1), the buffer outlet solenoid (SL3) turns off so that the path is directed in the direction of delivery. (The actual switch-over will occur after the trailing edge of the first sheet has moved past the flapper.)

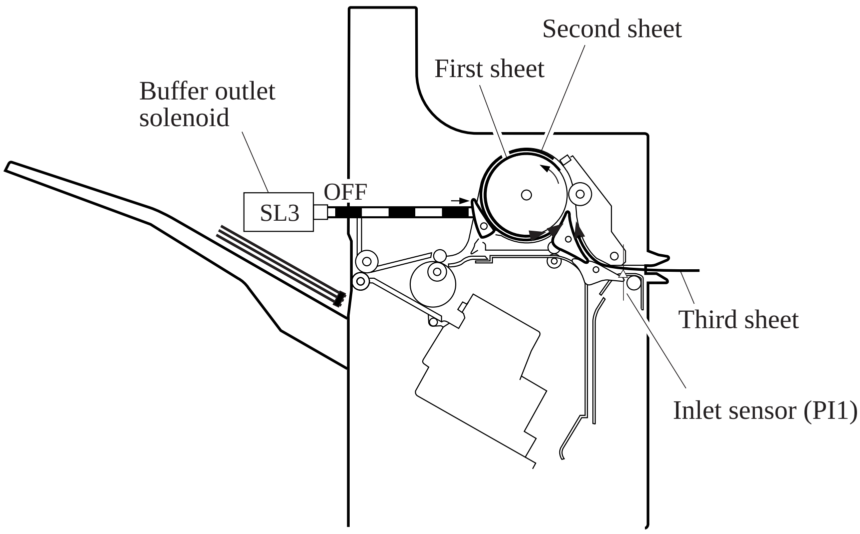


Figure 2-254

9) The buffer roller continues to rotate, the third sheet overlaps the first and second sheets, and the three sheets are fed together towards the delivery roller.

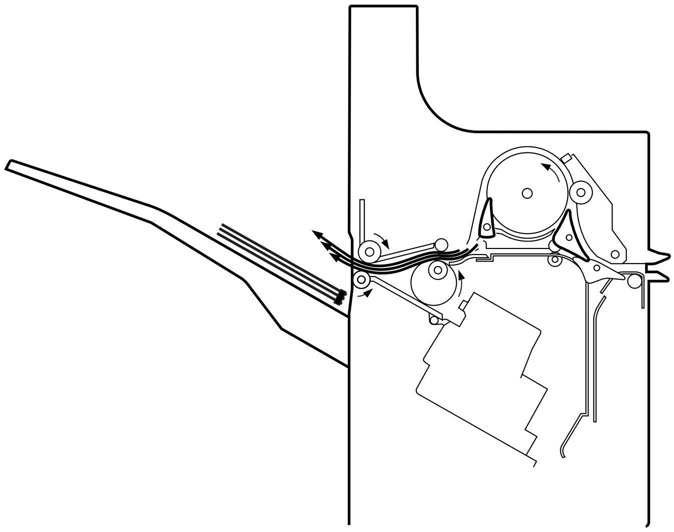


Figure 2-255

K. Detecting Jams

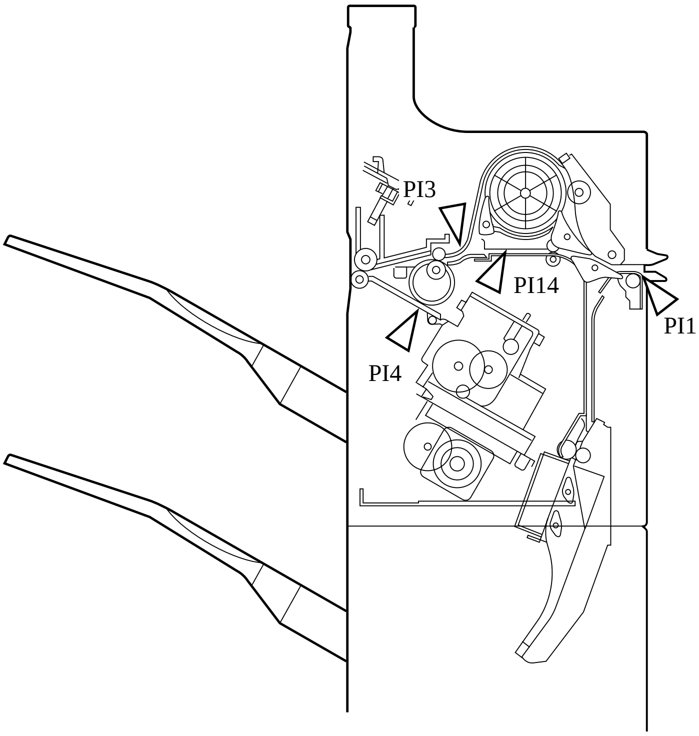
The following sensors are used to detect the presence/absence of paper and to make sure that sheets are moved properly:

- Inlet sensor (PI1)
- Delivery sensor (PI3)
- Stapling tray sensor (PI4)
- Buffer path paper sensor (PI14)

A jam is identified with reference to the presence/absence of paper at each specific sensor at the times programmed in the memory of the microprocessor (CPU) on the finisher controller PCB.

When the CPU identifies a jam, it suspends the finisher's delivery operation and informs the host machine DC controller of the presence of a jam. When all doors are closed after the paper jam is removed, the buffer path inlet paper sensor (PI17) checks whether or not copies are being detected in addition to the above four sensors (inlet sensor, delivery sensor, stapling tray sensor and buffer path paper sensor). If the sensors detect a copy, the finisher unit judges that paper jams have not completely been removed, and sends the paper jam removal signal to the host machine again.

The tray 1 paper sensor (PI11) and tray 2 paper sensor (PI12) are not used to detect jams.



No.	Sensor names
PI1	Inlet sensor
PI3	Delivery sensor
PI4	Stapler tray sensor
PI14	Buffer path paper sensor

Figure 2-256

Table 2-202

1. Inlet Sensor Delay Jam (1033)

The inlet sensor does not detect paper when feeding an equivalent of 400 mm from when the host machine delivery signal has been issued.

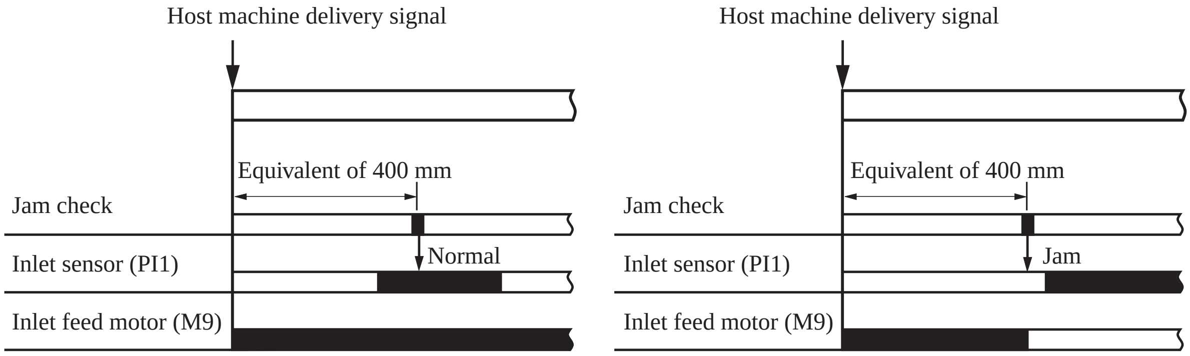


Figure 2-257

2. Inlet Sensor Stationary Jam (1133)

The sheet does not move past the inlet sensor when an equivalent of twice the feeding length of the sheet has been fed after the sensor turned on.

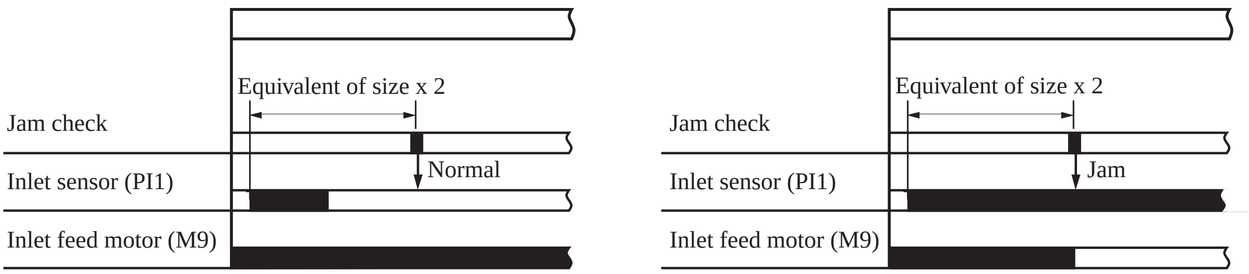


Figure 2-258

3. Buffer Path Paper Sensor Delay Jam (1032)

The buffer inlet sensor does not detect paper when an equivalent of 430 mm has been fed after the inlet sensor turned on.

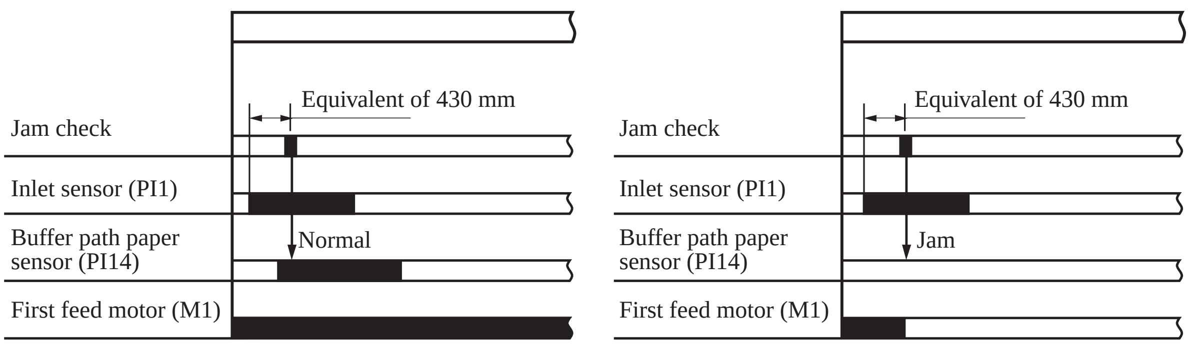


Figure 2-259

4. Buffer Path Paper Sensor Stationary Jam (1132)

The sheet does not move past the buffer inlet sensor when an equivalent of twice the feeding length of the sheet has been fed after the sensor turned on.

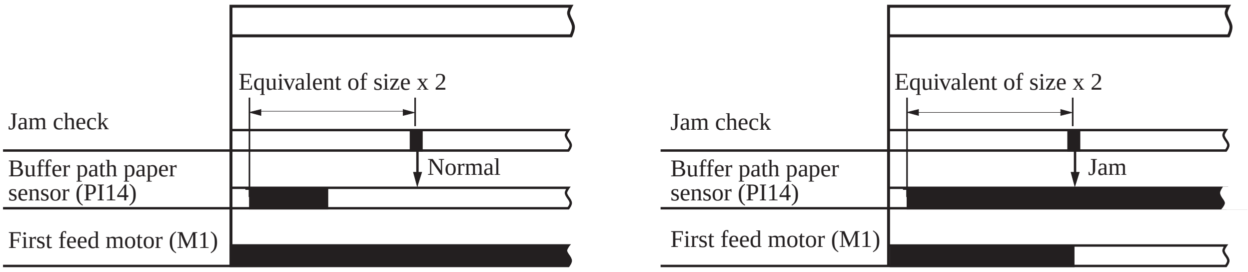


Figure 2-260

5. Delivery Sensor Delay Jam (1034)

a. Straight Path

The delivery sensor does not detect paper when an equivalent of 285 mm has been fed after the inlet sensor turned on.

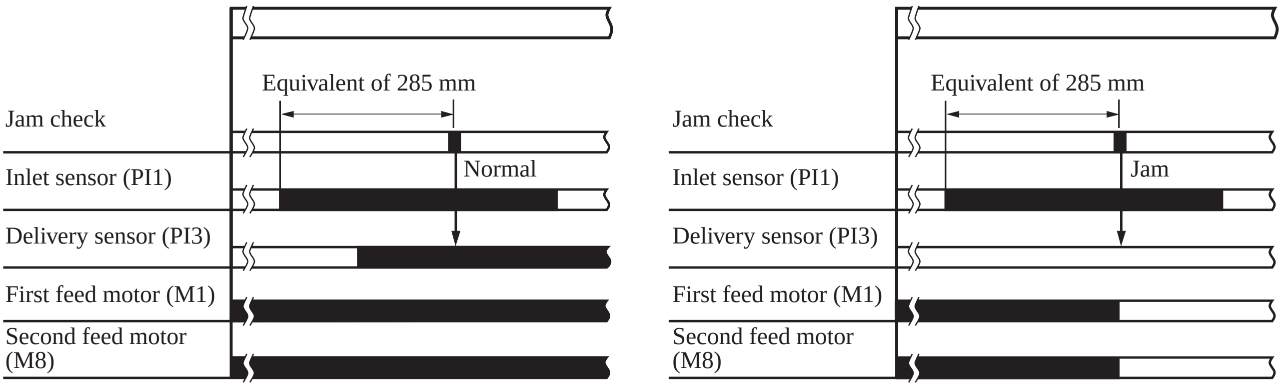


Figure 2-261

b. Buffer Path

The delivery sensor does not detect paper when an equivalent of 480 mm has been fed after the inlet sensor turned on.

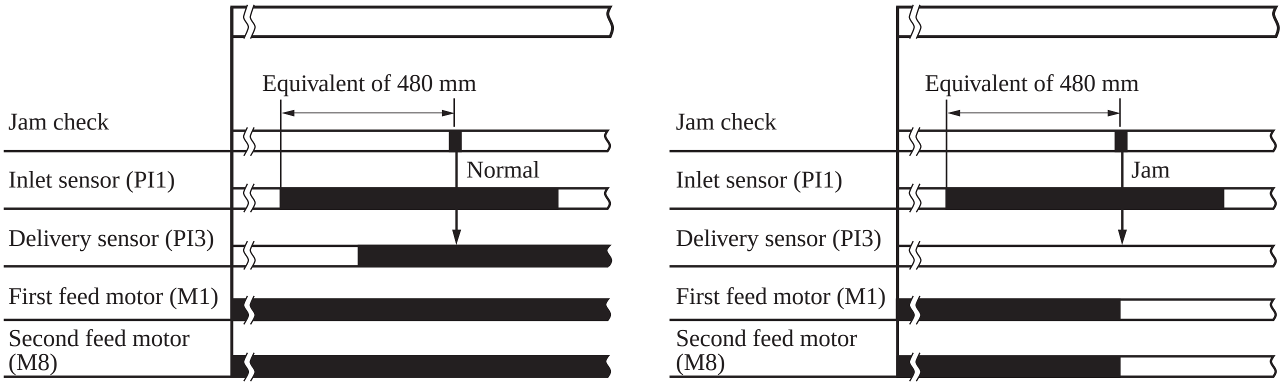


Figure 2-262

6. Delivery Sensor Stationary Jam (1134)

The sheet does not move past the delivery sensor when an equivalent of twice the feeding length of the sheet has been fed after the delivery sensor turned on.

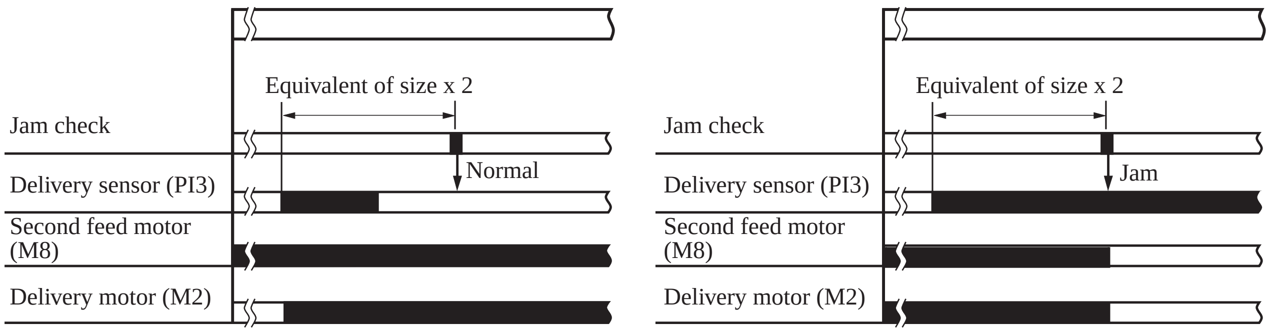


Figure 2-263

7. Stapling Tray Sensor Stationary Jam (1135)

The sheet does not move past the stapling tray sensor 1 sec after the delivery motor (M2) turned on.

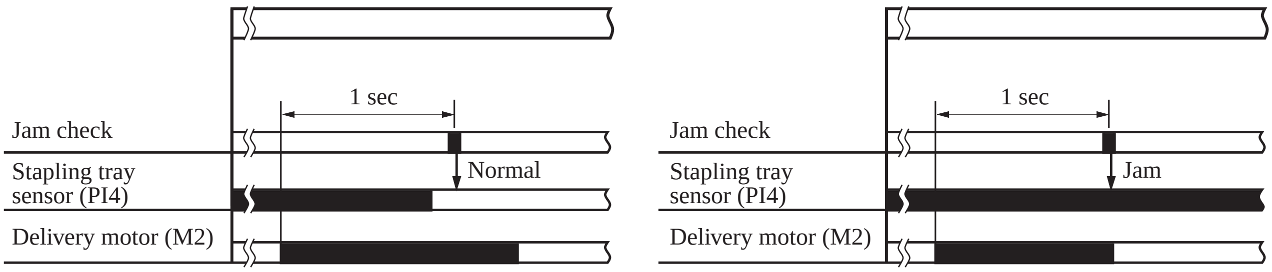


Figure 2-264

8. Timing Jam (1264)

The inlet sensor (PI1) detects a sheet before the delivery signal is received from the host machine.

9. Staple Jam (153A)

When the staple motor (M6) is rotating clockwise, the staple home position sensor (PI22) does not turn on within 0.5 sec. after it has turned off. However, the sensor turns on within 0.5 sec. after the motor has been rotated counterclockwise.

10. Power-On Jam (1338)

One of the inlet sensor (PI1), delivery sensor (PI3), buffer path paper sensor (PI4) or buffer path inlet paper sensor (PI17) detects paper at power-on.

11. Door Open Jam (143C)

One of the joint sensor (PI15), door open sensor (PI16) or door switches (MS1) detects the cover open during operation (including the upper door switch (MS1P) and front door switch (MS2P) when the optional puncher unit is mounted).

12. Punch Jam (163E)

The punch home sensor (PI3P) does not turn on again within 200 msec after turning off.

III. POWER SUPPLY SYSTEM

1. Outline

The finisher controller PCB is supplied with 24 VDC power (two lines) when the host machine is turned on: of the two lines, one is used to drive the motor solenoids, while the other is used for sensors and ICs on PCBs after being converted to 5 VDC by the regulator IC (Q14) on the finisher controller PCB. Both lines are also used to feed power from the finisher controller PCB to the saddle stitcher controller PCB. Power is also supplied to the punch driver PCB when the optional puncher unit is mounted.

Some of the 24 VDC power used to drive motors is cut off when the door switch (MS1) is open. The power to the saddle stitcher controller PCB, however, will not be cut off.

Figure 2-301 is a block diagram showing the power supply system.

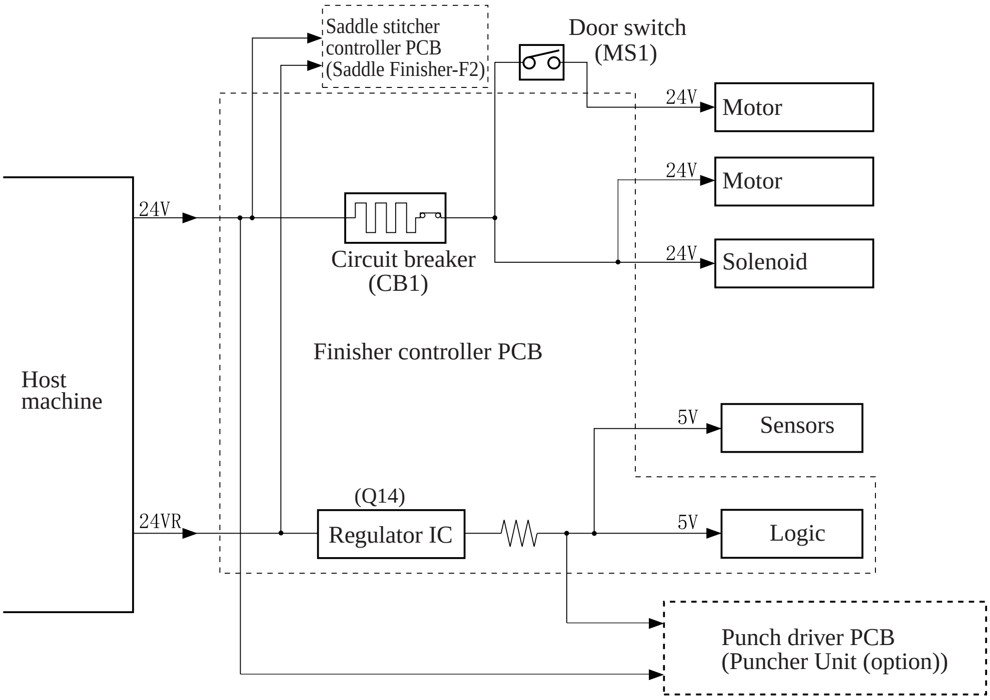


Figure 2-301

2. Protection Functions

The 24 VDC power line used to drive motors and solenoids is equipped with a circuit breaker (CB1) for protection against overcurrent. The 24 V line used to drive the first feed motor (M1), alignment motor (M3), and stapler shift motor (M4) are equipped with a fuse, which is designed to blow when an overcurrent occurs.

CHAPTER 3

SADDLE STITCHER UNIT BASIC OPERATION

1. This chapter discusses the purpose and role of each of the stitcher's functions, and the principles of operation used for the stitcher mechanical and electrical systems. It also explains the timing at which these systems are operated.

   The symbol in drawings indicates transmission of mechanical drive, and signals marked by → together with the signal name indicates the flow of electrical signals.

2. In descriptions of digital circuits on the stitcher, "1" indicates a high signal voltage level, while "0" indicates a low signal voltage level. Voltage values differ according to circuit.

   A microprocessor is used on the stitcher. A description of microprocessor operation is omitted in this chapter as it is practically impossible to check internal operation of the microprocessor.

   Descriptions in this chapter also assume that PCBs will not be repaired at user sites. For this reason, descriptions of circuits on PCBs is limited to block diagrams. Two types of block diagrams are provided for separate functions: diagrams indicating details from sensors up to input sections of major PCBs, and diagrams indicating details from the output sections of major PCBs up the loads.

I. BASIC OPERATION

A. Outline

The unit "stitches" (2 points) a stack of sheets delivered by the finisher unit and folds it in two for delivery. All these operations are controlled by the saddle stitcher controller PCB in response to commands from the host machine via the finisher unit.

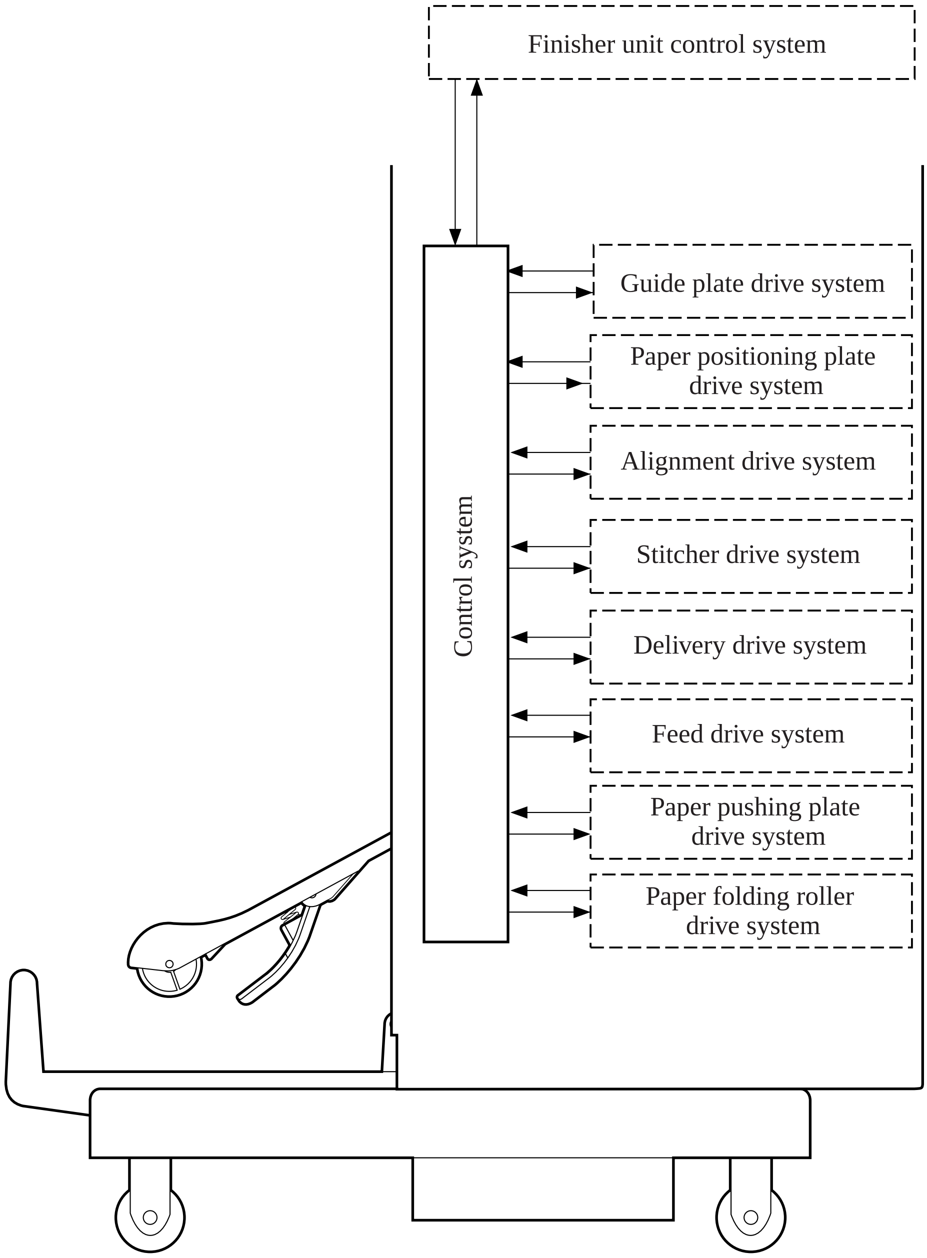


Figure 3-101

B. Electrical Circuitry

The sequence of operations used for the saddle stitcher is controlled by the saddle stitcher controller PCB. The saddle stitcher controller PCB has a microprocessor. This microprocessor is used to control the sequence of operations and to handle serial communications with the finisher controller PCB, driving solenoids and motors in response to the various commands from the finisher controller PCB.

The saddle stitcher controller PCB is also used to communicate the state of various sensors and switches to the finisher controller PCB in serial.

The functions of the major ICs mounted on the saddle stitcher controller PCB are as follows:

- Q1
  Controls the sequence of operations.
- Q2
  Contains the sequence program.
- Q3
  Controls the sequence of operations.
- Q4
  Handles IPC communications.

Electrical circuitry block diagram

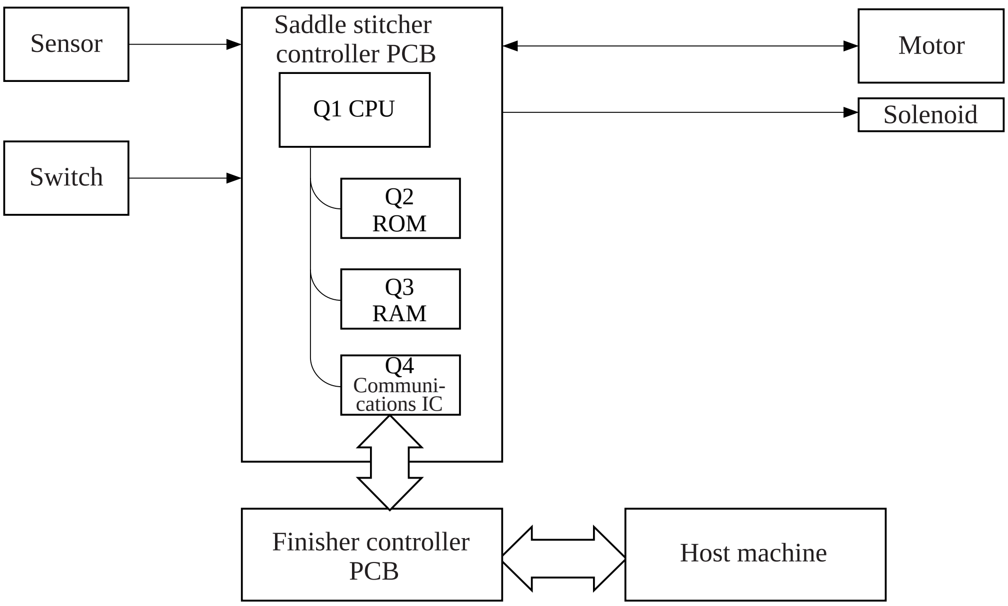


Figure 3-102

C. Inputs to and Outputs from the Saddle Stitcher Controller PCB

1. Inputs to the Saddle Stitcher Controller PCB

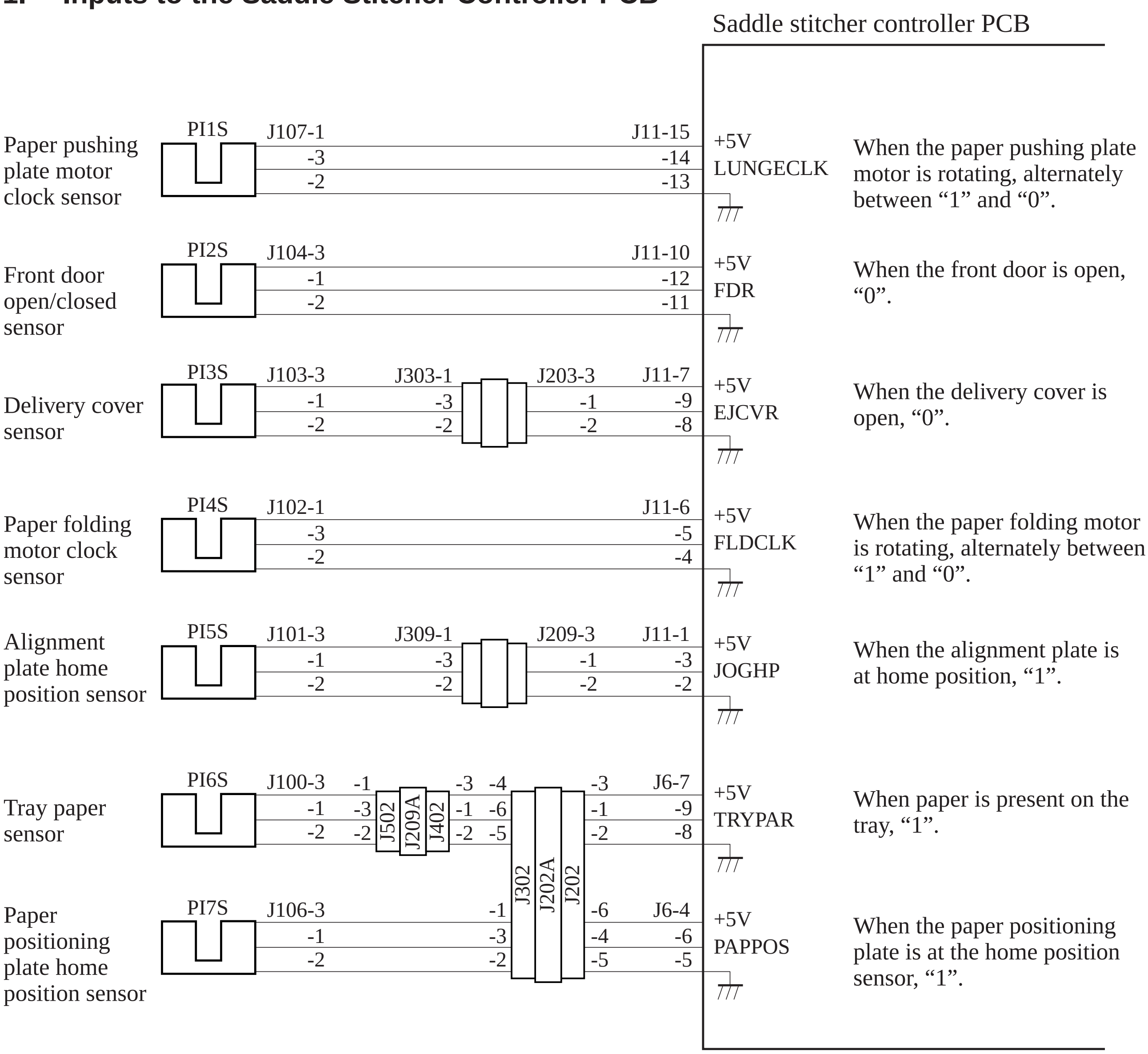


Figure 3-103

2. Inputs to the Saddle Stitcher Controller PCB

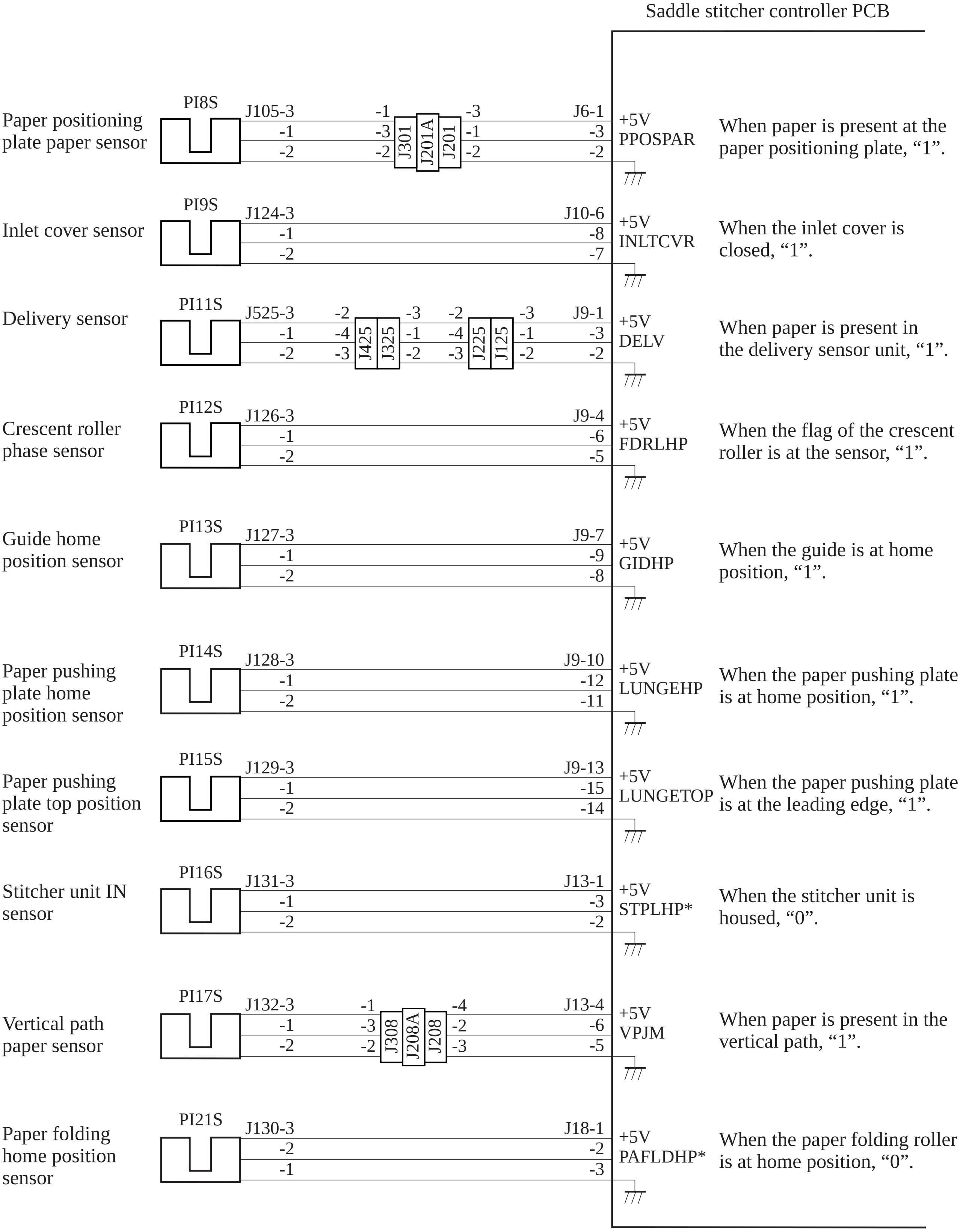


Figure 3-104

3. Inputs to the Saddle Stitcher Controller PCB

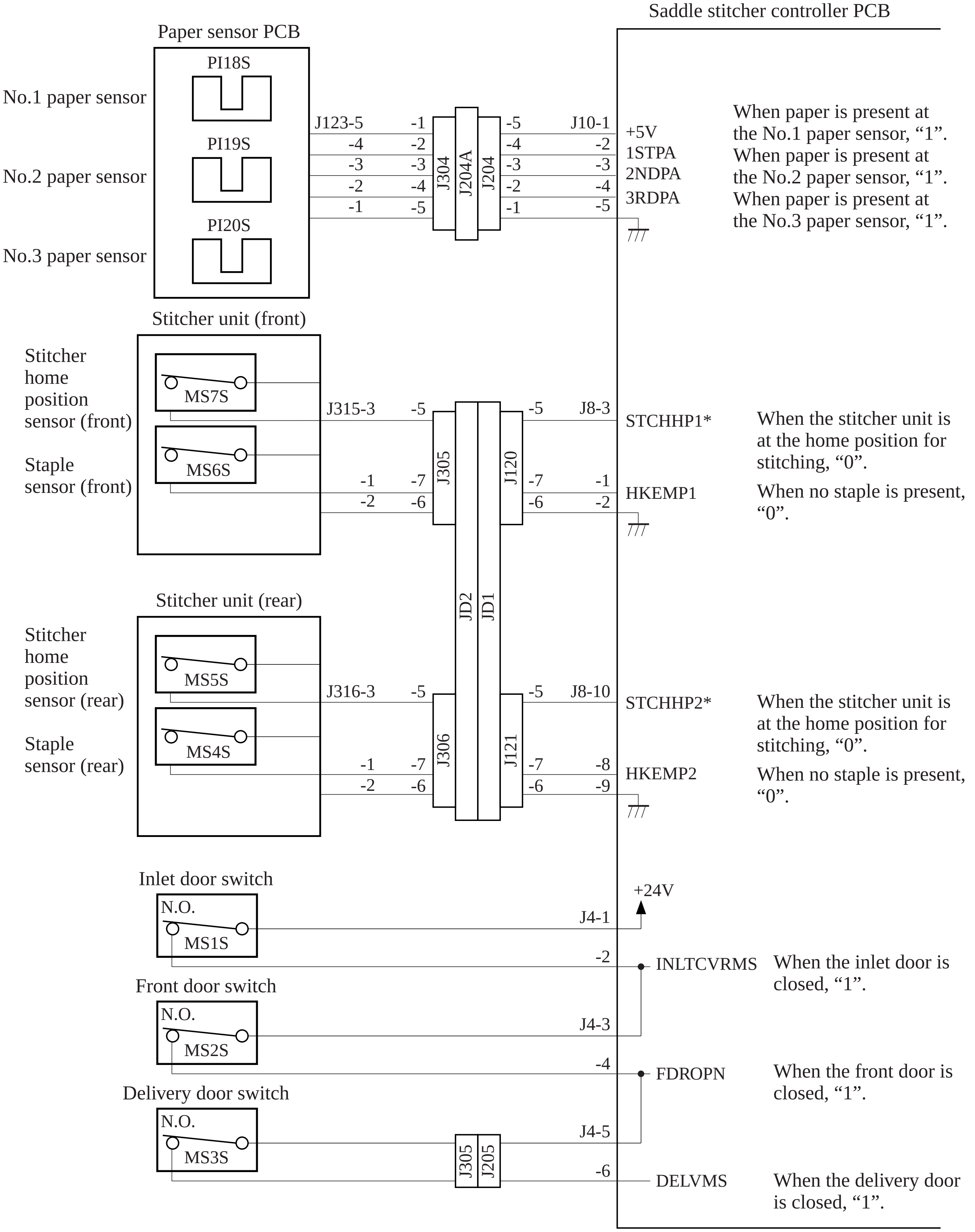


Figure 3-105

4. Outputs from the Saddle Stitcher Controller PCB

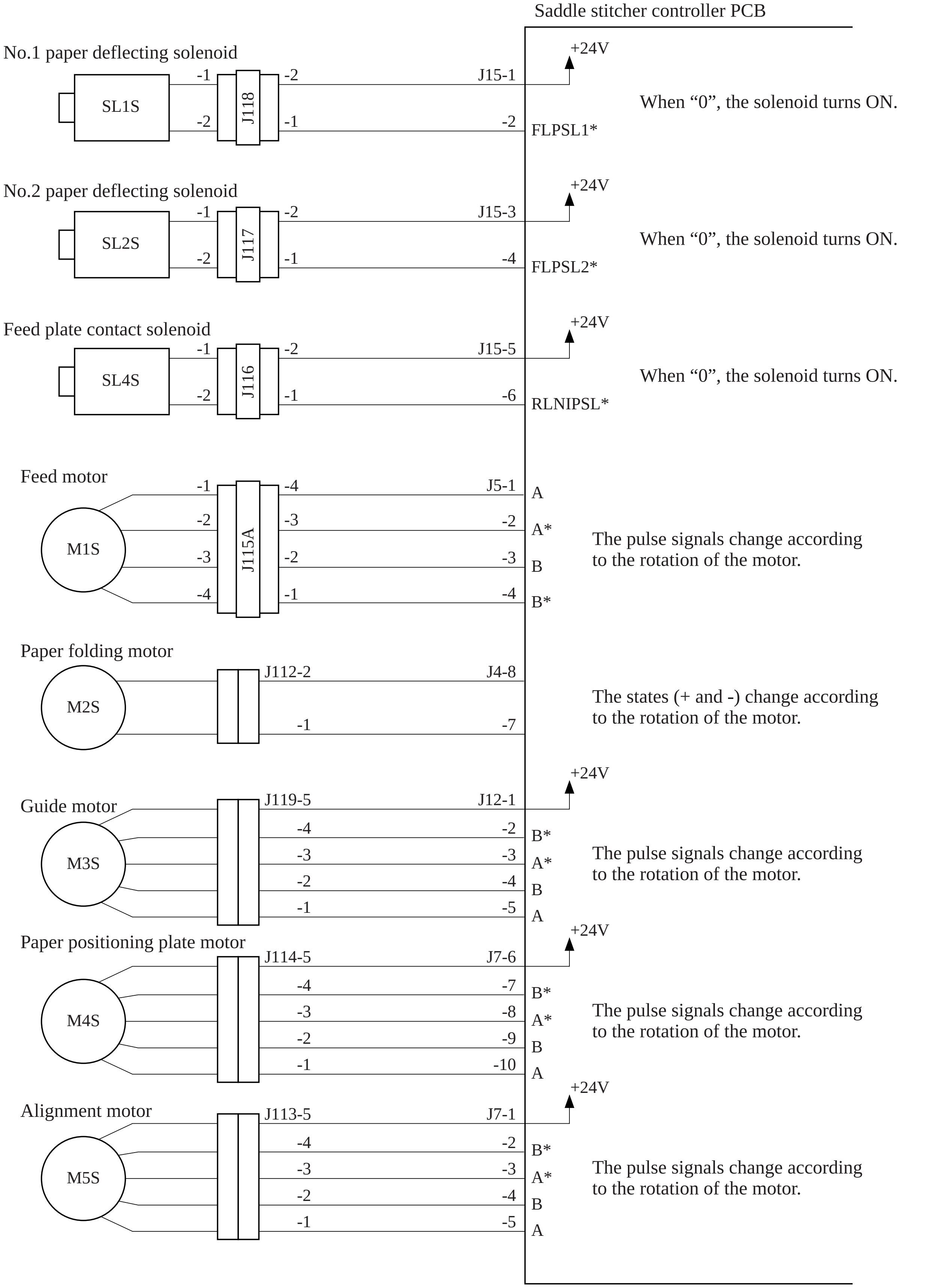


Figure 3-106

5. Outputs from the Saddle Stitcher Controller PCB

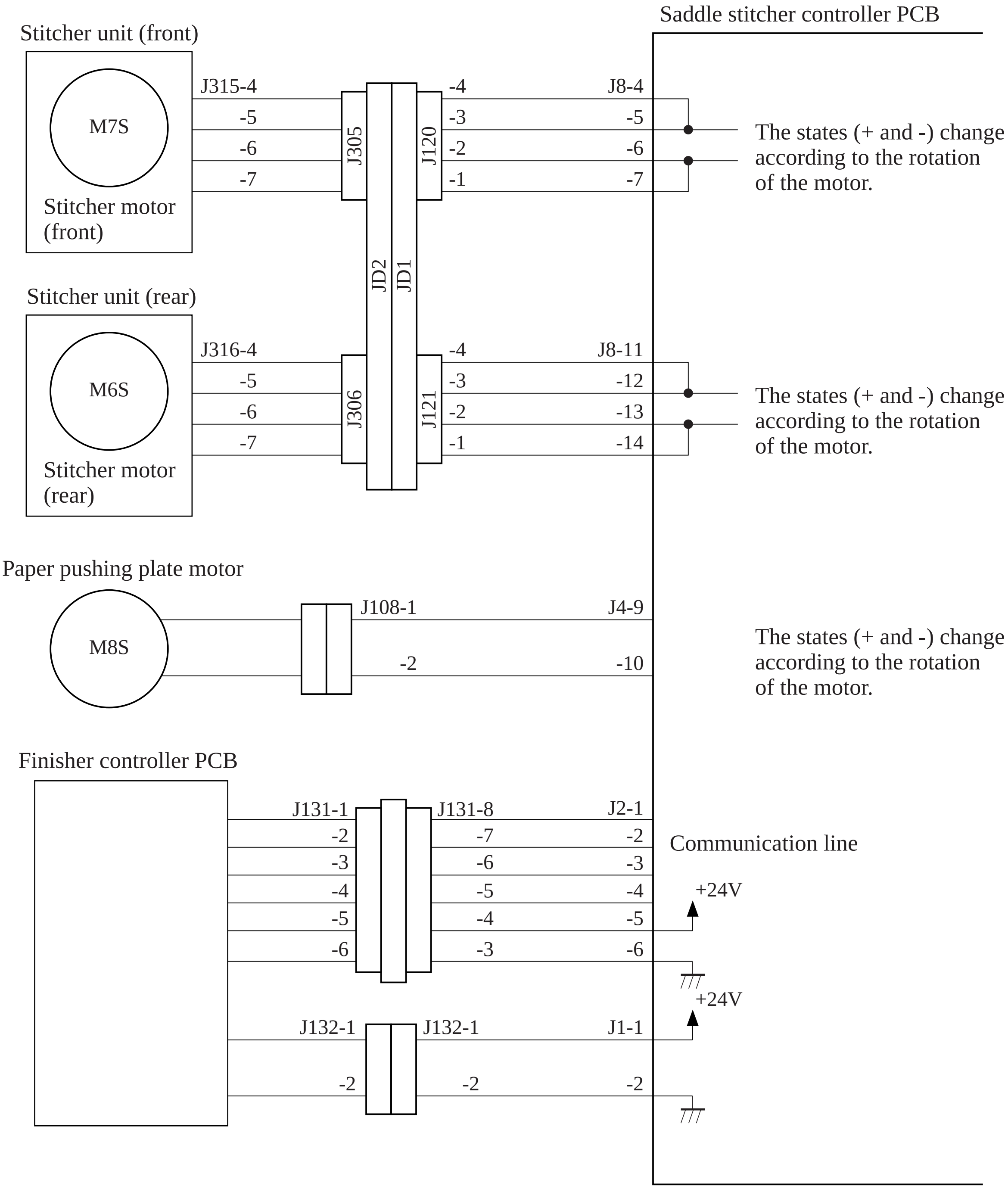


Figure 3-107

II. FEEDING/DRIVE SYSTEM

A. Outline

The stitcher unit aligns the sheets coming from the finisher unit and stitches the resulting stack for delivery to the delivery tray according to the commands coming from the finisher controller PCB.

The machine's operation consists of the following:

1. Receive sheets.
2. Aligns the sheets
3. Stitches the stack.
4. Feeds the stack.
5. Folds and delivers the stack.

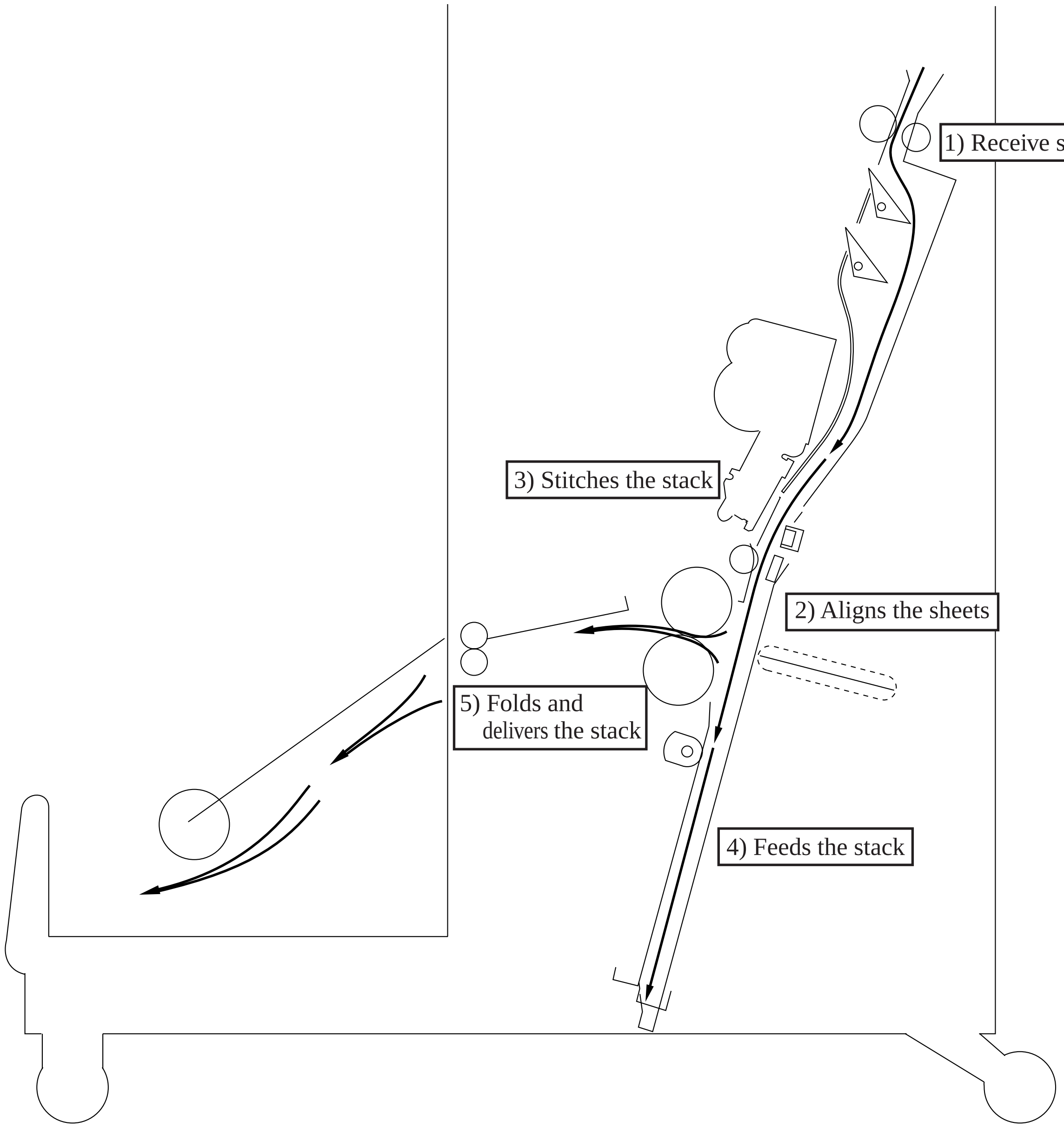


Figure 3-201

1. Receiving Sheets

The stitcher unit receives sheets from the finisher unit and outputs them inside the vertical path in vertical orientation.

The vertical path, while sheets are being output, is configured by two paper deflecting plates.

The position of the sheets being output is set by the paper positioning plate so that the center of the stack matches the stapling/folding position.

Sheets coming later are output closer to the delivery slot, and the volume of paper that may be output is as follows:

- 15 sheets (maximum of 14 sheets of 80 g/m^2 + 1 sheet of 200 g/m^2)

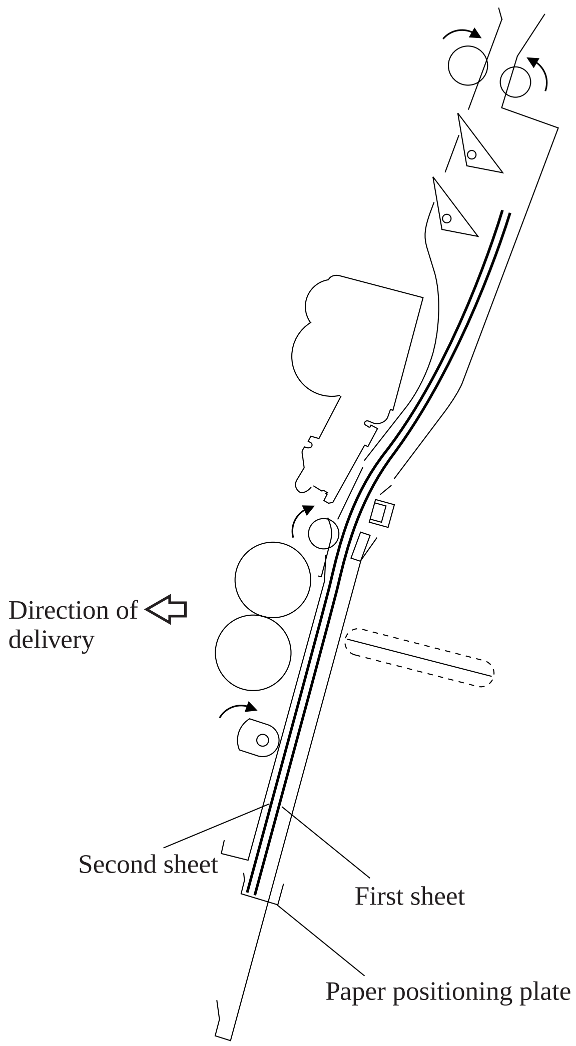


Figure 3-202

2. Aligning the Sheets

The alignment plates operate to put the sheets in order each time a sheet of paper is output to the vertical path assembly. The alignment plates are mounted at the edge of the vertical path assembly.

The alignment plates also operate after stapling to prepare the stack for delivery.

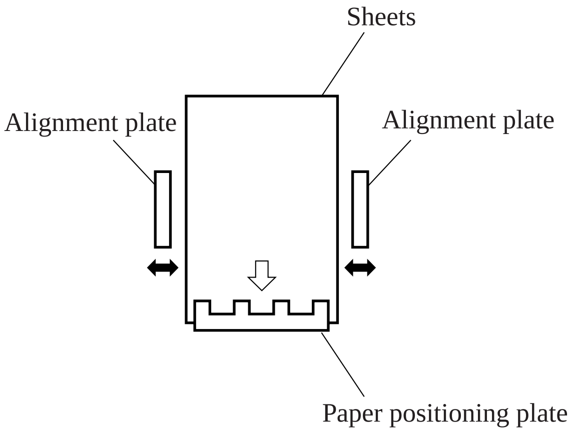


Figure 3-203

3. Stitching

When all sheets have been output, the two stitchers stitch the stack. The stitchers are positioned so that they face the center of a stack.

The two stitchers are not operated simultaneously so as to prevent the paper from wrinkling between two staples and to limit the load on the power supply.

If only one sheet of paper arrives from the host machine, stitching does not take place and the sequence goes to the next operation (stack feeding).

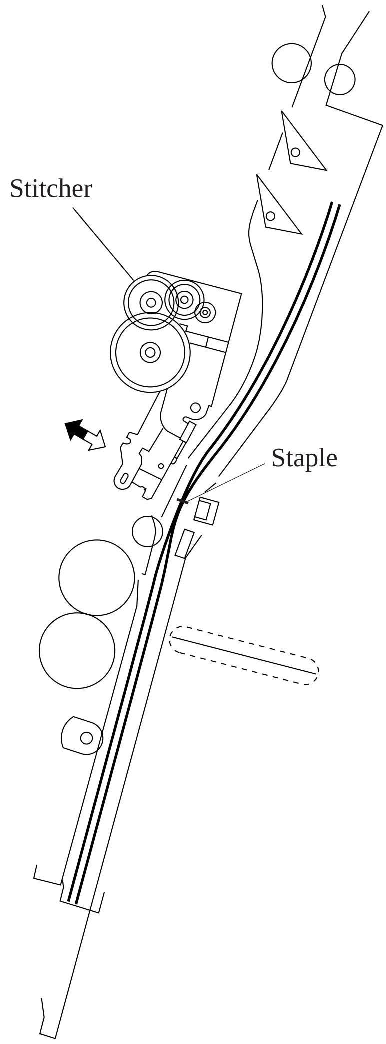


Figure 3-204

4. Feeding the Stack

The unit folds the stitched stack of sheets, and then feeds it to the point of delivery. This point is where the center of the stack, i.e., stapling position, matches the height of the paper pushing plate and the paper folding roller nip.

The stack is moved forward by operating the paper positioning plate. When the plate is operated, the guide plate which has been covering the paper folding rollers, also moves down so that the paper folding rollers directly face the stack.

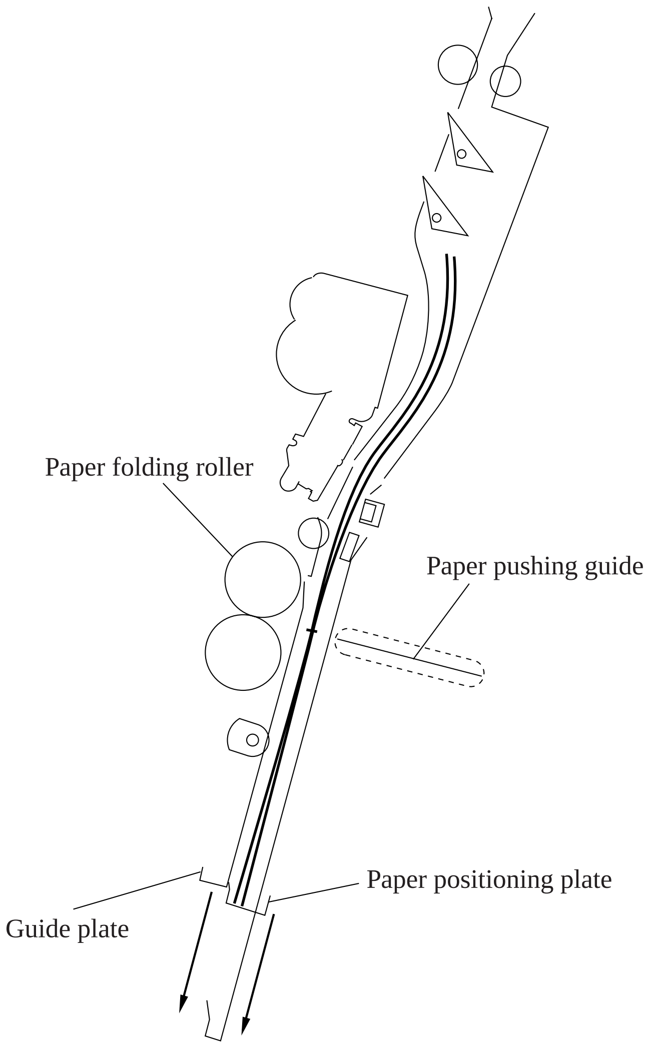


Figure 3-205

5. Folding/Delivering the Stack

The paper pushing plate pushes against the center of the stack to move it in the direction of the paper folding rollers. In response, the paper folding rollers pick the stack along its center and fold it in two. The paper folding rollers together with the delivery roller then move the stack along to output it on the delivery tray.

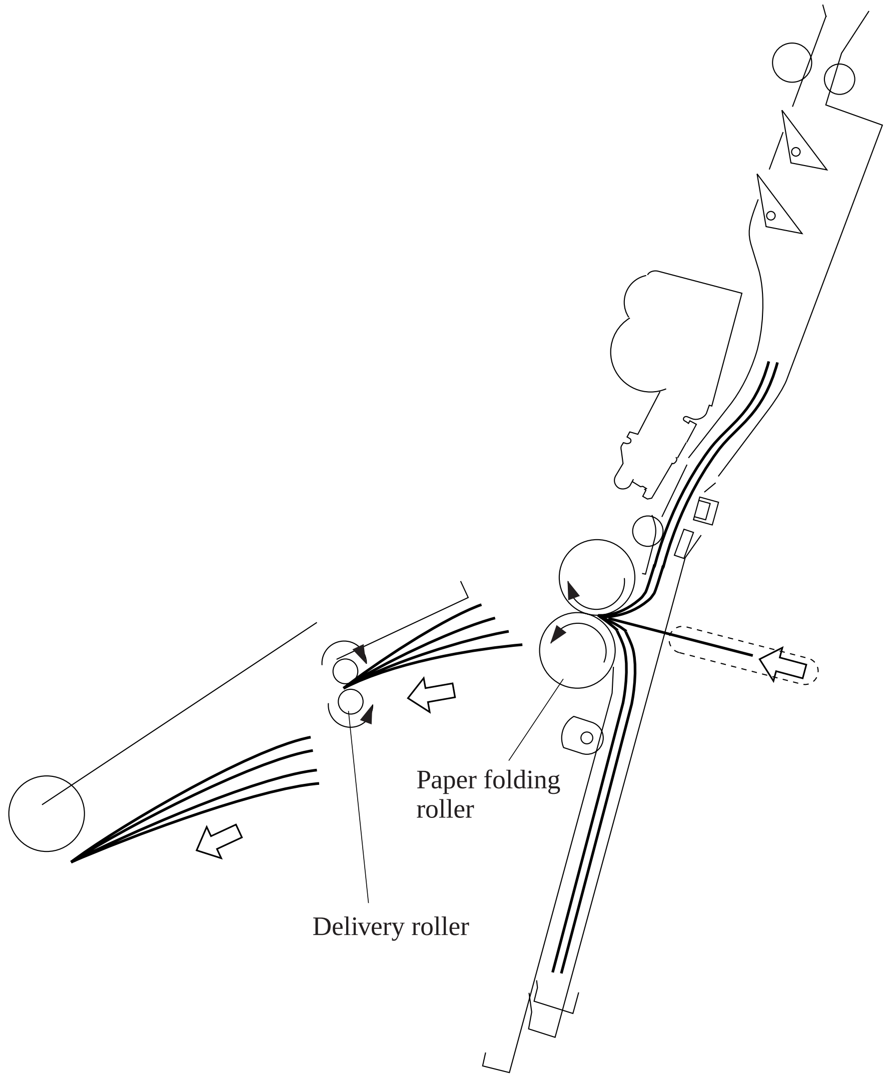


Figure 3-206

III. PAPER OUTPUT MECHANISM

A. Outline

The paper output mechanism serves to keep a stack of sheets coming from the finisher in place for the next steps (stapling, folding).

The paper inlet is equipped with the No.1 flapper and the No.2 flapper, which operate to configure the paper path to suit the size of paper. The paper positioning plate is kept in wait at a predetermined location to suit the size of paper. The paper positioning plate is driven by the paper positioning plate motor (M4S), and the position of the plate is identified in reference to the number of motor pulses coming from the paper positioning plate home position sensor (PI7S). A sheet moved by the inlet roller is handled by the feed rollers and the crescent roller and held in a predetermined position. The feed plate serve to move sheets by coming into contact with or moving away from sheets as needed.

The alignment plates put the stack into order each time a sheet is output. The alignment plates are driven by the alignment motor (M5S), whose position is identified in reference to the number of motor pulses coming from the alignment plate home position sensor (PI5S).

To prevent interference between paper and the paper folding rollers when the paper is being output, the folding rollers are designed to be covered by a guide plate. The guide plate moves down before paper is folded so as to expose the paper folding rollers.

The inlet is equipped with the No.1, No.2 and No.3 paper sensors (PI18S, PI19S, PI20S) each suited to a specific paper size, and the paper positioning plate is equipped with a paper positioning plate paper sensor (PI8S).

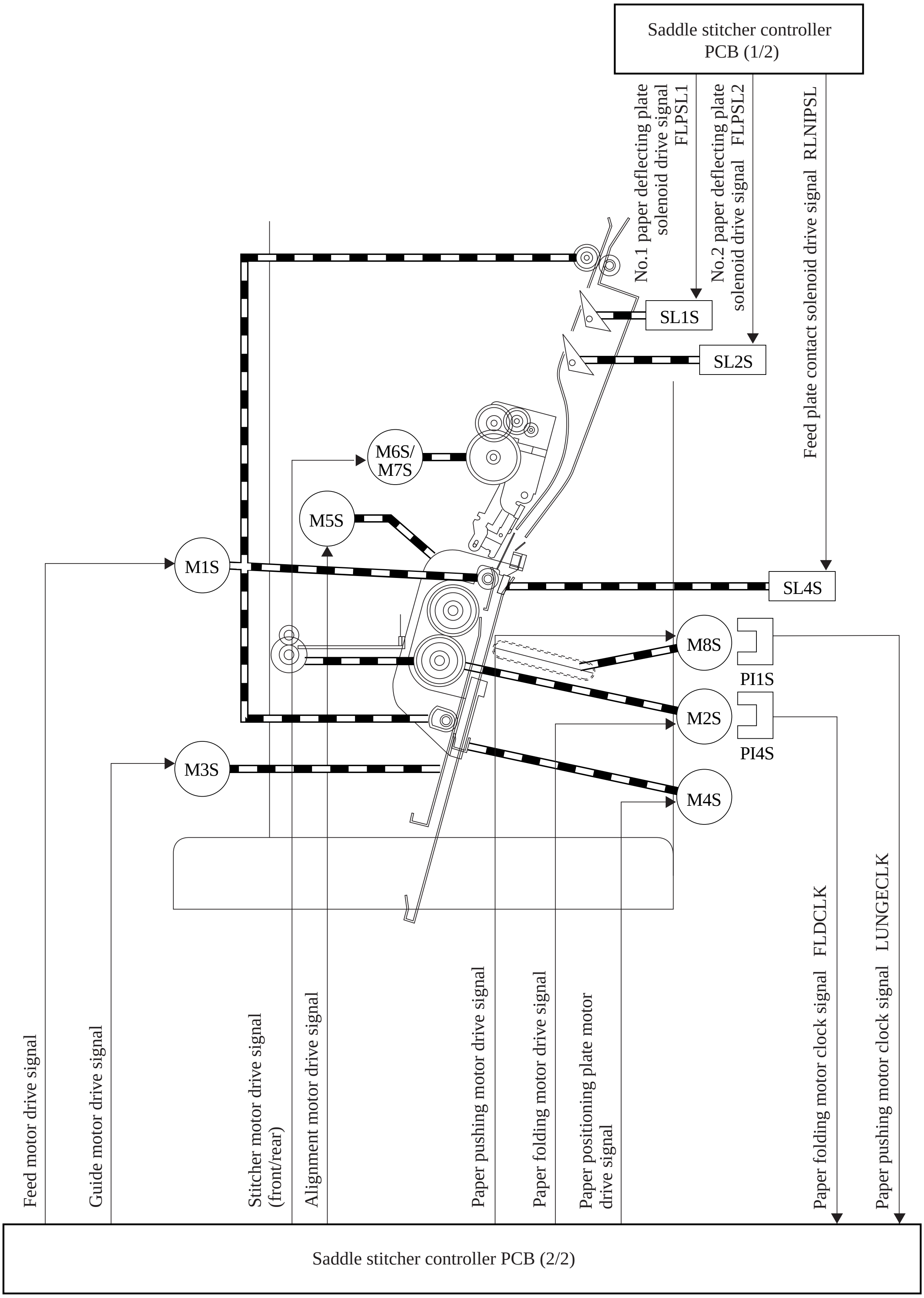

Saddle stitcher controller PCB (1/2)
No.1 paper deflecting plate solenoid drive signal FLPSL1
No.2 paper deflecting plate solenoid drive signal FLPSL2
Feed plate contact solenoid drive signal RLNIPSL
SL1S
SL2S
M6S/ M7S
M5S
M1S
SL4S
M8S
PI1S
M2S
PI4S
M3S
M4S
Feed motor drive signal
Guide motor drive signal
Stitcher motor drive signal (front/rear)
Alignment motor drive signal
Paper pushing motor drive signal
Paper folding motor drive signal
Paper positioning plate motor drive signal
Paper folding motor clock signal FLDCLK
Paper pushing motor clock signal LUNGECLK
Saddle stitcher controller PCB (2/2)

Figure 3-301

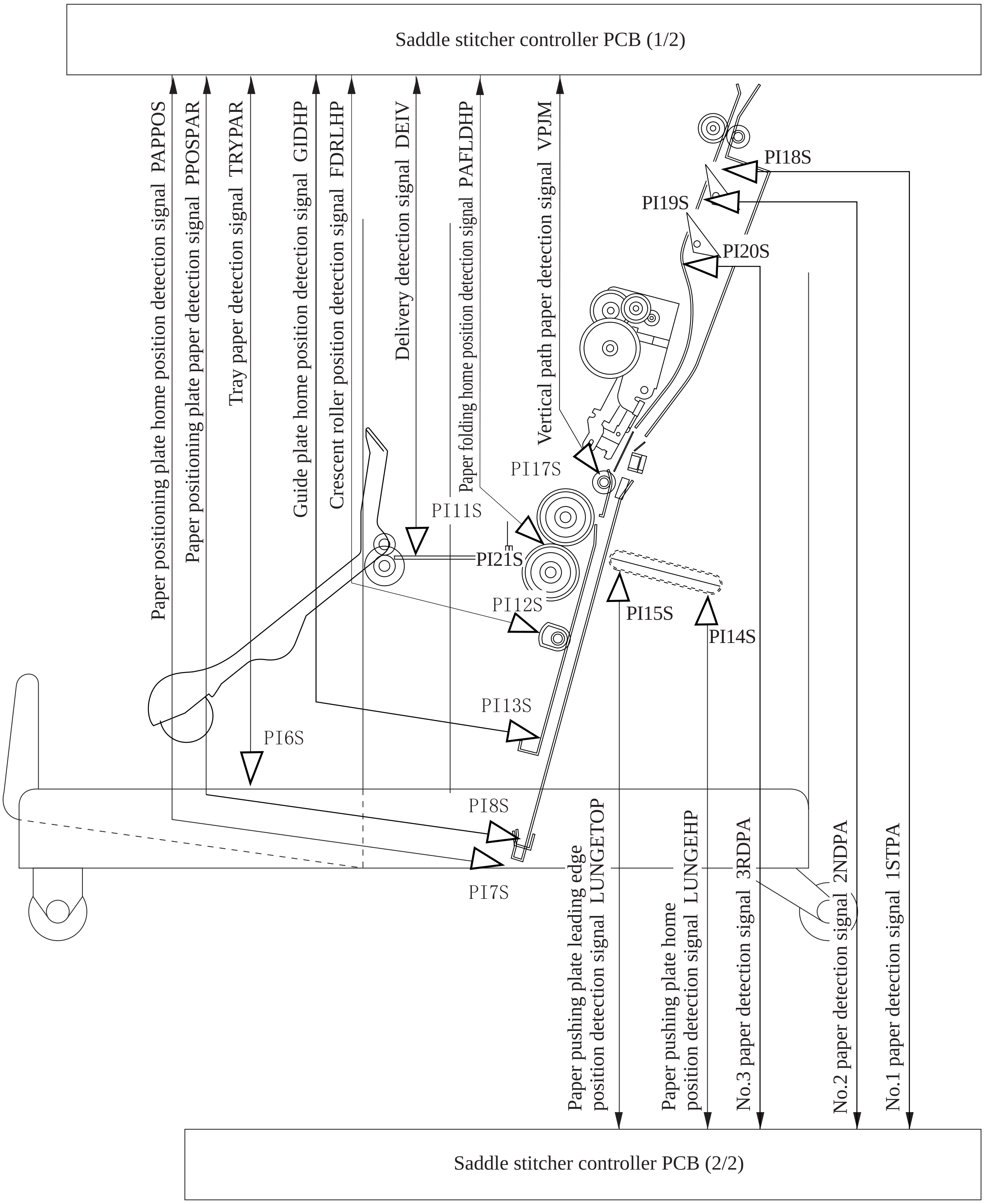

Saddle stitcher controller PCB (1/2)
Paper positioning plate home position detection signal PAPPOS
Paper positioning plate paper detection signal PPOSPAR
Tray paper detection signal TRYPAR
Guide plate home position detection signal GIDHP
Crescent roller position detection signal FDRLHP
Delivery detection signal DEIV
Paper folding home position detection signal PAFLDHP
Vertical path paper detection signal VPJM
PI18S
PI19S
PI20S
PI17S
PI11S
PI21S
PI12S
PI15S
PI14S
PI13S
PI6S
PI8S
PI7S
Paper pushing plate leading edge position detection signal LUNGETOP
Paper pushing plate home position detection signal LUNGEHP
No.3 paper detection signal 3RDPA
No.2 paper detection signal 2NDPA
No.1 paper detection signal 1STPA
Saddle stitcher controller PCB (2/2)

Figure 3-302

B. Controlling the Inlet Flappers

1. Outline

The two flappers mounted at the paper inlet are operated to configure the feed path according to the size of paper. The flappers are used to enable the following:

1. To detect the passage of the trailing edge of the paper being moved by an appropriate sensor.
2. To prevent the following sheet from butting against the top of the existing stack,

Table 3-301 shows the relationship between sensors and paper sizes.

Sensor	A3/279mm×432mm (11″×17″)	B4	A4R/LTRR
No.1 paper sensor (PI18S)	Used	Used	Used
No.2 paper sensor (PI19S)	Not used	Used	Used
No.3 paper sensor (PI20S)	No t used	Not used	Used

Table 3-301

Each flapper is driven by its own solenoid.
Table 3-302 shows the relationship between solenoids and paper sizes.

Solenoid	A3/279mm×432mm (11″×17″)	B4	A4R/LTRR
No.1 paper deflecting plate solenoid (SL1S)	OFF	ON	ON
No.2 paper deflecting plate solenoid (SL2S)	OFF	OFF	ON

Table 3-302

2. A3/279mm × 432mm (11″ × 17″) Paper Path (3 sheets)

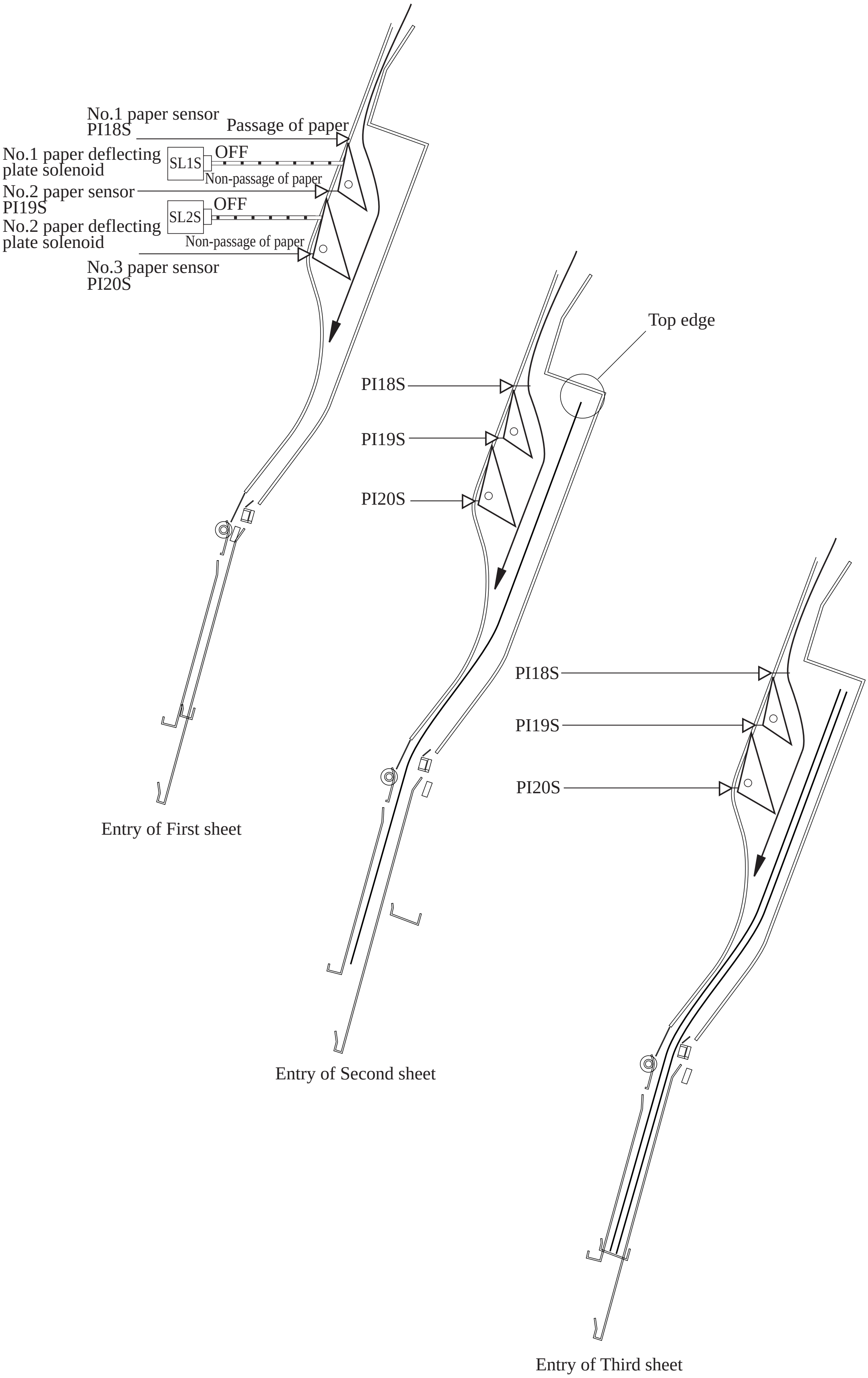


Figure 3-303

3. B4 Paper Path (3 sheets)

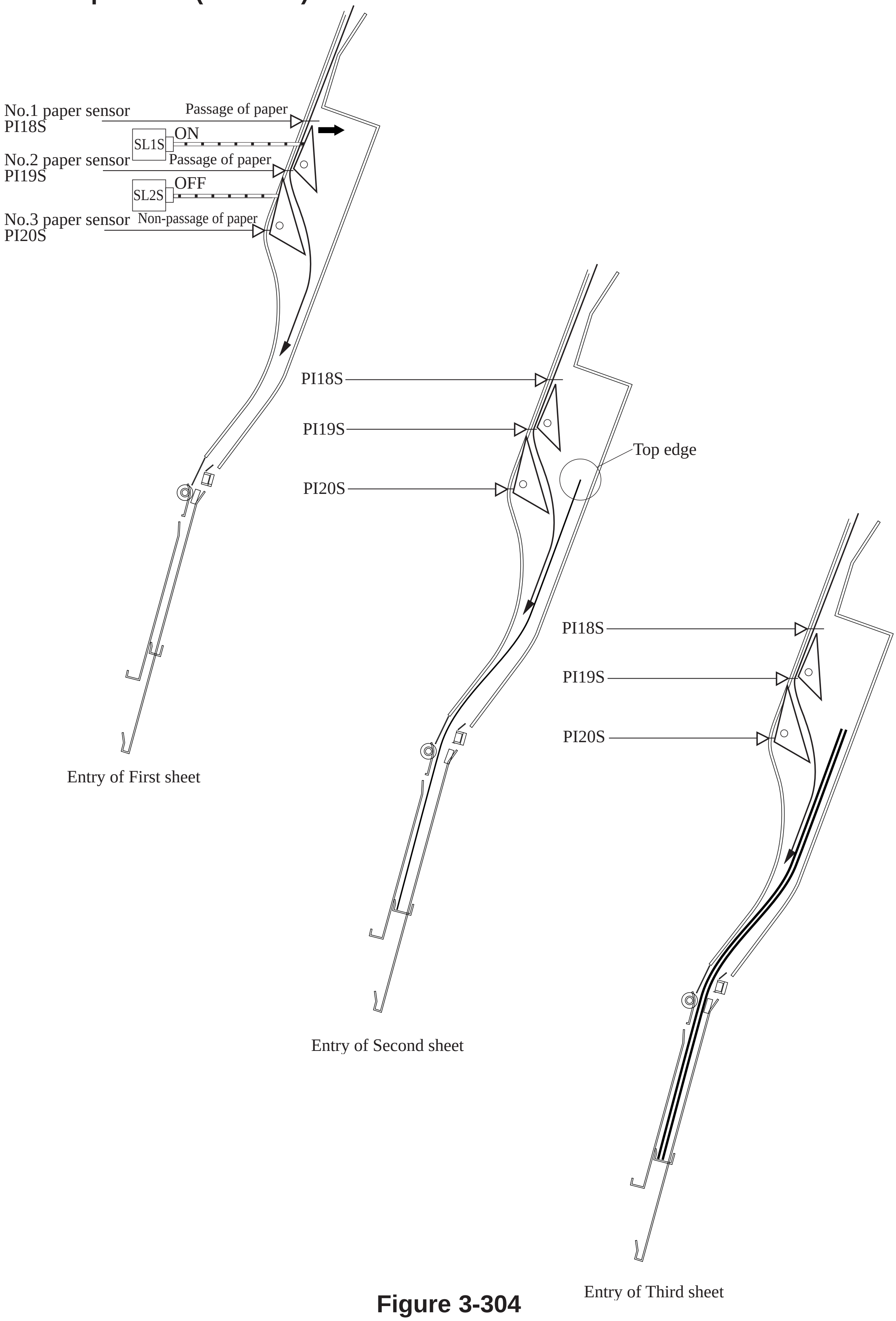


Figure 3-304

4. A4R/LTR-R Paper Path (3 sheets)

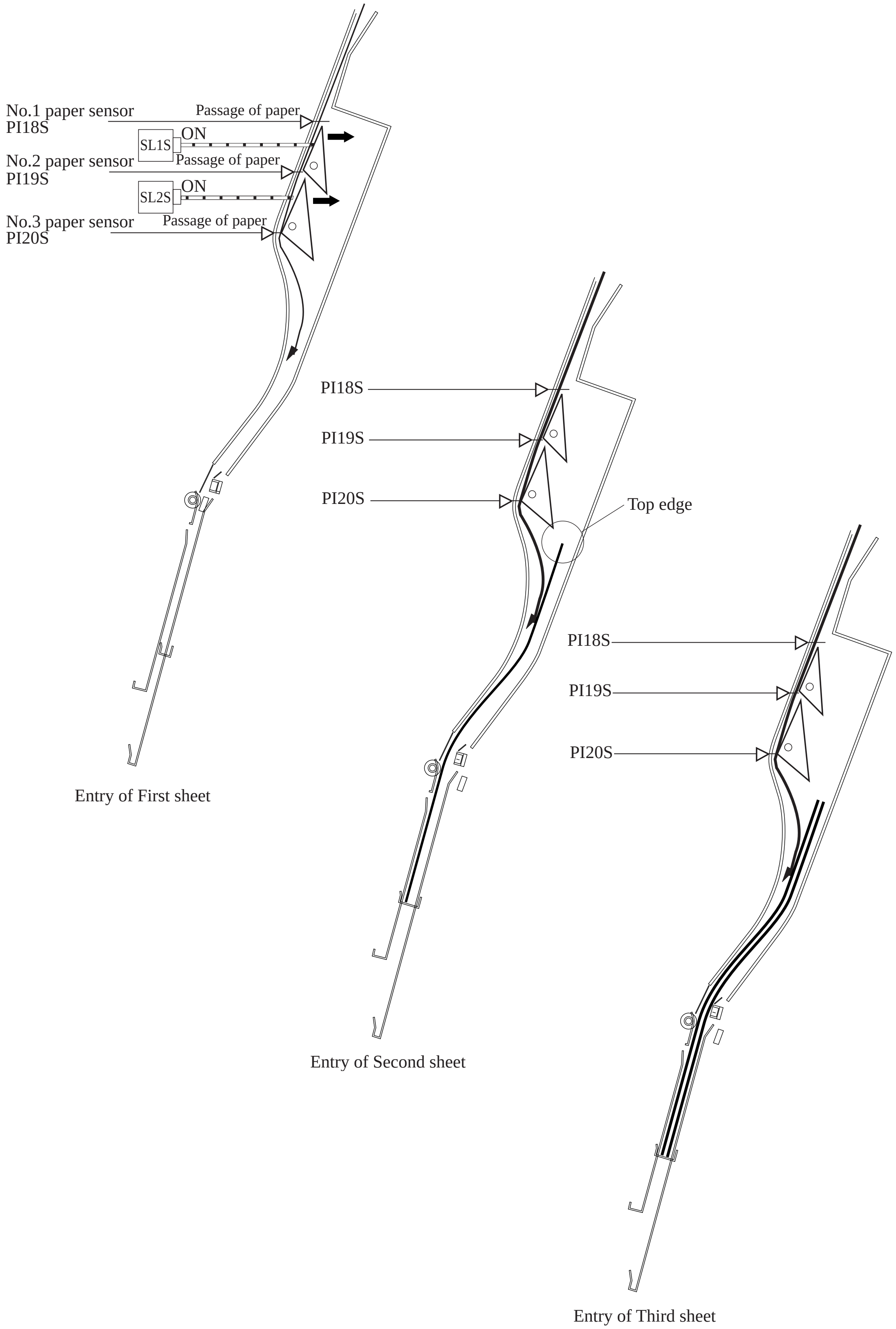


Figure 3-305

C. Controlling the Movement of Sheets

When the leading edge of a sheet has moved past the inlet flapper, the intermediate feed roller and the crescent roller start to move the sheet forward.

The intermediate feed roller is normally not in contact with the path bed. When the leading edge of a sheet reaches the intermediate feed roller contact section, the feed plate contact solenoid (SL4S) causes the roller to come into contact with the path bed so as to move the sheet. The contact is broken as soon as the leading edge of the sheet reaches the paper positioning plate. This series of operations is executed each time a sheet arrives.

When the leading edge of the first sheet reaches the paper positioning plate, the paper positioning plate paper sensor (PI8S) turns ON. The arrival of the second and subsequent sheets will not be checked since the first sheet will still be over the sensor.

The crescent roller keeps rotating while sheets are being output, butting the leading edge of each sheet against the paper positioning plate, and ultimately, keeping the leading edge of the stack in order.

The alignment plate motor (M5S) drives the alignment plates for each sheet so as to put both left and right edges of the sheet in order.

1) The solenoid turns ON while paper is being moved so that the feed plate comes into contact.

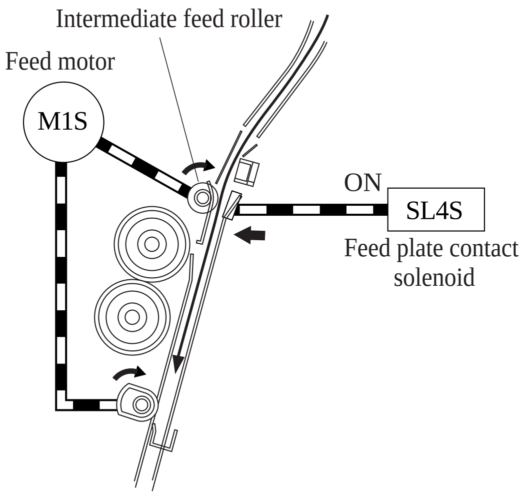


Figure 3-306

2) The solenoid turn OFF when the paper butts against the paper positioning plate. The feed motor continues to rotate.

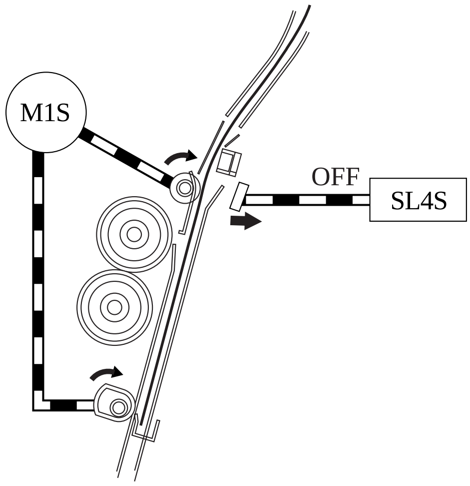


Figure 3-307

3) The solenoid turns ON when the next sheet arrives, and the feed plate comes into contact.

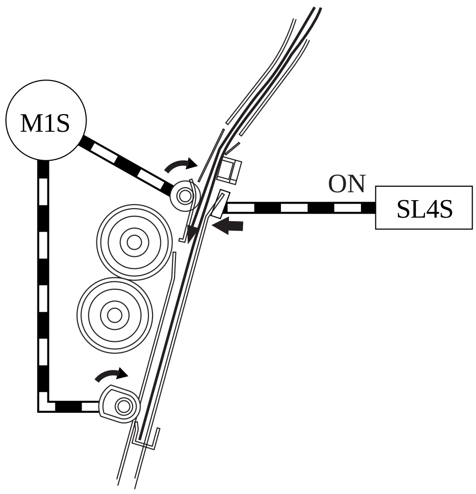


Figure 3-308

D. Aligning the Sheets

The alignment plate motor (M5S) drives the alignment plates each time a sheet is output, putting both left and right edges of the sheet in order. The alignment plate motor is a 4-phase stepping motor. The position of the alignment plate is identified in reference to the number of motor pulses from the alignment plate home position sensor (PI5S).

The following briefly describes what takes place when the saddle stitching mechanism operates on two sheets.

1) When the first sheet has been output, the alignment plates butt against the left and right edges of the stack (first alignment). The alignment plates leave the home position in advance and remain in wait at points 10 mm from the edges of the stack.

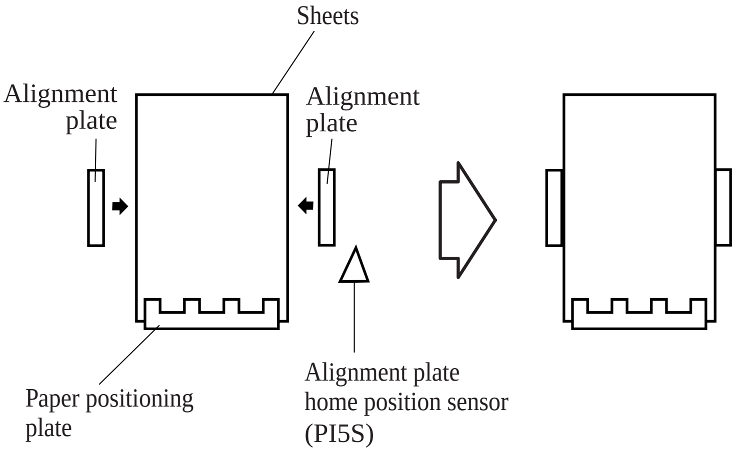


Figure 3-309

2) The alignment plates move away from the edges of the stack over a short distance and then butt against the edges once again (Second alignment).

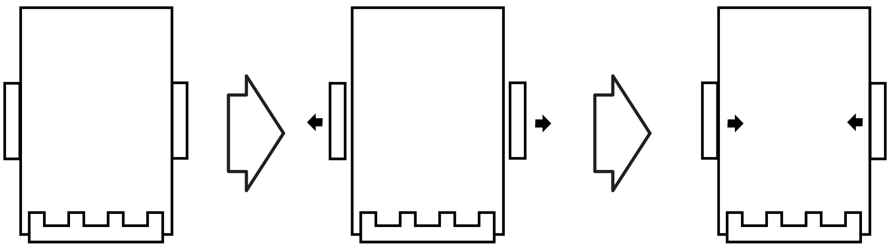


Figure 3-310

3) The alignment plates escape to points 10 mm from the edge of the stack.

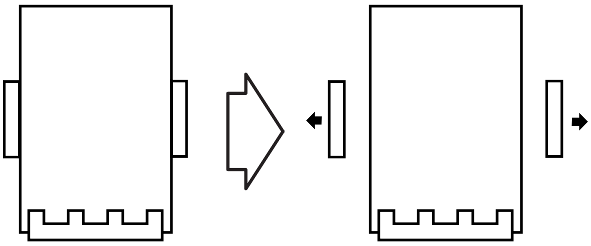


Figure 3-311

4) When the following stack arrives, steps 1 through 3 above are repeated.
5) The alignment plates butt against the stack once again, during which stitching takes place.

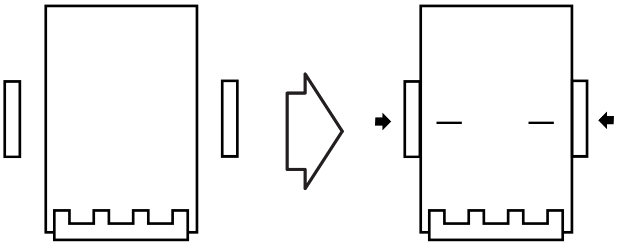


Figure 3-312

6) The alignment plates escape to points 10 mm from the edges of the stack, after which folding and delivery take place.

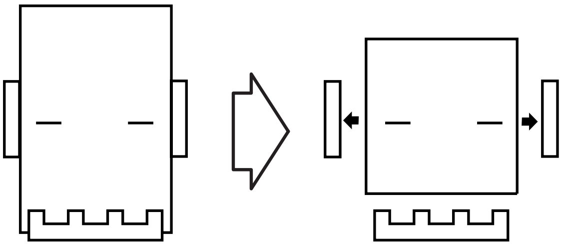


Figure 3-313

7) When the first sheet of the following stack reaches the No.1 paper sensor, the guide moves to a point 10 mm from the edge of the stack to be ready for the next alignment operation.

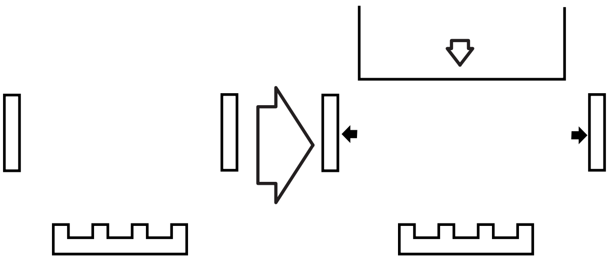
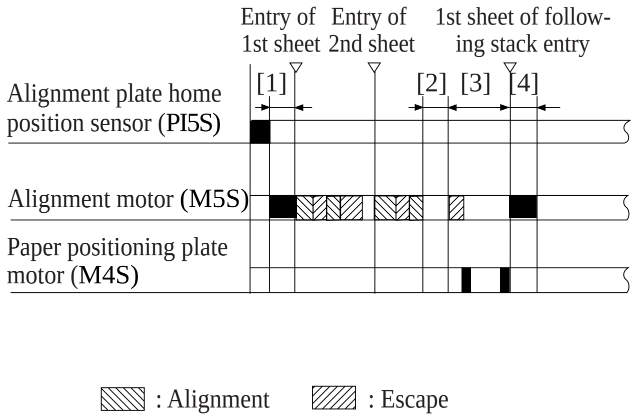


Figure 3-314

In case of 2 sheets:



[1]: Move to wait position
[2]: Stapling period
[3]: Paper folding/delivery period
[4]: Move to following stack size wait position

Figure 3-315

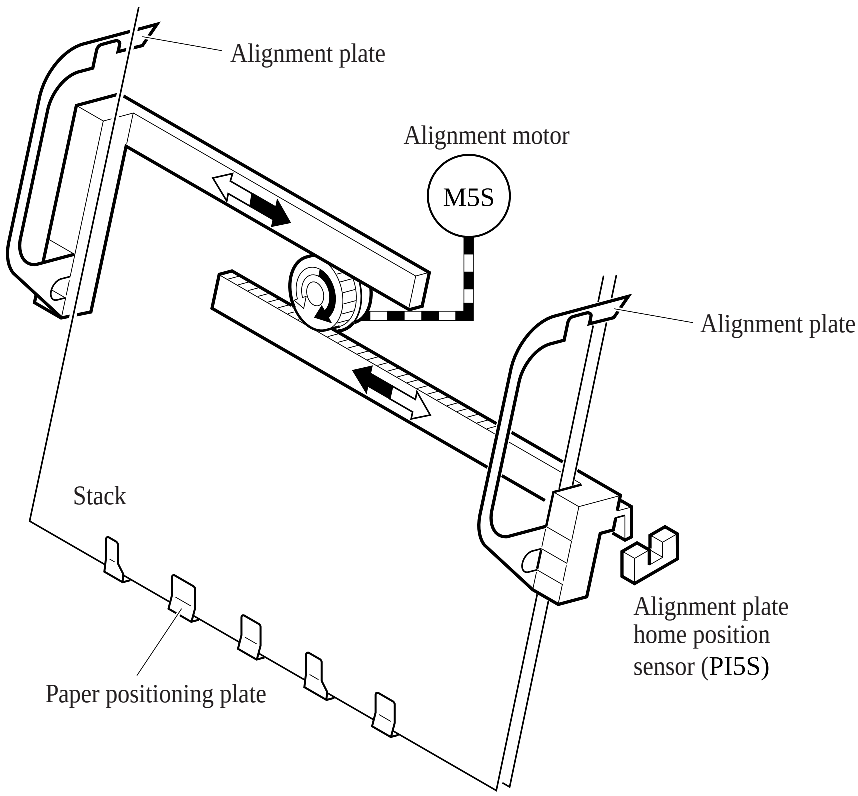


Figure 3-316

E. Controlling the Phase of the Crescent Roller

1. Outline

If alignment was executed with the crescent roller in contact with the stack of sheets, the resulting friction against the roller causes the stack to move inappropriately (Figure 3-317). To prevent this problem, the phase of the roller is identified and used to determine the timing of alignment.

The phase of the crescent roller is identified by the crescent roller phase sensor (PI12S). The flag for the crescent roller phase sensor is mounted to the crescent roller shaft. The flag will leave the sensor while the roller shaft rotates, turning the sensor ON or OFF, enabling the assumption that the crescent roller is positioned at the opposite side of the stack (Figure 3-319). The alignment plates are operated to correspond with this change in the state of the sensor.

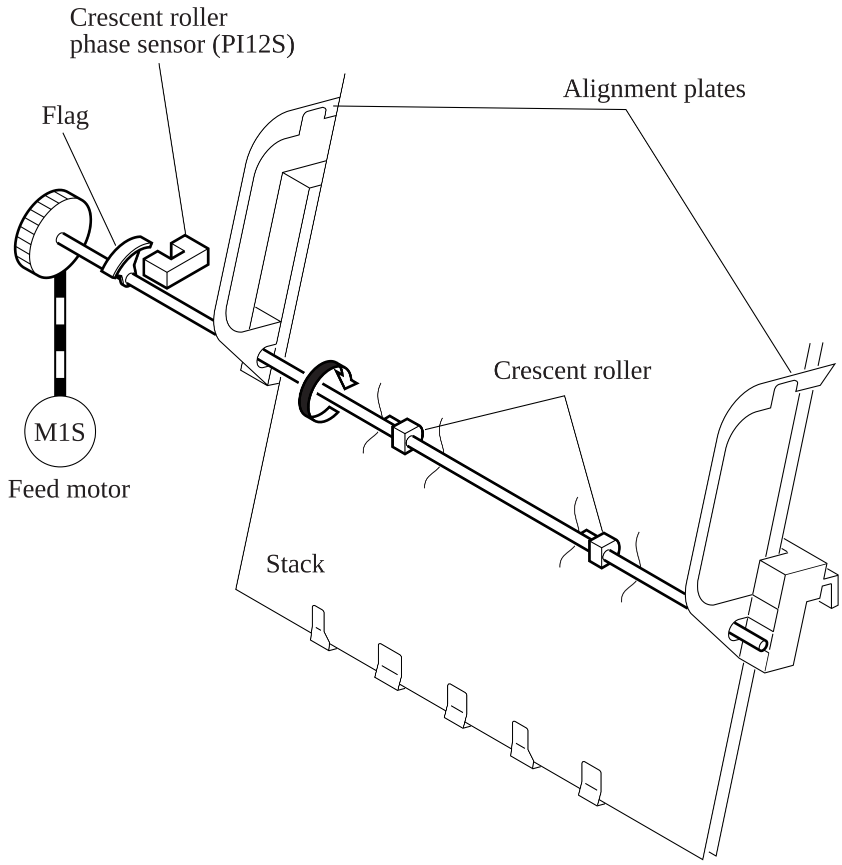


Figure 3-317

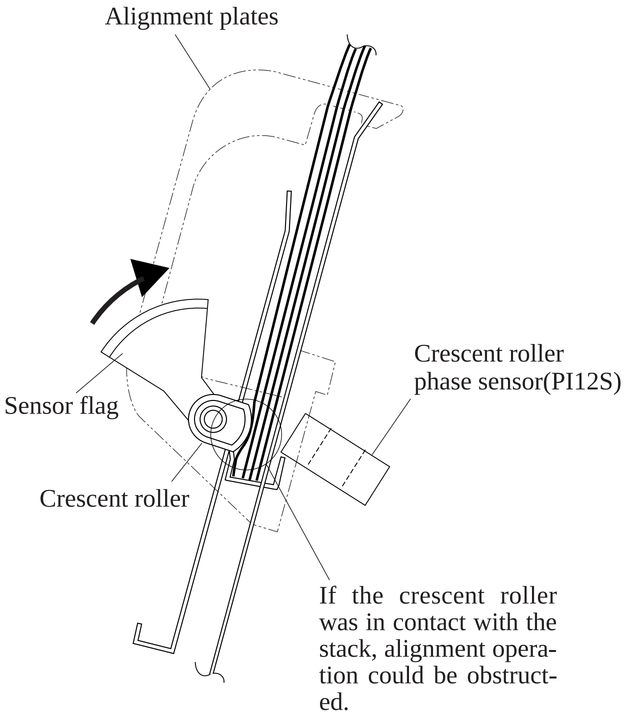


Figure 3-318

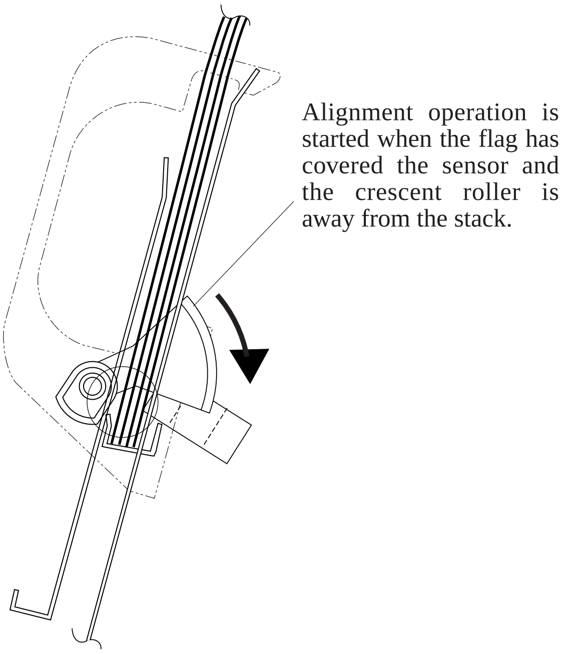


Figure 3-319

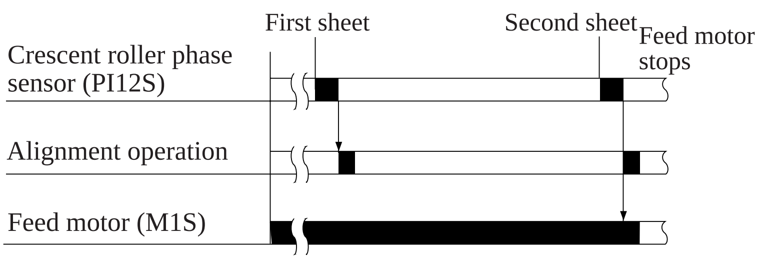


Figure 3-320

IV. STITCHING SYSTEM

1. Outline

The stitching system “stitches” the center of an output stack with staples.

To enable stitching at two locations on a stack, two stitcher units (front, rear) are used. Each stitcher unit is equipped with a stitcher motor (M7S, M6S) for drive, a stitcher home position sensor (MS7S, MS5S) for detection of position and a staple sensor (MS6S, MS4S) for detection of the presence/absence of staples.

The stitcher base is designed so that it may be drawn out to the front from the saddle stitcher for replacement of the staple cartridge or removal of a staple jam. The stitcher unit in sensor (PI16S) is used to make sure that the stitcher base is properly fitted to the saddle stitcher.

Safety switches are not mounted for the stitcher unit (front, rear), as the location does not allow access by the user.

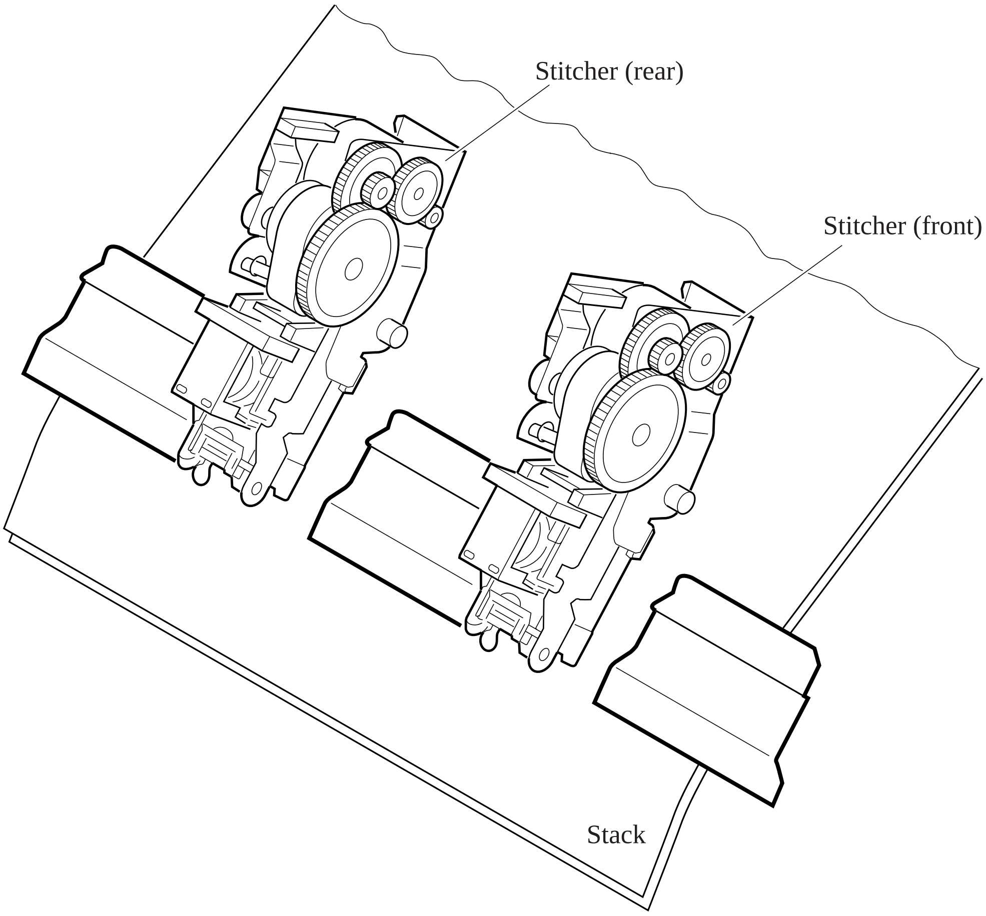


Figure 3-401

2. Stitcher Unit Operation

The stitcher base unit consists of two stitchers and stitcher bases. The stitchers are fixed in position, and are not designed to slide or swing.

Stitching is executed by driving the rotary cam by the stitcher motor (M7S, M6S). The front and rear stitcher units are operated with a time delay so as to prevent wrinkling of paper and to limit the load applied to the power supply. (A time delay for initiating the stitcher motor startup current helps decrease the load on the power supply.)

The stitcher home position sensor (MS7S, MS5S) is used to monitor the movement of the rotary cam, enabling identification of individual stitcher operations. The presence/absence of staples inside the staple cartridge fitted to the stitcher is detected by the staple sensor (MS6S, MS4S).

The alignment plates keep both edges of the stack in place while stitching takes place.

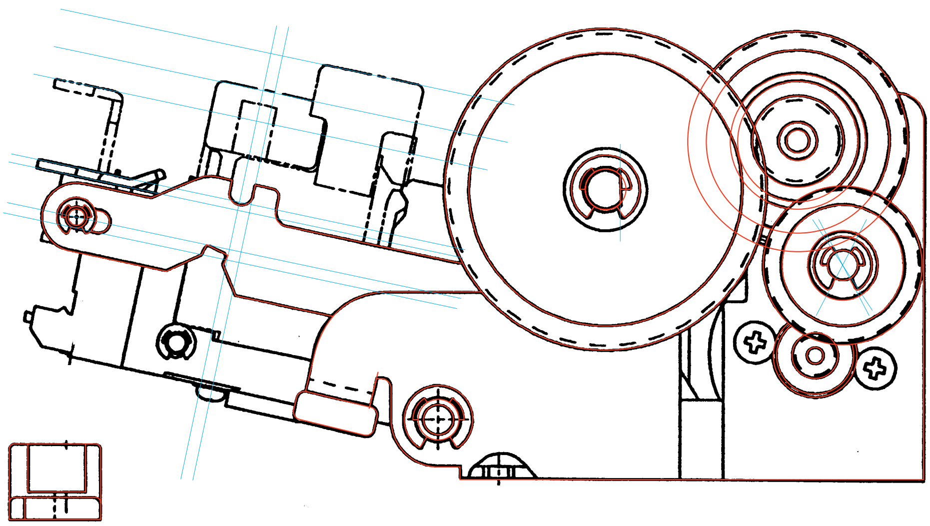


Figure 3-402

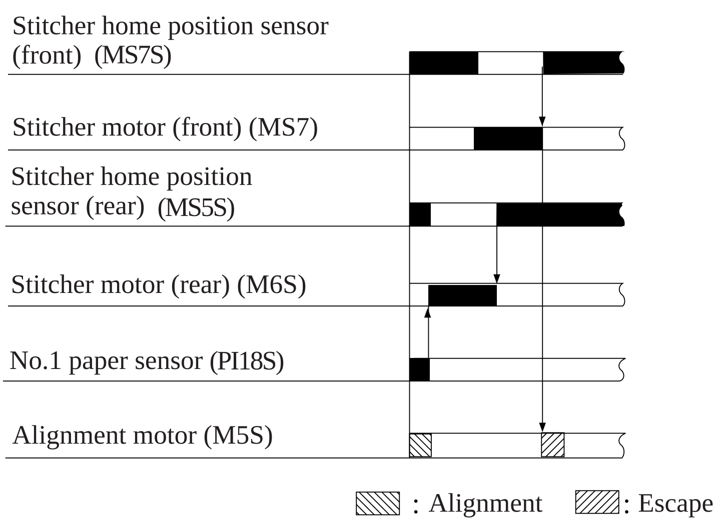


Figure 3-403

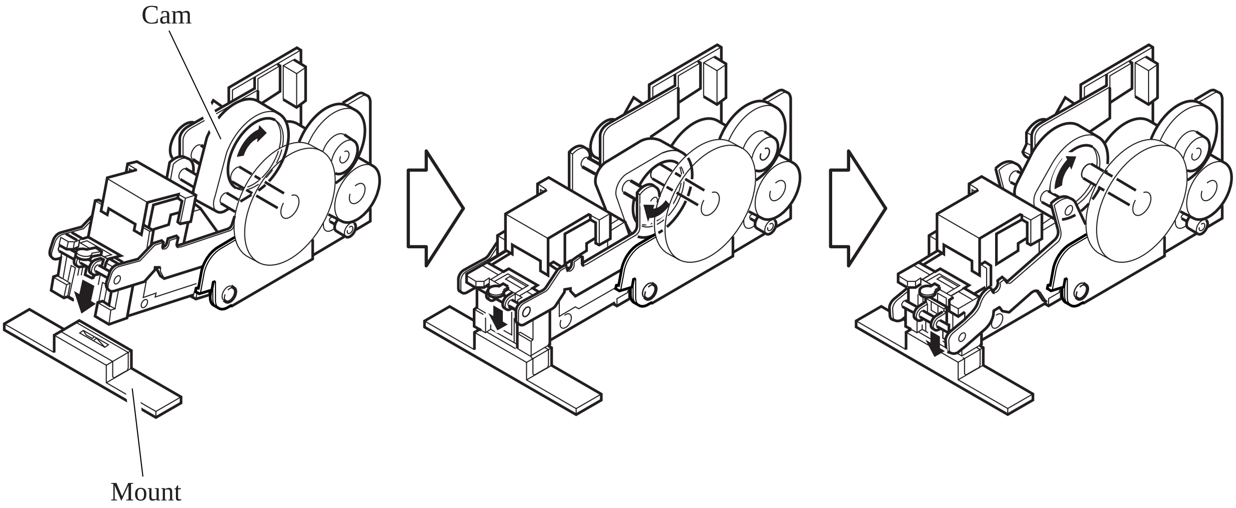


Figure 3-404

V. FOLDING/DELIVERY SYSTEM

1. Outline

The paper folding mechanism consists of a guide plate, paper folding rollers, paper pushing plate, and paper positioning plate.

The guide plate is used to cover the folding rollers while sheets are output so as to prevent sheets from coming into contact with the folding rollers during output. Before the stack is folded, the guide plate moves down to enable the folding rollers to operate.

The folding rollers are driven by the paper folding motor (M2S), and the drive of the motor is monitored by the paper folding motor clock sensor (PI4S). The mechanism is also equipped with a paper folding home position sensor (PI21S) for detecting the position of the paper folding rollers.

The paper pushing plate is driven by the paper pushing plate motor (M8S), and the drive of the paper pushing plate motor is monitored by the paper pushing plate motor clock sensor (PI1S). The paper pushing plate home position sensor (PI14S) and the paper pushing plate top position sensor (PI15S) are used to detect the position of the paper pushing plate.

After being folded into two by the paper folding rollers, a stack is moved ahead by the delivery roller for delivery. The delivery roller is driven by the paper folding motor. The delivery sensor (PI11S) is mounted to the delivery assembly to detect delivery of paper. The tray paper sensor (PI6S) is used to detect the presence/absence of paper on the tray, but does not detect jams. The vertical path paper sensor (PI17S) serves to detect the presence of paper after jam removal.

2. Controlling the Movement of Stacks

When a stack has been stitched (2 points), the paper positioning plate lowers so that the stack will move to where the paper folding rollers come into contact with the stack and where the paper pushing plate is located. The position of the paper positioning plate is controlled in reference to the number of motor pulses coming from the paper positioning home position sensor (PI7S).

At the same time as the paper positioning plate operates, the guide plate lowers so that folding may take place.

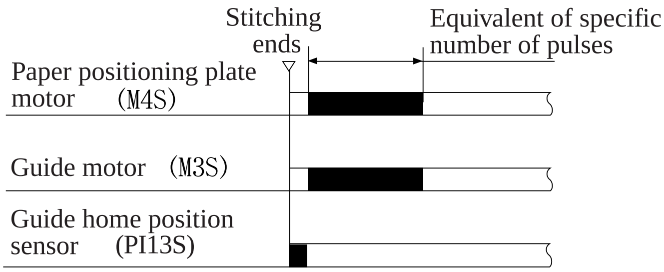


Figure 3-501

3. Folding a Stack

A stack is folded by the action of the paper folding rollers and the paper pushing plate.

The paper pushing plate pushes against the center of a stack toward the roller contact section. The paper pushing plate starts at its home position and waits at the leading edge position until the stack has been drawn to the paper folding roller and is gripped for a length of 10 mm. When the paper folding roller has gripped the stack for a length of about 10 mm, the paper pushing plate motor starts to rotate once again, and the paper pushing plate returns to its home position. The stack gripped in this way by the paper folding roller is drawn further by the paper folding roller and then is moved by the delivery roller to the paper tray.

Half of the peripheral area of the paper folding rollers excluding the center part is punched out. This punched out area only feeds the paper as the paper feeding roller (lower) contacts the paper feeding roller (upper) only at the center of the roller to prevent the paper from wrinkling. As the paper feeding roller (lower) contacts the paper feeding roller (upper) at their entire surfaces on the remaining half of the peripheral area, paper folding starts from this half of the peripheral area, and paper is fed while it is being folded. The stop position of the paper folding rollers is in this half of the peripheral area.

The paper folding start and stop positions on the paper folding rollers is controlled according to the motor clock signals from the paper folding home position sensor (PI21S).

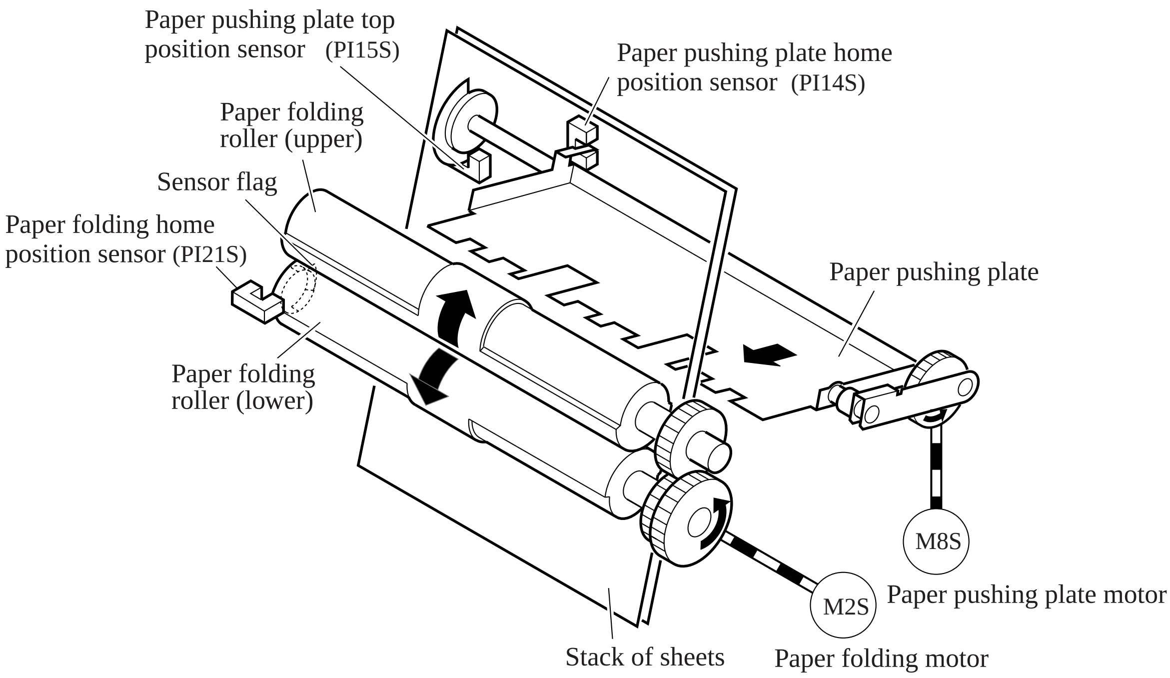


Figure 3-502

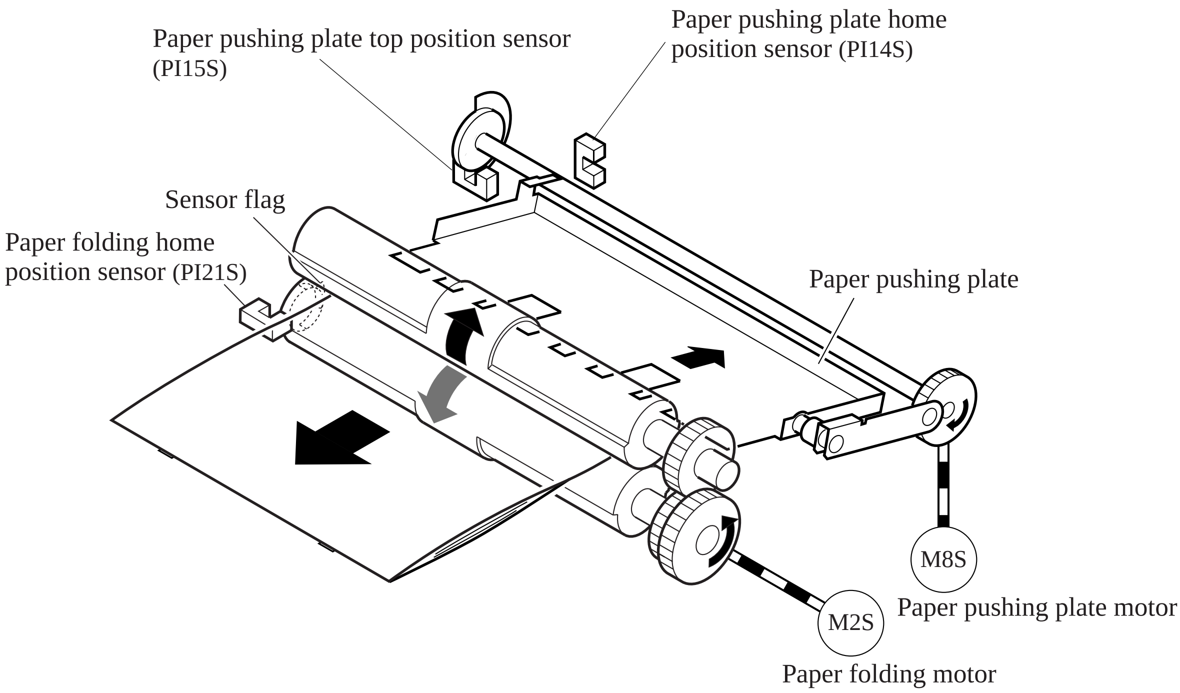


Figure 3-503

[Paper folding start position]

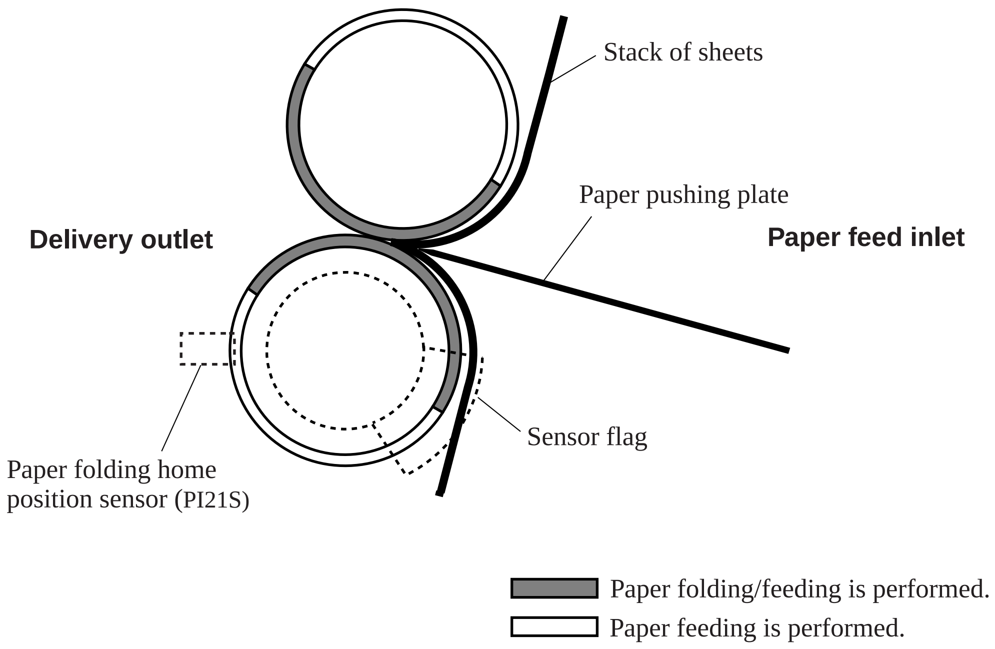


Figure 3-504

[Paper folding roller stop position]

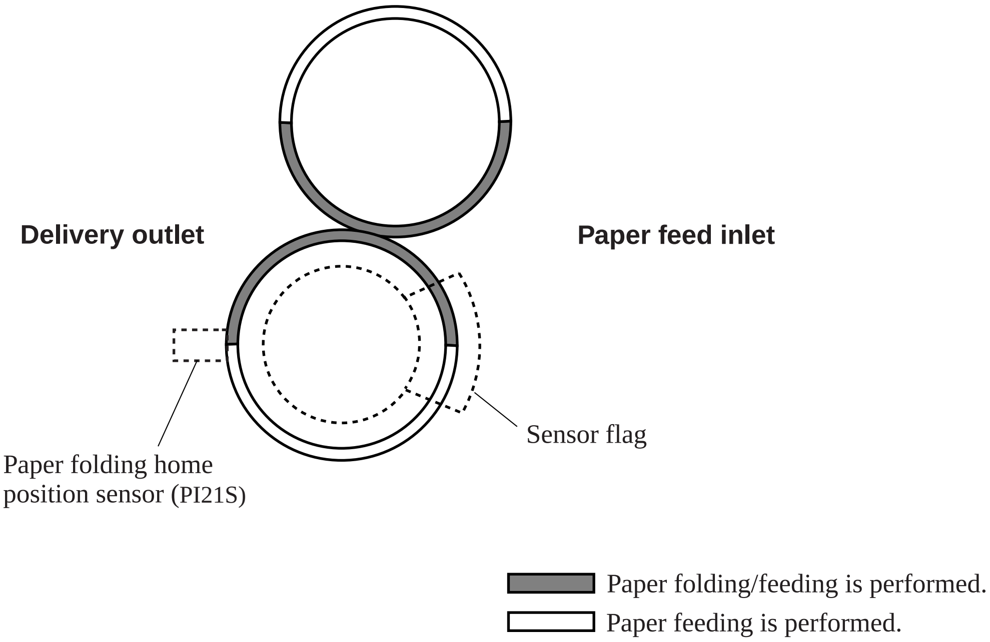


Figure 3-505

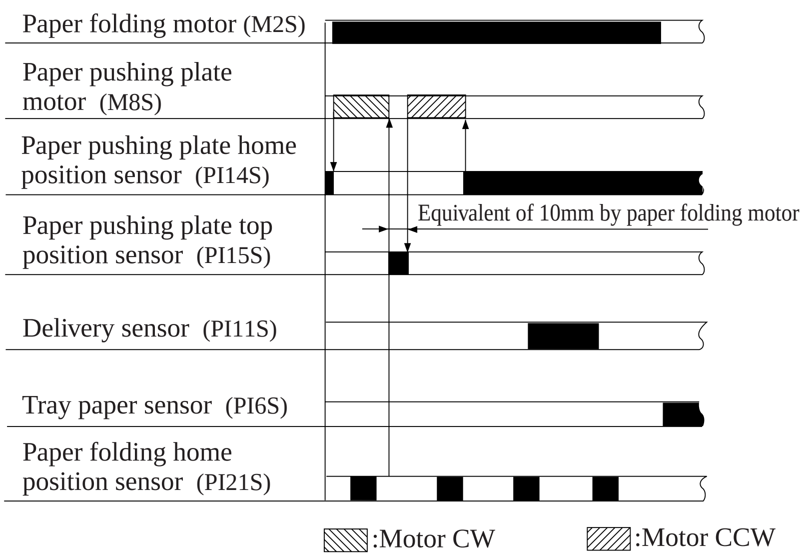


Figure 3-506

4. Double Folding a Stack

To fold a stack consisting of 10 or more A4R or LTR-R sheets, folding is executed twice for the same sheet.

The paper folding rollers rotate in reverse for an equivalent of 20 mm after gripping the stack for a length of 20 mm, enabling the paper folding rollers to apply an increased degree of pressure along the crease on the stack. Then, the paper folding rollers rotate normally, and the paper pushing plate returns to its home position while the stack is being delivered.

This way, a stack requiring a large force may properly be folded with less pressure.

1) The paper pushing plate pushes the stack in the direction of the paper folding rollers.

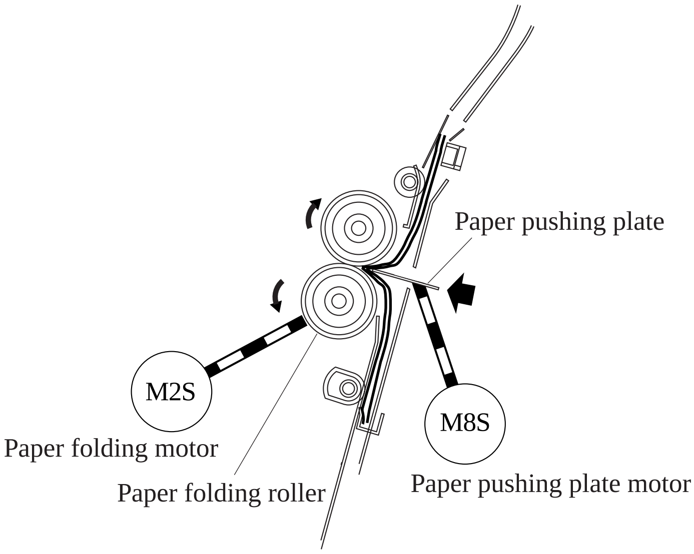


Figure 3-507

2) The paper folding rollers grip the stack for a length of about 20 mm.

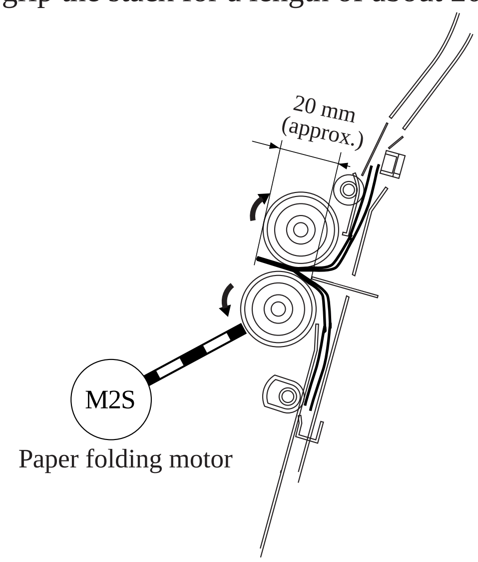


Figure 3-508

3) The paper folding rollers rotate in reverse, pushing back the stack for a length of about 20 mm (reverse feeding).

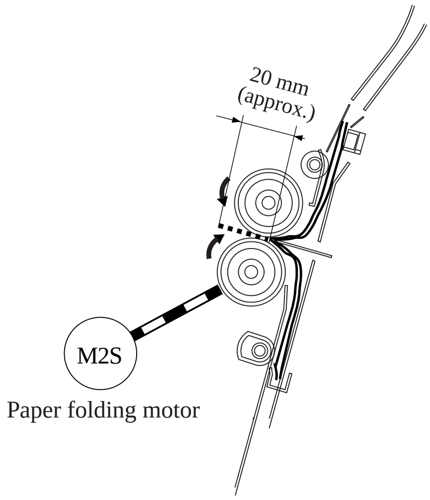


Figure 3-509

4) The paper folding rollers rotate again, feeding out the stack. The paper pushing plate returns to its home position.

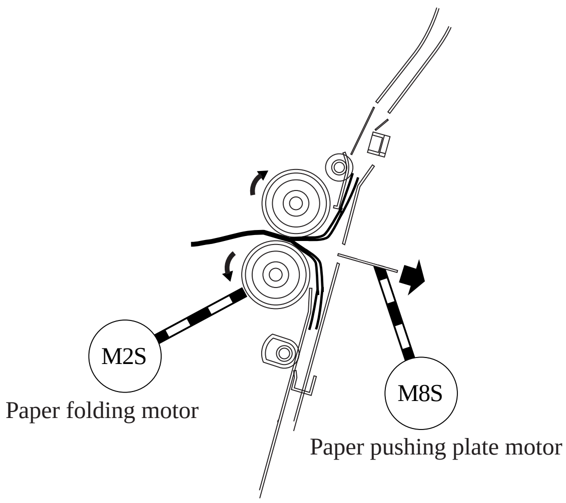


Figure 3-510

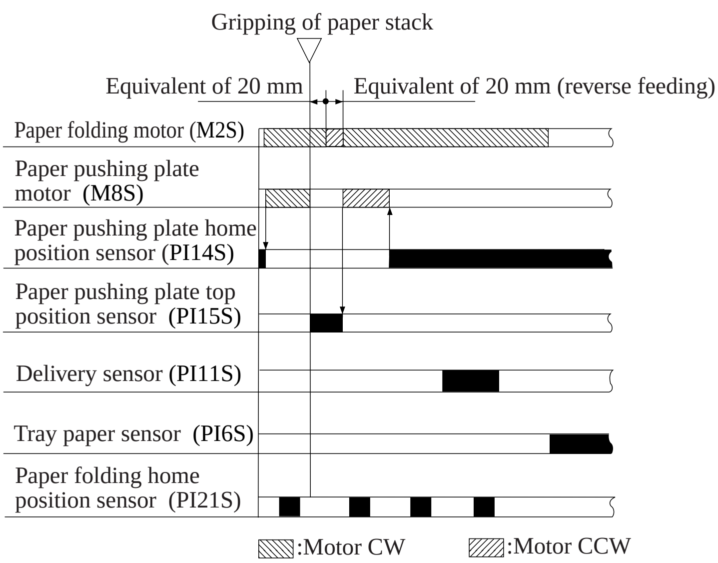


Figure 3-511

VI. CHECKING FOR A JAM

1. Checking for a Jam

The saddle stitcher unit identifies any of the following conditions as a jam, and sends the jam signal to the host machine. In response, the host machine may stop copying operation and indicate the presence of a jam on its control panel.

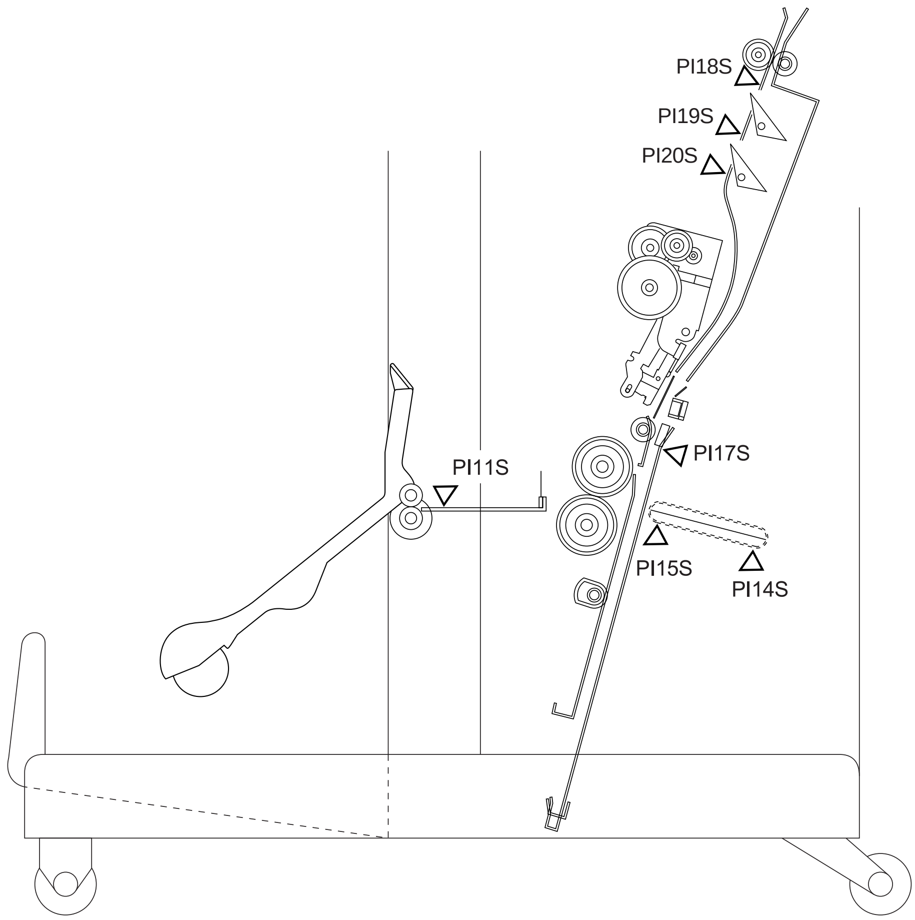


Figure 3-601

No.	Sensor
PI11S	Delivery sensor
PI14S	Paper pushing plate home position sensor
PI15S	Paper pushing plate top position sensor
PI17S	Vertical path paper sensor
PI18S	No.1 paper sensor
PI19S	No.2 paper sensor
PI20S	No.3 paper sensor

Table 3-601

2. Inlet Delay Jam (1036)

The No.1 paper sensor (PI18S) on the paper sensor PCB does not turn ON for a specific period of time after the inlet sensor (PI1) of the finisher turned ON.

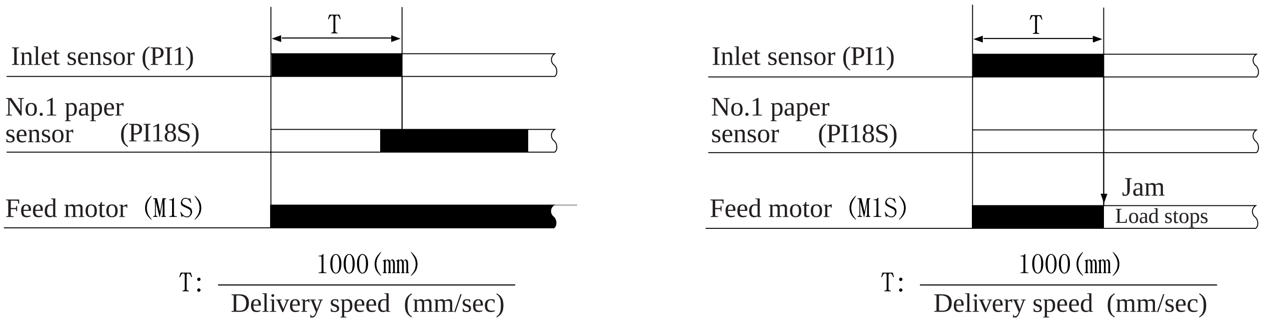


Figure 3-602

3. Inlet Stationary Jam (1136)

The No.1 paper sensor (PI18S), No.2 paper sensor (PI19S), and No.3 paper sensor (PI20S) on the paper sensor PCB do not turn OFF when the stack has been fed for a specific period after the No.1 paper sensor (PI18S) turns ON. The paper sensor used varies according to the paper size.

a. A3/279mm×432mm (11″× 17″) Stack

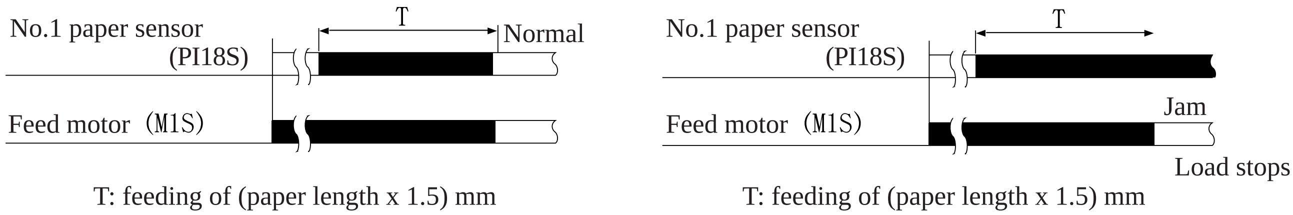
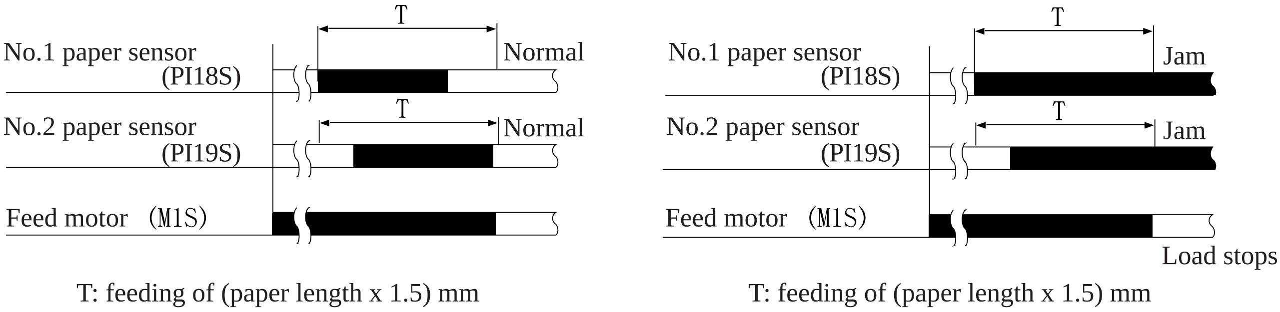


Figure 3-603

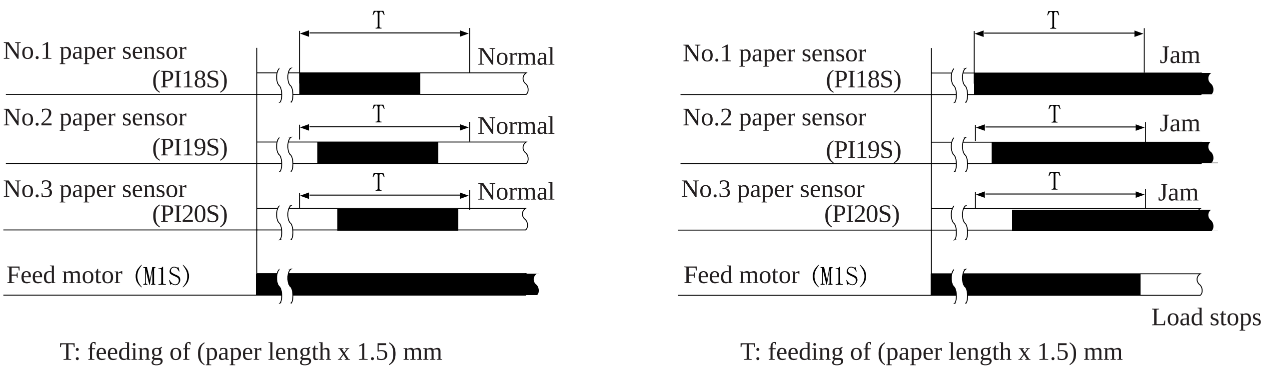
b. B4 Stack



Note: The diagram shows two sensors checking for jams. Single detection, however, uses only one sensor.

Figure 3-604

c. A4R/LTR-R Stack



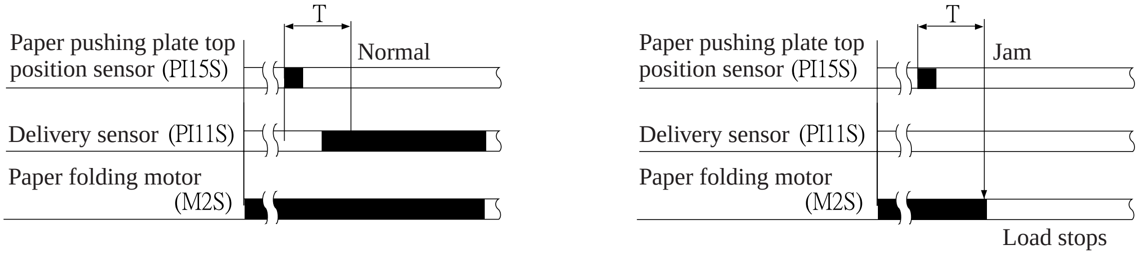
Note: The diagram shows three sensors checking for jams. Single detection, however, uses only one sensor.

Figure 3-605

4. Delivery Delay Jam (1037)

a. By delivery sensor

The delivery sensor (PI11S) does not turn ON within a specific period of time after the paper pushing plate top position sensor has turned ON.



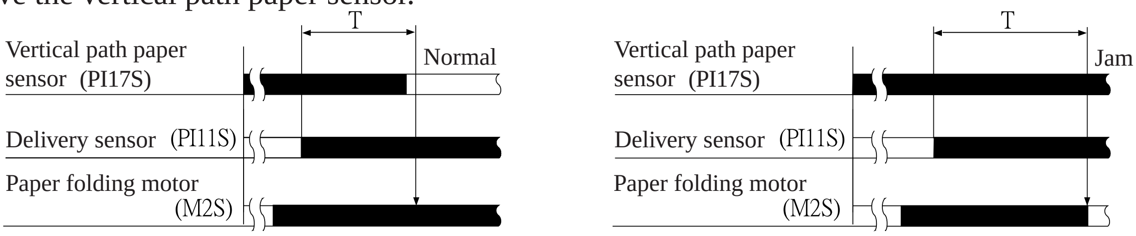
T: Equivalent of 180 mm   T: Equivalent of 180 mm

Figure 3-606

5. Delivery Stationary Jam (1137)

a. By vertical path paper sensor

The vertical path paper sensor (PI17S) does not turn OFF within a specific period of time (feeding) after the delivery sensor (PI11S) has turned ON, i.e., the trailing edge of the stack does not leave the vertical path paper sensor.



T: Feeding of $\left(\frac{\text{Paper length}}{2} - 130\right) + 50$ mm   T: Feeding of $\left(\frac{\text{Paper length}}{2} - 130\right) + 50$ mm

Note: The length 130 mm is the length of the feeding path from the vertical path paper sensor to the delivery paper sensor, while the length 50 mm is a margin.

Figure 3-607

b. By delivery sensor

The delivery sensor (PI11S) does not turn OFF within a specific period of time (feeding) after it has turned ON.

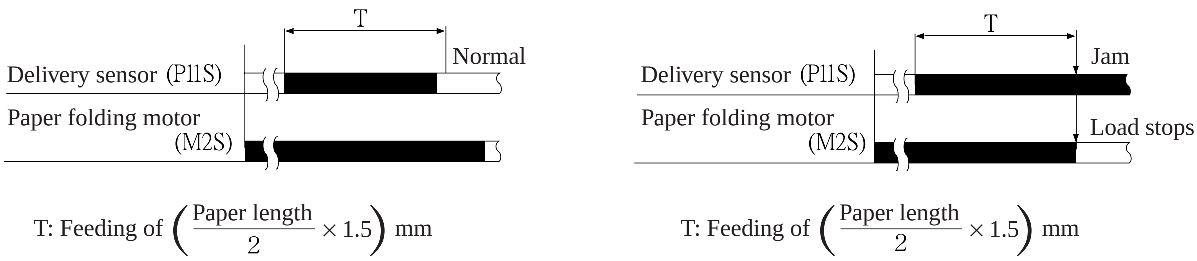


Figure 3-608

6. Power-ON Jam (1339)

Any of the No.1 paper sensor (PI18S), No.2 paper sensor (PI19S), No.3 paper sensor (PI20S), Vertical path paper sensor (PI17S) or delivery sensor (PI11S) on the paper sensor PCB detects paper at power-ON.

7. Door Open Jam (143D)

The front door open/closed sensor (PI2S), outlet cover sensor (PI3S), or inlet cover sensor (PI9S) finds that the respective cover is open during operation.

8. Stitcher Staple Jam (153B)

When the stitcher motor (M7S/M6S) is rotating clockwise, the stitcher home position sensor (MS7S/MS5S) does not turn ON within 0.5 secs after it has turned OFF. In addition, the sensor turns ON within 0.5 secs after the motor has been rotated counterclockwise.

Reference:

When all doors are closed after the user has removed the jam, the saddle stitcher unit checks whether the vertical path paper sensor (PI17S) has detected the presence of paper. If the sensor has detected paper, the unit will identify the condition as being faulty jam removal and send the jam signal to the host machine once again.

VII. POWER SUPPLY

1. Outline

When the host machine power switch is turned ON, two 24V power lines are supplied by the finisher controller PCB.

Of the two 24V lines, one is used to drive solenoids. The 24V power from the finisher controller PCB to solenoids does not pass through any protective mechanisms (microswitches, or the like).

The 24V power to motors, on the other hand, will not be supplied if any of the three door switches is open.

The 24V line is used for the generation of 5V power intended for sensors.

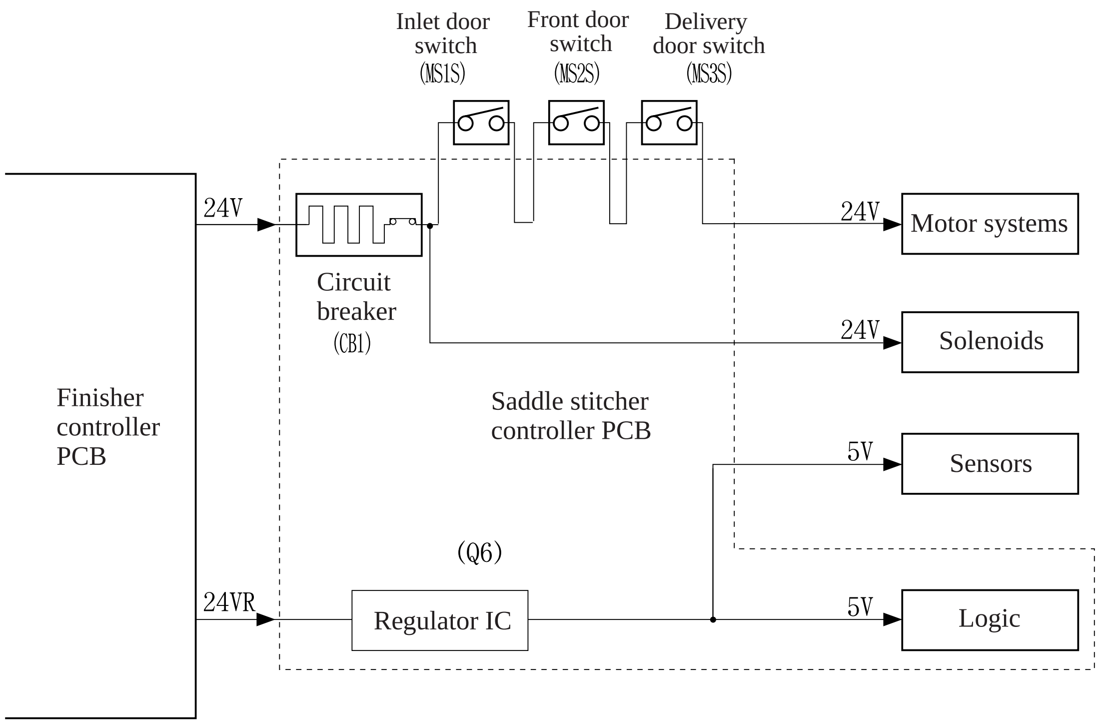


Figure 3-701

2. Protective Mechanisms

The 24 VDC power supply used for motors and solenoids is equipped with a circuit breaker (CB1). The 24V power supply used to drive the feed motor (M1S), alignment motor (M5S), and the paper positioning plate motor (M4S) is equipped with a fuse designed to blow when an overcurrent flows.

CHAPTER 4

PUNCHER UNIT (OPTION) BASIC OPERATION

1. This chapter discusses the purpose and role of each of the puncher unit's functions, and the principles of operation used for the puncher unit mechanical and electrical systems. It also explains the timing at which these systems are operated.

   The symbol in drawings indicates transmission of mechanical drive, and signals marked by ⟶ together with the signal name indicates the flow of electrical signals.

2. In descriptions of digital circuits on the puncher unit, "1" indicates a high signal voltage level, while "0" indicates a low signal voltage level. Voltage values differ according to circuit.

   Descriptions in this chapter also assume that PCBs will not be repaired at user sites. For this reason, descriptions of circuits on PCBs is limited to block diagrams. Two types of block diagrams are provided for separate functions: diagrams indicating details from sensors up to input sections of major PCBs, and diagrams indicating details from the output sections of major PCBs up the loads.

I. BASIC OPERATION

A. Outline

The puncher unit (option) is attached on the feed path between the host machine and the finisher.

The puncher unit does not have a paper feed mechanism. Paper from the host machine is fed by feed drive from the finisher via the puncher unit. When the trailing edge of the paper from the host machine reaches the puncher unit, the paper stops temporarily, and the punch shaft is rotated to punch the trailing edge of the paper. This operation is controlled by the finisher controller PCB, and each of the parts on the finisher is driven by the punch driver PCB.

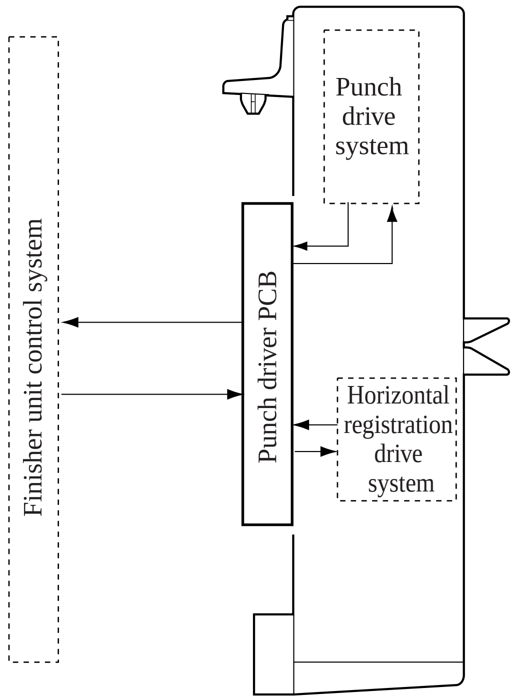


Figure 4-101

B. Inputs to and Outputs from Punch Driver PCB

1. Inputs to Punch Driver PCB (1/3)

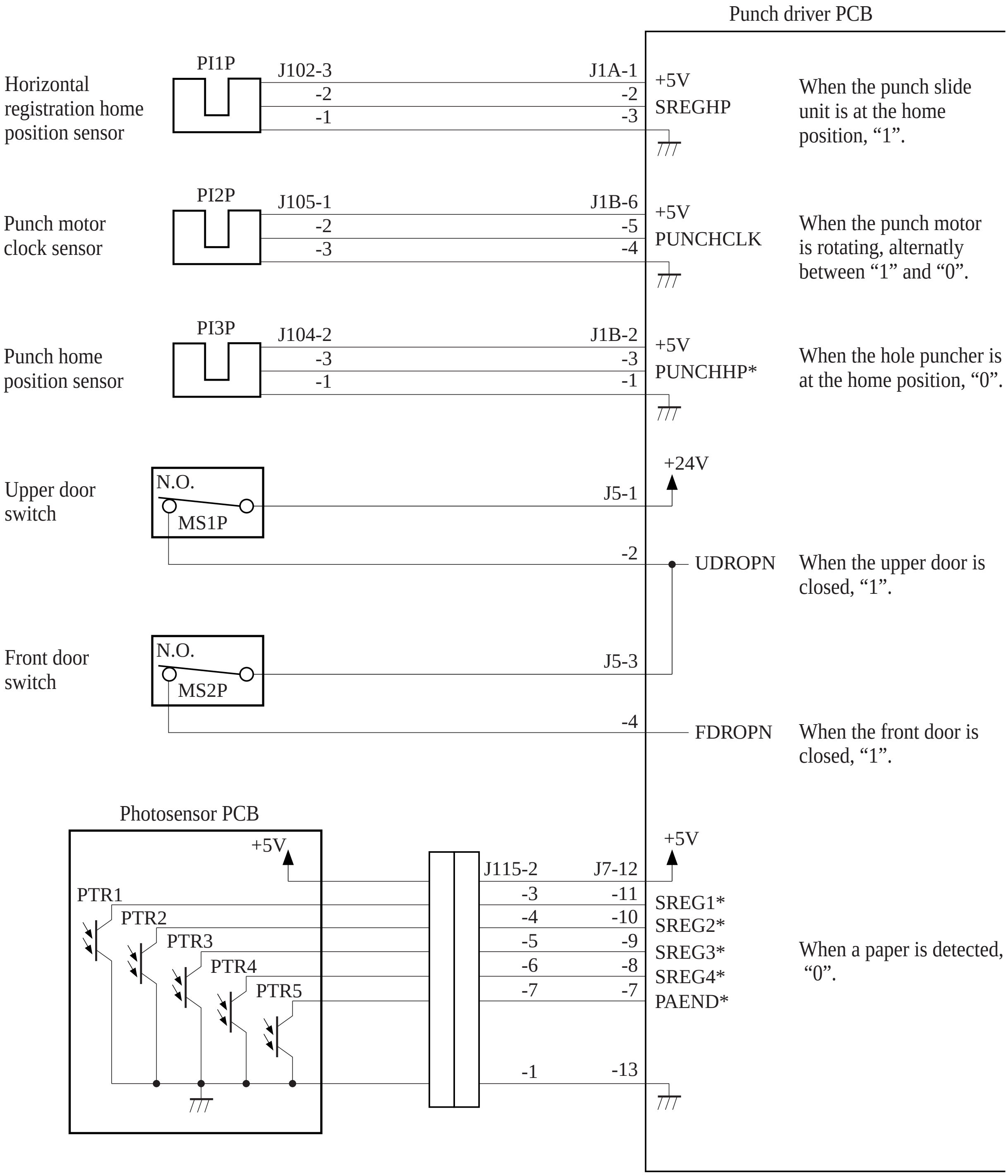


Figure 4-102

2. Outputs from Punch Driver PCB (2/3)

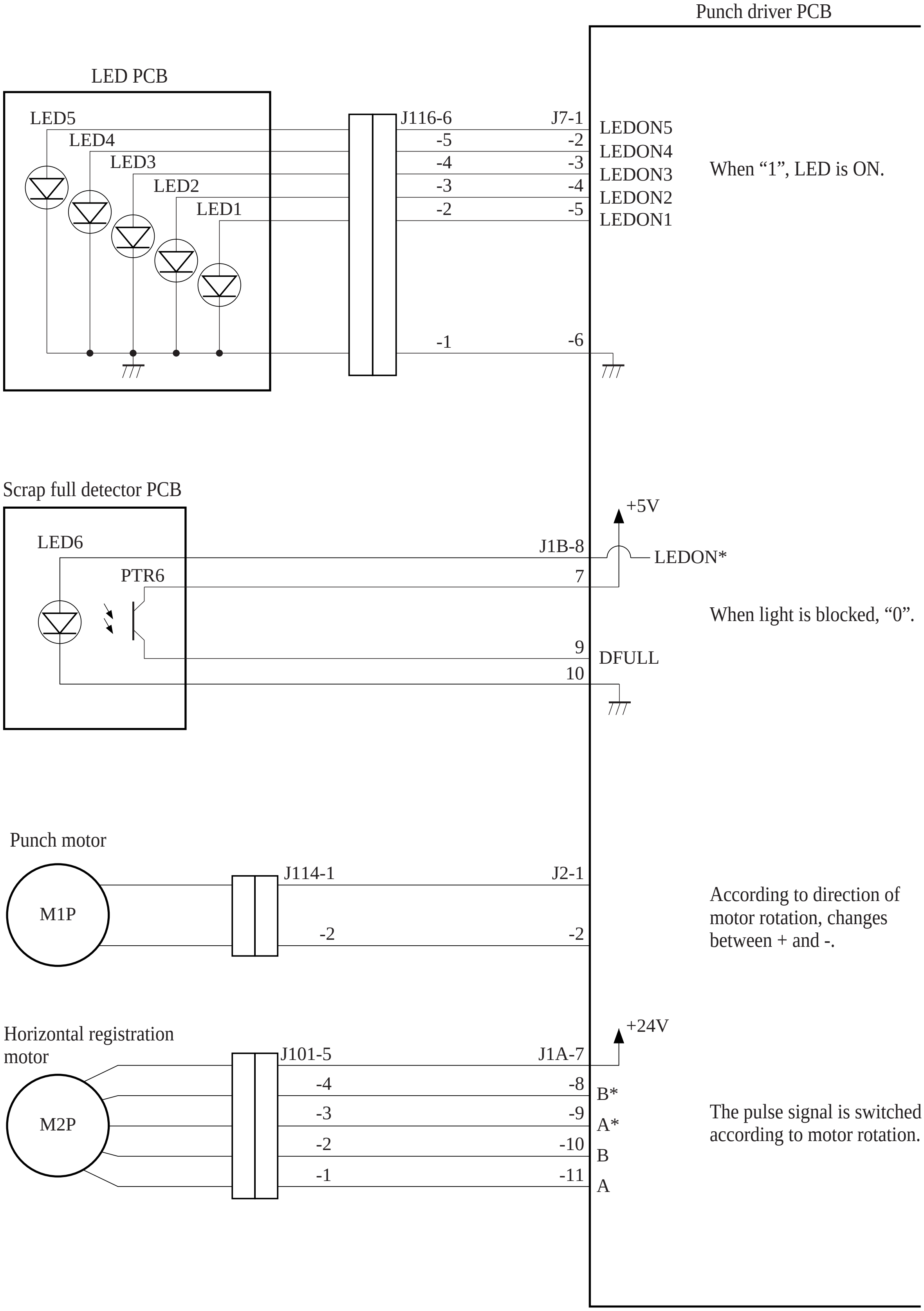


Figure 4-103

3. Outputs from Punch Driver PCB (3/3)

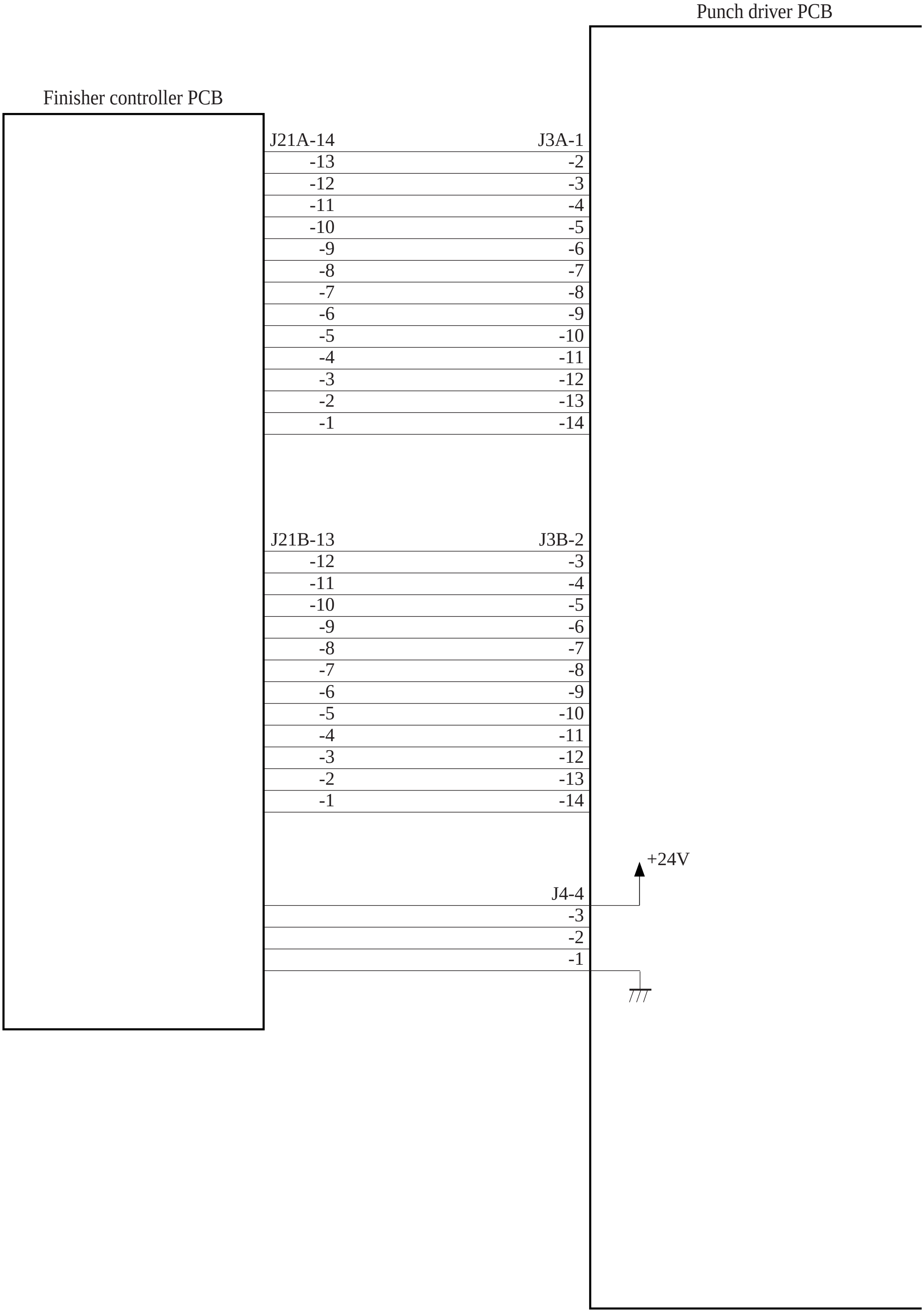


Figure 4-104

II. PUNCH OPERATION

A. Outline

The puncher unit is located on the feed path between the host machine and the finisher, and successively punches holes when the paper stops temporarily. When the trailing edge of the paper reaches the puncher unit, the inlet roller of the finisher unit temporarily stops the paper and holes are punched on the trailing edge of the paper.

The puncher unit consists of a die and hole puncher (punch blade).

The hole puncher is driven by the punch motor (M1P). The hole puncher is attached to the eccentric cam of the punch shaft, and rotary action of the punch shaft is converted to reciprocal motion to perform punching.

Punch motor (M1P) is a DC motor. The home position of the punch shaft is detected by punch home position sensor (PI3P). To stop the DC punch motor accurately at its home position, the punch motor clock sensor (PI2P) counts a predetermined number of clock pulses to stop the punch motor. A single punch operation is performed by rotating the punch shaft 180° from its home position.

Five light sensors (photosensor PCB) are located at the upper side of the inlet paper feed path of the puncher unit and a set of five LEDs (LED PCB) are located at the lower side. These sensors and LEDs function as five sensors. The frontmost sensor (LED5, PTR5) are the trailing edge sensor and are used for detecting the trailing edge of the paper. The remaining sensors (LED1 to LED4, PTR1 to PTR4) are horizontal registration sensors, and are used for detecting the inner position of the paper for determining the hole punching position.

The punch motor, puncher unit and above sensors comprise the punch slide unit. This unit moves backwards and forwards according to the size of the paper. Backward and forward movement is driven by the horizontal registration motor (M2P). The home position of the punch slide unit is detected by the horizontal registration home position sensor (PI1P). The horizontal registration motor (M2P) is a 2-phase stepping motor.

The punch motor and horizontal registration motor is driven by the punch driver PCB according to control signals from the finisher controller PCB.

Punch scraps caused by punching are stored in the punched scrap container. Scrap full detection is performed by a reflective sensor (LED6 and PTR6 on the scrap full detector PCB unit).

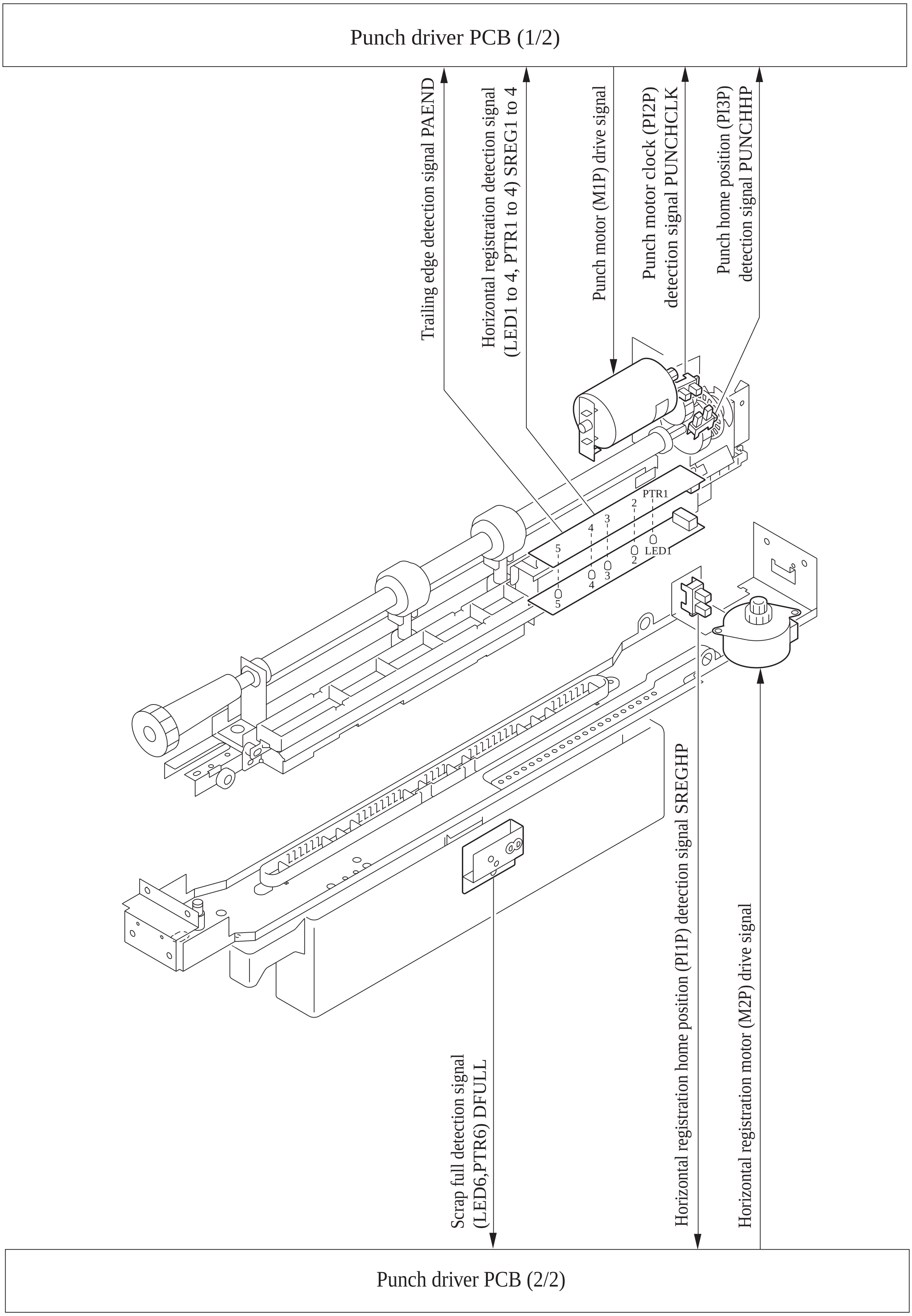

Punch driver PCB (1/2)
Trailing edge detection signal PAEND
Horizontal registration detection signal (LED1 to 4, PTR1 to 4) SREG1 to 4
Punch motor (M1P) drive signal
Punch motor clock (PI2P) detection signal PUNCHCLK
Punch home position (PI3P) detection signal PUNCHHP
PTR1
LED1
Scrap full detection signal (LED6,PTR6) DFULL
Horizontal registration home position (PI1P) detection signal SREGHP
Horizontal registration motor (M2P) drive signal
Punch driver PCB (2/2)

Figure 4-201

B. PUNCH OPERATION

The hole puncher is driven by the punch motor (M1P). The hole puncher home position is detected by the punch home position sensor (PI3P).

In all, there are four types of puncher units depending on the destination: 2-hole type (Puncher unit A1), 2-/3-hole Dual Use (Puncher unit B1), and two 4-hole types (Puncher unit C1 and Puncher unit D1). With the 2-hole and 4-hole types, the hole puncher is moved reciprocally and punching is performed by the punch shaft rotating 180° from its home position. With the 2-/3-hole dual use type, too, the hole puncher is moved reciprocally and punching is performed by the punch shaft rotating 180° from its home position. However, half of the peripheral area of the punch shaft can be used as a 2-hole type while the other half can be as a 3-hole type. Whether the punch shaft is used as a 2-hole punch or a 3-hole punch depends on the instructions from the host machine.

1. 2-/4-hole Type

At the home position, the punch home position sensor is ON. Punching of the first sheet ends when the punch shaft has rotated in the forward direction 180°, and the state of the punch home position sensor has changed from OFF to ON. Punching of the second sheet ends when the punch shaft has rotated in the reverse direction 180°, and the state of the punch home position sensor has changed from OFF to ON.

The following illustrates punching when two sheets are punched.

1) A hole is punched in the trailing edge of the first sheet.

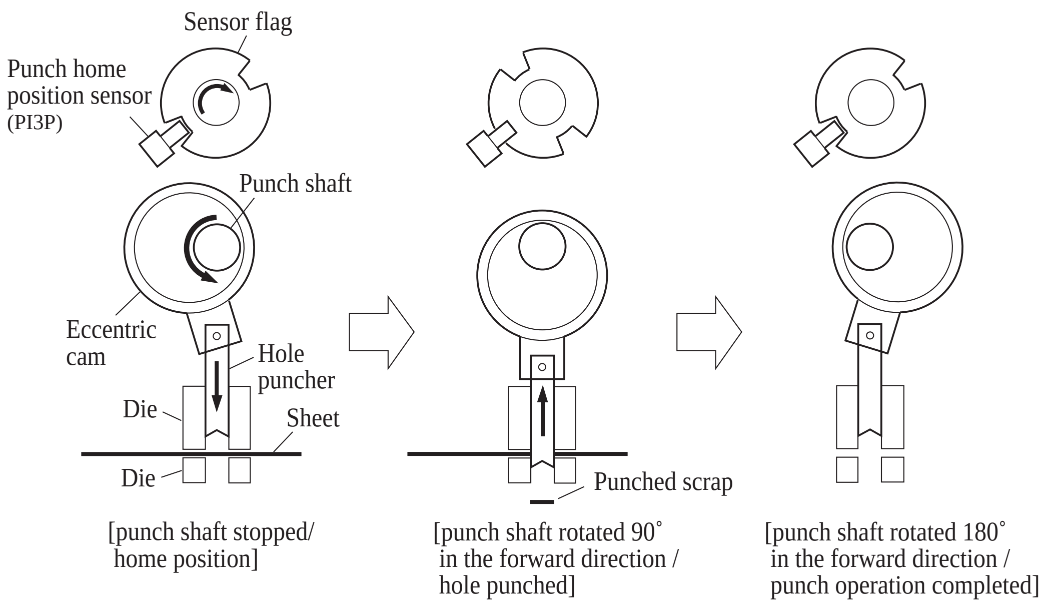


Figure 4-202

2) A hole is punched in the trailing edge of the second sheet.

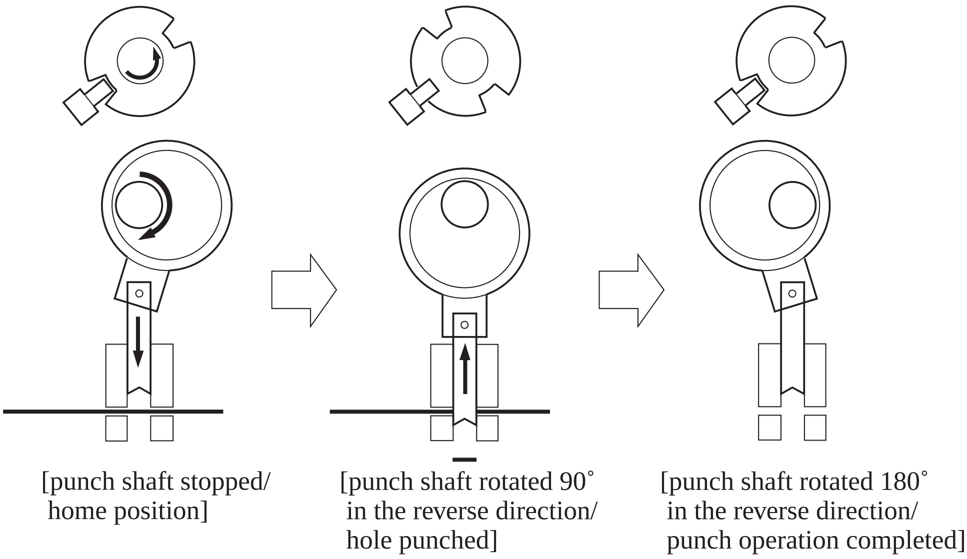


Figure 4-203

2. 2-/3-hole Dual Use Type

At the home position, the punch home position sensor is ON. To punch two holes, punching of the first sheet ends when the punch shaft half peripheral area has rotated in the forward direction 180°, and the state of the punch home position sensor has changed from OFF to ON. At this time, the 3-hole puncher is moved reciprocally in the escape direction (hole puncher rise direction) on the remaining half peripheral area on the punch shaft. Punching of the second sheet ends when the punch shaft half peripheral area has rotated in the reverse direction 180°, and the state of the punch home position sensor has changed from OFF to ON. Also at this time, the 3-hole puncher is moved reciprocally in the escape direction (hole puncher rise direction) on the remaining half peripheral area on the punch shaft. To punch three holes, the 2-hole puncher is moved reciprocally in the escape direction (hole puncher rise direction).

The following illustrates punching when two sheets are punched with two holes.

1) A hole is punched in the trailing edge of the first sheet.

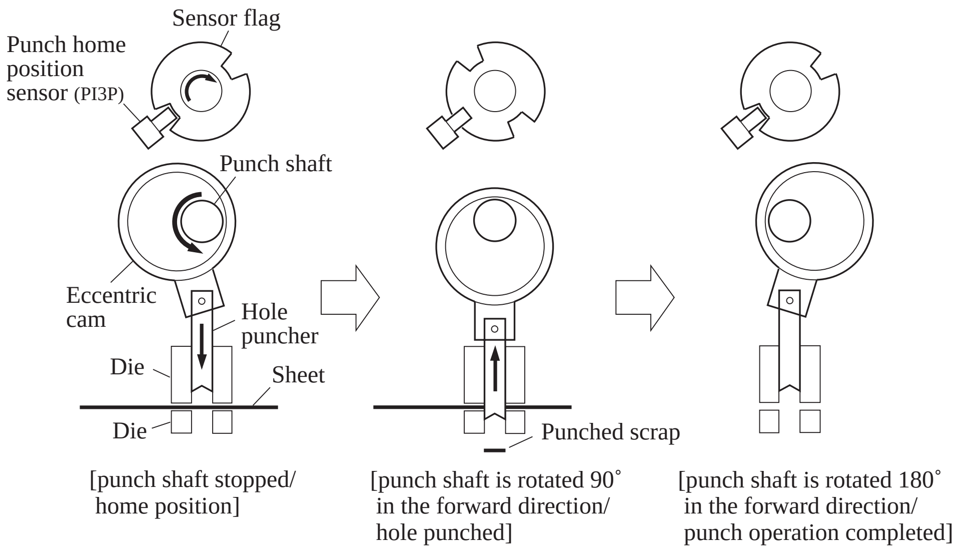


Figure 4-204

When two holes are punched, the 3-hole puncher is fed reciprocally in the escape direction (hole puncher rise direction) as shown below.

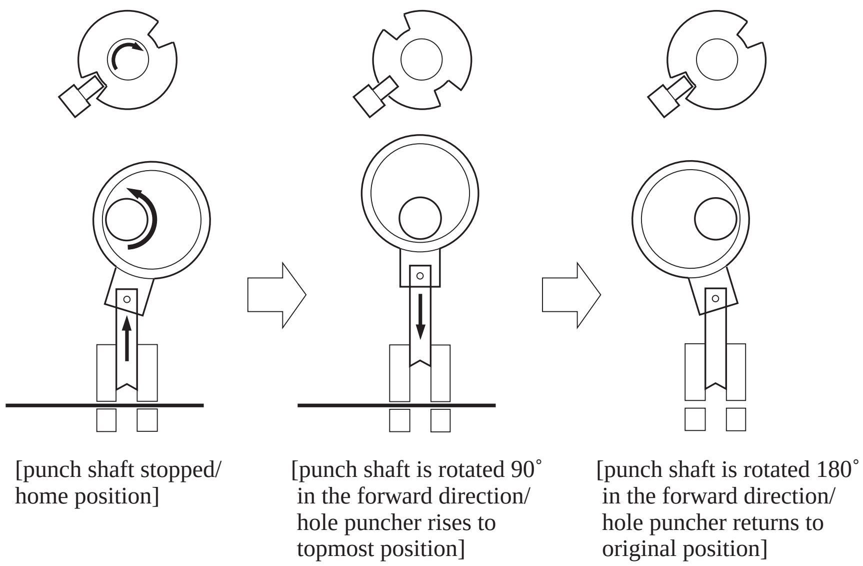


Figure 4-205

2) A hole is punched in the trailing edge of the second sheet.

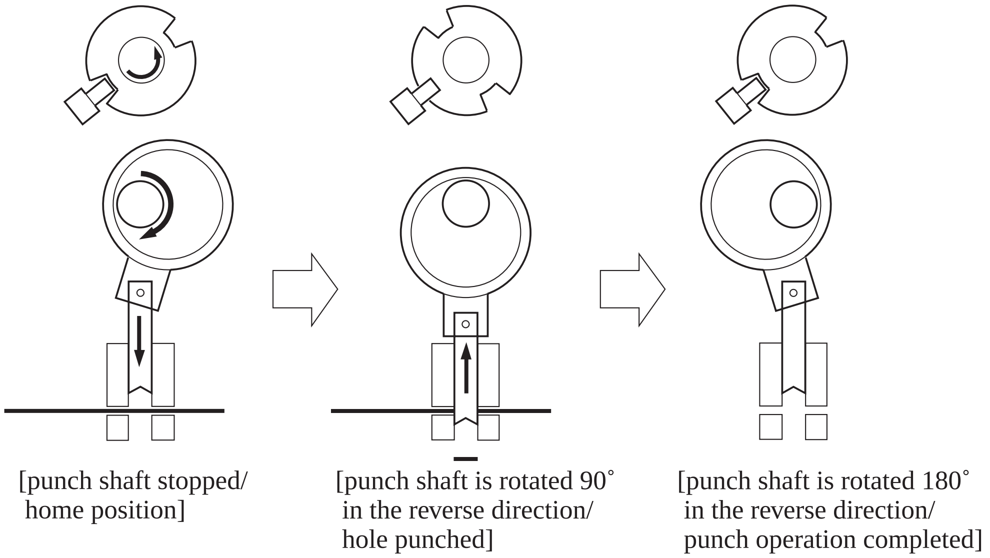


Figure 4-206

When two holes are punched, the 3-hole puncher is fed reciprocally in the escape direction (hole puncher rise direction) as shown below.

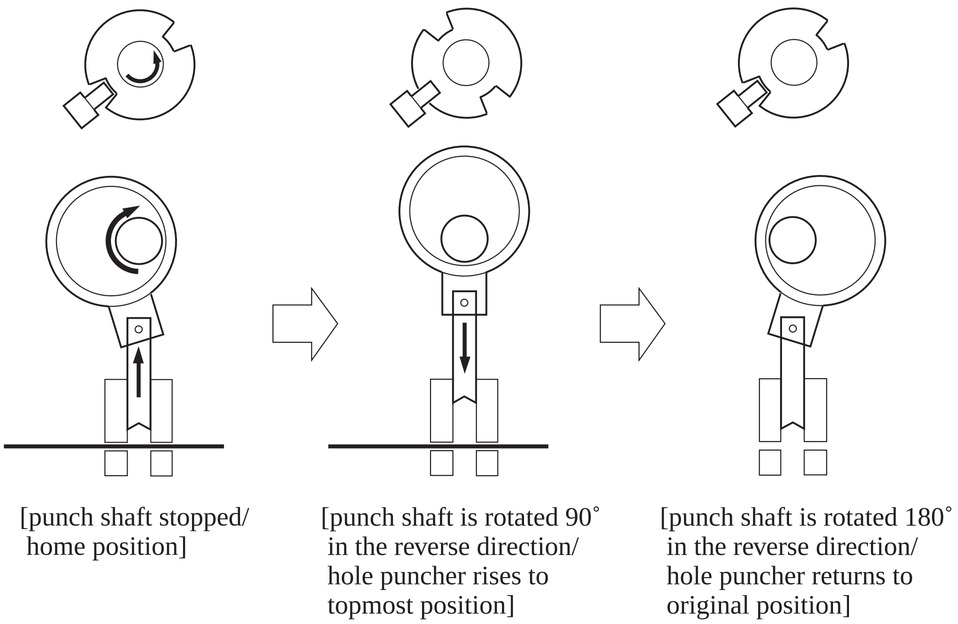


Figure 4-207

C. Horizontal Registration Operation

Horizontal registration drive of the punch slide unit is performed by the horizontal registration motor (M2P). The home position of the punch slide unit is detected by the horizontal registration home position sensor (PI1P). The punch slide unit detects the trailing edge of the paper by the trailing edge sensor (LED5, PTR5) and horizontal registration sensors (LED1 to 4, SREG1 to 4) and is moved to the trailing edge position matched to the paper size.

The following shows horizontal registration operation.

1) When the leading edge of the paper from the host machine is detected by the trailing edge sensor (LED5, PTR5) on the puncher unit, the horizontal registration motor (M2P) starts to move the punch slide unit towards the front.

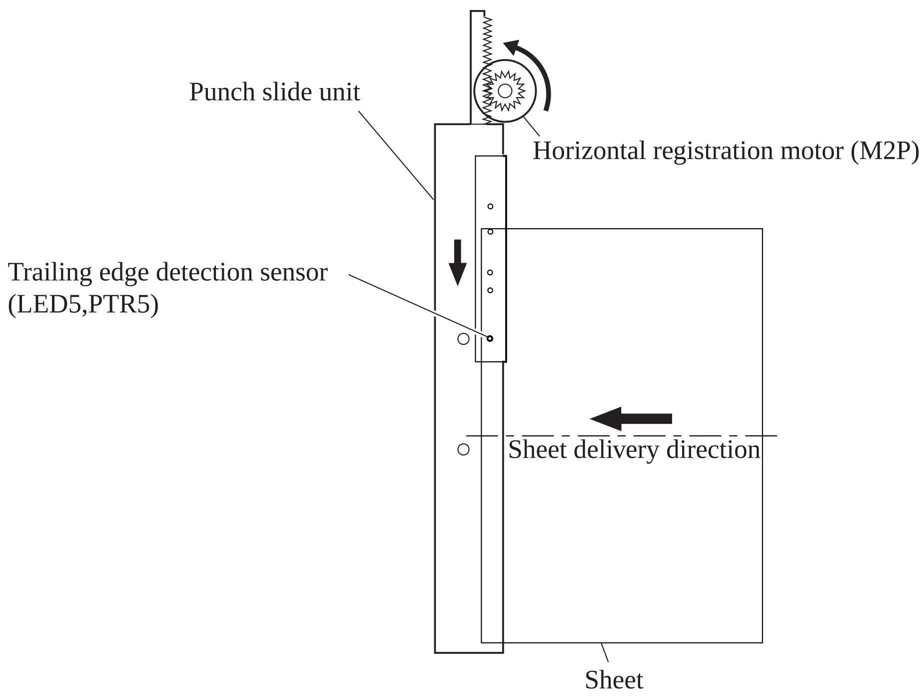


Figure 4-208

2) After the horizontal registration sensors (LED1 to 4, PTR1 to 4) detect the edge of the paper at its inner side in keeping with the paper size signals arriving from the host machine, the horizontal registration motor (M2P) drives the punch slide unit to a predetermined position further towards the front, and stops the unit at this position.

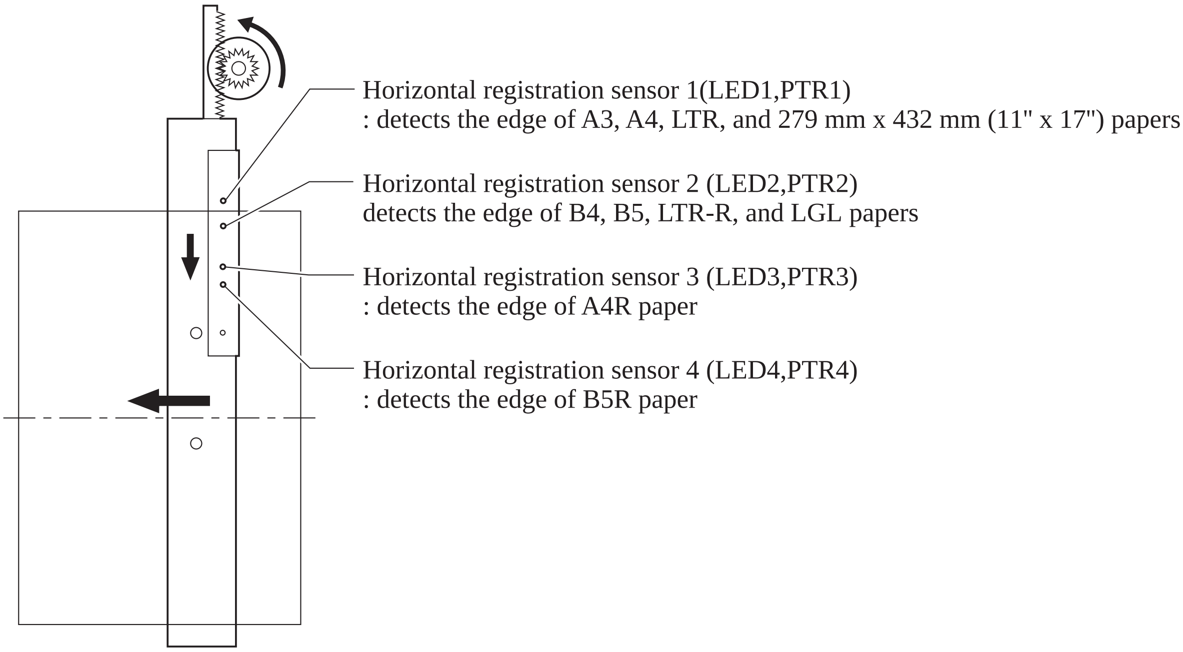


Figure 4-209

3) When the trailing edge sensor (LED5, PTR5) detects the trailing edge of the paper, drive of the inlet feed motor (M9) and first feed motor (M1) on the finisher is stopped to stop paper feed. Next, the punch motor (M1P) is driven to punch holes in the paper.

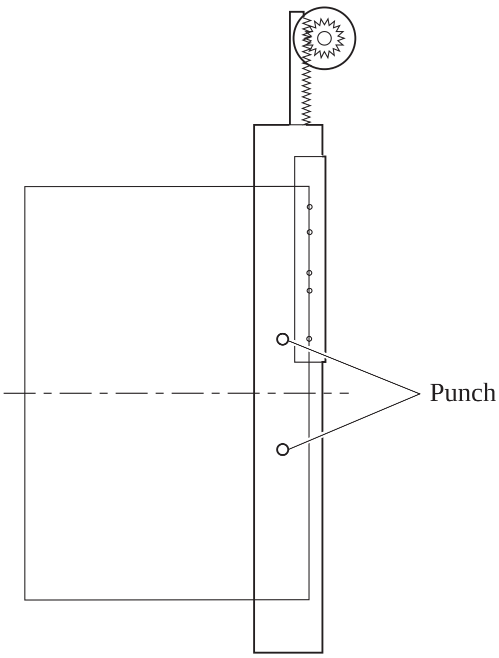


Figure 4-210

4) When punching ends, drive of the inlet feed motor (M9) and first feed motor (M1) on the finisher is started, the horizontal registration motor (M2P) is operated in the reverse direction, and the punch slide unit is returned to its home position where it comes to a stop.

5) Even if paper to be punched continues to arrive, the punch slide unit returns to its home position for each arriving sheet, and steps 1 to 4 are repeated.

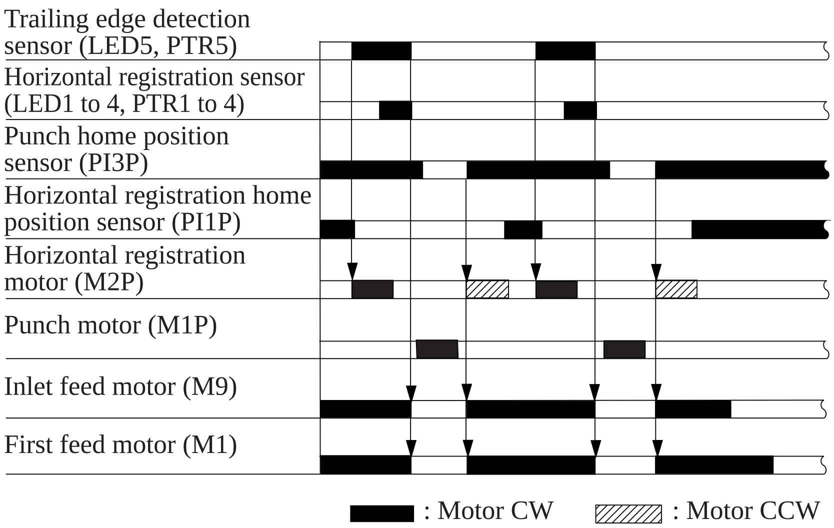


Figure 4-211

III. POWER SUPPLY SYSTEM

1. Outline

24V power and 5V power are supplied from the finisher controller PCB when the power switch on the host machine is turned ON.

24V power is used for driving motors, while 5V power is used for driving sensors and the ICs on the punch driver PCB.

24V power to the motors is not supplied when either of the two door switches on the puncher unit is open.

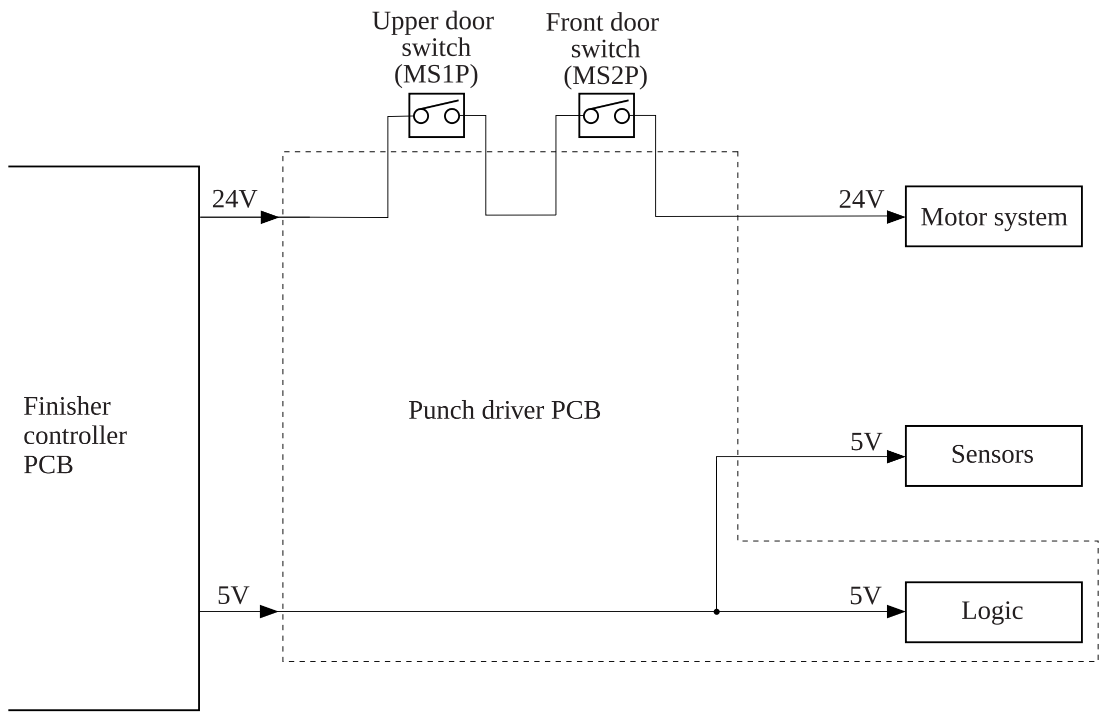


Figure 4-301

2. Protection Function

The 24V power supplies for the punch motor (M1P) and horizontal registration motor (M2P) are equipped with a fuse designed to blow when an overcurrent flows.

CHAPTER 5

MECHANICAL CONSTRUCTION

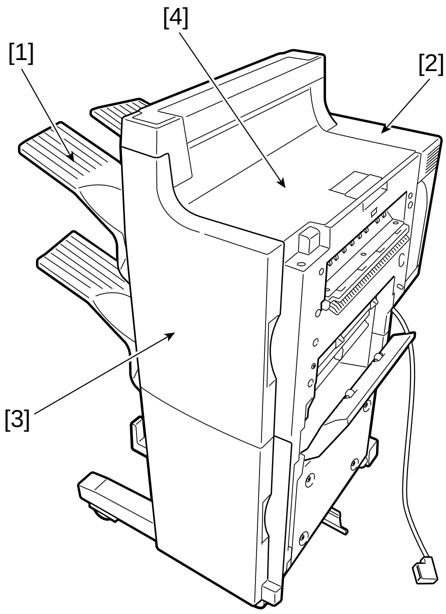
This chapter describes the mechanical features and operations, and disassembly and assembly procedures.

Be sure to observe the following points when disassembling and assembling the machine:

1. ⚠ Before performing disassembly and assembly, be sure to unplug the power plug for safety's sake.
2. Assemble parts by following the disassembly procedure in reverse unless otherwise mentioned.
3. Assemble screws, etc., making sure that their type (length and diameter) and location of use are correct.
4. In principle, do not operate the machine with any parts removed.

I. FINISHER UNIT

A. Externals and Controls



[1] Tray
[2] Rear cover (3)
[3] Front door
[4] Upper door assembly
Figures in parentheses ( ) indicate the number of mounting screws.

Figure 5-101

1. Removing the Front Door Assembly

1) Open the front door assembly [1].
2) Remove the screw [2], and remove the bushing [3] (center).
3) Remove the screw [4], and remove the bushing (top) [5]. Then, remove the front door assembly.

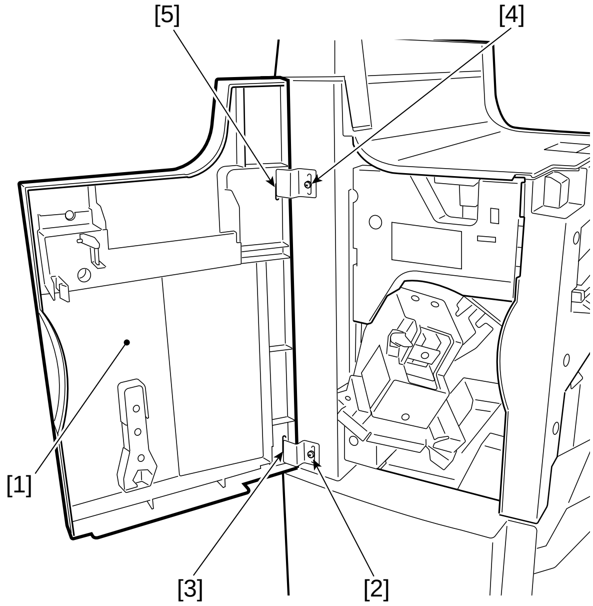
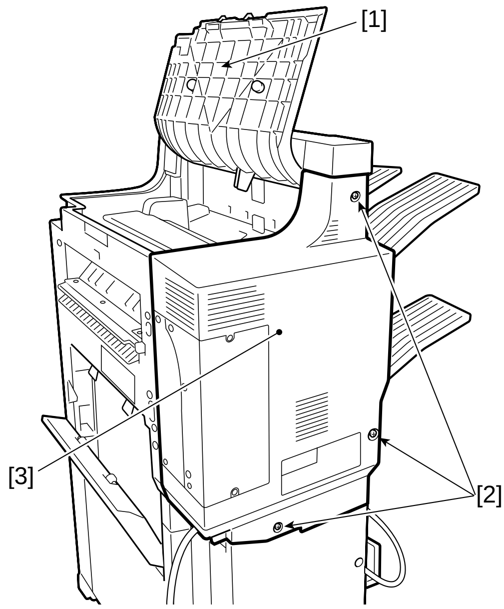


Figure 5-102

2. Removing the Rear Cover

1) Open the upper door assembly [1].
2) Remove the three screws [2], and lift the rear cover [3] to remove.



[1] Upper door assembly
[2] Screws
[3] Rear cover

Figure 5-103

3. Removing the Upper Door Assembly

1) Open the upper door assembly [1].
2) Remove the two claws [2], and remove the upper door assembly.

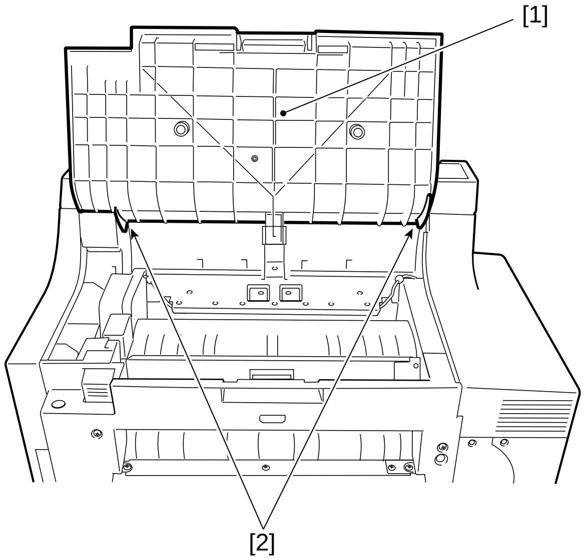


Figure 5-104

4. Removing the Front Cover

1) Open the front door assembly [1].
2) Remove the screw [2], and remove the front cover [3].

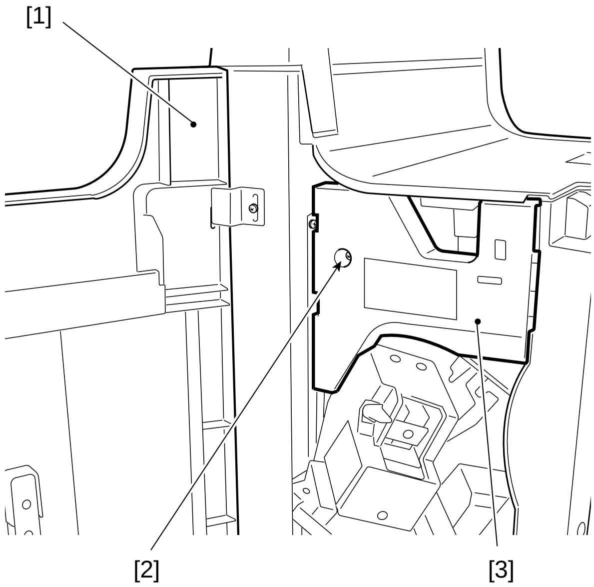


Figure 5-105

5. Removing the Tray Assembly

1) Remove the rear cover (see I-A-2).
2) For the Saddle Finisher-F2, remove the rear lower cover also (see II-A-2).
3) Disconnect the J201 [1] and grounding wire [2], and release harness stop [3].

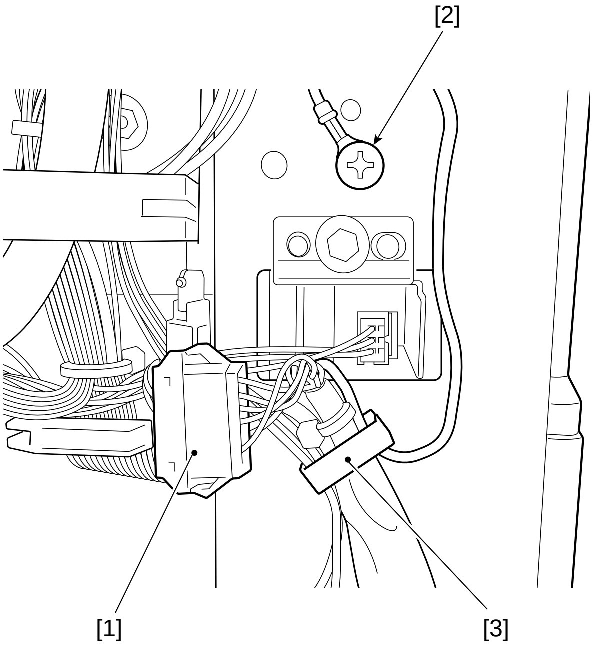


Figure 5-106

4) Remove the slide guide [4].
5) Remove the end cap (F) [5] and end cap (R) [6].
6) Lift the tray assembly [7] to remove.

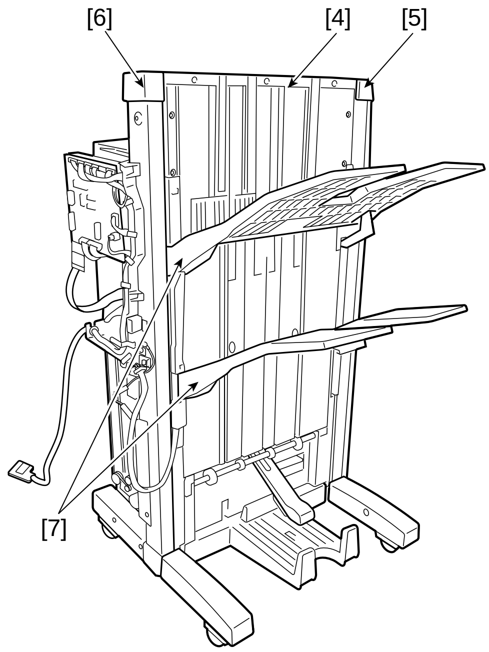


Figure 5-107

Caution:
When installing the removed tray assembly back to the finisher assembly, be sure to release the tray lift motor gear clutch [1] with a screwdriver or similar object when inserting it. Take extra care during this operation.

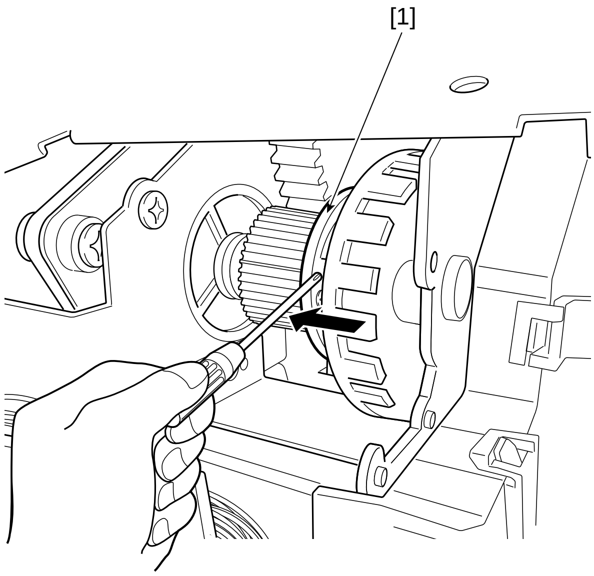


Figure 5-108

6. Removing the Grate-Shaped Upper Guide

1) Remove the rear cover (see I-A-2).
2) Release the tray lift motor gear clutch with a screwdriver or similar object while supporting the tray assembly, and gently lower the tray assembly down to its lowest position (see Figure 4-108).
3) Remove the slide guide [1].
4) Remove the five screws [2] (M4).
5) Remove the screw [3] (M3), and remove the grate-shaped upper guide [4].

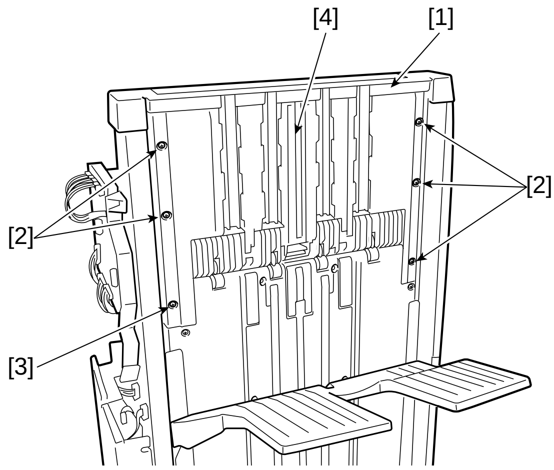


Figure 5-109

7. Removing the Grate-Shaped Lower Guide

1) Remove the tray assembly (see I-A-5).
2) Remove the three screws [1] (M4).
3) Remove the three screws [2] (M3), and open the grate-shaped lower guide [3] to the front.

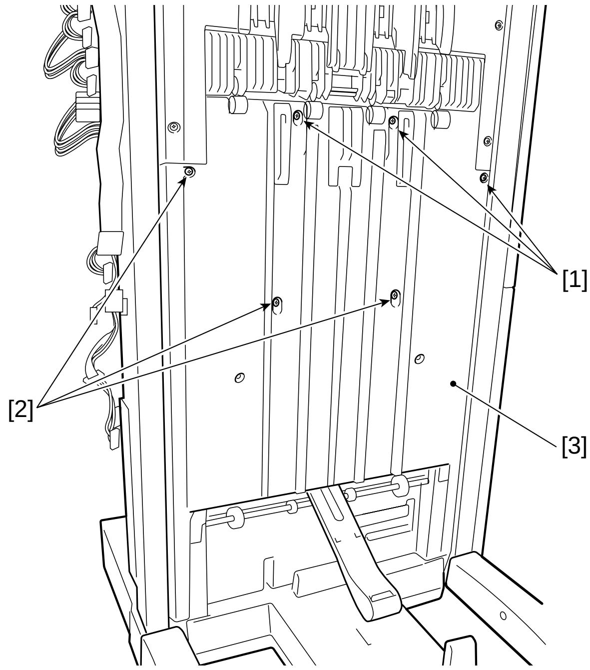


Figure 5-110

4) Free the harness [5] from the harness stop [4].
5) Disconnect the two connectors [6], and remove the grate-shaped lower guide [3].

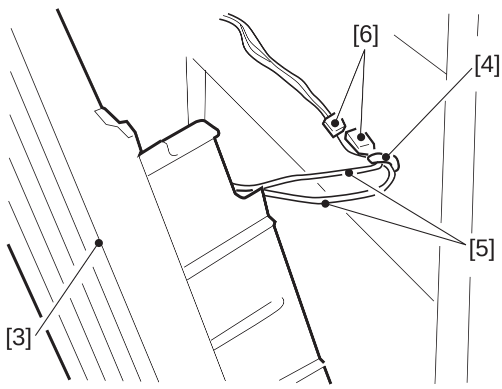


Figure 5-111

8. Removing the Right Guide Assembly

1) Remove the rear cover (see I-A-2).
2) Open the front door assembly [1].
3) Remove the five screws [2], and remove the right guide assembly [3].

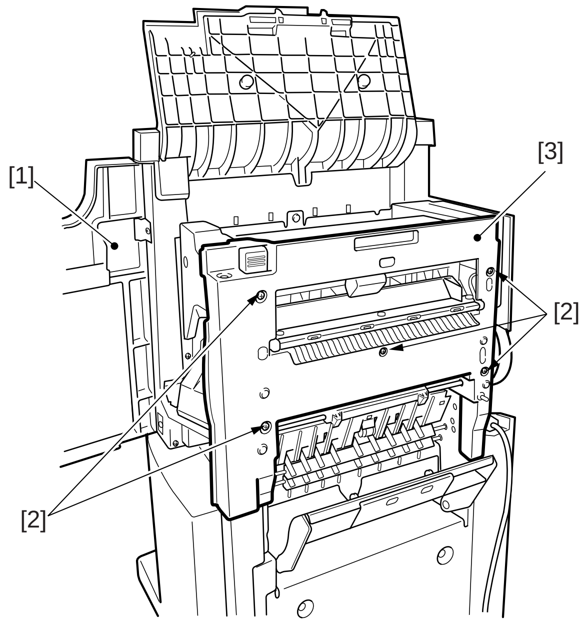


Figure 5-112

B. FEEDING SYSTEM

1. Removing the Swing Unit

1) Remove the tray assembly (see I-A-5).
2) Remove the grate-shaped upper guide (see I-A-6).
3) Remove the grate-shaped lower guide (see I-A-7).
4) Remove the harness from the two harness stops [1], and disconnect the four connectors [2].
5) Remove the screw [3], and remove the stapler stay holder [4].

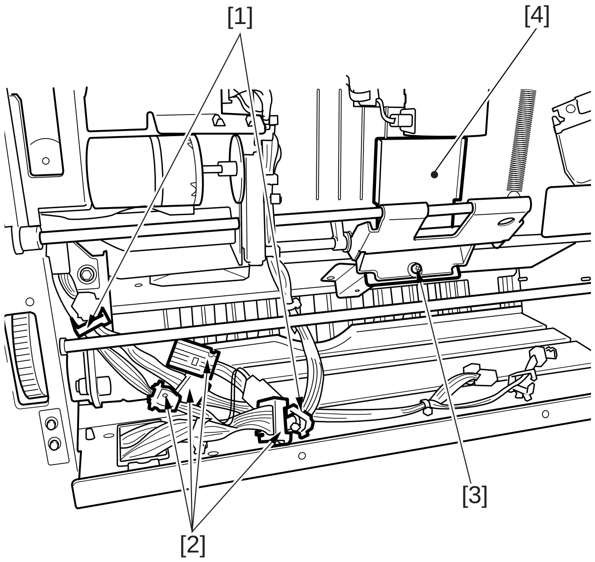


Figure 5-113

6) Remove the three screws [5], and slide out the swing unit [6] towards you.

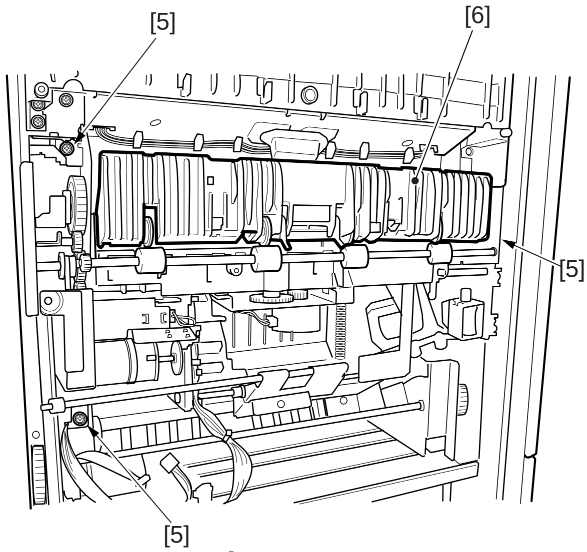


Figure 5-114

7) Remove the claws of the two feed belt roll holders [7] and remove the swing unit.

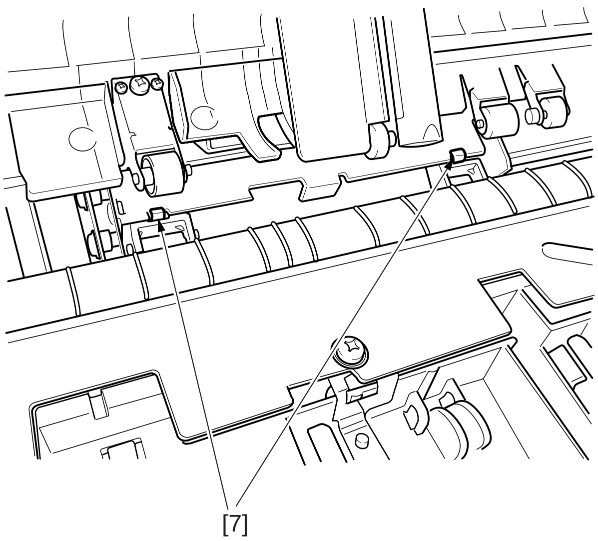


Figure 5-115

2. Removing the Feed Drive Unit

1) Remove the finisher controller PCB (see I-C-1).
2) Remove the harness leads [2] from the two harness stops [1] at the PCB base, and disconnect the two connectors [3].

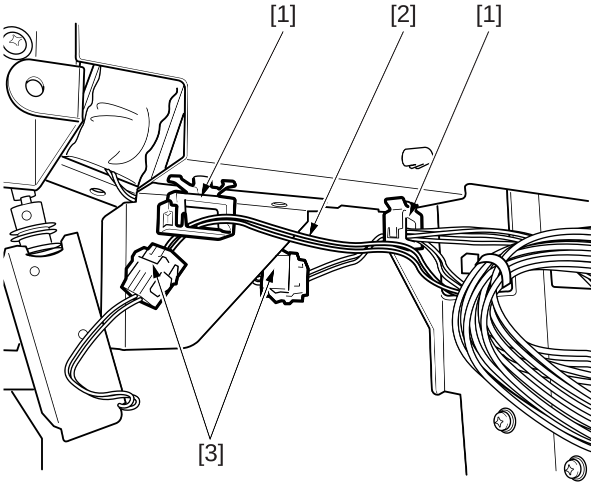


Figure 5-116

3) Remove the ground lead [4] and the three screws [5], and pull down PCB base [6] towards you.

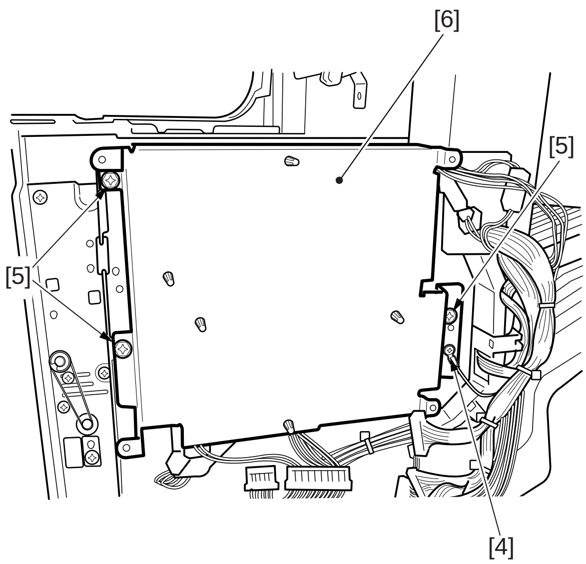


Figure 5-117

4) Remove the harness leads [8] from the two edge saddles [7], and remove the PCB base.

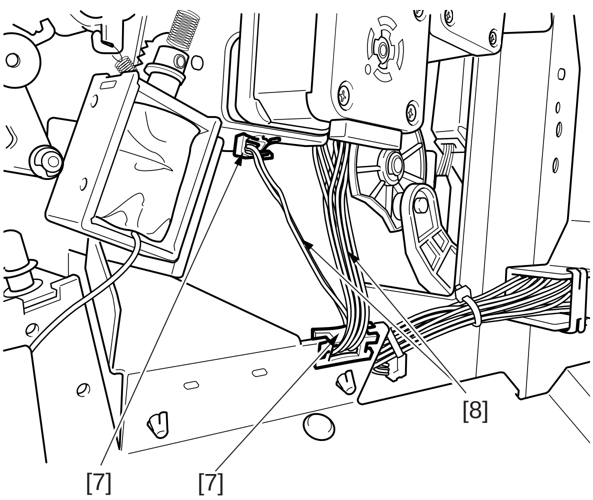


Figure 5-118

5) Remove the three screws [9], and remove the feed drive unit [10].

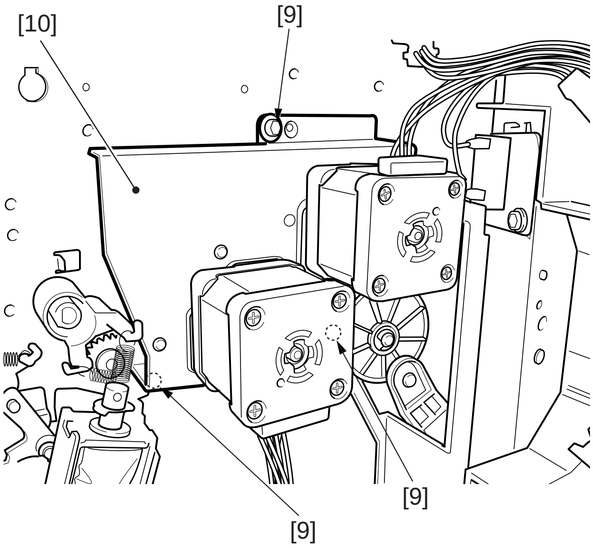


Figure 5-119

Caution:
Before re-attaching the removed feed drive unit back on the finisher unit, loosen the move gear stop screw [11] to relieve the tension, and then fasten the screw after attaching the feed drive unit.
The move gear attachment must be adjusted also when removing and attaching the swing unit.
If you forget to fasten the screw, the gear teeth may disengage, resulting in defective feed.

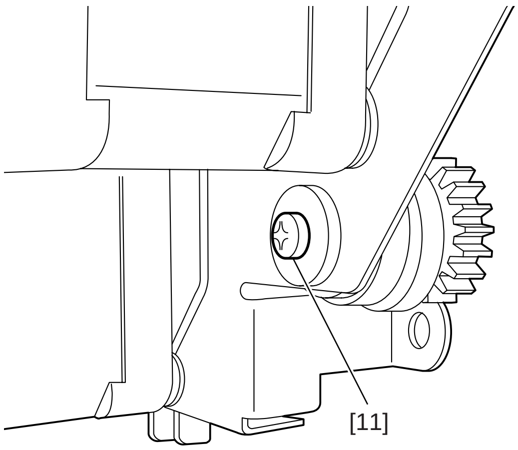


Figure 5-120

3. Removing the Buffer Roller Assembly

1) Remove the finisher controller PCB (see I-C-1).
2) Remove the feed drive unit (see I-B-2).
3) Remove the screw [1], and remove the guide support plate assembly [2] to slide out the harness leads [3] towards the buffer roller assembly side.

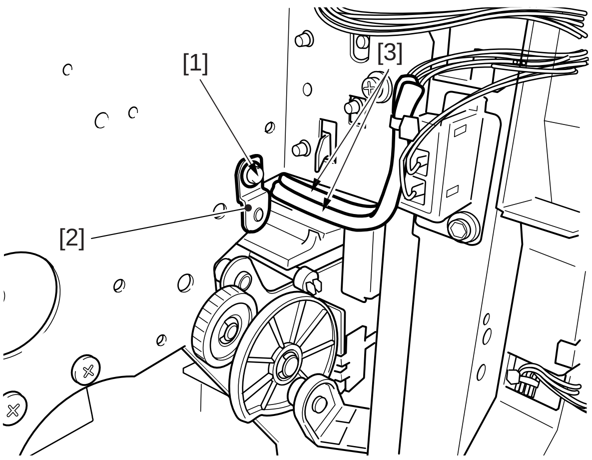


Figure 5-121

4) Remove the front cover (see I-A-4).
5) Remove the screw [4], and remove the guide support plate assembly [5]. Then, remove the buffer roller assembly [6].

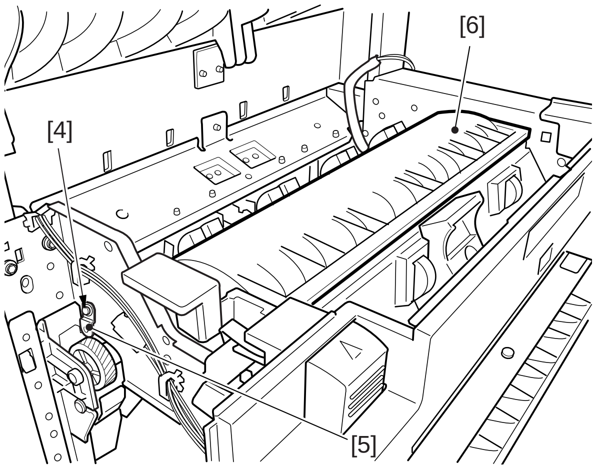


Figure 5-122

4. Removing the Stapler

1) Open the front cover, and move the stapler assembly to the front.
2) Remove the screw [1], and slide out the stapler assembly [2].

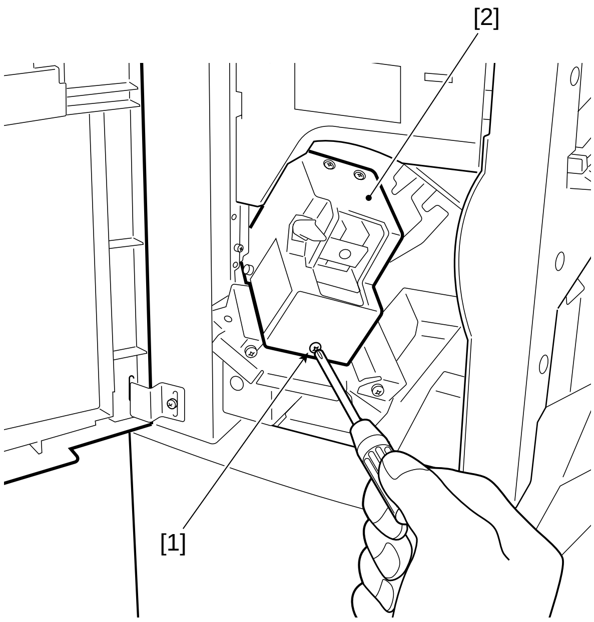


Figure 5-123

3) Disconnect the connector [4] of the stapler assembly [3].

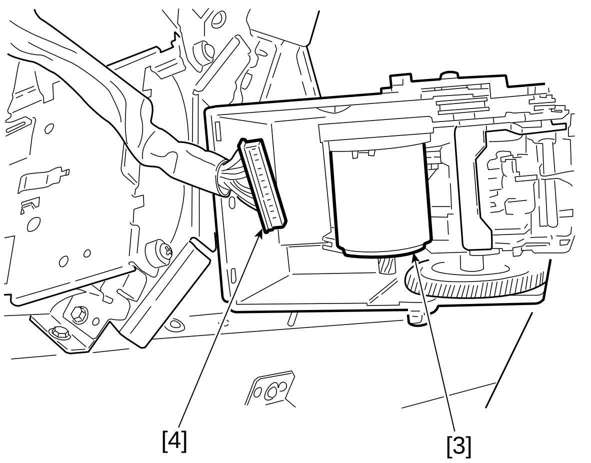


Figure 5-124

4) Remove the two screws [6] from the stapler cover [5], and remove the stapler.

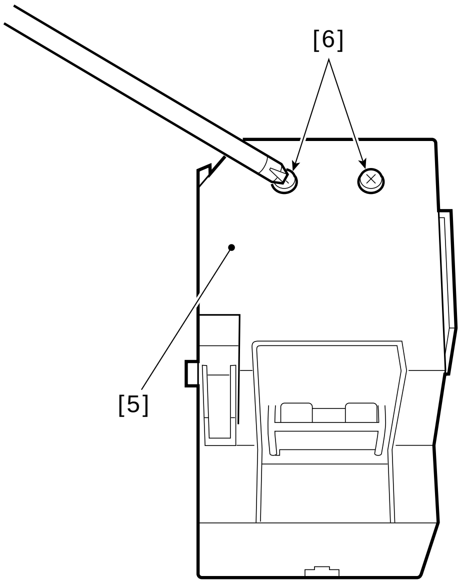


Figure 5-125

C. PCBs

1. Removing the Finisher Controller PCB

1) Remove the rear cover (see I-A-2).
2) Disconnect the 16 connectors [1].
3) Remove the four screws [2], and remove the finisher controller PCB [3].

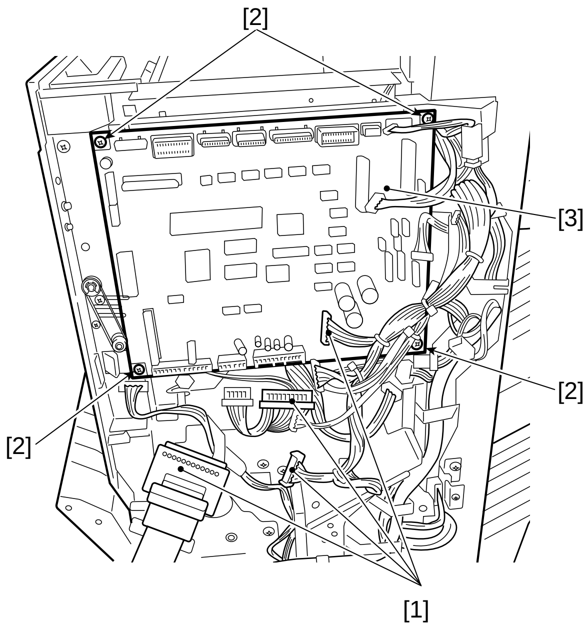
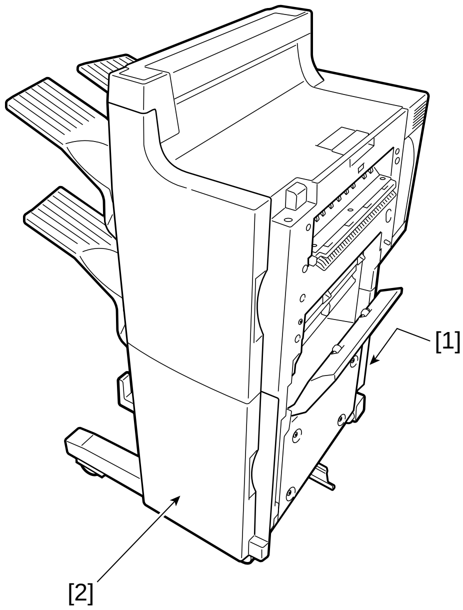


Figure 5-126

II. SADDLE STITCHER UNIT

A. Externals and Controls



[1] Rear lower cover (4)
[2] Front lower door
Figures in parentheses ( ) indicate the number of mounting screws.

Figure 5-201

1. Removing the Front Lower Door Assembly

1) Open the front lower door assembly [1].
2) Remove the screw [2] and remove the bushing [3], and then remove the front lower door assembly.

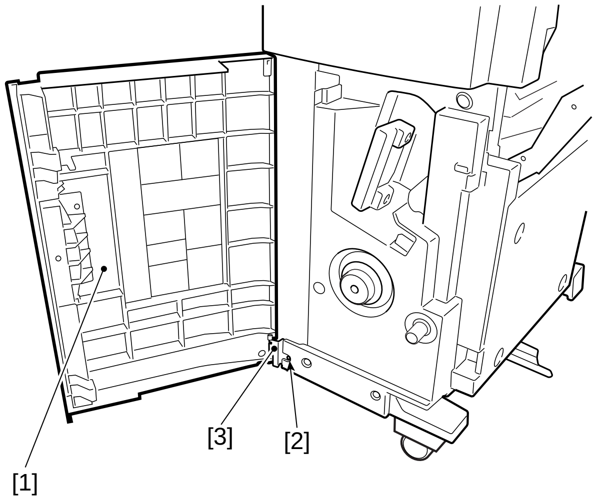


Figure 5-202

2. Removing the Rear Lower Cover

1) Remove the four screws [1], and remove the rear lower cover [2].

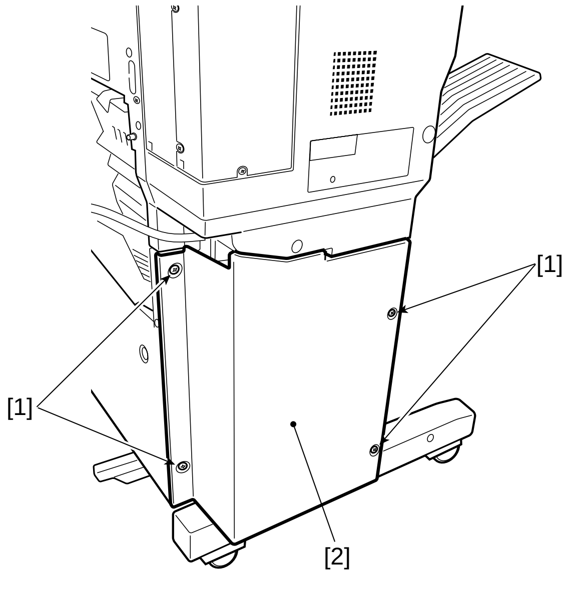


Figure 5-203

3. Removing the Front Inside Cover

1) Open the front lower door assembly [1].
2) Remove the screw [2], and remove the folding roller knob [3].
3) Remove the five screws [4], and remove the front inside cover [5].

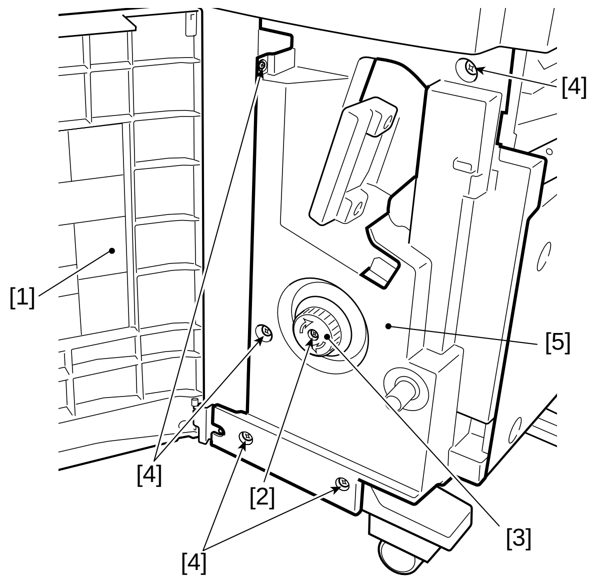


Figure 5-204

4. Removing the Saddle Delivery Tray Assembly

1) Lift up the open/close lever [2] of the saddle delivery tray assembly [1], and open the saddle delivery tray assembly.

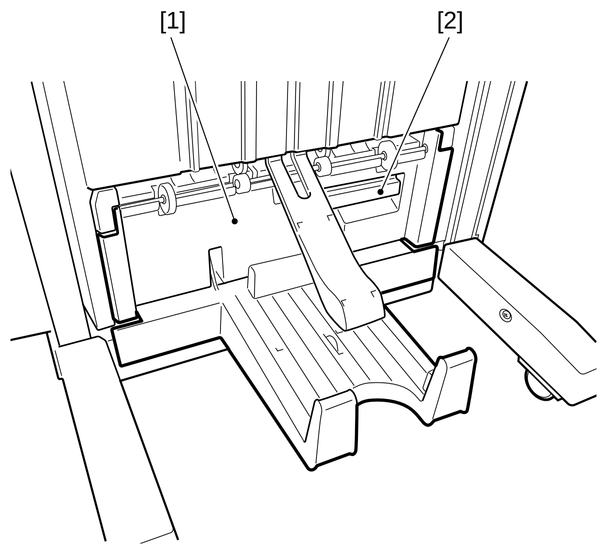


Figure 5-205

2) Remove the door shaft [3] in the direction of the arrow, and slide out towards the front of the saddle delivery tray assembly [4].

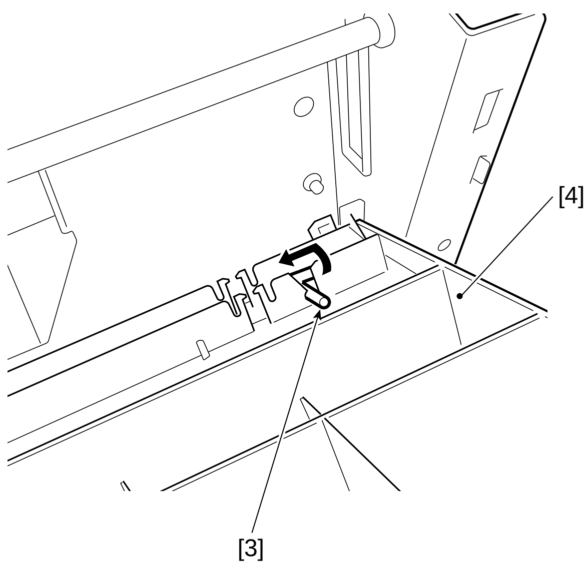


Figure 5-206

3) Remove the harness leads from the harness stop [5] and edge saddle [6].
4) Disconnect the two connectors [7], and remove the saddle delivery tray assembly [8].

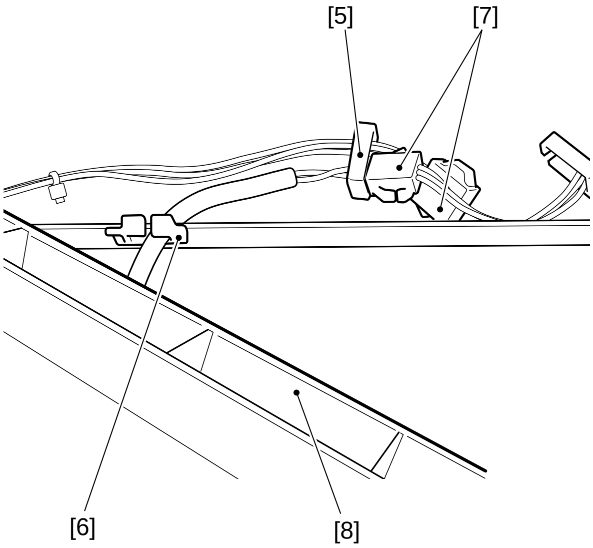


Figure 5-207

5. Removing Upper Delivery Guide Assembly

1) Remove the grate-shaped lower guide (see I-A-7).
2) Remove the two screws [1] and ground lead [2], and remove the upper delivery guide assembly [3].

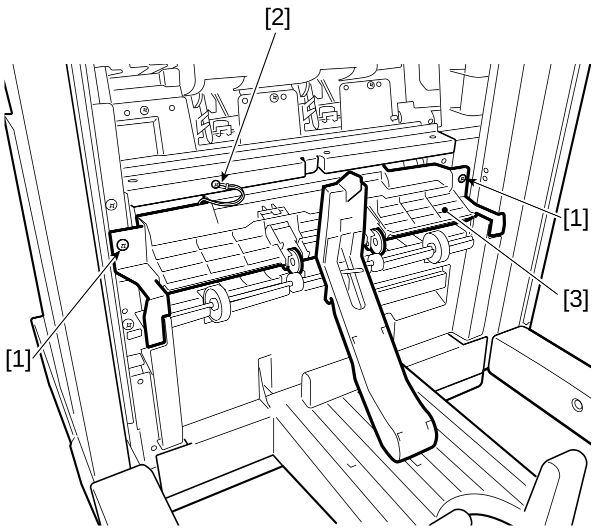


Figure 5-208

6. Removing the PCB Cover

1) Remove the four screws [4], and remove the PCB cover [2].

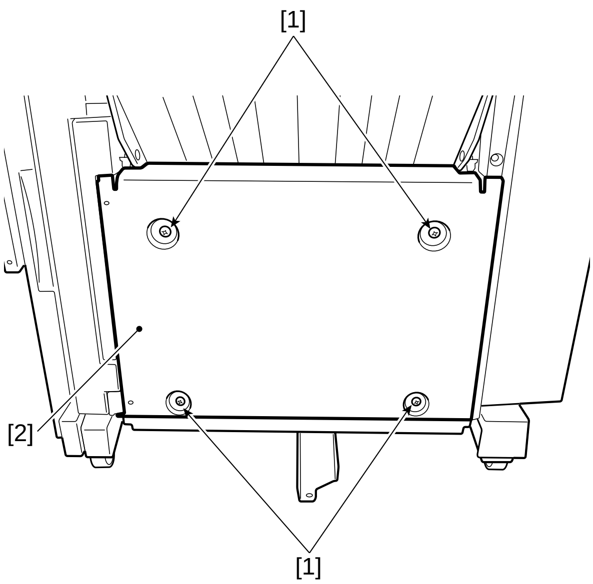


Figure 5-209

B. SADDLE UNIT

1. Removing the Saddle Unit

1) Remove the grate-shaped lower guide (see I-A-7).
2) Remove the right guide assembly (see I-A-8).
3) Remove the front lower door assembly (see II-A-1).
4) Remove the rear lower cover (see II-A-2).
5) Remove the front inside cover (see II-A-3).
6) Remove the saddle delivery tray assembly (see II-A-4).
7) Remove the upper delivery guide (see II-A-5).
8) Remove the PCB cover (see II-A-6).
9) Disconnect two connectors [1] and remove the two screws [2].

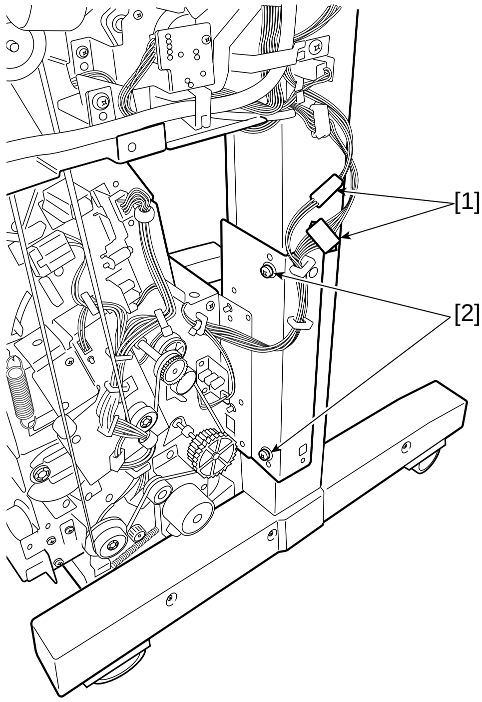


Figure 5-210

10) Remove harness stop [3] and harness lead [4].

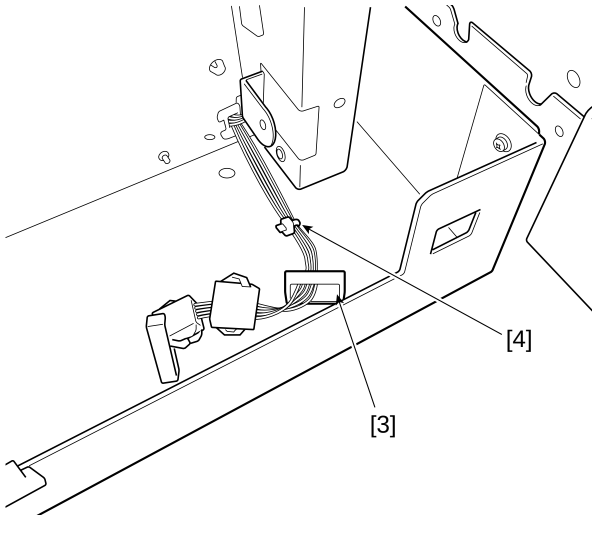


Figure 5-211

11) Remove the screw [5].

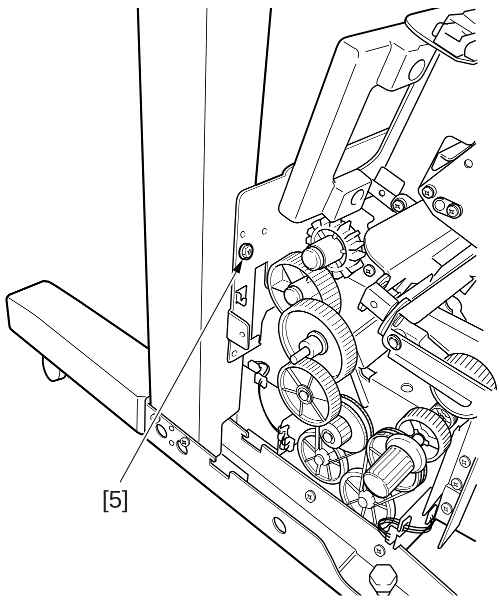


Figure 5-212

12) Remove the two screws [6], and remove the saddle stitcher unit [7] by moving it in the pick-up direction.

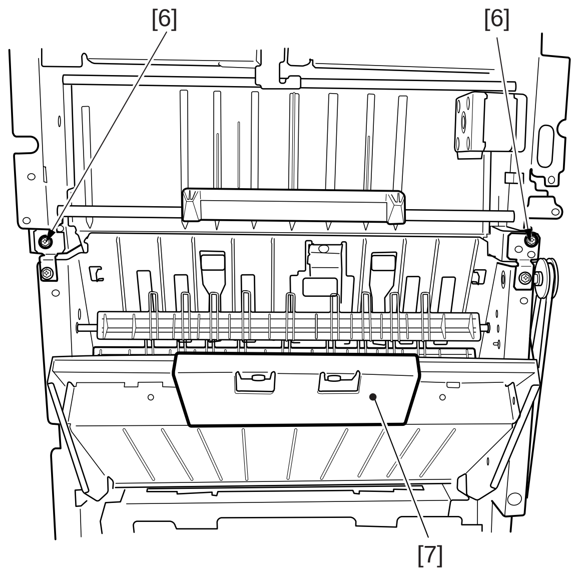


Figure 5-213

Caution:
When removing the saddle unit from the finisher unit body, prevent the timing belt [8] from catching on the communications cable bracket [9].

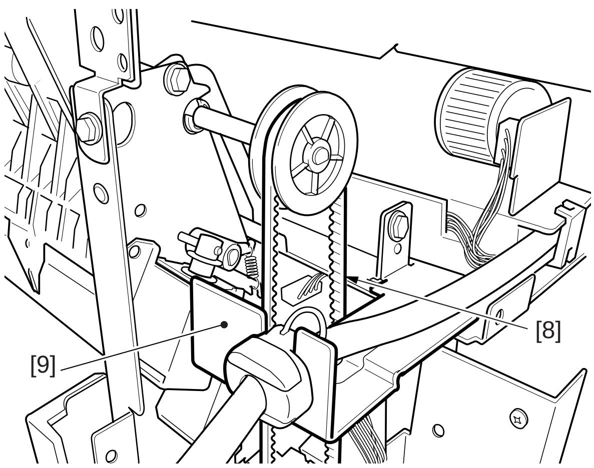


Figure 5-214

2. Removing the Paper Folding Roller

1) Remove the front lower door assembly (see II-A-1).
2) Remove the front inside cover (see II-A-3).
3) Remove the upper delivery guide (see II-A-5).
4) Remove the PCB cover (see II-A-6).
5) Disconnect the two connectors [1].

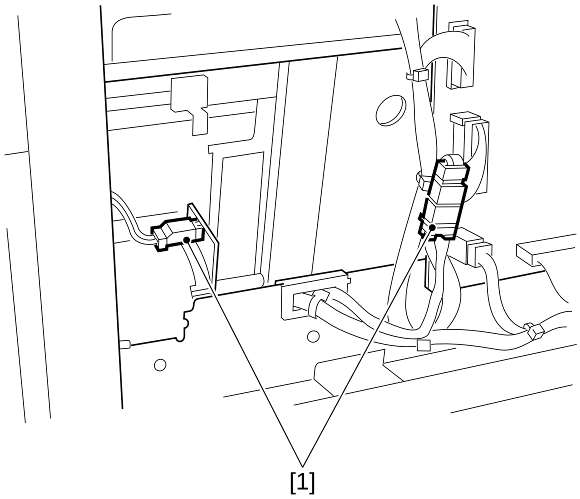


Figure 5-215

6) Disconnect two connectors [2], remove the three screws [3], and remove the paper pushing motor mount [4].

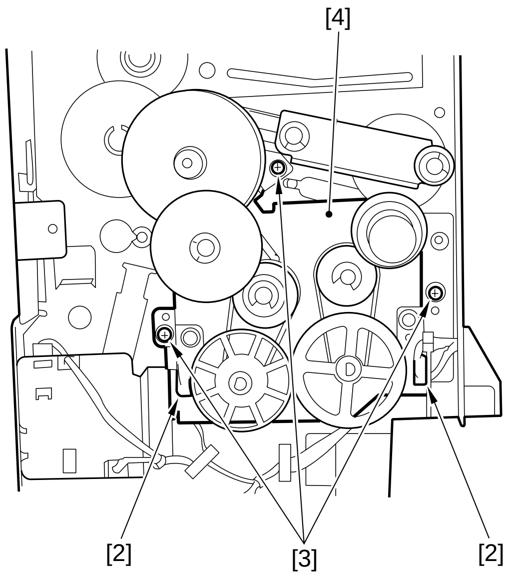


Figure 5-216

7) Remove the tension springs (front [5], rear [6]).

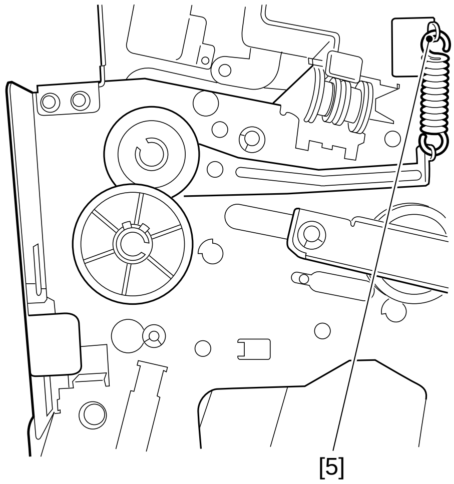


Figure 5-217

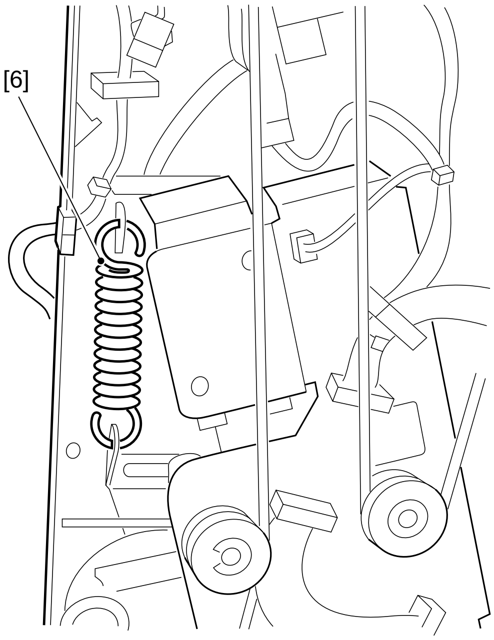


Figure 5-218

8) Remove the two C-rings [7], and remove the sensor flag [8] and two bearings [9] at the rear.

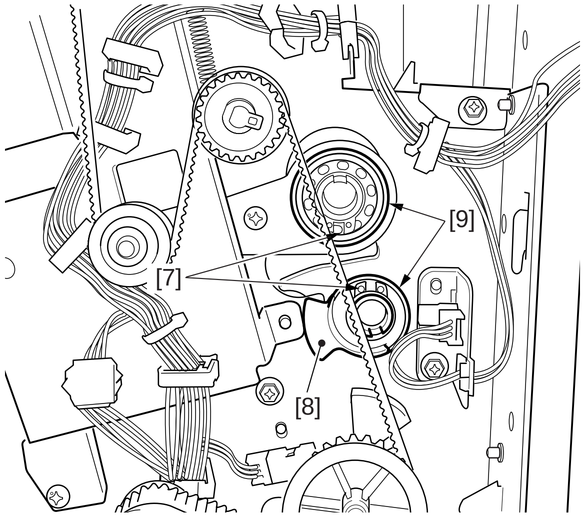


Figure 5-219

9) Remove the two C-rings [10], and remove the two gears [11] at the front.

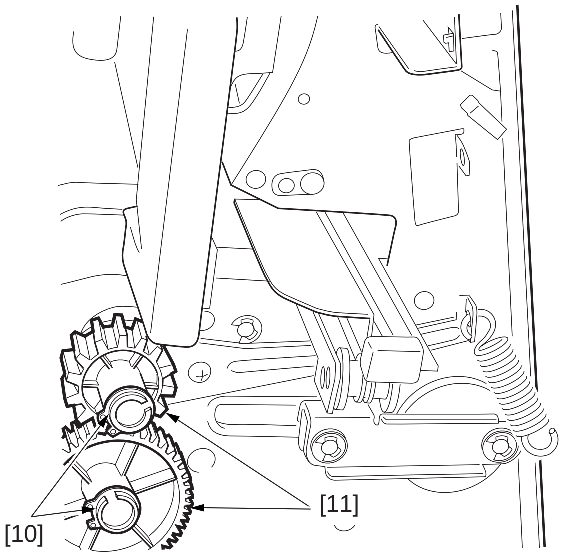


Figure 5-220

10) Remove the two bearings [12].

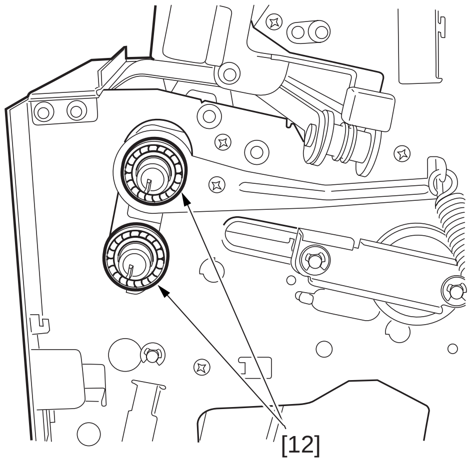


Figure 5-221

11) Open the saddle delivery tray assembly [13].
12) Remove the two screws [14], and remove the two alignment plates [15].
13) Slide the paper folding roller [16] to the front, and pull it out in the delivery direction.

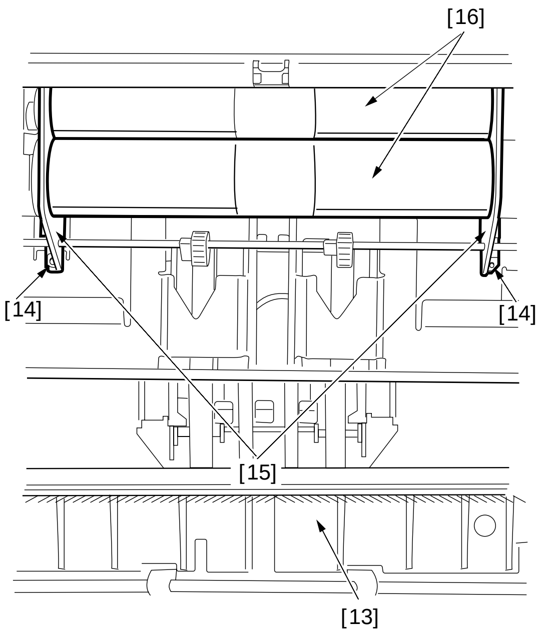


Figure 5-222

3. Installing the Paper Folding Roller

1) Attach the gear [2] so that the grooved section [1] on the gear is facing the grooved section [1] on the paper folding roller to align the phases.

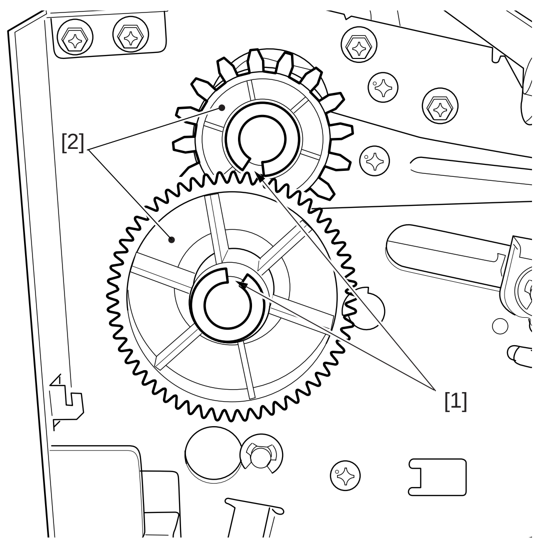


Figure 5-223

4. Removing the Stitcher Mount Unit

1) Remove the front inside cover (see II-A-3).
2) Remove the E-ring [1], and remove the roll [2] and the shaft [3].

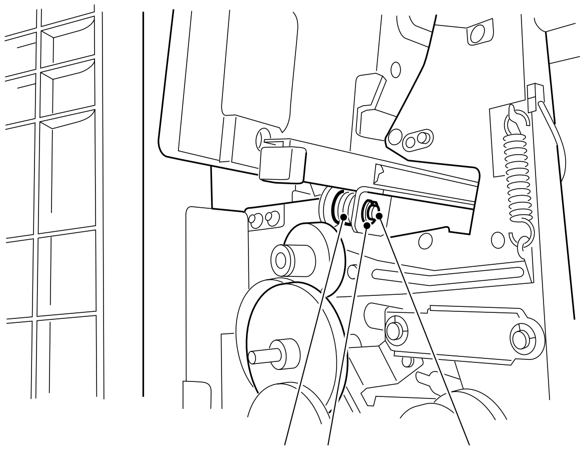


Figure 5-224

3) Pull out the stitcher mount unit [4] to the front.

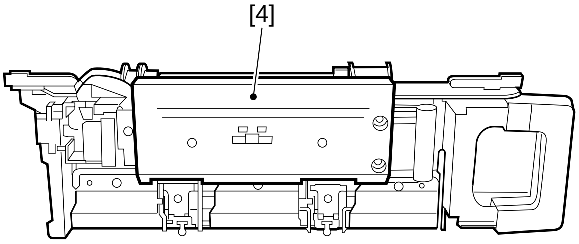


Figure 5-225

5. Adjusting the Stitcher Position

1) Remove the front lower door (see II-A-1).
2) Remove the front inside cover (see II-A-3).
3) Open the front door assembly.
4) Pull out the stitcher mount unit to the front, then pull out the stitcher towards you and then pull the stitcher down.
5) Remove the three screws [1], and remove the stitcher mount unit cover [2].

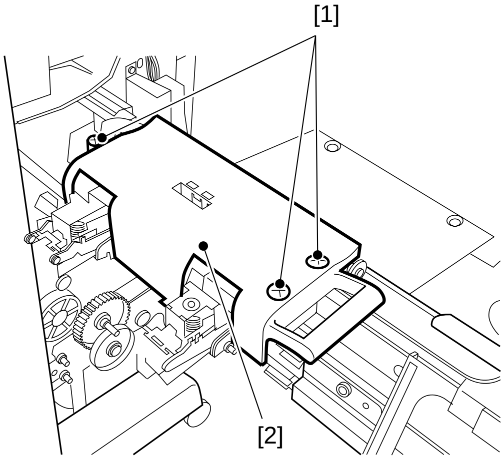


Figure 5-226

6) Remove the stitcher positioning tool [3] from the back of the cover.

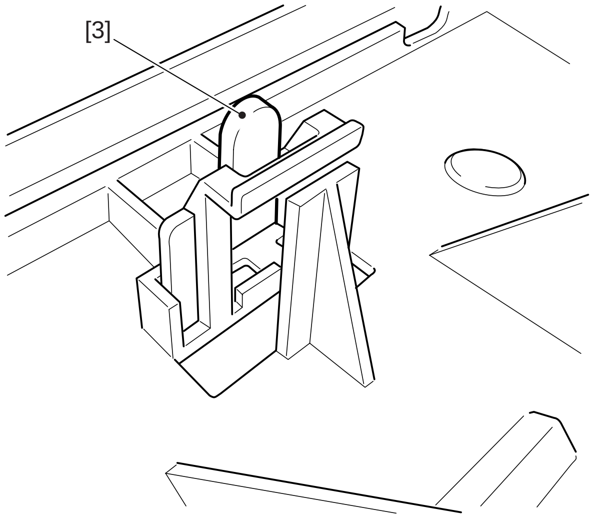


Figure 5-227

7) If you must adjust the front stitcher, remove the center guide plate [5] and front guide plate [4] (one screw each). If you must adjust the rear stitcher, remove the center guide plate [5] and the rear guide plate [6] (one screw each).

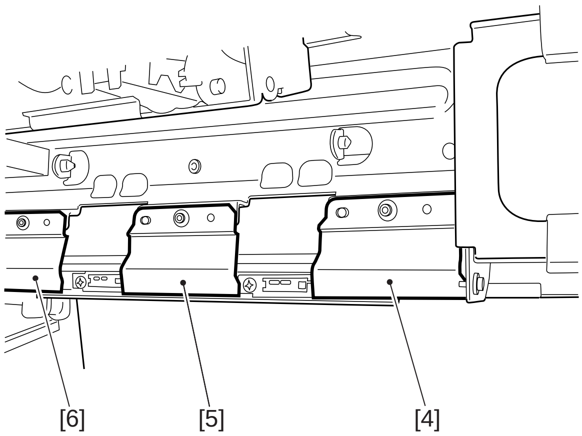


Figure 5-228

8) If you must adjust the front stitcher, loosen the two screws [8] on the stitcher mount [7]. If you must adjust the rear stitcher, loosen the two screws [9].

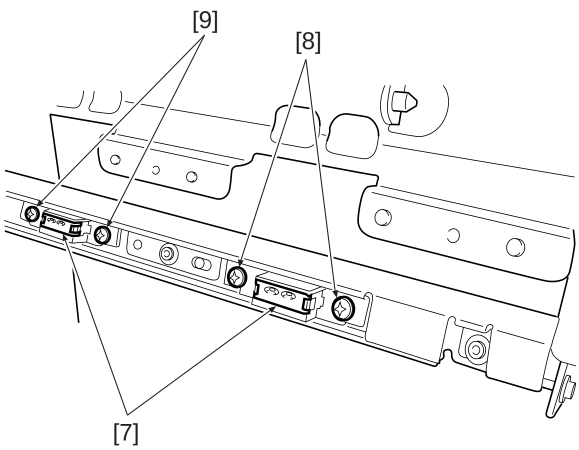


Figure 5-229

9) Insert the tool [10] into the staple slot of the stitcher [9].

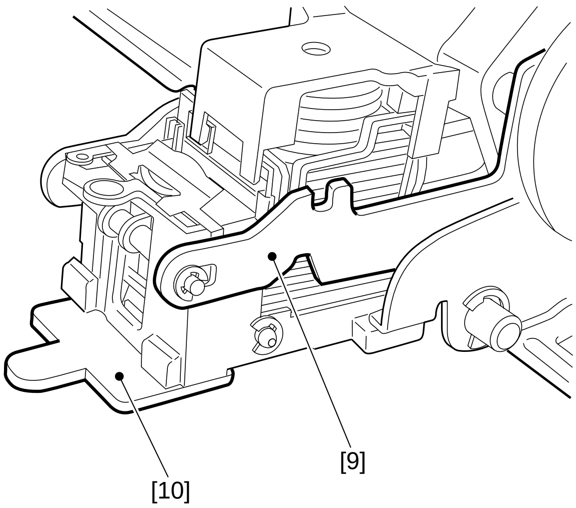


Figure 5-230

10) Shift down the stitcher, and turn the stitcher gear so that the boss on the tool [11] and the recess of the mount match. Then, tighten the screws [12] on the mount to fix the two in place.

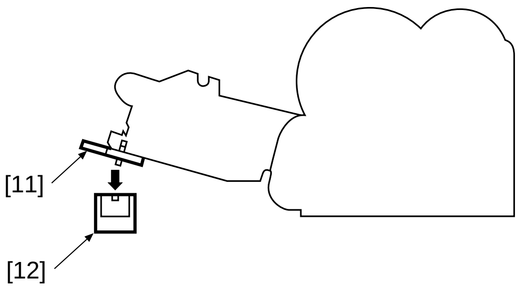


Figure 5-231

6. Removing the Positioning Plate Unit

1) Remove the saddle stitcher controller PCB (see II-C-1).
2) Disconnect the two connectors [1], remove the three harness stops [2], and remove the harness leads [3] from the two edge saddles [4].
3) Remove the two screws [5], slide the positioning plate unit [6] once towards the front and remove from the rear side.

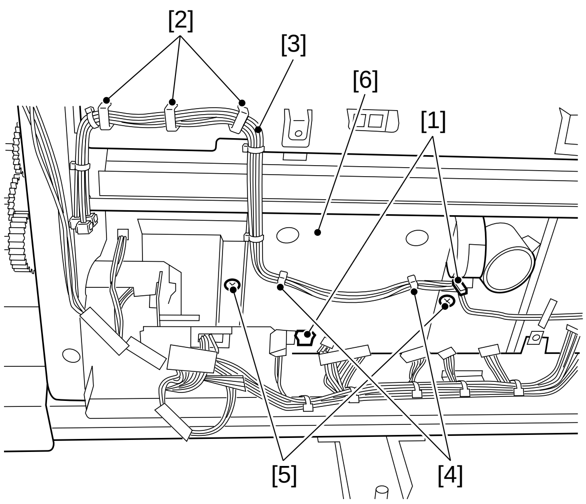


Figure 5-232

7. Removing the No.1 and No.2 Paper Deflecting Plates

1) Remove the rear cover (see I-A-2).
2) Remove the lower rear cover (see II-A-2).
3) Remove the claw [1] of the No.1 deflecting plate bushing, and pull out the No.1 deflecting plate shaft [2] toward the rear. (The procedure is the same for the No.2 paper deflecting plate.)

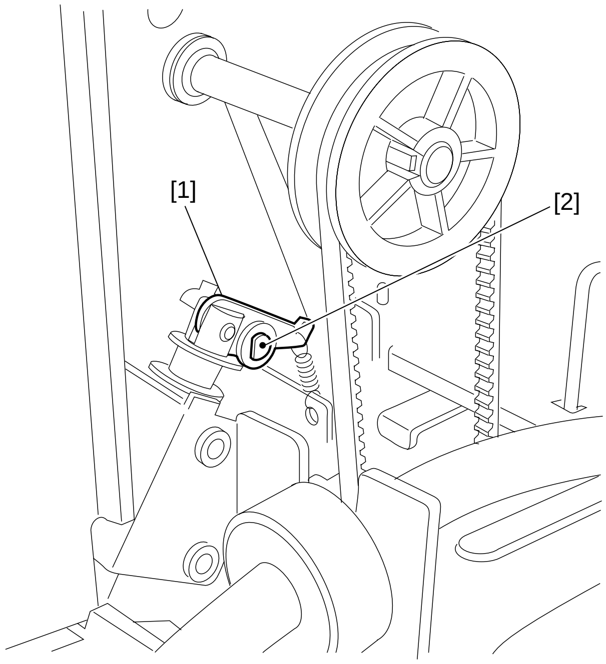


Figure 5-233

4) After detaching the front shaft of the No.1 paper deflecting plate [3] from the front side plate, remove the No.1 paper deflecting plate.

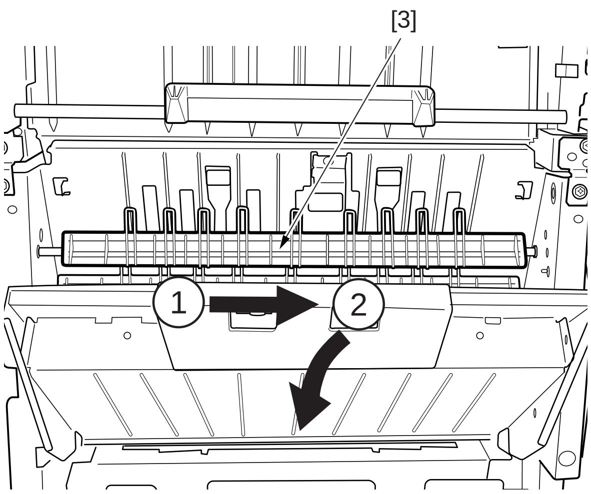


Figure 5-234

C. PCBs

1. Removing the Saddle Stitcher Controller PCB

1) Remove the PCB cover (see II-A-6).
2) Remove the four screws [1] and 14 connectors [2], and remove the saddle stitcher controller PCB [3].

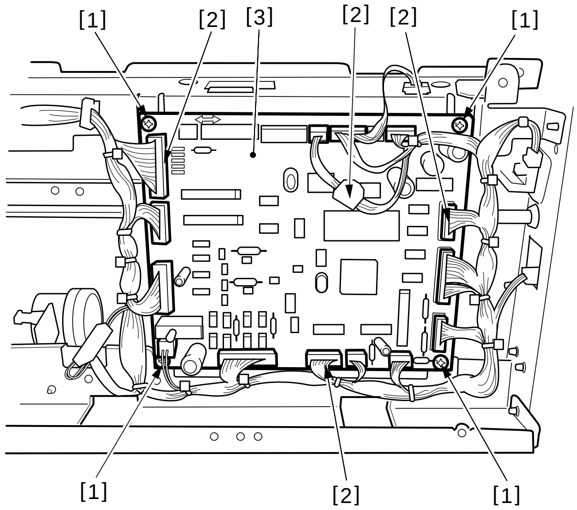
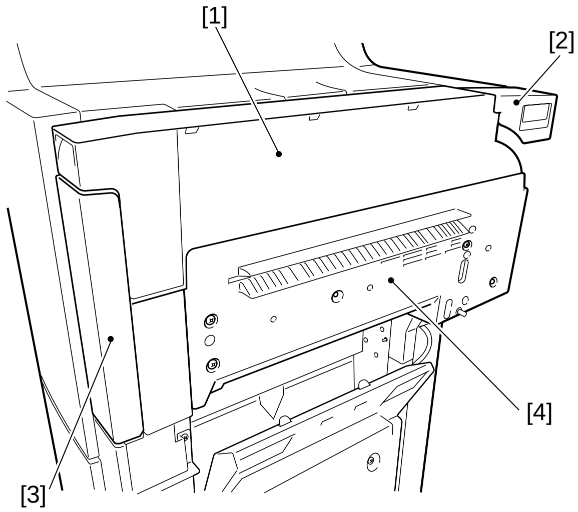


Figure 5-235

III. PUNCHER UNIT (OPTION)

A. Externals and Controls



[1] Upper cover (3)
[2] Upper cover 2
[3] Front door
[4] Right guide assembly (5)
Figures in parentheses ( ) indicate the number of mounting screws.

Figure 5-301

1. Removing the Right Guide Assembly

1) Remove the five screws [1], and remove the right guide assembly [2].

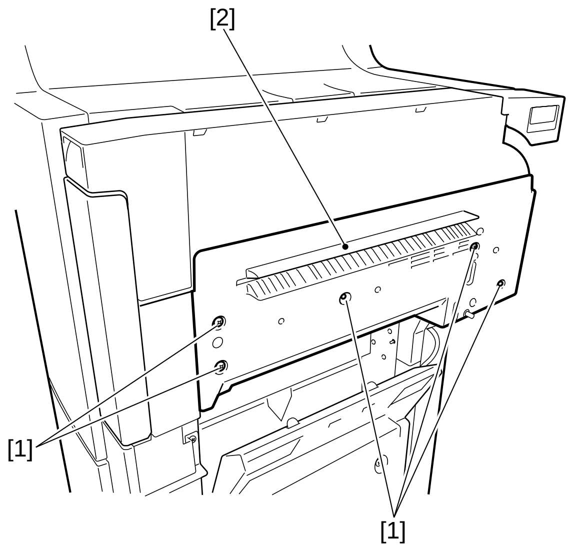


Figure 5-302

2. Removing the Upper Cover

1) Open the front door [1], remove the three screws [2], and slacken the inner side of the right cover [3] to remove the upper cover [4] from the hook [5].

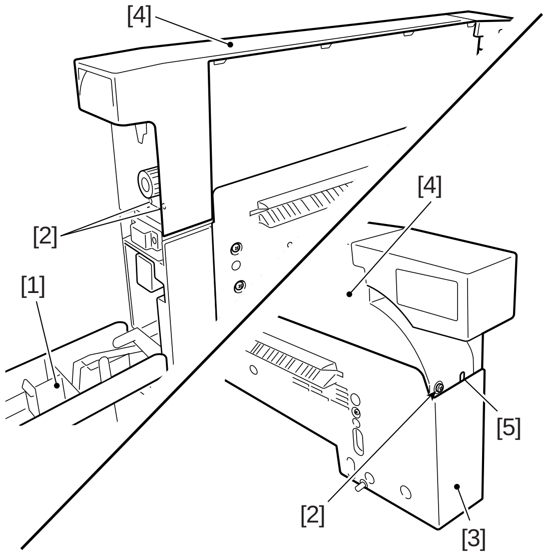


Figure 5-303

B. Puncher Driver System

1. Removing the Punch Motor

1) Remove the upper cover (see III-A-2).
2) Disconnect the connector [1].
3) Remove the two screws [2], and remove the punch motor [3].

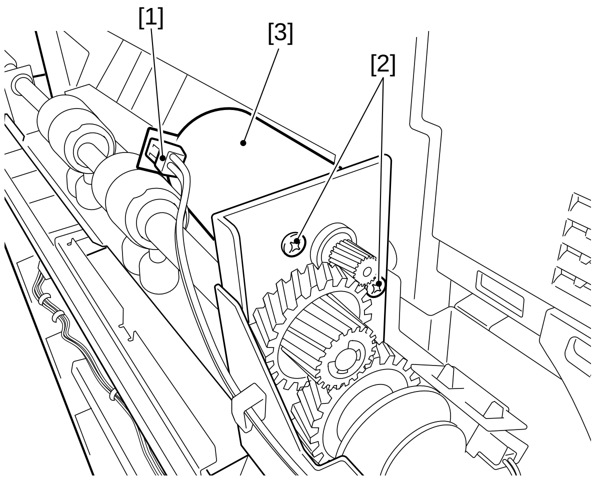


Figure 5-304

2. Removing the Horizontal Registration Motor

1) Remove the right guide assembly (see III-A-1).
2) Disconnect the connector [1].
3) Remove the two screws [2], and slide the horizontal registration motor [3] in the direction of the arrow.

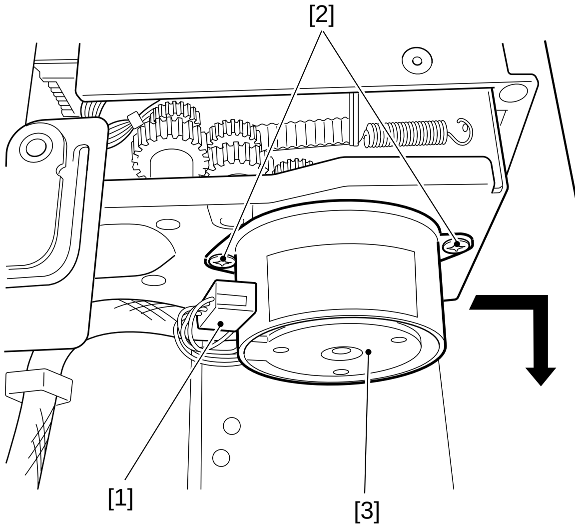


Figure 5-305

3. Removing the Punch Unit

Caution:
When removing the punch unit, the punch unit section sometimes opens.
If necessary, perform work with the punch unit section in an open state.

1) Remove the right guide assembly (see III-A-1).
2) Remove the upper cover (see III-A-2).
3) Remove the E-ring [1], washer [2] and puncher spring [3].

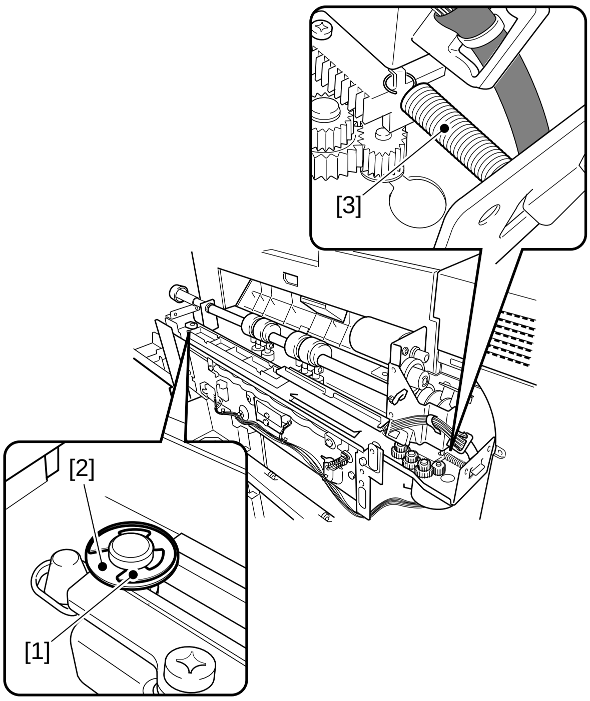


Figure 5-306

4) Turn the gear [4] in the direction of the arrow, and move the punch unit section [5] to the front side.

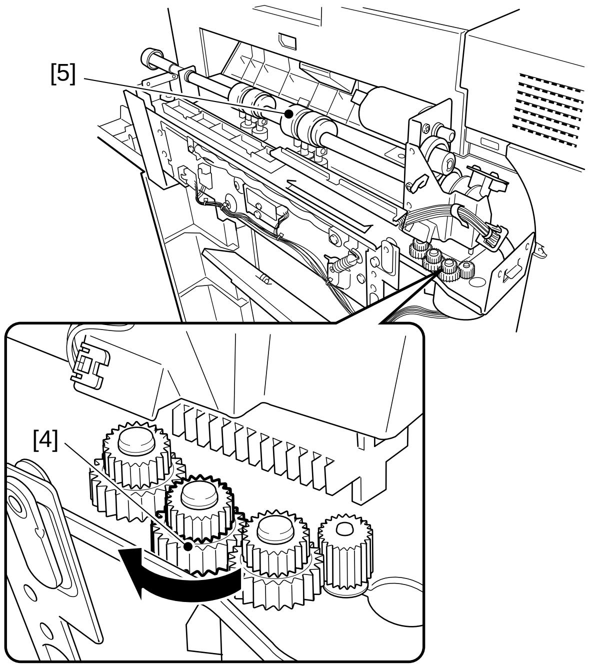


Figure 5-307

5) Remove the three screws [5], and remove the sensor mount (upper) [7]. Then, remove the connector on the photosensor PCB.

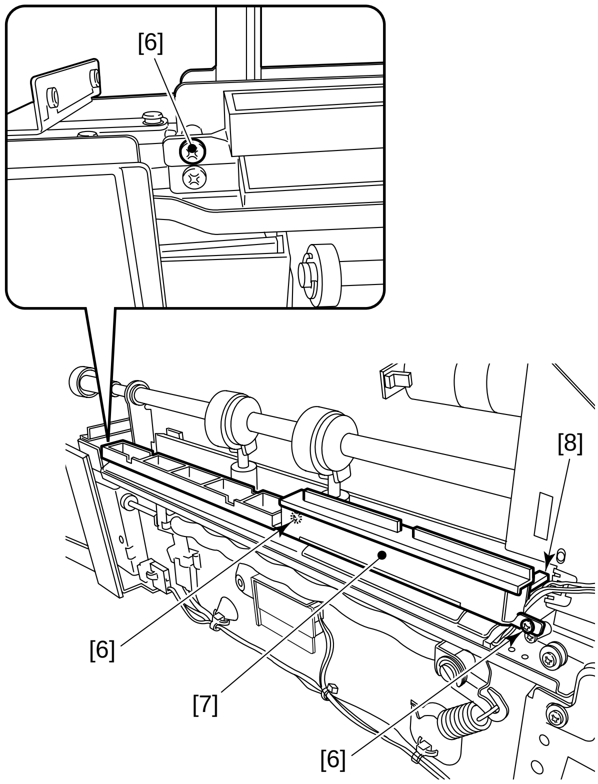


Figure 5-308

6) Disconnect the connector [9] and remove the screw [10], and remove the horizontal registration sensor [11].

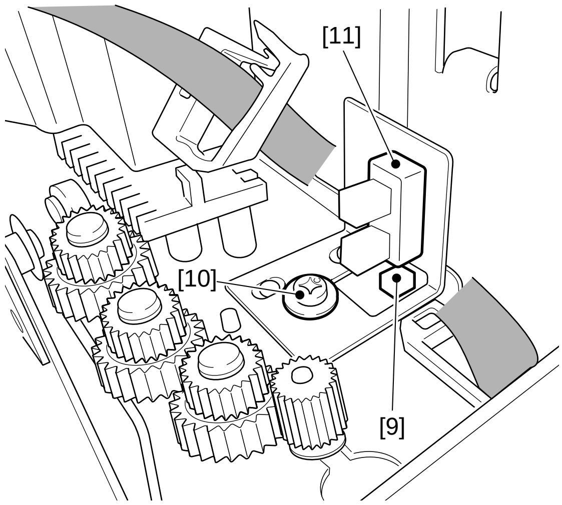


Figure 5-309

7) Turn the gear [12] in the direction of the arrow, and move the punch unit section [13] to the inner side.

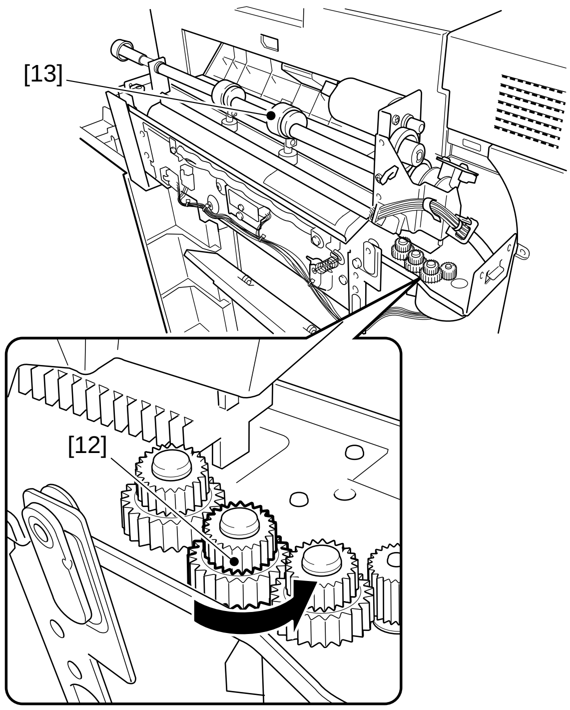


Figure 5-310

8) Remove the tie wrap with lock [14] while holding its claw between your fingers. (The tie wrap must be removed without being cut.)
9) Disconnect the three connectors [15] and remove the screw [16], and remove the harness guide [17].

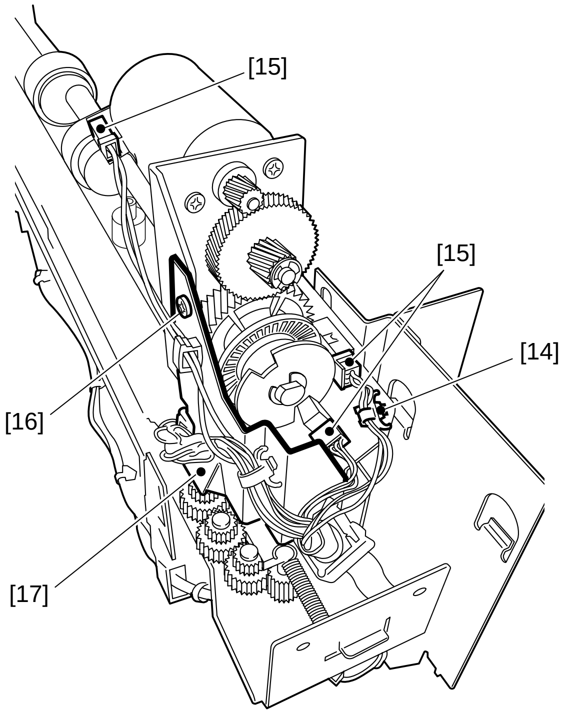


Figure 5-311

10) Lift up the front side of the punch unit section [18] first, then move in the direction of the arrow to remove the punch unit section [18].

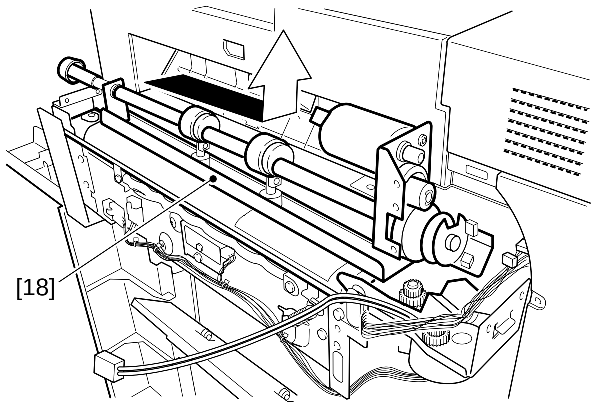


Figure 5-312

11) Disconnect the connector [19] on the LED PCB.

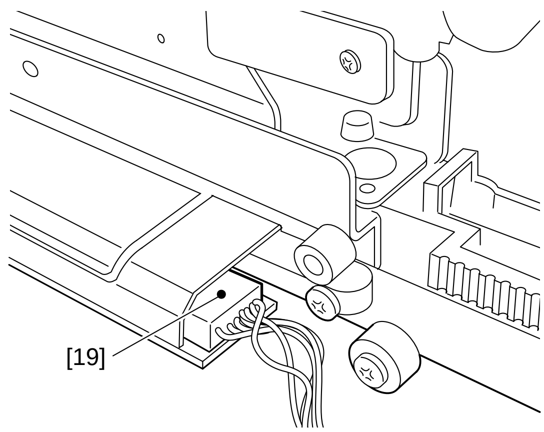


Figure 5-313

12) Remove the slide shaft support [20], the sensor mount (lower) [21] and the puncher knob [22] from the punch unit section.

Caution:
The slide shaft support [20] is not attached to punch unit sections that are currently set as consumable parts.
When replacing the punch unit section, be sure to attach the slide shaft support that was in use beforehand.
If you forget to attach the slide shaft support, the machine may malfunction.

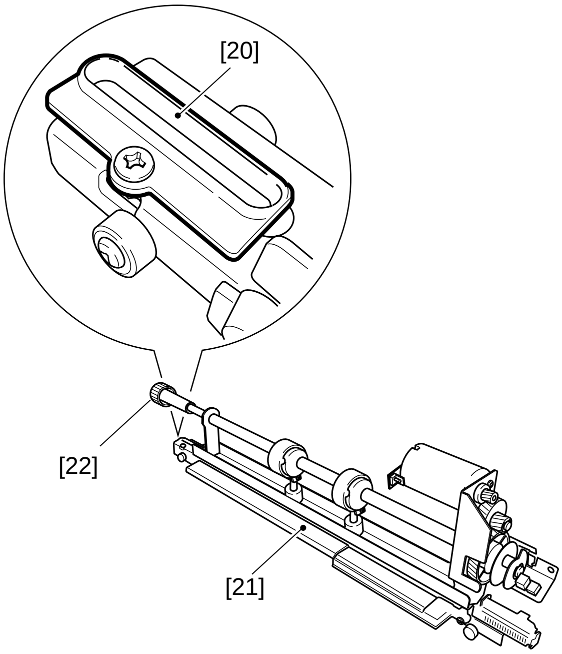


Figure 5-314

4. Removing the Punch Unit Harness

Caution:
When removing the punch unit, the punch unit section sometimes opens.
If necessary, perform work with the punch unit section in an open state.

1) Remove the punch unit from the finisher assembly.
2) Remove the right guide assembly (see III-A-1).
3) Remove the upper cover (see III-A-2).
4) Disconnect the four connectors [2] on the punch driver PCB [1].

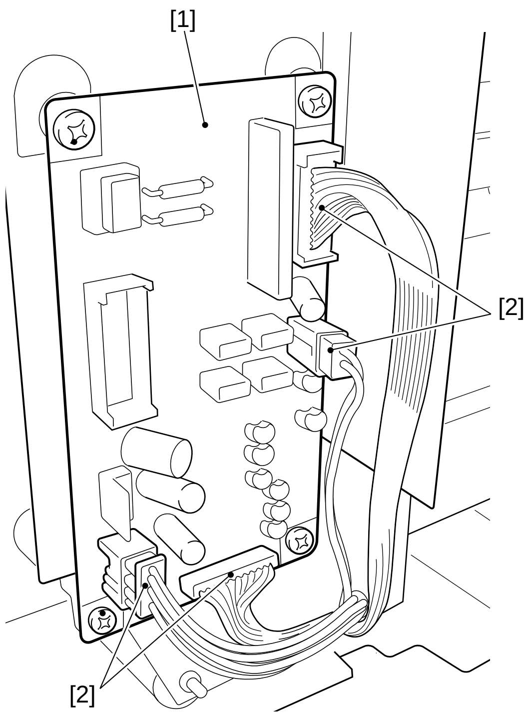


Figure 5-315

5) Remove the two tie wraps with lock [14] while holding its claw between your fingers. (The tie wraps must be removed without being cut.)
6) Disconnect the three connectors [4].
7) Free the harness [6] from the three harness stops [5].

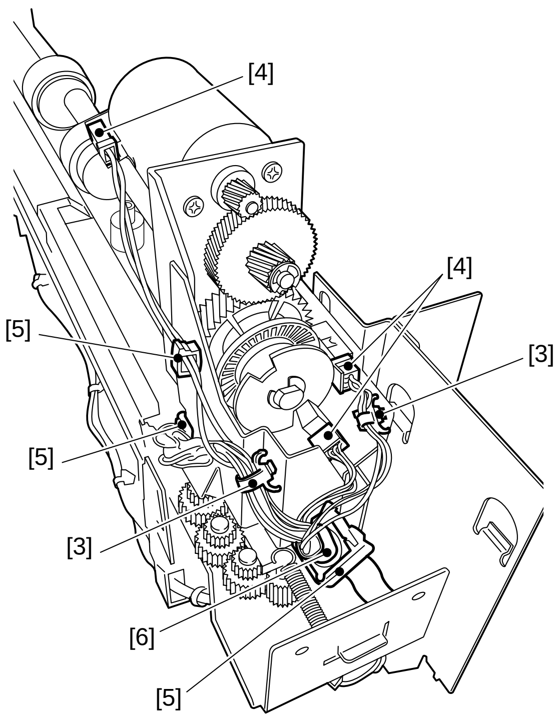


Figure 5-316

8) Turn the gear [7] in the direction of the arrow, and move the punch unit section [8] to the front side.

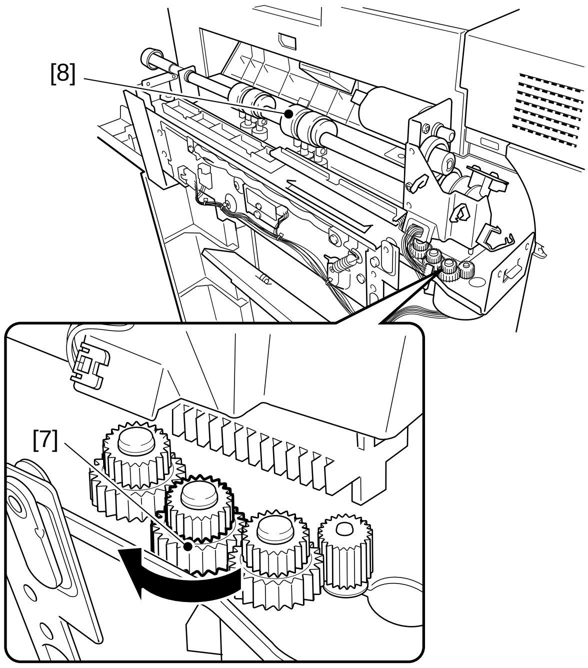


Figure 5-317

9) Remove the three screws [9] and sensor mount (upper) [10]. Disconnect the connector [11] on the photosensor PCB and the connector [12] on the LED PCB.

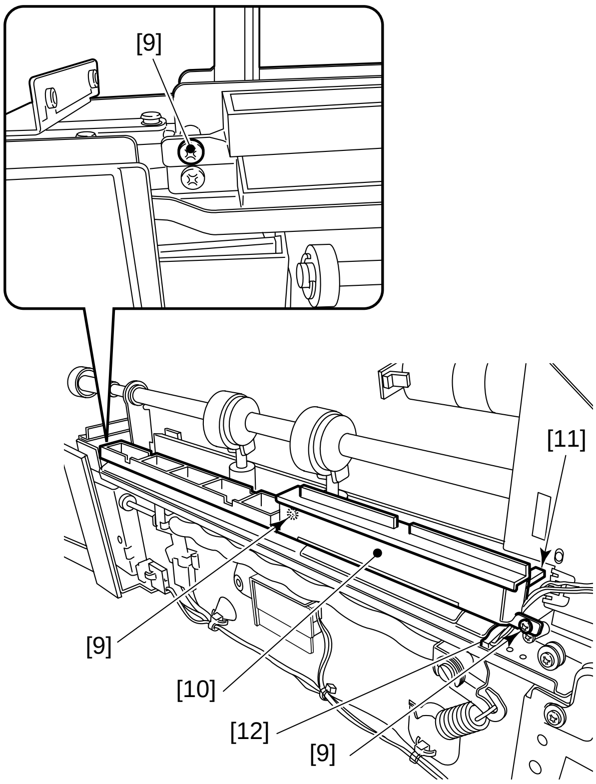


Figure 5-318

10) Draw out the punched scrap container [13].

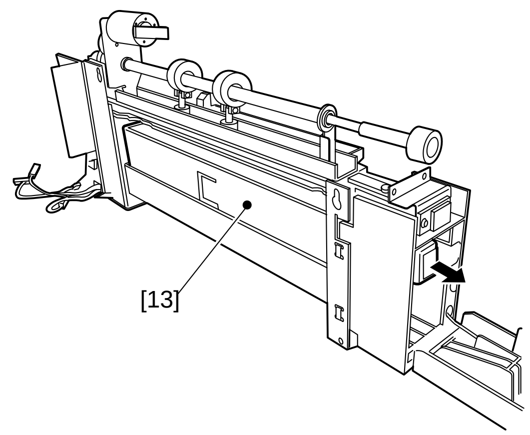


Figure 5-319

11) Remove the two tie wraps with lock [14] while holding its claw between your fingers. (The tie wraps must be removed without being cut.)

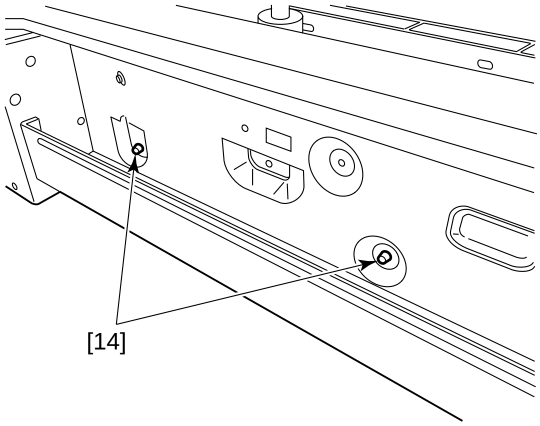


Figure 5-320

12) Disconnect the three connectors [15], and free the harness [16] from the harness stop [17].

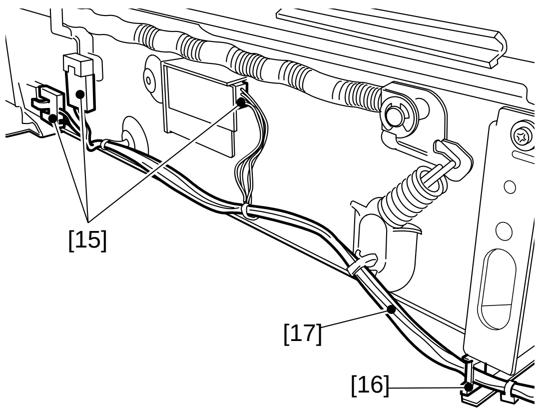


Figure 5-321

13) Free the harness [19] from the four harness stops [18].

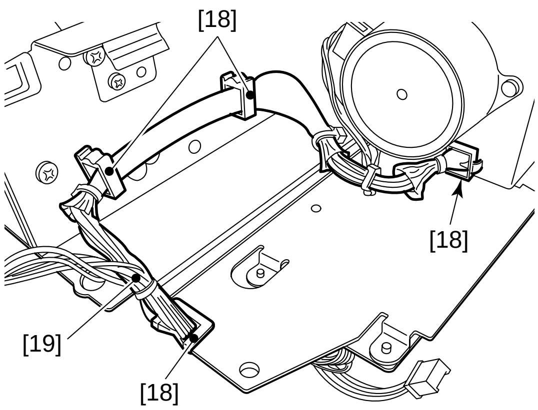


Figure 5-322

14) Disconnect the connector [20] of the horizontal registration and the connector [21] of the horizontal registration home position sensor, and remove the pun.

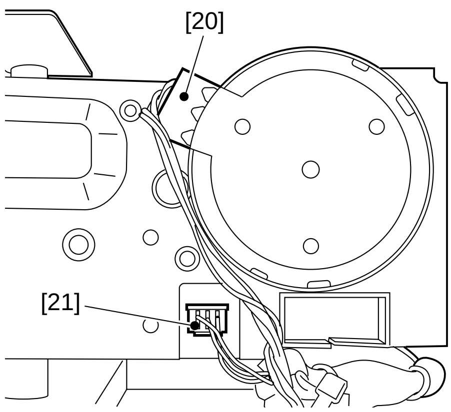


Figure 5-323

5. Installing the Punch Unit Harness

Caution:
If the punch unit harnesses shift away from their installation positions, this may cause defective operation. The punch unit harnesses must be firmly installed at the positions described below.

1) Fasten the punch unit harnesses at the positions where the two tie wraps [1] of the punch unit harnesses are outside the two respective harness fasteners [2].

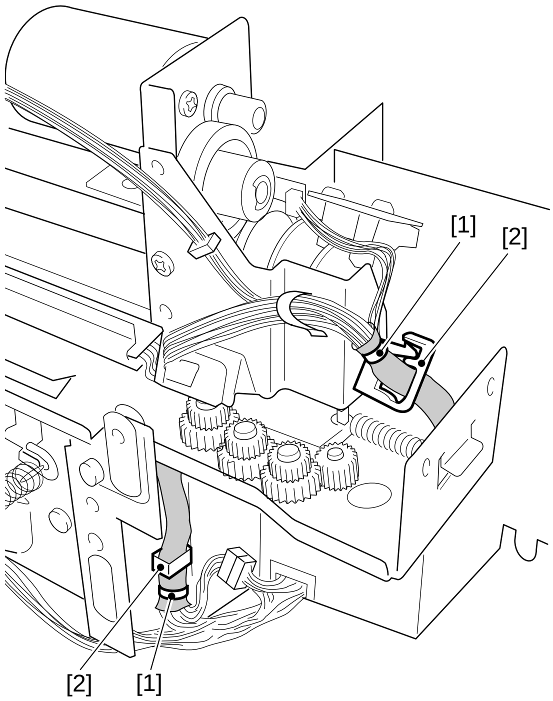


Figure 5-324

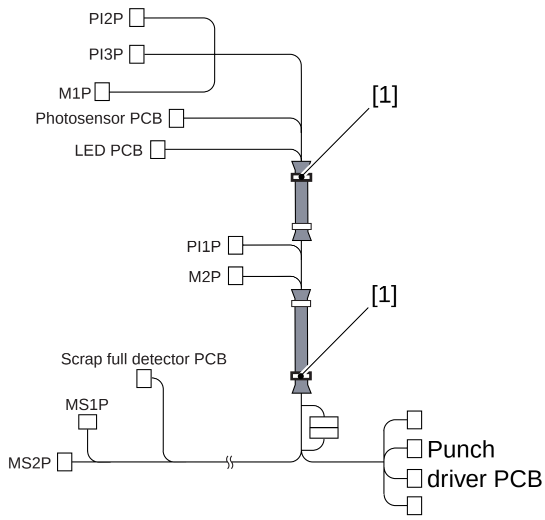


Figure 5-325

C. PCBs

1. Removing the LED PCB

1) Remove the punch unit assembly (see III-B-3).
2) Remove the screw [1] and the LED PCB [2].

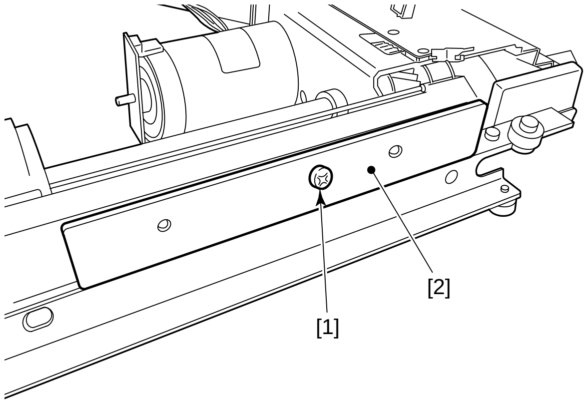


Figure 5-326

2. Removing the Photosensor PCB

1) Remove the upper cover (see III-A-2).
2) Remove the two screws [1], and remove the sensor plate [2].
3) Disconnect the connector [2], and remove the photosensor PCB [4].

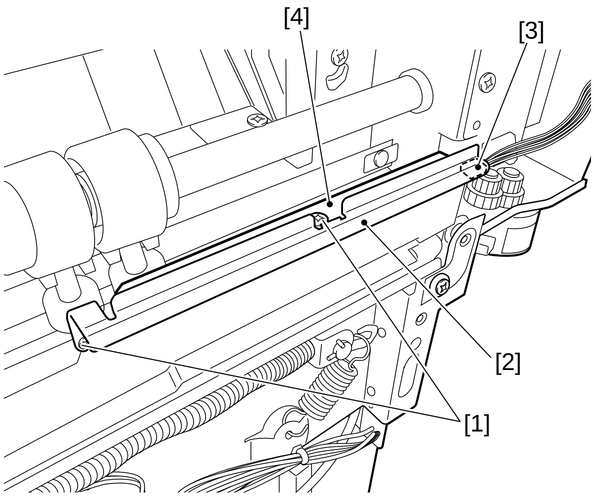


Figure 5-327

3. Removing the Scrap Full Detector PCB Unit

1) Remove the right guide assembly (see III-A-1).
2) Remove the screw [1], disconnect the connector [2], and remove the scrap full detector PCB unit [3].

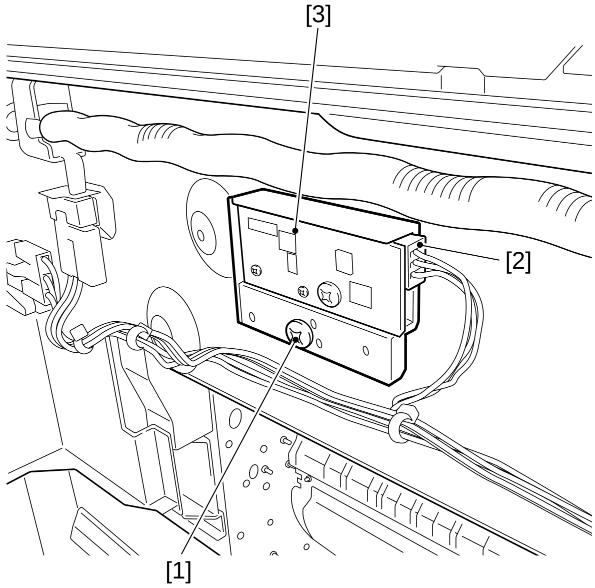


Figure 5-328

4. Removing the Punch Driver PCB

1) Remove the puncher unit from the finisher.
2) Remove the four screws [1], disconnect four connectors [2], and remove the punch driver PCB [3].

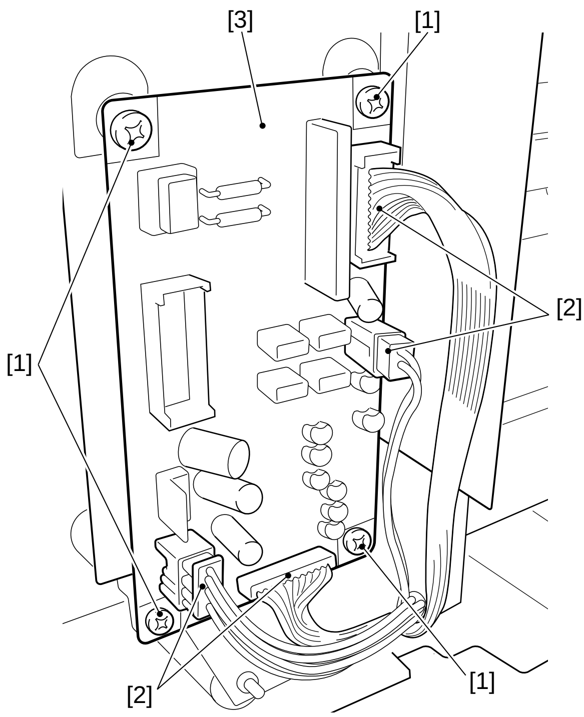


Figure 5-329

CHAPTER 6

MAINTENANCE AND INSPECTION

I. PERIODICALLY REPLACED PARTS

A. Finisher Unit

The finisher unit does not have parts that must be replaced on a periodical basis.

B. Saddle Stitcher Unit

The saddle stitcher unit does not have parts that must be replaced on a periodical basis.

C. Puncher Unit (option)

The puncher unit does not have parts that must be replaced on a periodical basis.

II. CONSUMABLES AND DURABLES

Some of the parts of the machine may need to be replaced one or more times because of wear or tear during the machine's warranty period. Replace them as necessary.

A. Finisher Unit

As of June 2000

No.	Name	Parts No.	Q'ty	Estimated Life	Remarks
1	Stapler	FB4-5390-000	1	500,000 operations	5,000 operations/cartridge
2	Feed belt	FB4-6656-000	2	1,000,000 copies	
3	Paddle	FG5-8178-000	2	1,000,000 copies	Paddle unit
		FB4-5825-000	4		Paddle rubber only

B. Saddle Stitcher Unit

As of June 2000

No.	Name	Parts No.	Q'ty	Estimated Life	Remarks
1	Stitcher	FB3-7860-000	2	100,000 operations	2,000 operations/cartridge

C. Puncher Unit (option)

As of June 2000

No.	Name	Parts No.	Q'ty	Estimated Life	Remarks
1	Punch unit	FG6-6500-000	1	1,000,000 operations	Puncher Unit-A1
		FG6-6501-000			Puncher Unit-B1
		FG6-6502-000			Puncher Unit-C1
		FG6-6503-000			Puncher Unit-D1
2	Punch unit harness	FG3-1374-000	1	1,000,000 operations	

III. PERIODICAL SERVICING

As of June 2000

Item	Interval	Work	Remarks
Feed belt	Host machine minimum servicing interval	Cleaning	Use moist cloth
Paddle			
Transmission sensor (Puncher Unit) (option)			Use dry cloth

CHAPTER 7

TROUBLESHOOTING

I. ADJUSTMENTS

A. Electrical System (finisher unit)

1. Adjusting the Height Sensor (PS1)

Perform the following adjustments whenever you have replaced the finisher controller PCB or the height sensor (PS1).

1) Set SW3 on the finisher controller PCB as indicated.

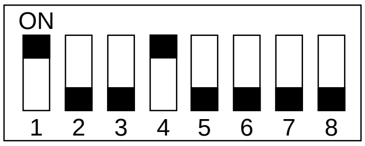


Figure 7-101

2) Make sure that there is no unwanted paper on the trays.
3) Press SW1 on the finisher controller PCB. This causes the finisher to execute automatic adjustment, in which the tray unit will shift tray 1, and tray 2 in sequence.
   - At the end of adjustment, trays will return to their home positions.
   - During adjustment, LED1 flashes. At the end of adjustment, LED1 turns and remains ON.
   - If automatic adjustment fails, the mechanism stops while the tray in question is being adjusted (at the same time, LED1 turns OFF).
4) Shift all bits on SW3 to OFF, and turn OFF the host machine once.

2. Adjusting the Alignment Position

If you have replaced the finisher controller PCB or if an alignment fault occurs, adjust as follows. Performing the steps will affect all paper sizes.

1) Remove the rear cover of the finisher unit.
2) Set SW3 of the finisher controller PCB as indicated.

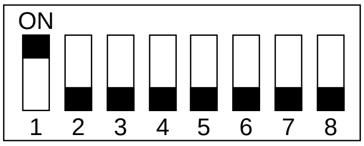


Figure 7-102

3) If you are using A4 paper, press SW1 on the finisher controller PCB. If you are using LTR paper, press SW2 on the finisher controller PCB.
   - Pressing SW1/2 will open the swing guide and cause the alignment plate to move to A4/LTR positions.
4) Place 10 sheets of A4/LTR paper between the alignment plate and the guide plate, butting them against the stoppers.
5) Press SW1 or SW2 on the finisher controller PCB, and butt the alignment plate against the sheets.
   - Pressing SW1 will shift the alignment plate to the front in 0.35 mm increments.
   - Pressing SW2 will shift the alignment plate to the rear in 0.35 mm increments.

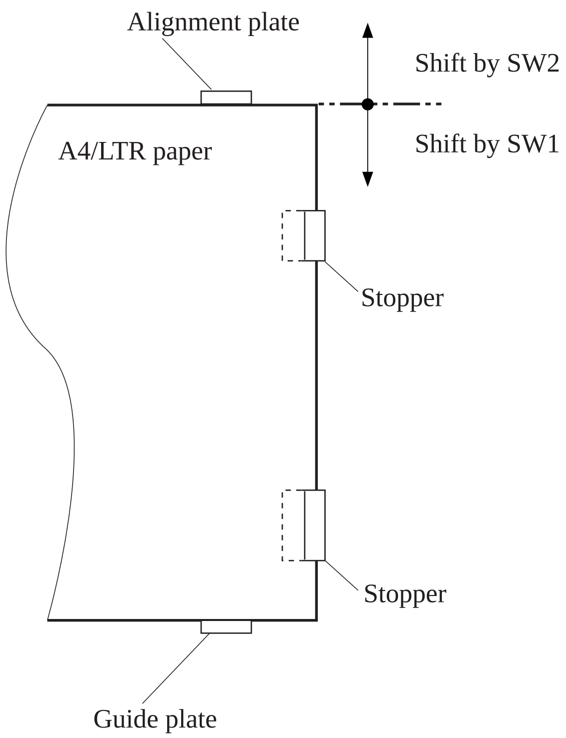


Figure 7-103

6) Press SW1 and SW2 simultaneously to store the adjustment value (this will lower the swinging guide).
7) Shift all bits of SW3 to OFF, and install the rear cover of the finisher unit.

3. Adjusting the Staple Position (stapler movement range)

Adjust as follows if you have replaced the finisher controller PCB. Performing the steps will affect all paper sizes and all stapling positions.

1) Remove the rear cover from the finisher unit.
2) Set SW3 on the finisher controller PCB as indicated.

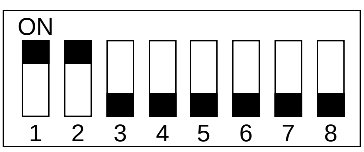


Figure 7-104

3) If you are using A4 paper, press SW1 on the finisher controller PCB. If you are using LTR paper, press SW2 on the finisher controller PCB.
   - Pressing SW1/2 will open the swing guide and cause the feed belt to rotate.
4) Within 5 secs after pressing the switch, place one sheet of A4/LTR paper between the alignment plate and the guide plate, butting it against the stoppers.
   - When the finisher detects the paper, it will lower the swing guide and execute stapling (rear, 1-position). Take out the stapled paper manually as delivery will not be executed.

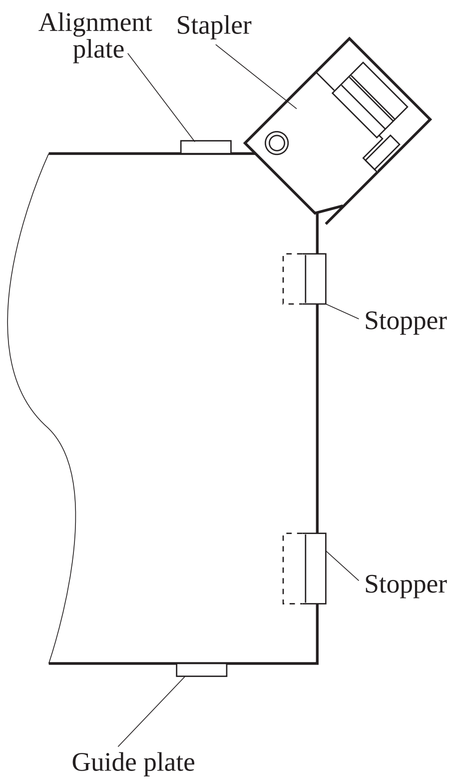


Figure 7-105

5) If the stapling position is correct, set all bits on SW3 to OFF to end the adjustments. If you need to change the stapling position, on the other hand, go to the next step.
6) To suit the position of the staple on the paper, press SW1 or SW2 on the finisher controller PCB as many times as necessary.
   - Pressing SW1 will shift the stapling position to the front in 0.3 mm increments.
   - Pressing SW2 will shift the stapling position to the rear in 0.3 mm increments.

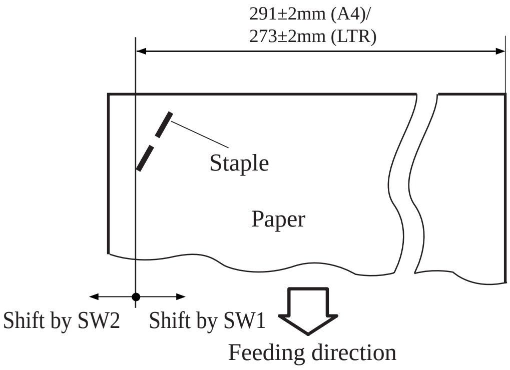


Figure 7-106

7) Press SW1 and SW2 simultaneously.
   - This will open the swing guide, and cause the feed belt to rotate. Placement of one sheet of A4/LTR paper will cause the finisher to start stapling.
8) Check the stapling position. If good, set all bits of SW3 to OFF. If re-adjustments are necessary, go back to Step 6.

Caution:
The settings held by the finisher controller PCB are changed as soon as SW1 or SW2 is pressed. As such, to recover the previous settings after the press, you must press the other of the two switches as many times as you pressed previously.

4. Adjusting the Buffer Roller Winding Amount

Perform this adjustment in the following instances:

a. When the finisher controller PCB or the EEPROM (Q2) on the finisher controller PCB has been replaced
b. When something causes the winding amount to fluctuate
   The "winding amount" is the amount of difference between the First and Second sheets wound onto the buffer roller device in the feed direction.

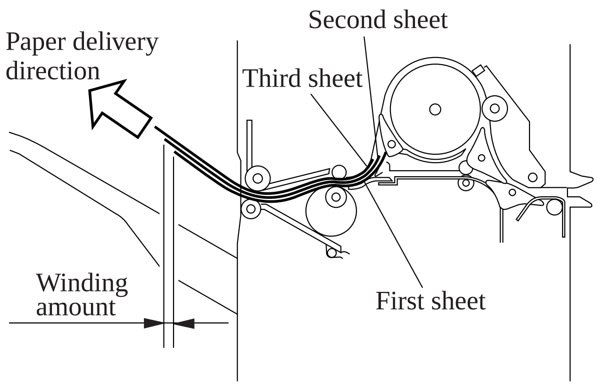


Figure 7-107

1) Set SW3 on the finisher controller PCB as indicated.

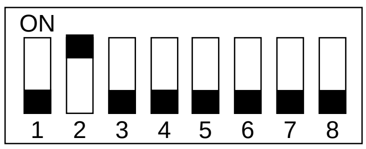


Figure 7-108

2) Turn the host machine OFF then back ON again.
3) Set the mode setting on the host machine to "1" and the number of originals (A4 or LTR) to "3" in the staple mode.
4) Press the copy start key.
   - Copying starts, three sheets for the first copy are output as a stack on the staple tray, and copying stops with the copies held at the delivery roller.
5) Remove the stack of sheets from the finisher delivery taking care to prevent the offset of the output sheets from changing.

6) Measure the winding amount (shift) of the stack of sheets, and compare this amount with the standard amounts.
   • This amount should be measured at the center of the paper leading edge.

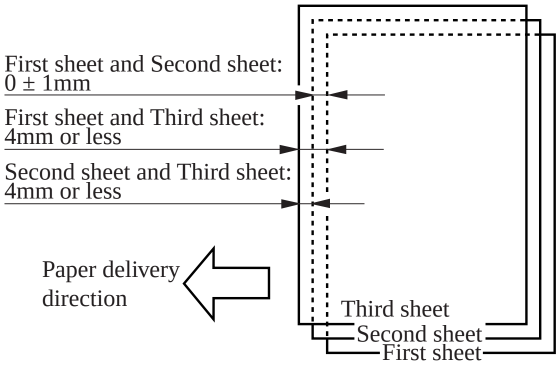


Figure 7-109

7) If the amount is within the standard, turn the host machine OFF, and then set all bits of SW3 to OFF. If the amount is outside the standard, perform the following.
8) Turn the host machine OFF, and set SW3 on the finisher controller PCB as indicated. If EEPROM (Q2) on the finisher controller PCB has been replaced, proceed to step 10).

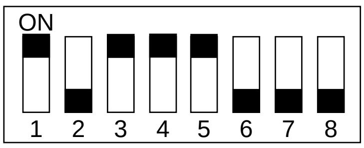


Figure 7-110

9) Turn the host machine ON, and then press SW2 on the finisher controller LCB.
   • The current setting values are displayed at LED1.

Adjustment value 0	Lights for 1 second (once)
Adjustment value +N	Blinks (lights for 0.2 second) for N times.
Adjustment value -N	Lights for 1 second (once), and blinks (lights for 0.2 second) for N times.

The adjustment width is 0.72mm for each N=1.

Table 7-101

10) Turn the host machine OFF, and then set SW3 on the finisher controller PCB as indicated.

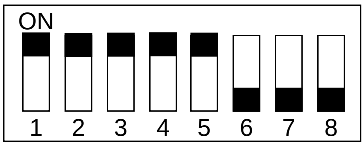


Figure 7-111

11) Press SW1 or SW2 on the finisher controller PCB as necessary.
   • Each press of SW1 increments the winding amount in 0.72mm increments.
   • Each press of SW2 decrements the winding amount in 0.72mm increments.

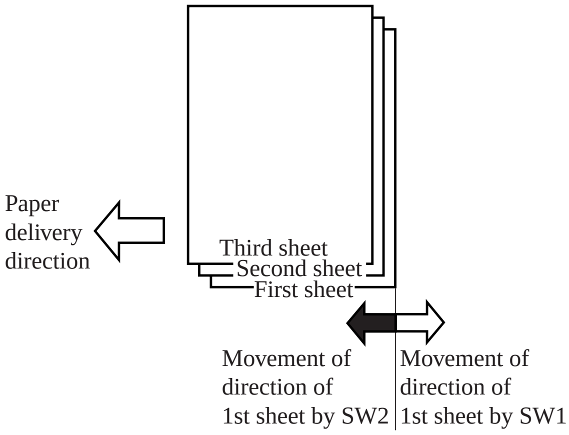


Figure 7-112

12) Repeat steps 1) though 6) twice. Check that the winding amount is within the standard in both times.
13) Turn the host machine OFF, and set all bits of SW3 to OFF.
    This completes the adjustment.

5. Setting the Upward Curling Sheet Mode

a. Outline

Upward curling of sheets stacked on the tray sometimes increases depending on the state of the copy paper. If this happens, the stacked sheets are pushed out by subsequent output sheets. This sometimes increases the alignment deviation.

See the stacking example below.

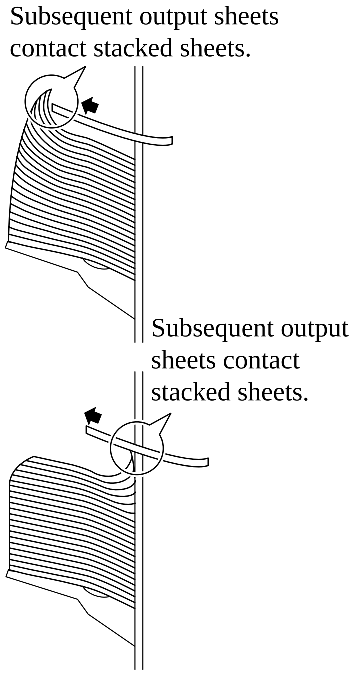


Figure 7-113

If this happens:

1) Turn over the paper in the paper feed cassette and load the paper again.
If upward curling is larger than before the paper was loaded again, return the paper in the paper feed cassettes to its original orientation.
From here on, too, if upward curling is excessive, resulting in stacked sheets being pushed out by subsequent output sheets, try setting the upward curling sheet mode as indicated.

b. Setting the upward curling sheet mode

1) Turn the host machine OFF.
2) Set SW3 on the finisher controller PCB as indicated.

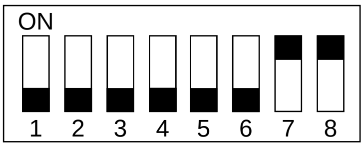


Figure 7-114

3) Turn the host machine ON.
   - When the machine enters the upward curling sheet mode, the stop position of the stacking tray is lowered by about 15mm when stack sheets are output to prevent subsequent output sheets from catching on the sheets on the stacking tray.
   - After setting this mode, if sheets with little curling or downward curling sheets are output and stacked, the stacking tray is lowered too far. For this reason, sheets are sometimes stacked away from the stacking wall. (Figure 7-115). Set this mode after carefully checking the type of paper used by the user.

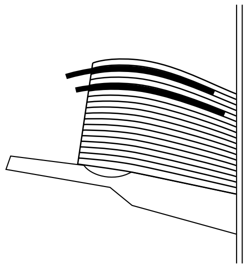


Figure 7-115

6. Setting the Downward Curling Sheet Mode

a. Outline

Downward curling of sheets stacked on the tray sometimes increases depending on the state of the copy paper. If this happens, the sheets are sometimes stacked away from the stacking wall when they are output and stacked on the stacking tray.
See the stacking example below.

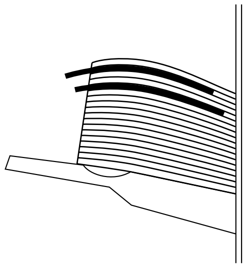


Figure 7-116

If this happens:

1) Turn over the paper in the paper feed cassettes and load the paper again.
If downward curling is larger than before the paper was loaded again, return the paper in the paper feed cassette to its original orientation.
From here on, too, if downward curling is excessive, resulting in output sheets being stacked incorrectly, try setting the downward curling sheet mode as indicated.

b. Setting the downward curling sheet mode

1) Turn the host machine OFF.
2) Set SW3 on the finisher controller PCB as indicated.

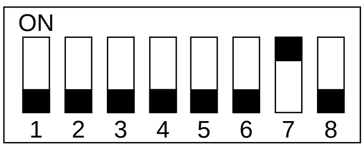


Figure 7-117

3) Turn the host machine ON.
   - When the machine enters the downward curling sheet mode, the stop position of the stacking tray is raised by about 10mm when stack sheets are output so that output sheets are stacked without being away from the stacking wall.
   - After setting this mode, if sheets with little curling or upward curling sheets are output and stacked, the stacking tray is raised too far. For this reason, sheets are stacked pressed out by subsequent output sheets. (Figure 7-118). Set this mode after carefully checking the type of paper used by the user.

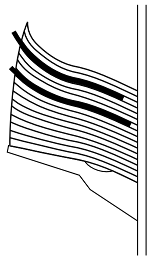


Figure 7-118

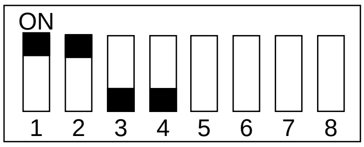
B. Electrical System (saddle stitcher unit)

1. Adjusting the Folding Position

The folding position is adjusted by changing the settings of bits 6 through 8 of DIPSW1 on the saddle stitcher controller PCB to match the stitching position (i.e., adjusting the distance over which the paper positioning plate is moved to the folding position from the stitching position.)

If you have replaced the saddle stitcher controller PCB, be sure to set the new DIPSW1 so that the settings will be the same as those on the old DIPSW1. If, for any reason, you must change the following position, perform the following steps:

1) Remove the PCB cover, and set bits 1 through 4 of DIPSW1 on the saddle stitcher controller PCB as indicated.



Do not change bits 5 through 8.

Figure 7-119

2) Remove the rear cover of the saddle stitcher unit, and tape the actuator of the inlet cover open sensor (PI9S) and the inlet cover open detection switch (MS1S) of the saddle stitcher unit in place.
3) Press SW2 on the saddle stitcher controller PCB so that the feed motor (M1S) starts to rotate.
4) Before inserting the paper, mark the top of the paper (you will be using two sheets of A3 or LDR paper).

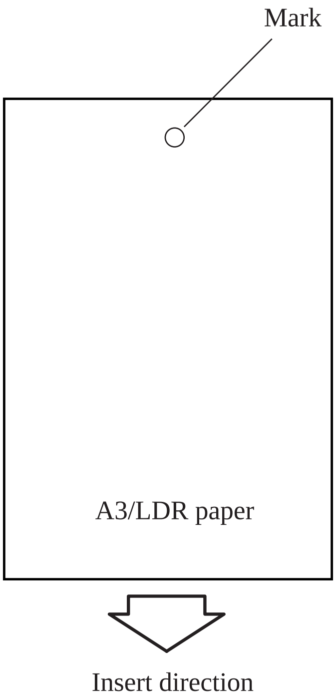


Figure 7-120

5) Open the inlet cover, and insert two sheets of paper (push them in by hand until the leading edge of the sheets butts against the paper positioning plate).

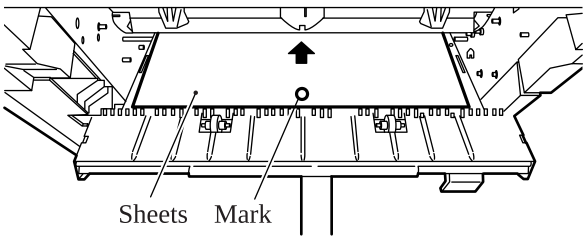
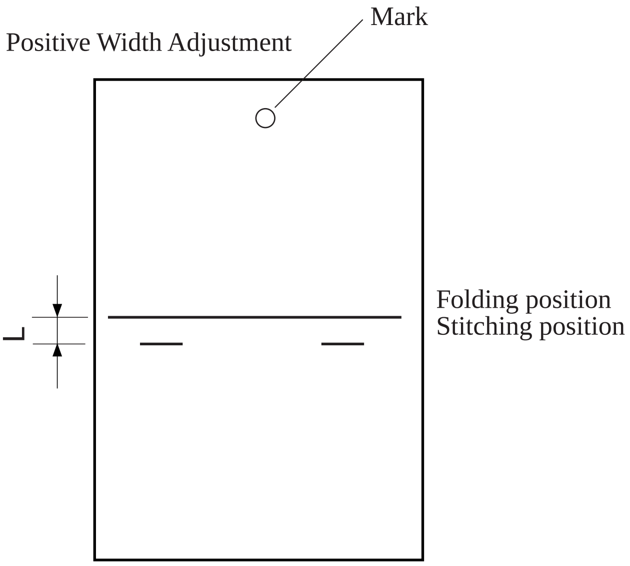
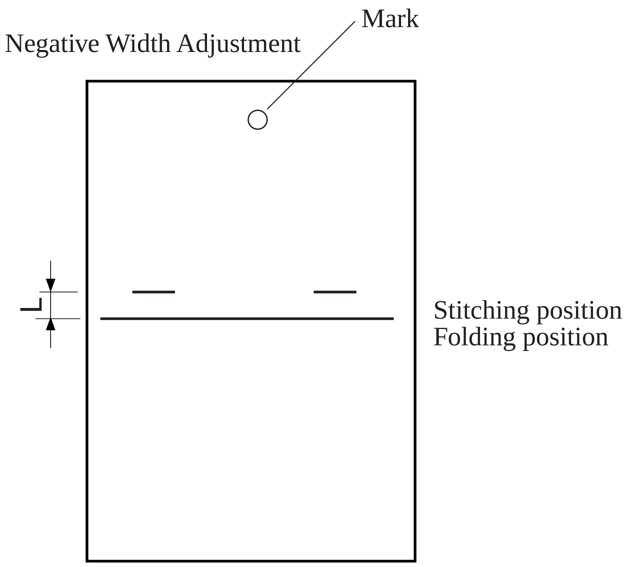


Figure 7-121

6) Close the inlet door while holding it down with your hand.
7) Press SW2 on the saddle stitcher controller PCB.
   • The saddle stitcher unit will “stitch” the sheets, and fold and deliver the stack automatically.
8) Measure the distance (L) between the stitching position and the folding position. Then, perform “positive width adjustment” or “negative width adjustment” to suit the relationship between the stitching position and the folding position.
   • If the stitching position is below the folding position, perform “positive width adjustment.”
   • If the stitching position is above the folding position, perform “negative width adjustment.”



Unit: mm
Example: If L is 1 mm, provide “+1 mm”.



Unit: mm
Example: If L is 0.5 mm, provide “-0.5 mm”.

Figure 7-122

9) Change the settings of bits 6 through 8 on DIPSW1 referring to Table 7-102 below.
- If the width adjustment is “0”,
  The stitching position and the folding position match, requiring no change.
- If for “positive width adjustment,”
  Set DIPSW1 so that the difference resulting from subtraction of the interval from the appropriate setting in Table 7-102 is provided.
  For instance, if the DIPSW1 is currently set to +2 and the interval is +1 mm, set DIPSW1 to reflect -2.
- If for “negative width adjustment”
  Set DIPSW1 so that the sum resulting from addition of the interval from the appropriate setting is provided.
  For instance, if the DIPSW1 is currently set to -1 and the interval is +0.5 mm, set DIPSW1 to reflect +1.

DIPSW1 bit settings			Settings (in units of 0.5 mm)
bit 6	bit 7	bit 8	
OFF	ON	ON	+3
OFF	ON	OFF	+2
OFF	OFF	ON	+1
OFF	OFF	OFF	0
ON	OFF	ON	–1
ON	ON	OFF	–2
ON	ON	ON	–3

Do not touch the following:

bit 6	bit 7	bit 8
ON	OFF	OFF

Table 7-102

10) Set bits 1 through 4 on DIPSW1 to OFF.

2. Stitching Position (adjusting center stitching)

Use the host machine user mode to perform the following:

1) Press the user mode key on the host machine control panel to enter the user mode.
2) Press the “adjust/clean” key on the LCD.
3) Press the “down” key to display the 2/2 screen.
4) Press “adjust center folding position” key.
5) Press the appropriate key: “A3, 279 × 432mm (11"×17"), “B4”, or “A4R, LTRR”.

6) Enter the adjustment value in 0.25 mm increments by pressing the “down” key or “up” key. To stop adjustment, press the “stop” key.

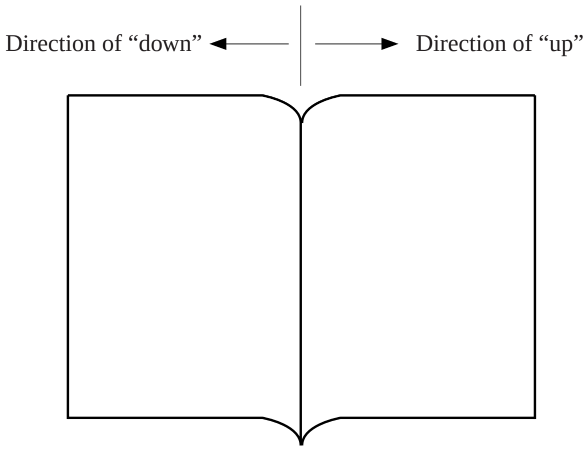


Figure 7-123

7) Press the “OK” key to store the new adjustment value.

C. Electrical System (puncher unit (option))

1. Punch hole position adjustment (feed direction)

This adjustment can be performed only in the host machine's service mode. Set within the range 2 to 4 to move the punch hole position in 1mm increments. Increasing the setting moves the punch hole position in the direction of the leading edge of the paper. (Refer to the host machine's service manual.)

2. Sensor output adjustment

Perform this adjustment when the punch driver PCB, transmission sensor (photosensor PCB/LED PCB) or reflection sensor (scrap full detection PCB unit) has been replaced.

1) Remove the rear cover of the finisher unit.
2) Set bits 1 through 6 of DIPSW3 on the finisher controller PCB as indicated.

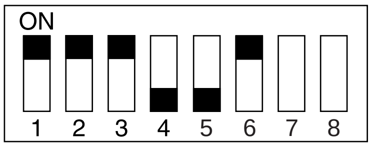


Figure 7-124

3) Press SW1 on the finisher controller PCB. Pressing this switch automatically adjusts sensor output.
4) Set all bits on DIPSW3 to OFF.

3. Registering the number of punch holes

This operation registers which puncher unit is attached to the IC on the punch driver PCB so that the puncher unit can be identified by the finisher. For this reason, this operation must be performed when the punch driver PCB has been replaced.

1) Remove the rear cover of the finisher unit.
2) Set bits 1 through 6 of DIPSW3 on the finisher controller PCB as indicated.

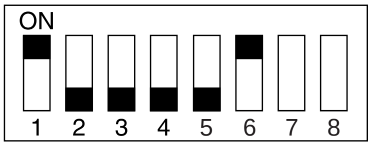


Figure 7-125

3) Set bits 7 and 8 on DIPSW3 on the finisher controller PCB to match the number of punch holes of the attached puncher unit according to Table 7-103.

Number of Punch Holes	DIPSW3 bit settings	
	bit 7	bit 8
2-hole (Puncher Unit-A1)	OFF	OFF
2-/3-hole (Puncher Unit-B1)	OFF	OFF
4-hole (Puncher Unit-C1)	ON	OFF
4-hole (Puncher Unit-D1)	ON	ON

Table 7-103

4) Press SW1 on the finisher controller PCB. Press SW2 when setting a 2-/3-hole model (Puncher Unit-B1). Pressing this switch registers the number of punch holes to the punch driver PCB.
5) Set all bits on DIPSW3 to OFF.

4. Checking the sensitivity level of the transmission sensor

How dirty the transmission sensor (photosensor PCB/LED PCB) can be checked by the number of times that LED1 on the finisher controller PCB lights. For this reason, how dirty the transmission sensor is serves as a guide for when to perform cleaning during periodic maintenance.

1) Remove the rear cover of the finisher unit.
2) Set bits 1 through 6 of DIPSW3 on the finisher controller PCB as indicated.

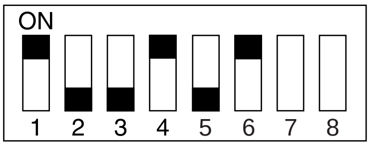


Figure 7-126

3) Press SW1 on the finisher controller PCB. Pressing this switch lights LED1 on the finisher controller PCB as indicated in Table 7-104 so that you can check the sensitivity level of the transmission sensor.

Sensitivity Level	Number of LED Lightings
Sensor not dirty	Lit 1X
Sensor slightly dirty	Lit 2X
Sensor dirty	Lit 3X

Figure 7-104

4) Set all bits of DIPSW3 to OFF.

II. ARRANGEMENT OF ELECTRICAL PARTS

A. Finisher Unit

1. Sensors

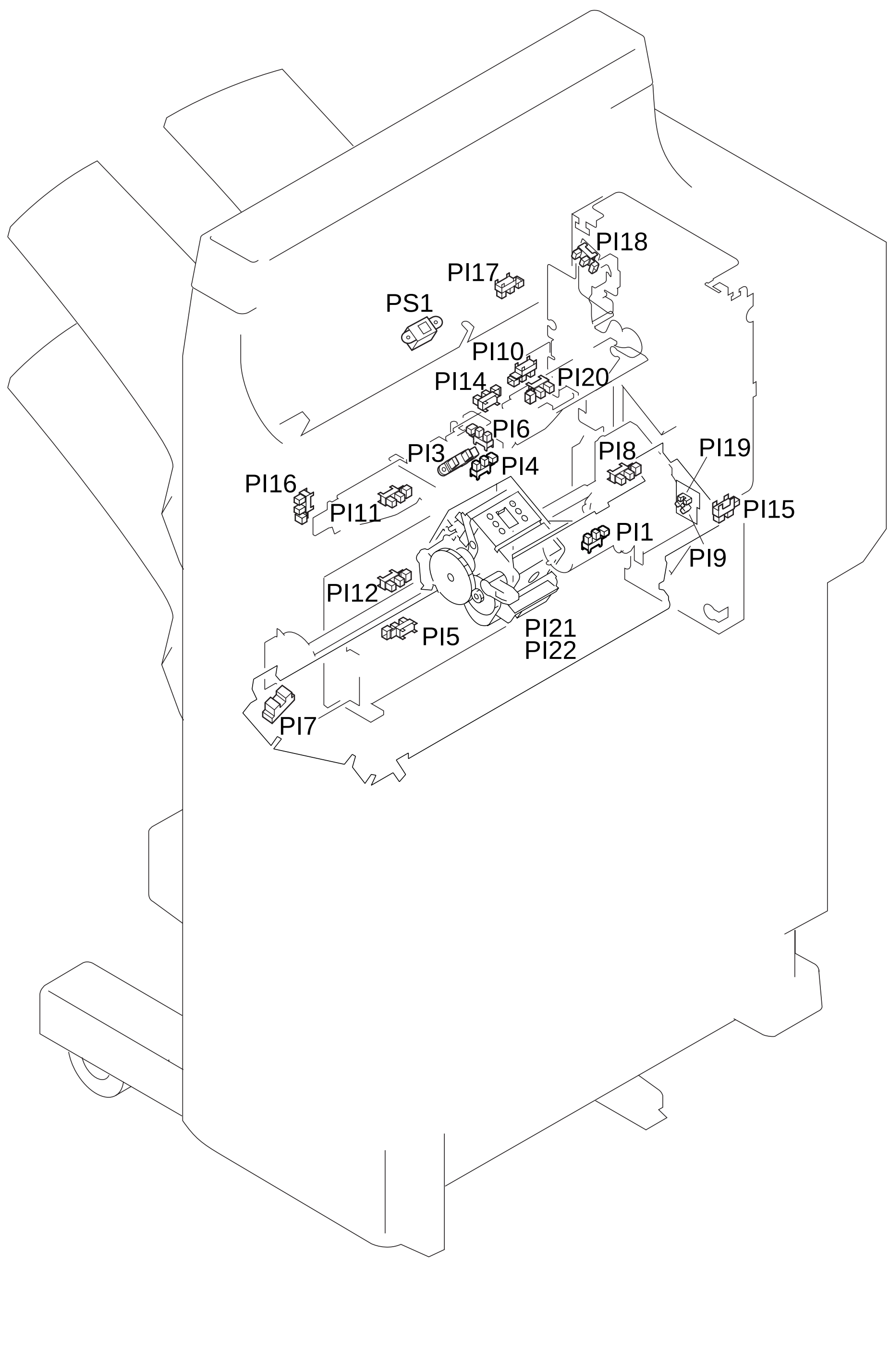


Figure 7-201

Name	Notation	Function
Photointerrupter	PI1	Detects paper in the inlet area
	PI3	Detects paper in the delivery area
	PI4	Detects paper on the stapling tray
	PI5	Detects the state (open) of the shutter
	PI6	Detects alignment plate at home position
	PI7	Detects the stapler at home position
	PI8	Detects the tray at home position
	PI10	Detects delivery motor clock pulses
	PI11	Detects paper on tray 1
	PI12	Detects paper on tray 2
	PI14	Detects paper in the buffer path
	PI15	Detects the finisher joint
	PI16	Detects the state (open) of the door
	PI17	Detects paper at the inlet to the buffer path
	PI18	Detects the state (open) of the swing guide
	PI9	Detects tray lift motor clock pulses 1 (on sensor PCB)
	PI19	Detects tray lift motor clock pulses 2 (on sensor PCB)
	PI20	Detects swing guide clock
	PI21	Detects edging of staples (inside stapler)
	PI22	Detects staple drive home position (inside stapler)
Height sensor	PS1	Detects the height of the stack on the tray

Table 7-201

2. Microswitches

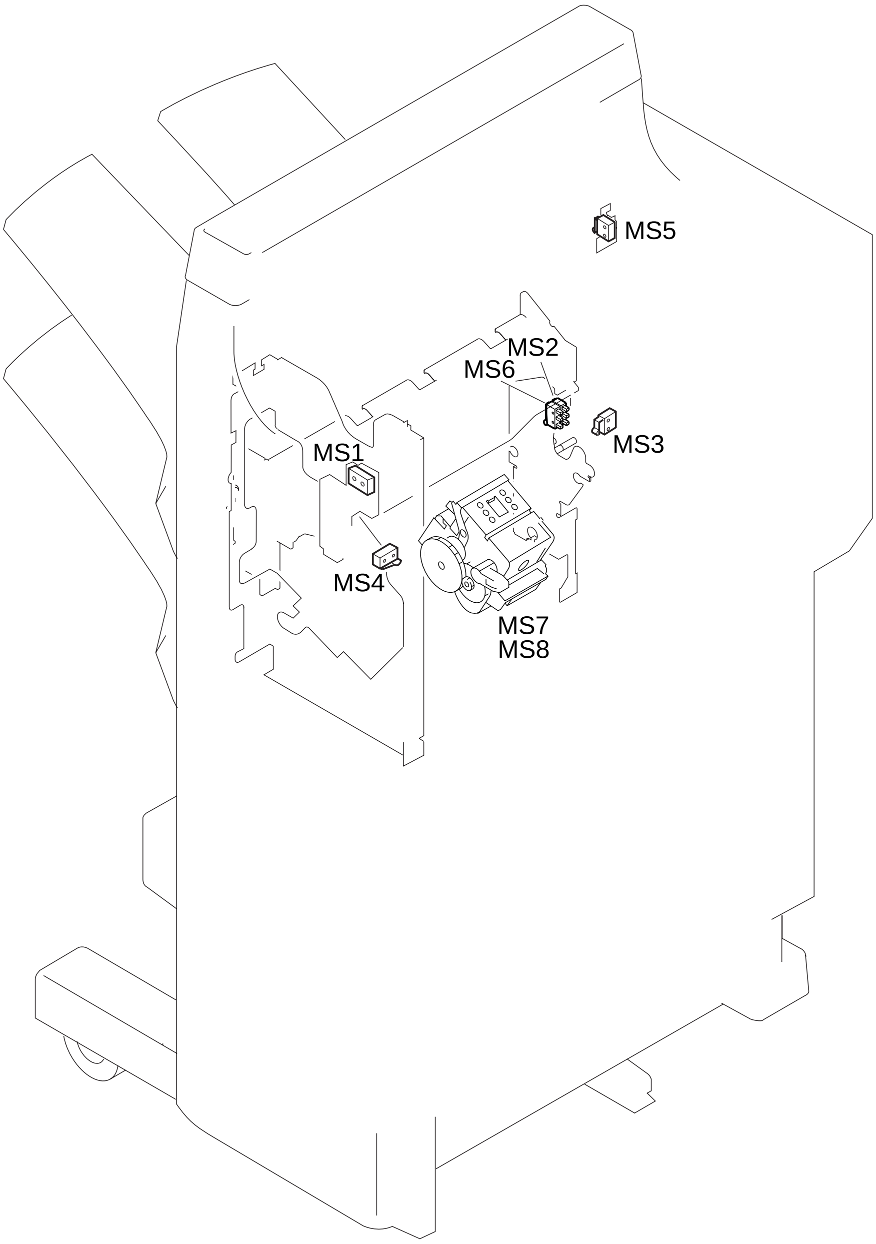


Figure 7-202

Name	Notation	Function
Microswitches	MS1	Detects the state (open) of the front door and the upper door
	MS2	Detects the state (closed) of the swing guide 1
	MS3	Detects the safety range
	MS4	Detects the state (closed) of the shutter
	MS5	Detects the tray at the upper limit
	MS6	Detects the state (closed) of the swing guide 2
	MS7	Detects the cartridge (inside stapler)
	MS8	Detects the presence/absence of staples (inside stapler)

Table 7-202

3. Motors

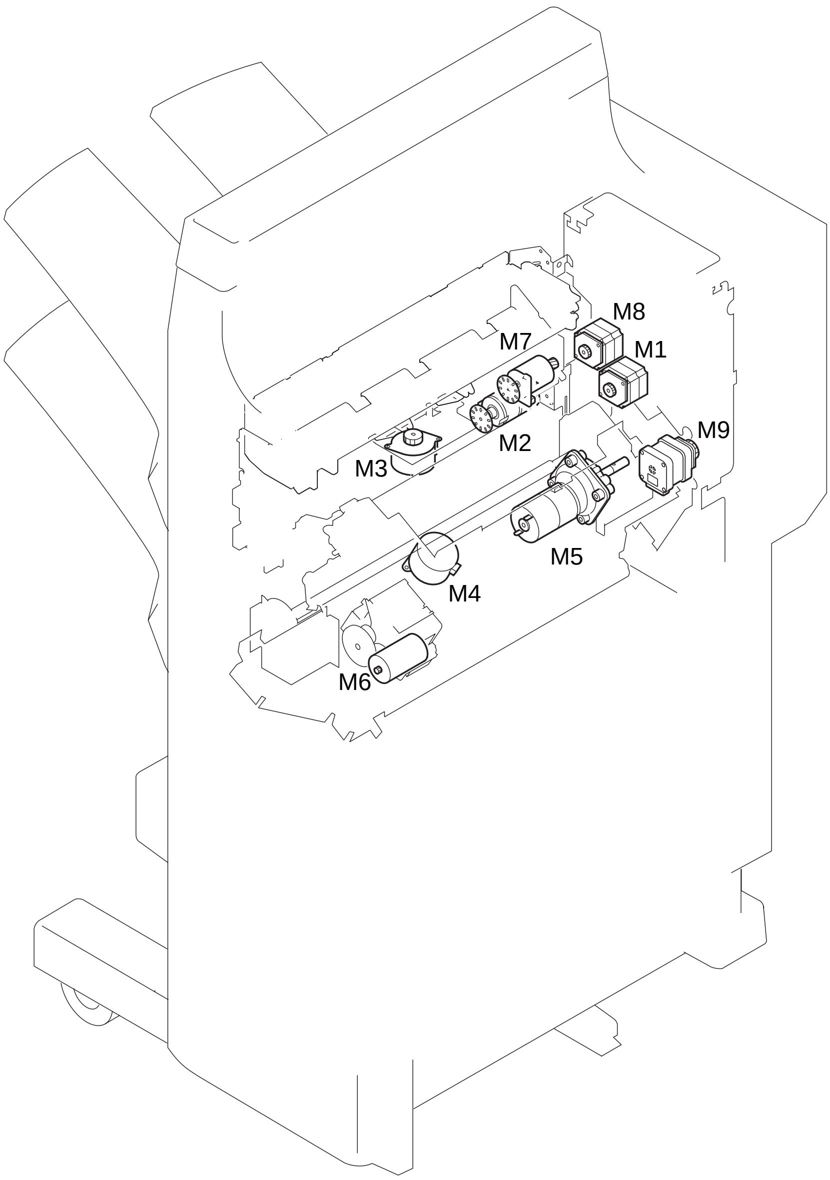


Figure 7-203

Name	Notation	Function
Motor	M1	First Feed motor
	M2	Delivery motor
	M3	Alignment motor
	M4	Stapler shift motor
	M5	Tray lift motor
	M6	Staple motor
	M7	Swing motor
	M8	Second feed motor
	M9	Inlet feed motor

Table 7-203

4. Solenoids

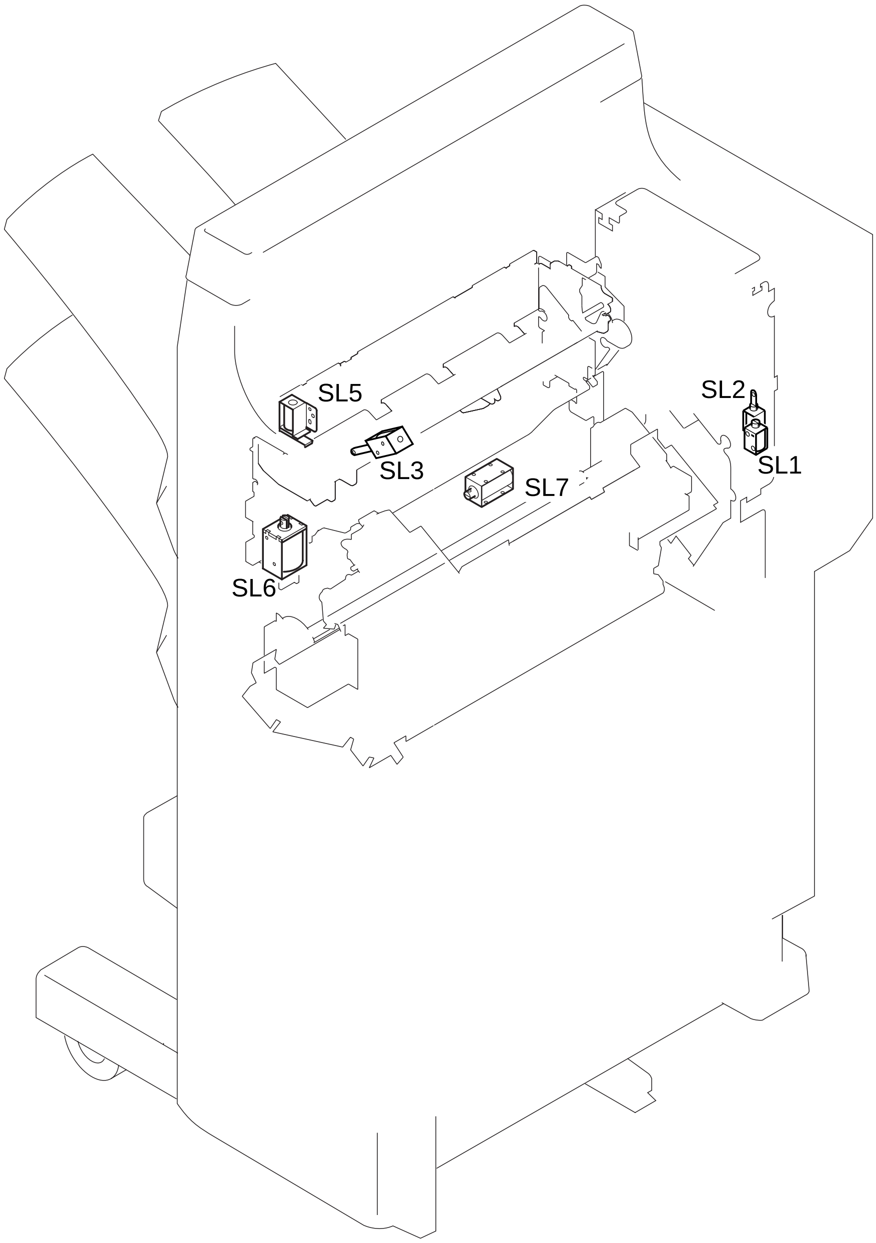


Figure 7-204

Name	Notation	Function
Solenoid	SL1	Flapper solenoid
	SL2	Buffer inlet solenoid
	SL3	Buffer outlet solenoid
	SL5	Paddle solenoid
	SL6	Escape solenoid
	SL7	Belt escape solenoid

Table 7-204

5. PCBs

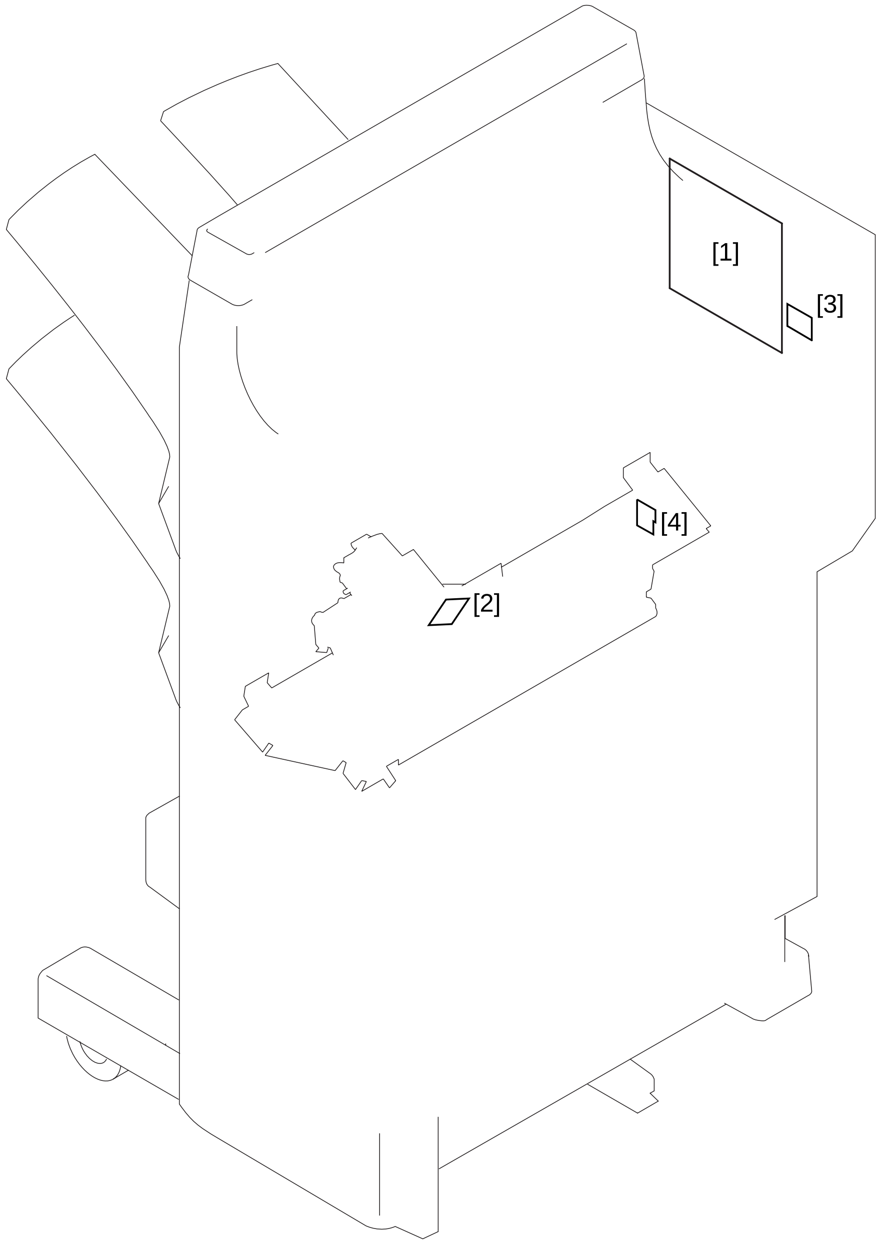


Figure 7-205

Reference	Name
[1]	Finisher controller PCB
[2]	Relay PCB 4
[3]	Relay PCB 3
[4]	Sensor PCB

Table 7-205

B. Saddle Stitcher Unit

1. Photointerrupters

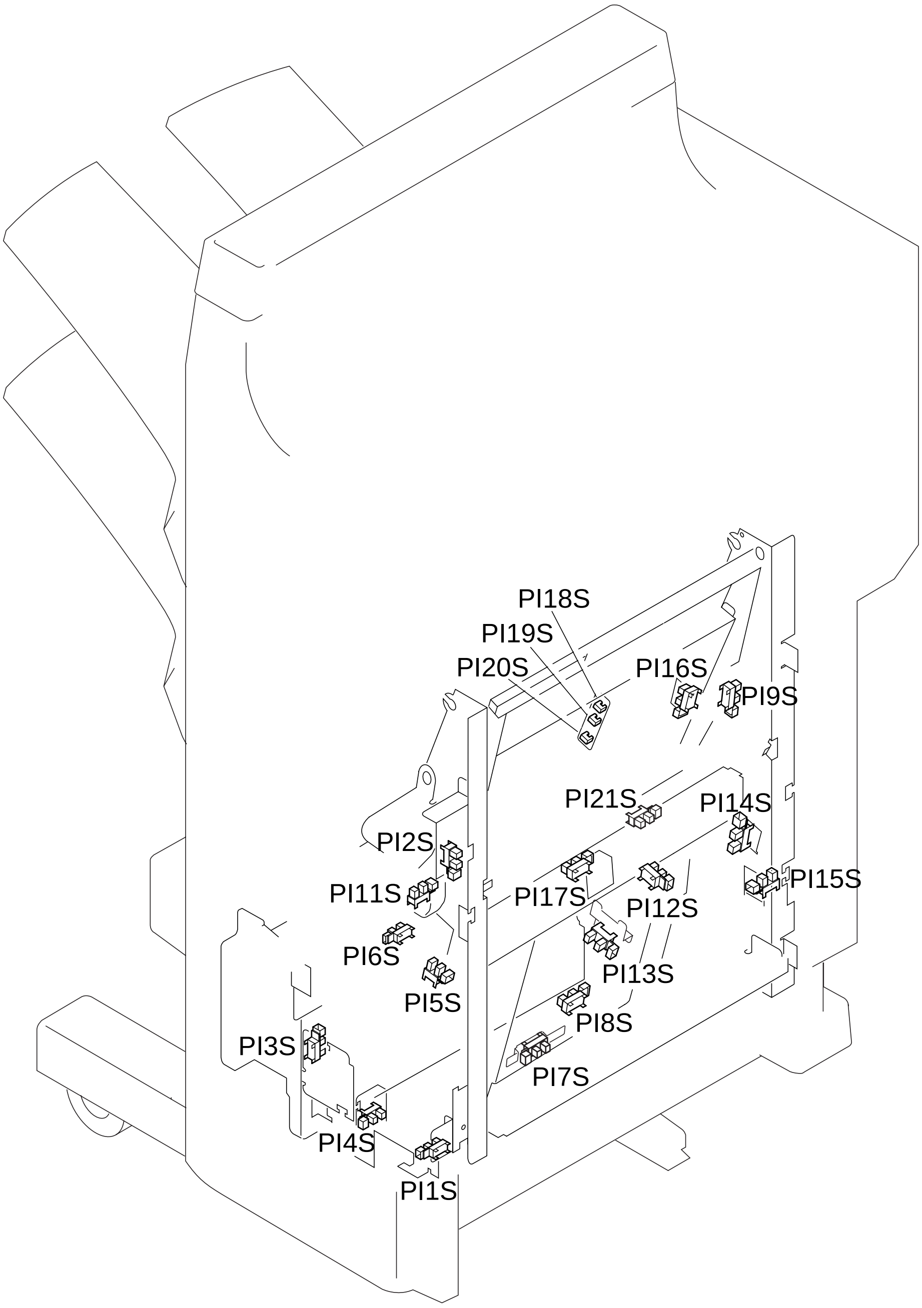


Figure 7-206

Name	Notation	Function
Photointerrupter	PI1S	Detects clock pulses from the paper pushing plate motor
	PI2S	Detects the state (open) of the front door
	PI3S	Detects the state (open) of the delivery cover
	PI4S	Detects clock pulses from the paper folding motor
	PI5S	Detects the alignment plates at home position
	PI6S	Detects paper on the tray
	PI7S	Detects paper positioning plate at home position
	PI8S	Detects paper on the paper positioning plate
	PI9S	Detects the state (open) of the inlet cover
	PI11S	Detects paper in the delivery area
	PI12S	Detects the phase of the crescent roller
	PI13S	Detects the guide at home position
	PI14S	Detects the paper pushing plate at home position
	PI15S	Detects the paper pushing plate at top position
	PI16S	Detects the state (in) of the stitcher unit
	PI17S	Detects paper in the vertical path
	PI18S	Detects paper (No. 1; on paper sensor PCB)
	PI19S	Detects paper (No. 2; on paper sensor PCB)
	PI20S	Detects paper (No. 3; on paper sensor PCB)
	PI21S	Detects the paper folding at home position

Table 7-206

2. Microswitches

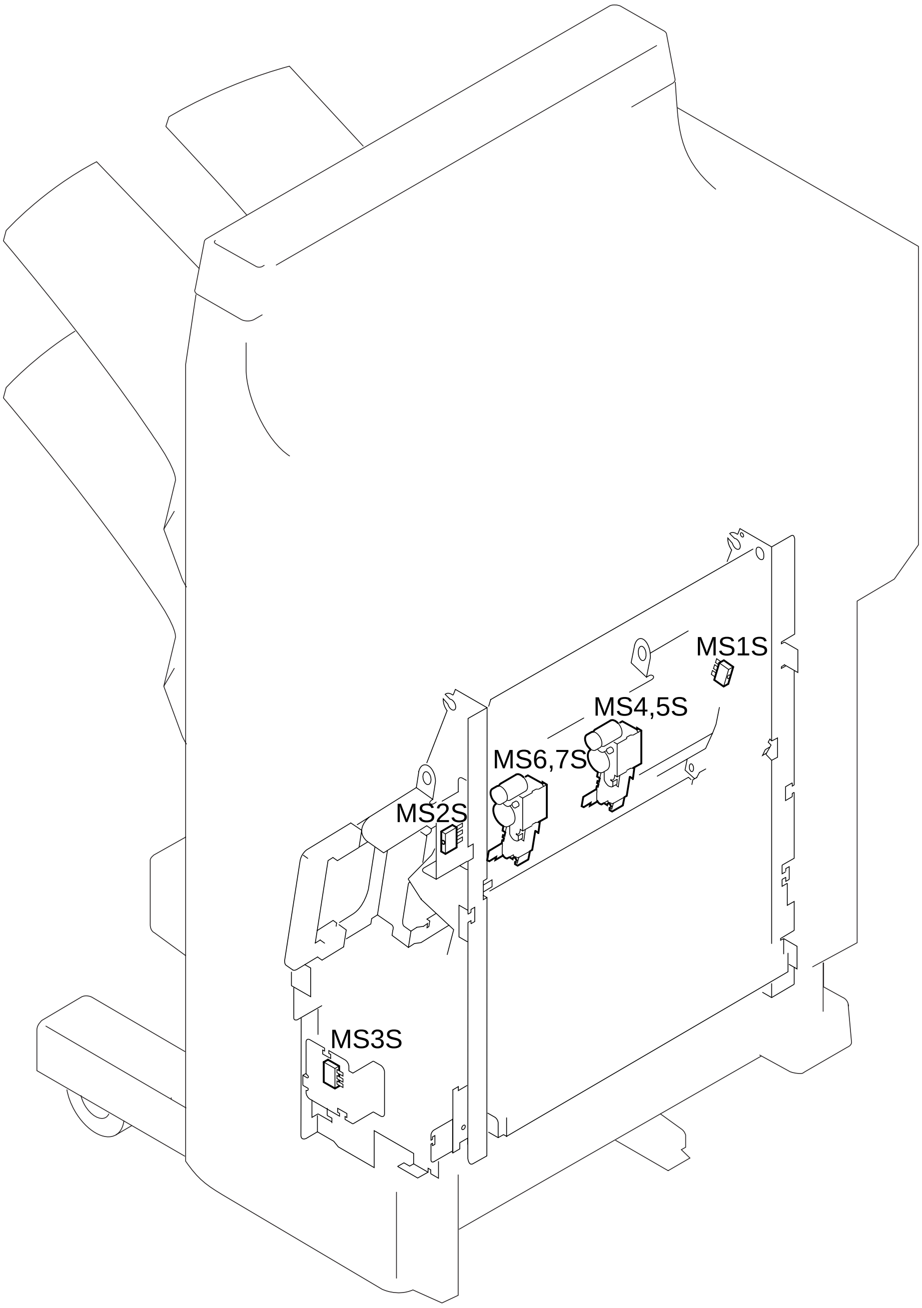


Figure 7-207

Name	Notation	Function
Microswitches	MS1S	Detects the state (open) of the inlet door
	MS2S	Detects the state (open) of the front door
	MS3S	Detects the state (open) of the delivery door
	MS4S	Detects the presence of staples (rear)
	MS5S	Detects stitching home position (rear)
	MS6S	Detects the presence of staples (front)
	MS7S	Detects stitching home position (front)

Table 7-207

3. Motors

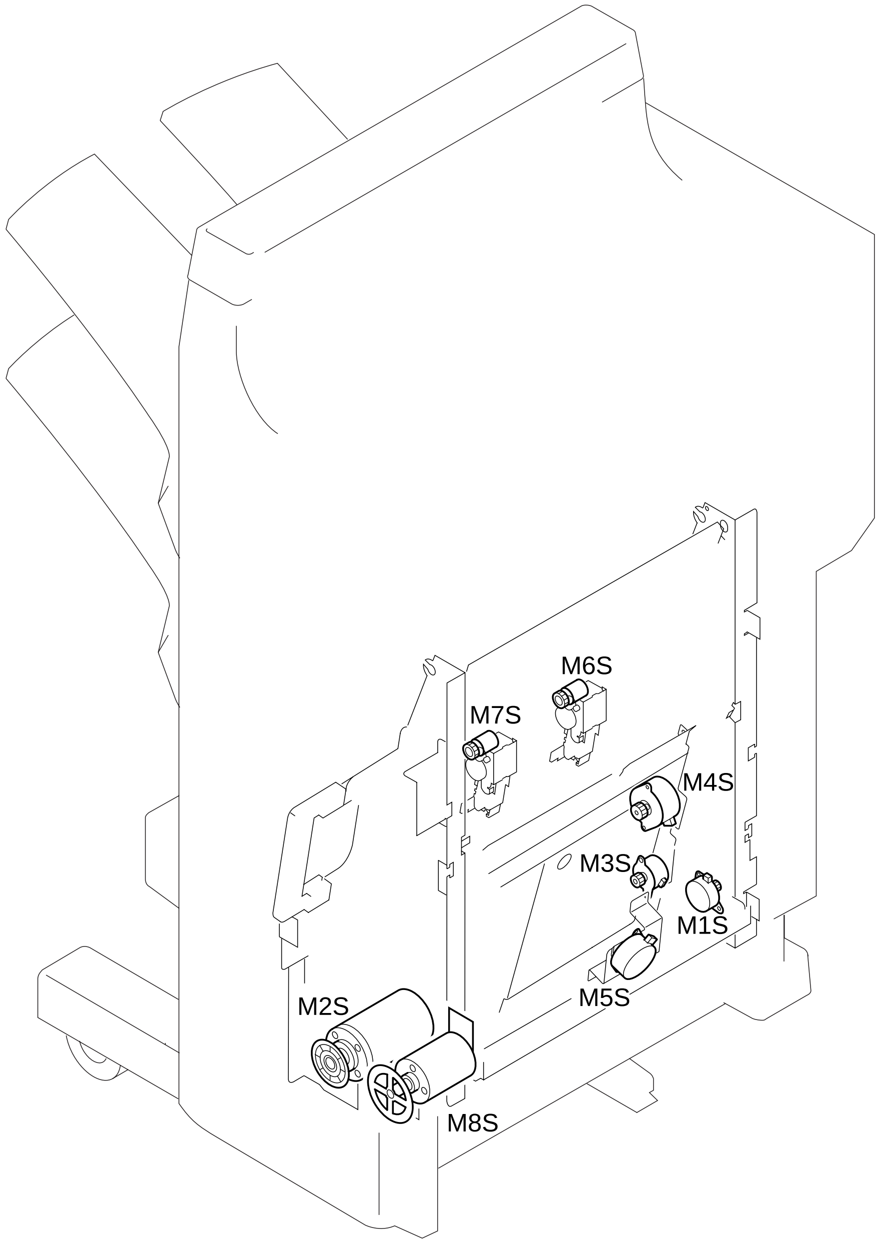


Figure 7-208

Name	Notation	Function
Motor	M1S	Feed motor
	M2S	Paper folding motor
	M3S	Guide motor
	M4S	Paper positioning plate motor
	M5S	Alignment motor
	M6S	Stitcher motor (rear)
	M7S	Stitcher motor (front)
	M8S	Paper pushing plate motor

Table 7-208

4. Solenoids

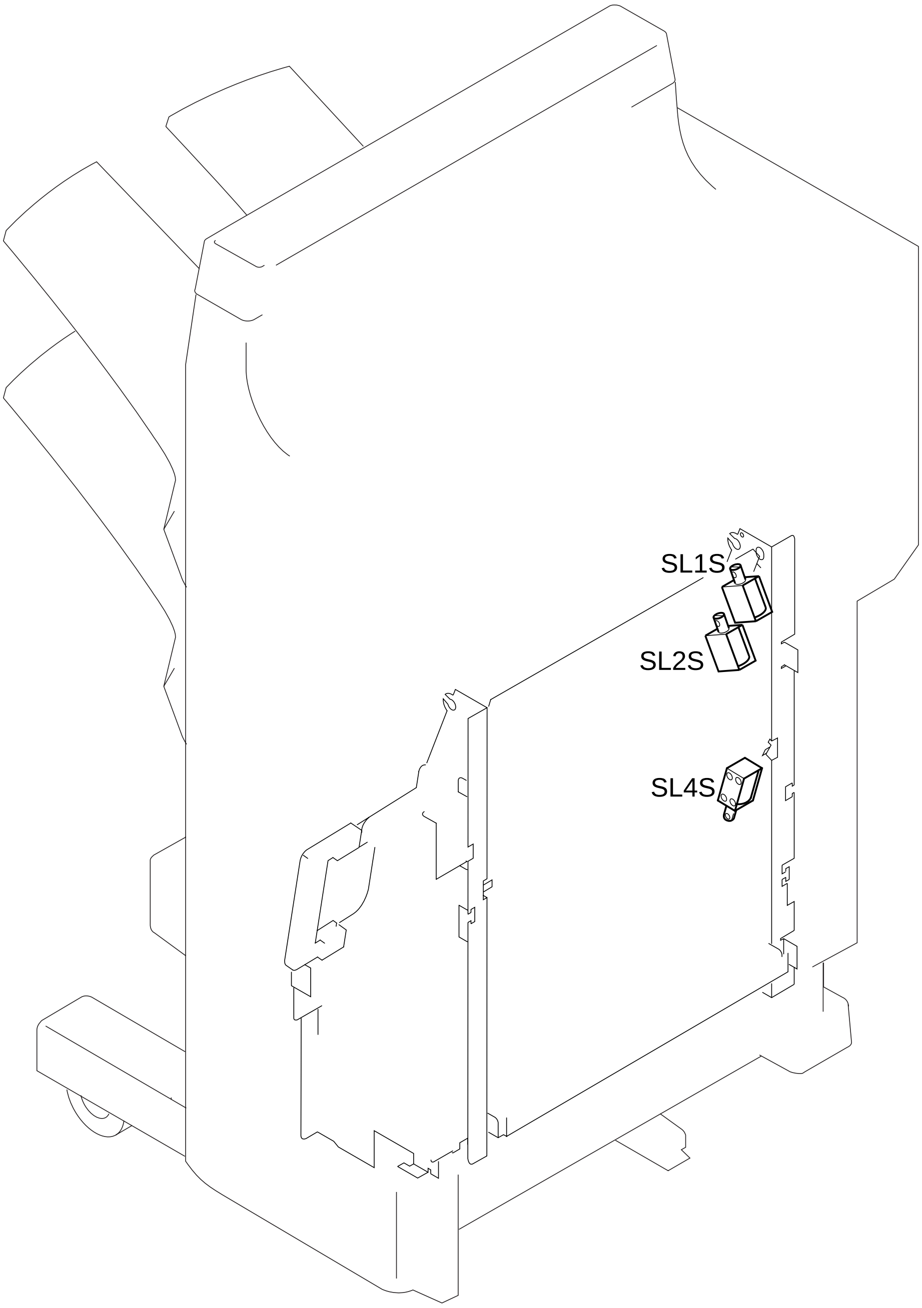


Figure 7-209

Name	Notation	Function
Solenoid	SL1S	No. 1 paper deflecting plate solenoid
	SL2S	No. 2 paper deflecting plate solenoid
	SL4S	Feed plate contact solenoid

Table 7-209

5. PCBs

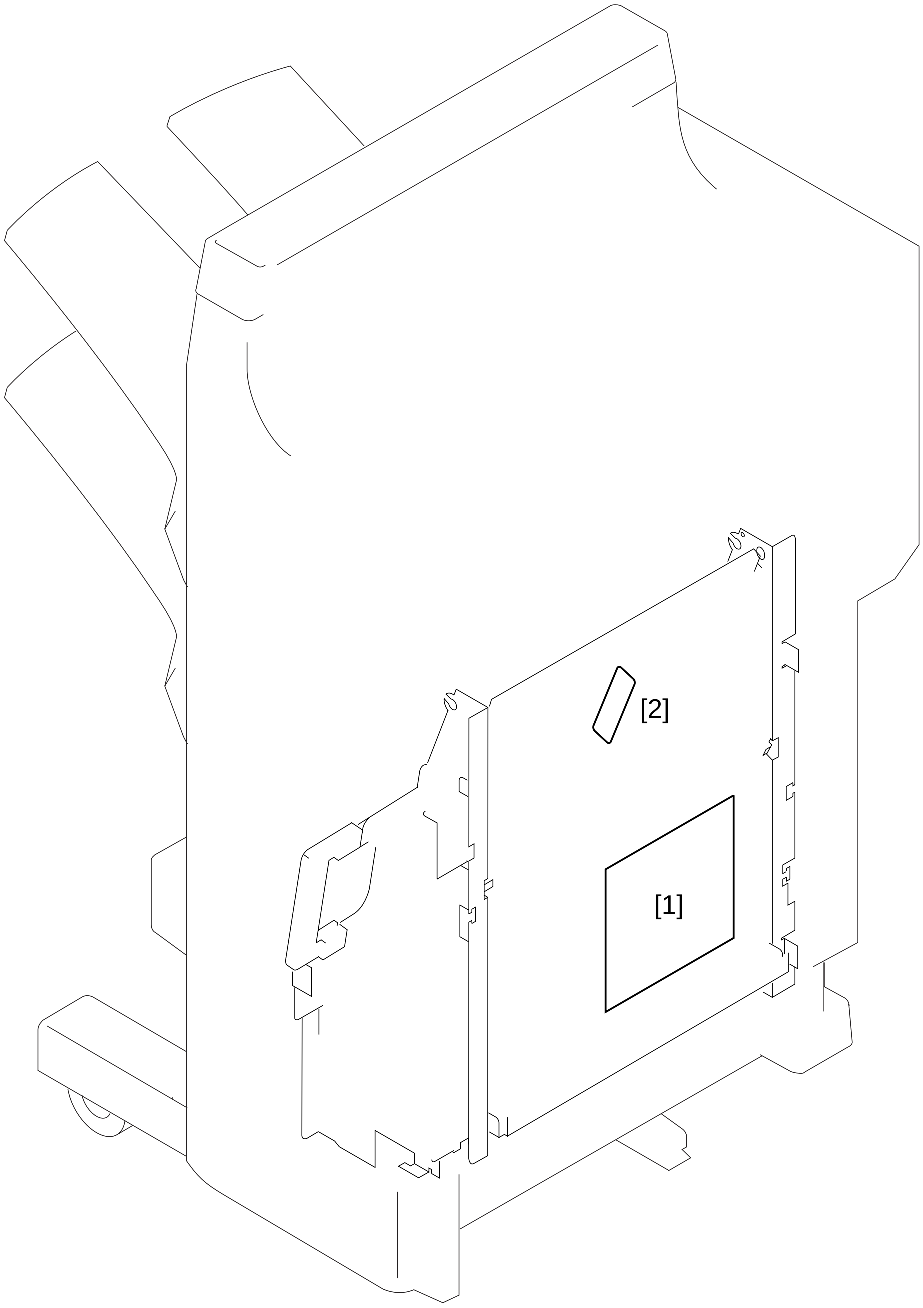


Figure 7-210

Reference	Name
[1]	Saddle stitcher controller PCB
[2]	Paper sensor PCB

Table 7-210

C. Puncher Unit (option)

1. Photointerrupters

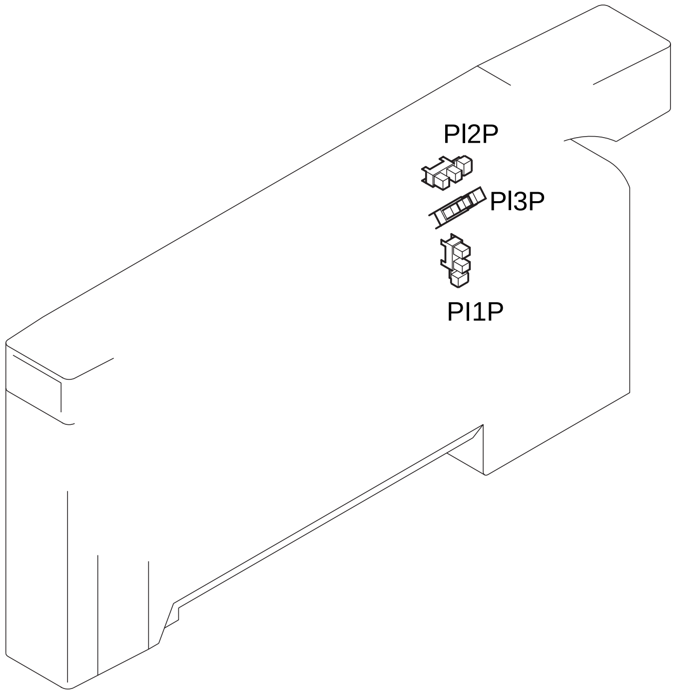


Figure 7-211

Name	Notation	Function
Photointerrupter	PI1P	Horizontal registration home position detection
	PI2P	Punch motor clock detection
	PI3P	Punch home position detection

Table 7-211

2. Microswitches

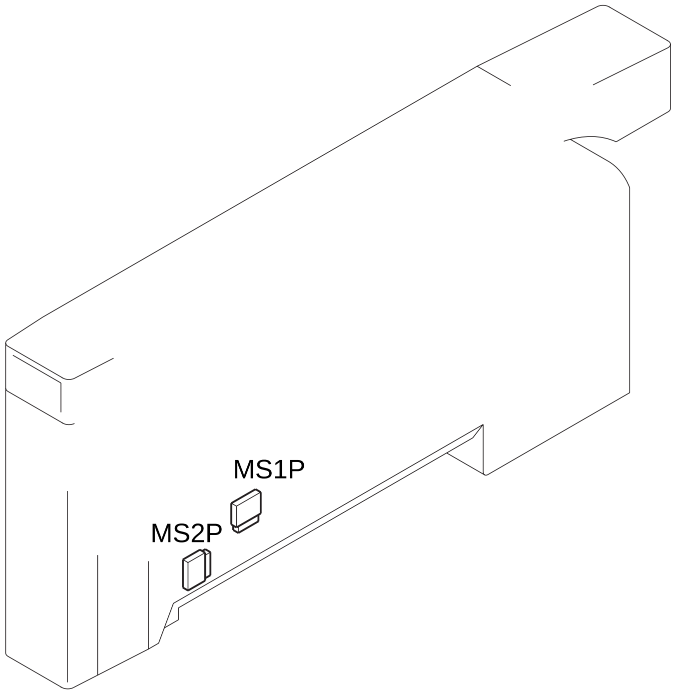


Figure 7-212

Name	Notation	Function
Microswitch	MS1P	Upper door open detection
	MS2P	Front door open detection

Table 7-212

3. Motors

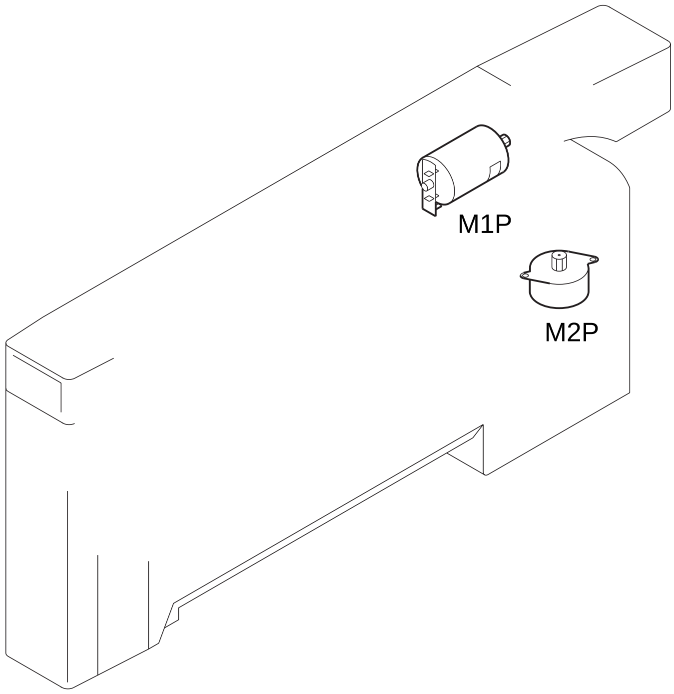


Figure 7-213

Name	Notation	Function
Motor	M1P	Punch motor
	M2P	Horizontal registration motor

Table 7-213

4. PCBs

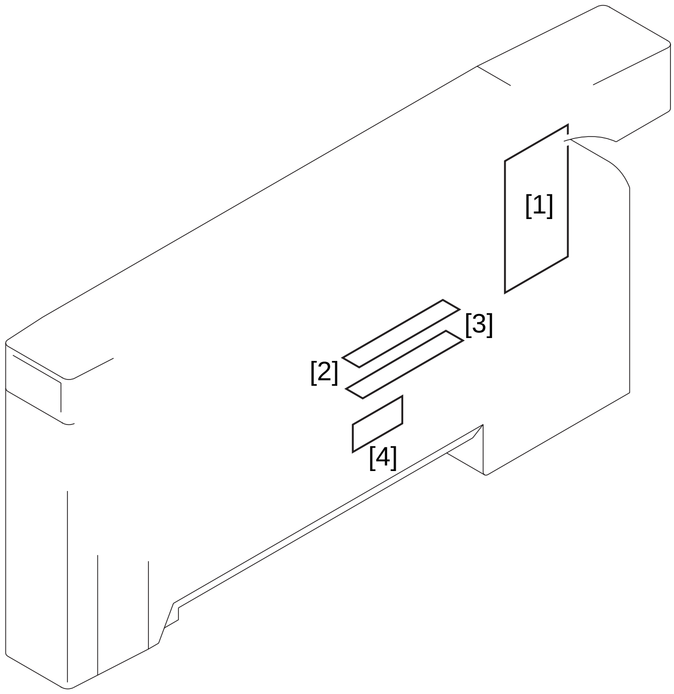


Figure 7-214

Reference	Name
[1]	Punch driver PCB
[2]	Photosensor PCB
[3]	LED PCB
[4]	Scrap full detector PCB

Table 7-214

D. Light-Emitting Diodes (LED) and Check Pins by PCB

This section discusses the LED s and check pins used in the machine that are needed in the field.

Caution:
The VRs and check pins not discussed in this section are for factory use only. Making adjustments and checks using these will require special tools and instruments and adjustments must be to high accuracy. Do not touch them in the field.

1. Finisher Controller PCB

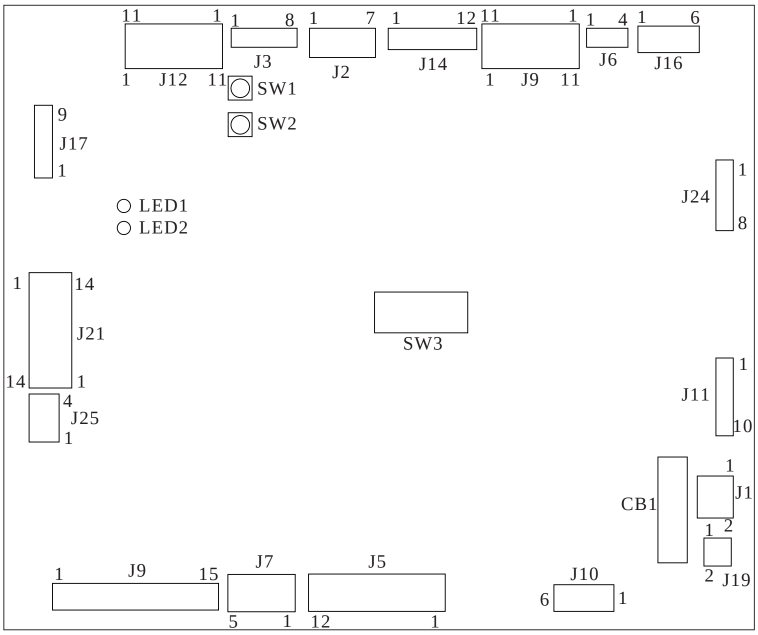


Figure 7-215

Switch	Function
SW1	Adjust the height sensor/alignment plate position/stapling position and move the trays up, etc.
SW2	Adjust the alignment plate position/staple position and move the trays down, etc.
SW3	Adjust the height sensor/alignment plate position and stapling position, etc.

Table 7-215

2. Saddle Stitcher Controller PCB

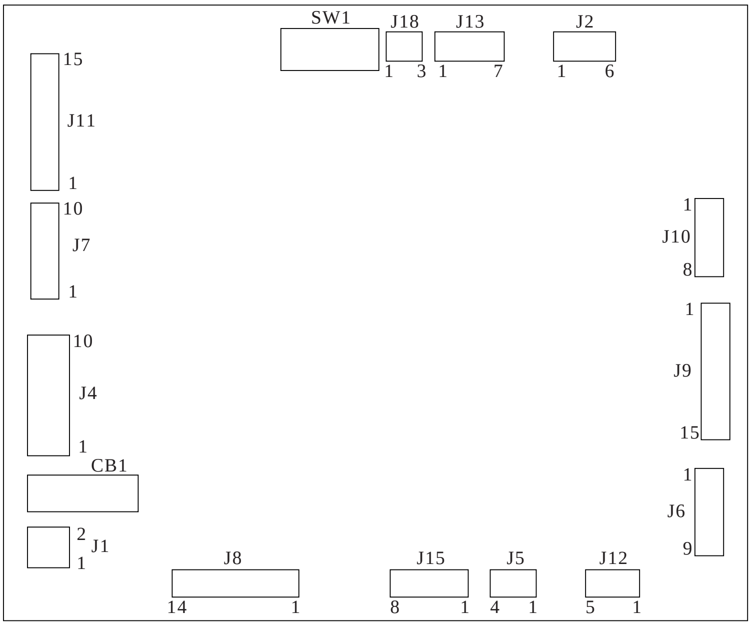


Figure 7-216

Switch	Function
DIPSW1 (bits 1-2)	Starts correction of discrepancy between stitching position and folding position.
DIPSW1 (bits 6-8)	Stores corrected settings for stapling position and folding position.
SW2	Starts correction of discrepancy between stitching position and folding position.

Table 7-216

III. TROUBLESHOOTING

A. Finisher Unit

1. E500 (fault in communication with host machine)

Cause	Step	Checks	Yes/No	Action
Finisher controller PCB, Host machine DC controller PCB	1	Turn the host machine OFF then ON. Is the problem corrected?	Yes	End.
Wiring	2	Is the wiring between the finisher controller PCB and the host machine controller PCB normal?	No	Correct it.
Finisher controller PCB, Host machine DC controller PCB	3	Replace the finisher controller PCB and the host machine DC controller PCB. Is the problem corrected?	Yes	End.

2. E503 (fault in communication with saddle stitcher unit)

Cause	Step	Checks	Yes/No	Action
Finisher controller PCB, Saddle stitcher controller PCB	1	Turn the host machine OFF then ON. Is the problem corrected?	Yes	End.
Wiring	2	Is the wiring between the finisher controller PCB and the saddle stitcher controller PCB normal?	No	Correct it.
Power supply	3	Measure the voltage between J3-2 (+) and J3-1 (–) on the finisher controller PCB. Is it 24 VDC?	No	Replace the finisher controller PCB.
Saddle stitcher controller PCB			Yes	Replace the saddle stitcher controller PCB.

3. E504 (faulty height sensor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Finisher controller PCB	1	Turn the host machine OFF then ON. Is the problem corrected?	Yes	End.
Wiring	2	Is the wiring between the finisher controller PCB and the sensors normal?	No	Correct the wiring.
Power supply	3	Measure the voltage between J6-2 (+) and J6-4 (–) on the finisher controller PCB. Is it 5 VDC?	No	Replace the finisher controller PCB.
Height sensor (PS1)			Yes	Adjust the height sensor once again. If an error occurs again, replace the height sensor.

4. E504 (faulty height sensor; detail code 03)

Cause	Step	Checks	Yes/No	Action
Connector	1	Is J6 on the finisher controller PCB, J114 on the height sensor, or the relay connector J212 disconnected?	Yes	Connect the connector.
Power supply	2	Measure the voltage between J6-2 (+) and J6-4 (–) on the finisher controller PCB. Is it 5 VDC?	No	Replace the finisher controller PCB.
Height sensor (PS1)	3	Is the wiring between the finisher controller PCB and sensors normal?	Yes	Replace the height sensor.
Wiring			No	Correct the wiring.

5. E504 (faulty height sensor; detail code 04)

Cause	Step	Checks	Yes/No	Action
Adjustment	1	Try making adjustments using the DIP switch once again. Is the problem corrected?	Yes	End.
Wiring	2	Is the wiring between the finisher controller PCB and sensors normal?	No	Correct the wiring.
Power supply	3	Measure the voltage between J6-2 (+) and J6-4 (–) on the finisher controller PCB. Is it 5 VDC?	No	Replace the finisher controller PCB.
Height sensor (PS1)			Yes	Replace the height sensor.

6. E505 (faulty back-up RAM; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Finisher controller PCB, punch drive PCB	1	Turn the host machine OFF then ON. Is the problem corrected?	Yes	End.
	2	Replace the finisher controller PCB and punch driver PCB. Is the problem corrected?	Yes	End.

7. E512 (faulty delivery motor)

Cause	Step	Checks	Yes/No	Action
Deliver roller	1	Turn the delivery roller by hand. Does it turn smoothly?	No	Correct mechanical operation.
Delivery motor clock sensor (PI10)	2	Check the delivery motor clock sensor. Is the sensor normal?	No	Replace the sensor.
Finisher controller PCB	3	Does the voltage between J11-4 and J11-5 on the finisher controller PCB change to 24 VDC as soon as the delivery motor starts to rotate?	No	Replace the finisher controller PCB.
			Yes	Check the wiring from the motor to the controller PCB. If normal, replace the motor.

8. E530 (faulty alignment motor)

Cause	Step	Checks	Yes/No	Action
Alignment plate home position sensor (PI6)	1	Check the alignment plate home position sensor. Is it normal?	No	Replace the sensor.
Wiring	2	Is the wiring between the finisher controller PCB and the alignment plate motor normal?	No	Correct the wiring.
Alignment plate	3	Is there any mechanical obstacle in the path of the alignment plate?	Yes	Remove the mechanical obstacle.
Alignment motor (M3)	4	Replace the alignment motor. Is the problem corrected?	Yes	End.
Finisher controller PCB			No	Replace the finisher controller PCB.

9. E531 (faulty staple motor)

Cause	Step	Checks	Yes/No	Action
Wiring	1	Is the wiring between the stapler and the finisher controller PCB normal?	No	Correct the wiring.
Stapler	2	Replace the stapler. Is the problem corrected?	Yes	End.
Finisher controller PCB			No	Replace the finisher controller PCB.

10. E532 (faulty stapler shift motor)

Cause	Step	Checks	Yes/No	Action
Stapler shift home position sensor (PI7)	1	Check the stapler shift home position sensor. Is the sensor normal?	No	Replace the sensor.
Wiring	2	Is the wiring between the finisher controller PCB and the stapler shift motor normal?	No	Correct the wiring.
Stapler shift base	3	Is there any mechanical obstacle in the path of the stapler shift base?	Yes	Remove the mechanical obstacles.
Stapler shift motor (M4)	4	Replace the stapler motor. Is the problem corrected?	Yes	End
Finisher controller PCB			No	Replace the finisher controller PCB.

11. E535 (faulty swing motor; detail code 01)

Cause	Step	Checks	Yes/No	Action
Swinging mechanism	1	Turn the swing motor in reverse by hand. Does the swing guide move up and down?	No	Correct the swing mechanism.
Swing guide closed detection switch 2 (MS6)	2	Is the swing guide closed detection switch 2 normal?	No	Replace the microswitch.
Swing motor (M7)	3	Does the swing motor rotate in reverse at a specific timing?	No	Replace the motor.
Finisher controller PCB			Yes	Replace the finisher controller PCB.

12. E535 (faulty swing motor; detail code 02)

<table>
<tr><th>Cause</th><th>Step</th><th>Checks</th><th>Yes/No</th><th>Action</th></tr>
<tr><td>Swinging mechanism</td><td>1</td><td>Turn the delivery motor in reverse by hand. Does the swing guide move up and down?</td><td>No</td><td>Correct the swinging mechanism.</td></tr>
<tr><td>Swing guide open sensor (PI18)</td><td>2</td><td>Is the swing guide open sensor normal?</td><td>No</td><td>Replace the sensor.</td></tr>
<tr><td>Swing motor (M7)</td><td rowspan="2">3</td><td rowspan="2">Does the swing motor rotate in reverse at a specific timing?</td><td>No</td><td>Replace the motor.</td></tr>
<tr><td>Finisher controller PCB</td><td>Yes</td><td>Replace the finisher controller PCB.</td></tr>
</table>

13. E535 (faulty swing motor; detail code 03)

<table>
<tr><th>Cause</th><th>Step</th><th>Checks</th><th>Yes/No</th><th>Action</th></tr>
<tr><td rowspan="2">Safety range switch (MS3)</td><td>1</td><td>Check the safety range switch. Is the switch normal?</td><td>No</td><td>Replace the switch.</td></tr>
<tr><td>2</td><td>Is the safety range detection switch pressed correctly?</td><td>No</td><td>Correct mechanical operation.</td></tr>
<tr><td rowspan="2">Swing guide closed detection switch 2 (MS6)</td><td>3</td><td>Check the swing guide closed detection switch 2. Is the switch normal?</td><td>No</td><td>Replace the switch.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Is the swing guide closed detection switch 2 pressed correctly?</td><td>No</td><td>Correct mechanical operation.</td></tr>
<tr><td>Finisher controller PCB</td><td>Yes</td><td>Replace the finisher controller PCB.</td></tr>
</table>

14. E535 (faulty swing motor; detail code 04)

Cause	Step	Checks	Yes/No	Action
Swing motor clock sensor (PI20)	1	Check the swing motor clock sensor. Is the sensor normal?	No	Replace the sensor.
Finisher controller PCB	2	Does the voltage of the swing motor between J11-6 and -7 on the finisher controller PCB reach 24 V at a specific rotation timing?	No	Replace the finisher controller PCB.
			Yes	Check the wiring from the motor to the finisher controller PCB. If normal, replace the motor.

15. E540 (faulty tray lift motor; detail code 01)

Cause	Step	Checks	Yes/No	Action
Tray home position sensor (PI8)	1	Check the tray home position sensor. Is it normal?	No	Replace the sensor.
Tray lift mechanism	2	Check the tray lift mechanism. Is the mechanism normal?	No	Correct the mechanism.
Finisher controller PCB	3	Is the tray lift motor supplied with 24 VDC by the finisher controller PCB as soon as the tray is driven?	No	Replace the finisher controller PCB.
Wiring	4	Check the wiring from the finisher controller PCB to the tray lift motor. Is the wiring normal?	No	Correct the wiring.
Tray lift motor (M5)			Yes	Replace the tray lift motor.

16. E540 (faulty tray lift motor; detail code 02)

Cause	Step	Checks	Yes/No	Action
Tray position	1	Is the tray at the tray upper limit switch?	Yes	Lower the tray.
Tray upper limit switch (MS5)	2	Check the tray upper limit switch. Is the switch normal?	No	Replace the switch.
Wiring	3	Check the wiring from the finisher controller PCB to the tray upper limit switch. Is the wiring normal?	No	Correct the wiring.
Finisher controller PCB			Yes	Replace the finisher controller PCB.

17. E540 (faulty tray motor; detail code 03)

Cause	Step	Checks	Yes/No	Action
___	1	Does the tray move up/down?	No	Go to step 2.
			Yes	Go to step 4.
	2	Is the motor supplied with power by the finisher controller PCB as soon as the tray moves up/down?	Yes	Go to step 3.
Finisher controller PCB			No	Replace the finisher controller PCB.
Tray lift mechanism	3	Is there a fault in the tray lift mechanism?	Yes	Correct the tray lift mechanism.
Tray lift motor (M5)			No	Replace the tray lift motor.
Tray lift motor clock sensor 1/2 (PI9/19)	4	Is the tray lift motor clock sensor 1/2 normal?	No	Replace the sensor PCB.
Finisher controller PCB			Yes	Replace the finisher controller PCB.

18. E584 (faulty second feed motor; detail code 01)

Cause	Step	Checks	Yes/No	Action
Second feed motor (M8)	1	Does the second feed motor in reverse at a specific timing?	No	Replace the second feed motor or the finisher controller PCB.
Shutter mechanism	2	Are the shutter and the shutter upper/lower bar engaged correctly?	No	Engage them correctly.
	3	Turn the feed roller 2 in reverse by hand. Does the shutter upper/lower bar move up/down?	No	Correct mechanism from the shutter upper/ lower bar to the gear of the feed roller 2.
Shutter open detection sensor (PI5)	4	Is the shutter open detection sensor normal?	No	Replace the sensor.
Finisher controller PCB			Yes	Replace the finisher controller PCB.

19. E584 (faulty second feed motor; detail code 02)

Cause	Step	Checks	Yes/No	Action
Second feed motor (M8)	1	Does the second feed motor rotate in reverse at a specific timing?	No	Replace the second feed motor or the finisher controller PCB.
Shutter mechanism	2	Are the shutter and the shutter upper/lower bar engaged correctly?	No	Engage them correctly.
	3	Turn the feed roller 2 in reverse by hand. Does the shutter upper/lower bar move up/down?	No	Correct the mechanism from the shutter upper/lower bar to the gear of the feed roller 2.
Shutter closed detection switch (MS4)	4	Is the shutter closed detection switch normal?	No	Replace the switch.
Finisher controller PCB			Yes	Replace the finisher controller PCB.

20. E584 (faulty second feed motor; detail code 03)

Cause	Step	Checks	Yes/No	Action
Safety range switch (MS3)	1	Check the safety range switch. Is the switch normal?	No	Replace the switch.
	2	Is the safety range detection switch passed correctly?	No	Correct mechanical operation.
Shutter closed detection switch (MS4)	3	Check the shutter closed detection switch. Is the switch normal?	No	Replace the switch.
	4	Is the shutter closed detection switch pressed correctly?	No	Correct the mechanism.
Finisher controller PCB			Yes	Replace the finisher controller PCB.

B. Saddle Stitcher Unit

1. E5F0 (faulty paper positioning plate; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Paper positioning plate home position sensor (PI7S)	1	Check the paper positioning plate home position sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	2	Do the paper positioning plates operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB.
Paper positioning plate motor (M4S)			No	Check the positioning plate drive mechanism. If a fault is found, correct it. Otherwise, go to step 3.
	3	Replace the paper positioning plate motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

2. E5F1 (faulty paper folding motor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Paper folding motor clock sensor (PI4S)	1	Check the paper folding motor clock sensor. Is the sensor normal?	No	Replace the sensor.
Paper folding home position sensor (PI21S)	2	Check the paper folding home position sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	3	Does the paper folding motor operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB.
Paper folding motor (M2S)			No	Check the paper folding roller drive mechanism. If a fault is found, correct it. Otherwise, go to step 4.
	4	Replace the paper folding motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

3. E5F2 (faulty guide motor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Guide home position sensor (PI13S)	1	Check the guide home position sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	2	Does the guide motor operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB.
Guide motor (M3S)			No	Check the guide plate drive mechanism. If a fault is found, correct it. Otherwise, go to step 3.
	3	Replace the guide motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

4. E5F3 (faulty alignment motor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Alignment plate home position sensor (PI5S)	1	Check the alignment plate home position sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	2	Does the alignment motor operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB.
Alignment motor (M5S)			No	Check the alignment plate drive mechanism. If a fault is found, correct it. Otherwise, go to step 3.
	3	Replace the alignment motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

5. E5F4/E5F5 (faulty stitcher; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Stitcher (installation)	1	Are the front and rear stitchers and bases installed correctly?	No	Install them correctly.
Stitching home position switch (MS7S/MS5S)	2	Is the stitching home position switch of the front and the rear stitchers normal?	No	Replace the front or rear stitcher.
Saddle stitcher controller PCB	3	Do the front and the rear stitchers operate at a specific timing?	Yes	Check the wiring between the stitcher and the saddle stitcher controller PCB. If normal, replace the controller PCB.
Stitcher motor (M7S/M6S)			No	Replace the front or the rear stitcher.

6. E5F6 (faulty paper pushing plate motor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Paper pushing plate home position sensor (PI14S)	1	Check the paper pushing plate home position sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	2	Does the paper pushing plate motor operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB
Paper pushing plate motor (M8S)			No	Check the paper pushing plate drive mechanisms. If a fault is found, correct it. Otherwise, go to step 3.
	3	Replace the paper pushing plate motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

7. E5F6 (faulty paper pushing plate motor; detail code 03)

Cause	Step	Checks	Yes/No	Action
Paper pushing top position sensor (PI15S)	1	Check the paper pushing plate top position sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	2	Does the paper pushing plate motor operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB.
Paper pushing plate motor (M8S)			No	Check the paper pushing plate drive mechanism. If a fault is found, correct it. Otherwise, go to step 3.
	3	Replace the paper pushing plate motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

8. E5F6 (faulty paper pushing plate motor; detail code 04)

Cause	Step	Checks	Yes/No	Action
Paper pushing plate motor clock sensor (PI1S)	1	Check the paper pushing plate motor clock sensor. Is the sensor normal?	No	Replace the sensor.
Saddle stitcher controller PCB	2	Does the paper pushing plate motor operate at a specific timing?	Yes	Replace the saddle stitcher controller PCB.
Paper pushing plate motor (M8S)			No	Check the paper pushing plate drive mechanism. If a fault is found, correct it. Otherwise, go to step 3.
	3	Replace the paper pushing plate motor. Is the problem corrected?	Yes	End.
Saddle stitcher controller PCB			No	Replace the saddle stitcher controller PCB.

9. E5F8 (disconnected sensor connector; detail code 01)

Cause	Step	Checks	Yes/No	Action
Guide home position sensor (PI13S; disconnected)	1	Are the connectors of the guide home position sensor and the saddle stitcher controller PCB connected correctly?	No	Connect the connectors.
Wiring	2	Is the wiring between the sensor and the saddle stitcher broken?	Yes	Correct the wiring.
Power supply	3	Is 5 VDC present at J9-7 on the saddle stitcher controller PCB?	No	Replace the saddle stitcher controller PCB.
Ground	4	Is J9-8 on the saddle stitcher controller PCB grounded correctly?	No	

10. E5F8 (disconnected sensor connector; detail code 02)

Cause	Step	Checks	Yes/No	Action
Paper pushing plate home position sensor (PI14S; disconnected)	1	Are the connectors of the paper pushing plate home position sensor and the saddle stitcher controller PCB connected correctly?	No	Connect the connectors.
Wiring	2	Is the wiring between the sensor and the saddle stitcher broken?	Yes	Correct the wiring.
Power supply	3	Is 5 VDC present at J9-10 on the saddle stitcher controller PCB?	No	Replace the saddle stitcher controller PCB.
Ground	4	Is J9-11 on the saddle stitcher controller PCB grounded correctly?	No	

11. E5F8 (disconnected sensor connector; detail code 03)

Cause	Step	Checks	Yes/No	Action
Paper pushing plate home position top position sensor (PI15S; disconnected)	1	Are the connectors of the paper pushing plate top position sensor and the saddle stitcher controller PCB connected correctly?	No	Connect the connectors.
Wiring	2	Is the wiring between the sensor and the saddle stitcher broken?	Yes	Correct the wiring.
Power supply	3	Is 5 VDC present at J9-13 on the saddle stitcher controller PCB?	No	Replace the saddle stitcher controller PCB.
Ground	4	Is J9-14 on the saddle stitcher controller PCB grounded correctly?	No	

12. E5F9 (faulty microswitch; detail code 01)

Cause	Step	Checks	Yes/No	Action
Switch actuator	1	Check the switch actuator of the inlet door. Do the switch and the sensor operate correctly?	No	Correct the mechanism.
Inlet door switch (MS1S)	2	Check the inlet door switch. Is the switch normal?	No	Replace the switch.
Inlet cover sensor (PI9S)	3	Measure the voltage at J10-8 on the saddle stitcher controller PCB with the inlet cover open. Is it 5 V?	Yes	The sensor is faulty. Replace the sensor.
Power supply, wiring	4	Measure the voltage between J19-1 (+) and J19-2 (–) on the finisher controller PCB. Is it 24 V?	No	Replace the finisher controller PCB.
			Yes	Check the wiring between J19 on the finisher controller PCB and J1 on the saddle stitcher controller PCB. If a fault is found, correct it. Otherwise, replace the saddle stitcher controller PCB.

13. E5F9 (faulty microswitch; detail code 02)

Cause	Step	Checks	Yes/No	Action
Switch actuator	1	Check the switch actuator of the front door. Do the switch and the sensor operate correctly?	No	Correct the mechanism.
Front door switch (MS2S)	2	Check the front door switch. Is the switch normal?	No	Replace the switch.
Front door open/closed sensor (PI12S)	3	Measure the voltage at J11-12 on the saddle stitcher controller PCB with the front door open. Is it 5 V?	Yes	The sensor is faulty. Replace the sensor.
			No	Replace the saddle stitcher controller PCB.

14. E5F9 (faulty microswitch; detail code 03)

Cause	Step	Checks	Yes/No	Action
Switch actuator	1	Check the delivery door switch actuator. Do the switch and the sensor operate correctly?	No	Correct the mechanism.
Delivery switch (MS3S)	2	Check the delivery door switch. Is the switch normal?	No	Replace the switch.
Delivery cover sensor (PI3S)	3	Measure the voltage at J11-9 on the saddle stitcher controller PCB with the delivery door open. Is it 5 V?	Yes	The sensor is faulty. Replace the sensor.
			No	Replace the saddle stitcher controller PCB.

C. Puncher Unit (option)

1. E590 (faulty punch motor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Punch motor clock sensor (PI2P)	1	Check the punch motor clock sensor. Is the sensor normal?	No	Replace the sensor.
Punch home position sensor (PI3P)	2	Check the punch home position sensor. Is the sensor normal?	No	Replace the sensor.
Wiring	3	Is the wiring between the punch home position sensor and the finisher controller PCB normal?	No	Correct the wiring.
Punch mechanism	4	Is there any trouble with the punch mechanism?	Yes	Correct the punch mechanism.
Punch motor (M1P)			No	Replace the punch motor.
Punch driver PCB	5	Replace the punch driver PCB. Is the problem corrected?	No	Replace the finisher controller PCB.
			Yes	End.

2. E593 (faulty horizontal registration motor; detail code 01/02)

Cause	Step	Checks	Yes/No	Action
Horizontal registration home position sensor (PI1P)	1	Check the horizontal registration home position sensor. Is the sensor normal?	No	Replace the sensor.
Wiring	2	Is the wiring between the horizontal registration home position sensor and the finisher controller PCB normal?	No	Correct the wiring.
Horizontal registration mechanism	3	Is there any problem with the horizontal registration mechanism?	Yes	Correct the horizontal registration mechanism.
Horizontal registration motor (M2P)			No	Replace the horizontal registration motor.
Punch driver PCB	4	Replace the punch driver PCB. Is the problem corrected?	No	Replace the finisher controller PCB.
			Yes	End.

IV. SELF-DIAGNOSIS

The CPU (Q1) on the machine's finisher controller PCB or on the saddle stitcher controller PCB is equipped with a self diagnosis function. This function runs a check at programmed times and sends an error code and a detail code to the host machine upon detection of a fault. You can check the code on the host machine control panel and detail code using the host machine service mode.

A. Finisher Unit

Error code	Detail code	Error type	Description
E500	—	· Data communication error	· Communications between the host machine and the finisher unit is disrupted. This error is detected by the host machine.
E503	02	· Communication error	· Communications with the saddle stitcher unit is disrupted.
E504	01	· Height sensor (PS1)	· Communications is not possible between the height sensor and the finisher controller PCB. Or, there is a fault in communication data.
	02		· Communications between the sensor and the finisher controller is not possible for a specific period of time.
	03		· The sensor is identified as being disconnected at power-ON.
	04		· Sensor adjustment using a DIP switch has a fault.
E505	01	· Back-up RAM	· There is a fault in the checksum value of the finisher controller PCB at power-ON.
	02		· There is a fault in the checksum value of the punch driver PCB at power-ON.
E512	01	· Delivery motor (M2) · Delivery motor clock sensor (PI10)	· A specific number of clock pulses have not been obtained from the delivery motor clock sensor at the beginning of operation.
	02		· Clock pulses in numbers equivalent to a feed length of 200 mm are not obtained while paper is being fed.
E530	01	· Alignment motor (M3) · Alignment plate home position sensor (PI6)	· The alignment plate does not leave the alignment home position sensor even after the alignment motor has operated for 2 sec.
	02		· The alignment plate does not return to the alignment plate home position sensor even after the alignment motor has operated for 2 sec.

Error code	Detail code	Error type	Description
E531	01	· Staple motor (M6) · Staple home position detection switch (MS7)	· The stapler does not leave the stapling home position even after the stapler motor has operated for 0.5 sec.
	02		· The stapler does not return to the stapling home position even after the stapler motor has operated for 0.5 sec.
E532	01	· Stapler shift motor (M4) · Stapler shift home position sensor (PI7)	· The stapler shift home position sensor does not turn OFF even after the stapler shift motor has operated for 4 sec.
	02		· The stapler shift home position cannot be detected even after the stapler shift motor has operated for 4 sec.
E535	01	· Swing motor (M7) · Swing guide closed detection switch 2 (MS6)	· The swing guide closed detection switch does not turn ON even after the swing motor has rotated counterclockwise for 1 sec.
	02	· Swing motor (M7) · Swing guide open detecting sensor (PI18)	· The swing guide open detection sensor does not turn ON even after the swing motor has rotated clockwise for 1 sec.
	03	· Safety range switch (MS3) · Swing guide closed detection switch 2 (MS6)	· The swing guide closed detection switch is OFF when the tray 1/2 is at the safety range switch OFF position.
	04	· Swing motor (M7) · Swing motor clock sensor (PI20)	· The clock pulse is discontinued for 200 ms during swing operation.
E540	01	· Tray lift motor (M5) · Tray lift motor clock sensor 1/2 (PI9/PI19) · Tray home position sensor (PI8)	· The movement does not end within 15 sec after the tray lift motor is driven. · The tray home position cannot be detected after the tray lift motor has been driven for 15 sec.
	02	· Tray upper limit detection switch (MS5)	· The tray upper limit detection switch is ON while the tray is moving up.
	03	· Tray lift motor (M5) · Tray lift motor clock sensor 1/2 (PI9/PI19)	· Clock pulses from the clock sensor 1/2 are not obtained for 200 ms after the tray lift motor has been driven.
E584	01	· Second feed motor (M8) · Shutter closed detection switch (MS4)	· The shutter closed detection switch does not turn ON after the second feed motor has rotated counterclockwise for 1 sec or more.
	02	· Second feed motor (M8) · Shutter open sensor (PI5)	· The shutter open sensor does not turn ON after the second feed motor has rotated counterclockwise for 1 sec or more.
	03	· Safety range detection switch (MS3) · Shutter closed detection switch (MS4)	· The shutter closed detection switch is OFF when the tray 1/2 is at the safety range switch OFF position during operation of the tray lift motor.

B. Saddle Stitcher Unit

Error code	Detail code	Error type	Description
E5F0	01	· Paper positioning plate motor (M4S) · Paper positioning plate home position sensor (PI7S)	· The paper positioning plate home position sensor does not turn ON even after the paper positioning plate motor has been driven for 1.33 sec or more.
	02		· The paper positioning plate home position sensor does not turn OFF even after the paper positioning plate motor has been driven for 1 sec or more.
E5F1	01	· Paper folding motor (M2S) · Paper folding motor clock sensor (PI4S)	· The number of detecting pulses from the paper folding motor clock sensor drops below a specific value.
	02	· Paper folding motor (M2S) · Paper folding home position sensor (PI21S)	· The state of the paper folding home position sensor does not change even after the paper folding motor has driven for 3 sec.
E5F2	01	· Guide motor (M3S) · Guide home position sensor (PI13S)	· The guide home position sensor does not turn ON even after the guide motor has been driven for 0.455 sec or more.
	02		· The guide home position sensor does not turn OFF even after the guide motor has been driven for 1 sec or more.
E5F3	01	· Alignment motor (M5S) · Alignment plate home position sensor (PI5S)	· The alignment plate home position sensor does not turn ON even when the alignment motor has been driven for 0.5 sec or more. (During initial operation, the motor is driven for 1.67 sec.)
	02		· The alignment plate home position sensor does not turn OFF even when the alignment motor has been driven for 1 sec or more.
E5F4	01	· Stitcher motor (rear, M6S) · Stitching home position sensor (rear, MS5S)	· The stitching home position sensor does not turn OFF even when the stitcher motor (rear) has been rotated clockwise for 0.5 sec or more.
	02		· The stitching home position sensor does not turn ON even when the stitcher motor (rear) has been rotated counterclockwise for 0.5 sec or more.
E5F5	01	· Stitcher motor (front, M7S) · Stitching home position sensor (front, MS7S)	· The stitching home position sensor does not turn OFF even when the stitcher motor (front) has been rotated clockwise for 0.5 sec or more.
	02		· The stitching home position sensor does not turn ON even when the stitcher motor (front) has been rotated counterclockwise for 0.5 sec or more.
E5F6	01	· Paper pushing plate motor (M8S) · Paper pushing plate home position sensor (PI14S)	· The paper pushing plate home position sensor does not turn ON even when the paper pushing plate motor has been driven for 0.3 sec or more.
	02		· The paper pushing plate home position sensor does not turn OFF even when the paper pushing plate motor has been driven for 80 msec or more.

Error code	Detail code	Error type	Description
E5F6	03	· Paper pushing plate motor (M8S) · Paper pushing plate top position sensor (PI15S)	· The paper pushing plate top position sensor does not turn OFF even after the paper pushing plate motor has been driven for 80 msec or more.
	04	· Paper pushing plate motor (M8S) · Paper pushing plate motor clock sensor (PI1S)	· The number of clock pulses for the paper pushing plate motor clock sensor drops below a specific value.
	05	· Paper pushing plate motor (M8S) · Paper pushing plate top position sensor (PI15S)	· The paper pushing plate top position sensor does not turn ON when the paper pushing plate motor has been driven for 0.3 sec or more.
E5F8	01	· Guide home position sensor (PI13S) connector	· The connector of the guide home position sensor is identified as being disconnected.
	02	· Paper pushing plate home position sensor (PI14S) connector	· The connector of the paper pushing plate home position sensor is identified as being disconnected.
	03	· Paper pushing plate top position sensor (PI15S) connector	· The connector of the paper pushing plate top position sensor is identified as being disconnected.
E5F9	01	· Inlet door switch (MS1S) · Front door switch (MS2S) · Delivery door switch (MS3S)	· After any of the following three photointerrupters used for the covers has found that its respective door is closed, the inlet door switch is identified as being open as soon as copying status or 1 sec or more after the start of the host machine initial rotation. · Inlet cover sensor (PI9S) · Front door open/closed sensor (PI2S) · Delivery cover sensor (PI3S) (The front door switch (MS2S) or the delivery door switch (MS3S) may be also open.)
	02	· Front door switch (MS2S) · Delivery door switch (MS3S)	· After any of the following three photointerrupters used for the covers has found that its respective door is closed, the front door switch is identified as being open as soon as copying status or 1 sec or more after the start of the host machine initial rotation. · Inlet cover sensor (PI9S) · Front door open/closed sensor (PI2S) · Delivery cover sensor (PI3S) (The delivery door switch (MS3S) may be also open.)
	03	· Delivery door switch (MS3S)	· After any of the following three photointerrupters used for the covers has found that its respective door is closed, the delivery door switch is identified as being open as soon as copying status or 1 sec or more after the start of the host machine initial rotation. · Inlet cover sensor (PI9S) · Front door open/closed sensor (PI2S) · Delivery cover sensor (PI3S)

C. Puncher Unit (option)

Error code	Detail code	Error type	Description
E590	01	· Punch motor (M1P) · Punch motor clock sensor (PI2P) · Punch home position sensor (PI3P)	· The punch motor clock sensor cannot detect the clock pulse within 100 ms.
	02		· The puncher does not leave the punch home position sensor even after the punch motor has operated for 200 ms. · The puncher does not return to the punch home position sensor even after the punch motor has operated for 200 ms.
	03		· The target number of clock pulses cannot be obtained from the punch motor clock sensor at start of operation.
E593	01	· Horizontal registration motor (M2P) · Horizontal registration home position sensor (PI1P)	· The puncher does not leave the horizontal registration home position even after the horizontal registration motor has operated for 4 sec.
	02		· The puncher does not return to the horizontal registration home position even after the horizontal registration motor has operated for 4 sec.

D. Alarms

1. Finisher unit alarms

Error	Condition	Detection timing	Machine operation	Resetting
Staple jam	· Alignment of staples cannot be performed properly.	· During staple alignment.	· Normal operation can be continued. However, whether or not normal operation is continued depends on the instruction from the host machine.	· Check the staple cartridge, and align the staples again.
No stapler	· The stapler is not attached.	· Monitored at all times.	· Operation of staple motor (M6) and stapler move motor (M4) is prohibited.	· Attach the stapler.
No staples	· The staple cartridge has run out of staples.	· Monitored at all times.	· Normal operation can be continued. However, whether or not normal operation is continued depends on the instruction from the host machine.	· Replace the staple cartridge. Or, load it correctly.

2. Saddle stitcher unit alarms

a. Stack exceeded alarm

Error	Condition	Detection timing	Machine operation	Resetting
Stack exceeded	· The stack of sheets on the output tray exceeds the maximum number of sheets that can be stacked.	· When output of the sheet that cause an excess is output on the output tray.	· Normal operation is continued.	· Remove the stack of sheets from the tray.
Stitching capacity error	· The number of sheets in the holding area has exceeded 15.	· When the sheet that causes an excess is output to the holding area.	· Stitching is prohibited.	· Remove the sheets from the holding area.

b. Stitcher Alarm

Error	Condition	Detection timing	Machine operation	Resetting
Stitching capacity error	· The number of sheets in the holding area has exceeded 15.	· When the sheet that causes an excess is output to the holding area.	· Stitching is prohibited.	· Remove the sheets from the holding area.
Mixed paper sizes	· Sheets of different sizes are output in the holding area.	· When the sheet that causes the fault is output to the holding area.	· Stitching is prohibited. · Alignment is prohibited.	· Remove the sheets from the holding area.
Staple shortage	· Staples have been pulled out of the stitcher unit. · The number of staples is inadequate.	· When a shortage of staples is detected except during stitching operation.	· Stitching is prohibited. · The staple shortage is communicated to the host machine.	· Load a new staple cartridge.

3. Puncher unit (option) alarms

Error	Condition	Detection timing	Machine operation	Resetting
Punch scrap full	· Punch scrap has reached the allowable value inside the punch scrap container.	· During punching.	· Normal operation is continued.	· Remove the punch scrap from the holding area.
Punch scrap error	· Copies are stacked with the punch scrap exceeding the allowable value inside the punch scrap container. Or, the punch scrap container is not loaded.	· During punching. Or, when the punch front cover is closed.	· Stacking operations including punching are prohibited.	· Remove the punch scrap from the holding area. · Load the punch scrap container.

E. Host Machine I/O Notations

A. Finisher Unit

Address	bit	Description	Signal	Connector	Remarks
IO-P01 (output)	bit0	–	–	–	
	bit1	–	–	–	
	bit2	Second feed motor phase A output	–	J16-6	
	bit3	Second feed motor phase B output	–	J16-5	
	bit4	Staple shift motor phase B output	–	J8-2	
	bit5	Staple shift motor phase A output	–	J8-1	
	bit6	Alignment motor phase B output	–	J9B-9	
	bit7	Alignment motor phase A output	–	J9B-10	
	bit8-15	–	–	–	
IO-P02 (output)	bit0	Tray lift motor PWM	–	–	
	bit1	Delivery motor PWM	–	–	
	bit2	Swing motor PWM	–	–	
	bit3	Punch motor PWM	–	–	
	bit4	Horizontal registration motor phase B output	–	J1A-10	
	bit5	Horizontal registration motor phase A output	–	J1A-11	
	bit6	Tray lift motor down drive output	–	–	H: down
	bit7	Tray lift motor up drive output	–	–	H: up
	bit8-15	–	–	–	
IO-P03 (output)	bit0	–	–	–	
	bit1	LED2 ON Signal (output)	–	–	L: on
	bit2	–	–	–	
	bit3	Height sensor (input)	–	–	
	bit4	LED1 ON Signal (output)	–	–	H: on
	bit5	Height sensor external clock (input)	–	–	
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	

Address	bit	Description	Signal	Connector	Remarks
IO-P04 (input)	bit0	Scrap full detection signal	DFULL	J1B-9	
	bit1	24V output discontinue detection signal	–	–	
	bit2	SIDE REGISTRATION DETECT Signal 1	SREG1	J7-11	
	bit3	SIDE REGISTRATION DETECT Signal 2	SREG2	J7-10	
	bit4	SIDE REGISTRATION DETECT Signal 3	SREG3	J7-9	
	bit5	SIDE REGISTRATION DETECT Signal 4	SREG4	J7-8	
	bit6	PAPER END DETECT Signal	PAEND	J7-7	
	bit7	Punch LED ON Signal (output)	–	–	
	bit8-15	–	–	–	
IO-P05 (output)	bit0	Inlet feed motor phase A output	–	J17-1	
	bit1	Inlet feed motor phase B output	–	J17-2	
	bit2	–	–	–	
	bit3	–	–	–	
	bit4	–	–	–	
	bit5	–	–	–	
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P06 (input)	bit0	STAPLE TRAY PAPER DETCT Signal	STPTY	J9A-3	L: paper present
	bit1	PUNCH MOTOR CLOCK DETECT Signal	–	–	
	bit2	First feed motor phase A output	–	J10-6	
	bit3	First feed motor phase B output	–	J10-5	
	bit4	Second feed motor clock input	–	–	
	bit5	Inlet feed motor clock input	–	–	
	bit6	First feed motor clock input	–	–	
	bit7	DELIVERY MOTOR CLOCK DETECT Signal	DELCLK	J9A-8	
	bit8-15	–	–	–	

Address	bit	Description	Signal	Connector	Remarks
IO-P07 (input)	bit0	–	–	–	
	bit1	–	–	–	
	bit2	–	–	–	
	bit3	–	–	–	
	bit4	–	–	–	
	bit5	Tray lift motor clock detection signal 1	SFCLK1	–	
	bit6	Tray lift motor clock detection signal 2	SFCLK2	J14-12	
	bit7	Swing motor clock detection signal	SWGCLK	J14-9	
	bit8-15	–	–	–	
IO-P08 (output)	bit0	Stacker area EEPROM CLK	–	J9B-4	
	bit1	Stacker area EEPROM Data Out	–	–	
	bit2	Stacker area EEPROM CS	–	–	
	bit3	*LWR (I/O)	–	–	
	bit4	*HWR (I/O)	–	–	
	bit5	*RD (I/O)	–	–	
	bit6	*AS (I/O)	–	–	
	bit7	Stacker area EEPROM Data In (input)	–	–	
	bit8-15	–	–	–	
IO-P09 (input)	bit0	Buffer path inlet paper detection signal	BUFENTR	J24-3	L: paper present
	bit1	DELIVERY PAPER DETECT Signal	PDEL	J11-2	H: paper present
	bit2	BUFFER PATH PAPER DETECT Signal	BUFPASS	J24-6	L: paper present
	bit3	INLET PAPER DETECT Signal	PENT	J17-9	L: paper present
	bit4	STAPLE DRIVE HP DETECT Signal	STPDRHP	J8-8	H: HP
	bit5	–	–	–	
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P10	bit0-15	–	–	–	
IO-P11	bit0-15	–	–	–	

Address	bit	Description	Signal	Connector	Remarks
IO-P12 (input)	bit0	STAPLER CONNECT DETECT Signal	STPCON	J8-7	L: connected
	bit1	Staple cartridge detection signal	CRTSET	J8-9	L: cartridge present
	bit2	Staple READY	–	–	
	bit3	HOOK EMPTY DETECT Signal	HOOKEMP	J8-10	L: staple present
	bit4	–	–	–	
	bit5	TRAY 1 PAPER DETECTION Signal	FSTTRAY	J14-3	L: paper present
	bit6	TRAY 2 PAPER DETECTION Signal	SNDTRAY	J14-6	L: paper present
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P13	bit0-15	–	–	–	
IO-P14 (input)	bit0	Puncher unit connection detection signal	–	–	
	bit1	PUNCH HOME POSITION DETECT Signal	PUNCHHP	J1B-3	H: HP
	bit2	SIDE REGISTRATION HOME POSITION DETECT Signal	SRECHP	J1A-2	L: HP
	bit3	FRONT DOOR OPEN DETECT SWITCH Signal	FDROPN	J5-4	L: closed
	bit4	UPPER DOOR OPEN DETECT SWITCH Signal	LDROPN	J5-2	L: closed
	bit5	–	–	–	
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P15 (input)	bit0	PUSH SW3	–		
	bit1	PUSH SW2	–		
	bit2	Puncher unit EEPROM Data In	–		
	bit3	STAPLE shift HP DETECT Signal	STPHP	J12A-9	L: HP
	bit4	ALIGNMENT PLATE HP DETECT Signal	JOGHP	J9A-6	L: HP
	bit5	TRAY HOME POSITION DETECT Signal	TRYHP	J12A-6	H: HP
	bit6	SHUTTER OPEN DETECT Signal	STOPN	J12B-6	H: open
	bit7	SWING GUIDE OPEN DETECT Signal	SWGOPN	J11-10	L: open
	bit8-15	–	–	–	–

Address	bit	Description	Signal	Connector	Remarks
IO-P16 (input)	bit0	DIP SW3 bit1	–	–	L: ON
	bit1	DIP SW3 bit2	–	–	L: ON
	bit2	DIP SW3 bit3	–	–	L: ON
	bit3	DIP SW3 bit4	–	–	L: ON
	bit4	DIP SW3 bit5	–	–	L: ON
	bit5	DIP SW3 bit6	–	–	L: ON
	bit6	DIP SW3 bit7	–	–	L: ON
	bit7	DIP SW3 bit8	–	–	L: ON
	bit8-15	–	–	–	
IO-P17 (input)	bit0	JOINT DETECT Signal	JOINT	J12A-3	H: connected
	bit1	DOOR OPEN DETECT Signal	DROPN	J12B-3	H: closed
	bit2	Saddle unit connection detection signal	–	–	
	bit3	TRAY UPPER LIMIT DETECTING SWITCH Signal	TRYLIM	J5-8	H: upper limit
	bit4	TRAY SAFETY SWITCH Signal	TRAYSAF	J5-6	L: safe
	bit5	DOOR SWITCH Signal	DRSW	J5-3	L: closed
	bit6	Shutter closed detection switch signal	SHUTCLD	J7-3	H: closed
	bit7	SWING GUIDE CLOSED DETECTION SWITCH Signal	SWGGCLD	J5-12	L: closed
	bit8-15	–	–	–	
IO-P18 (output)	bit0	Swing motor CW drive output	–	J11-6	H: CW
	bit1	Swing motor CCW drive output	–	J11-7	H: CCW
	bit2	Punch motor CCW drive output	–	J2-2	L: CCW
	bit3	Punch motor CW drive output	–	J2-1	L: CW
	bit4	Delivery motor CCW drive output	–	J11-5	H: CCW
	bit5	Delivery motor CW drive output	–	J11-4	H: CW
	bit6	Staple motor CCW drive output	–	J8-13	L: CCW
	bit7	Staple motor CW drive output	–	J8-14	L: CW
	bit8-15	–	–	–	
IO-P19 (output)	bit0	Stepping motor OFF	–	–	H: OFF
	bit1	Punch horizontal registration motor current change	–	–	L: driven
	bit2	Inlet feed motor current change 2	–	–	L: driven
	bit3	Inlet feed motor current change 1	–	–	L: driven
	bit4	Second feed motor current change 2	–	–	L: driven
	bit5	Second feed motor current change 1	–	–	L: driven
	bit6	First feed motor current change 2	–	–	L: driven
	bit7	First feed motor current change 1	–	–	L: driven
	bit8-15	–	–	–	

Address	bit	Description	Signal	Connector	Remarks
IO-P20 (output)	bit0	Puncher unit EEPROM Data Out	–	–	
	bit1	Puncher unit EEPROM CS	–	–	
	bit2	Puncher unit EEPROM CLK	–	–	
	bit3	–	–	–	
	bit4	–	–	–	
	bit5	Height sensor ON/OFF	–	–	
	bit6	Staple shift motor current change	–	–	L: driven
	bit7	Alignment motor current change	–	–	L: driven
	bit8-15	–	–	–	–
IO-P21 (output)	bit0	BELT ESCAPE SOLENOID DRIVE Signal	BESCPSL	BESCPSL	H: ON
	bit1	BUFFER OUTLET SOLENOID DRIVE Signal	EXITSL	EXITSL	H: ON
	bit2	–	–	–	
	bit3	BUFFER INLET SOLENOID DRIVE Signal	ENTSL	ENTSL	H: ON
	bit4	FLAPPER SOLENOID DRIVE Signal	FLPSL	FLPSL	H: ON
	bit5	PADDLE SOLENOID DRIVE Signal	PDLSL	PDLSL	H: ON
	bit6	Solenoid timer output	–	–	
	bit7	ESCAPE SOLENOID DRIVE Signal	ESCPSL	ESCPSL	H: ON
	bit8-15	–	–	–	
IO-P22	bit0-15	–	–	–	
AD-P01 (analog port)	–	DUST FULL DETECT Signal	DFULL	DFULL	
AD-P02 (analog port)	–	24V output discontinue detection signal	–	–	
AD-P03 (analog port)	–	SIDE REGISTRATION DETECT Signal 1	SREG1	SREG1	
AD-P04 (analog port)	–	SIDE REGISTRATION DETECT Signal 2	SREG2	SREG2	
AD-P05 (analog port)	–	SIDE REGISTRATION DETECT Signal 3	SREG3	SREG3	
AD-P06 (analog port)	–	SIDE REGISTRATION DETECT Signal 4	SREG4	SREG4	
AD-P07 (analog port)	–	PAPER END DETECT Signal	PAEND	PAEND	
DA-P01 (analog port)	–	Punch LED ON Signal (output)	–	–	

B. Saddle Stitcher Unit

Address	bit	Description	Signal	Connector	Remarks
IO-P23 (output)	bit0	Stitcher motor (rear) CW drive signal	–	J8-13/14	L: CW
	bit1	Stitcher motor (rear) CCW drive signal	–	J8-11/12	L: CCW
	bit2	Stitcher motor (front) CW drive signal	–	J8-6/7	L: CW
	bit3	Stitcher motor (front) CCW drive signal	–	J8-4/5	L: CCW
	bit4	Paper folding motor CW drive signal	–	J4-7	L: CW
	bit5	Paper folding motor CCW drive signal	–	J4-8	L: CCW
	bit6	FLAPPER DRIVE Signal 1	FLPSL1	J15-2	H: ON
	bit7	FLAPPER DRIVE Signal 2	FLPSL2	J15-4	H: ON
	bit8-15	–	–	–	
IO-P24 (output)	bit0	–	–	–	
	bit1	–	–	–	
	bit2	–	–	–	
	bit3	–	–	–	
	bit4	–	–	–	
	bit5	Feed plate contact solenoid drive signal	RLNIPSL	J15-6	H: ON
	bit6	Solenoid timer output	–	–	
	bit7	Paper positioning plate motor current change	–	–	L: driven
	bit8-15	–	–	–	
IO-P25 (input)	bit0	24V output discontinue detection signal	–	–	H: down
	bit1	LUNGE TOP POSITION DETECT Signal	LUNGETOP	J9-15	L: top position
	bit2	DELIVERY DETECT Signal	DELV	J9-3	L: paper present
	bit3	–	–	–	
	bit4	–	–	–	
	bit5	–	–	–	
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	

Address	bit	Description	Signal	Connector	Remarks
IO-P26 (input)	bit0	FOLD MOTOR CLOCK DETECTION Signal	FLDCLK	J11-5	
	bit1	LUNGE MOTOR CLOCK Signal	LUNGECLK	J11-14	
	bit2	LUNGE HP DETECT Signal	LUNGEHP	J9-12	H: HP
	bit3	ALIGNMENT PLATE HP DETECT Signal	JOGHP	J11-3	L: HP
	bit4	–	–	–	
	bit5	–	–	–	
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P27 (input)	bit0	PAPER POSITION PLATE HP DETECT Signal	PAPPOS	J6-6	L: HP
	bit1	Stitcher IN detection signal	–	J13-3	L: in
	bit2	PUSH SW2 ON/OFF	–	–	
	bit3	VERTICAL PATH PAPER DETECT Signal	VPJM	J13-6	H: paper present
	bit4	CRESCENT ROLLER PHASE DETECT Signal	FDRLHP	J9-6	L: HP
	bit5	PAPER GUIDE HOME POSITION DETECT Signal	GIDHP	J9-9	L: HP
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P28 (output)	bit0	Paper positioning plate motor phase A output	–	J7-10	
	bit1	Paper positioning plate motor phase B output	–	J7-9	
	bit2	Paper pushing plate motor PWM	–	–	
	bit3	Feed motor current change	–	–	L: driven
	bit4	Feed motor phase A output	–	J5-1	
	bit5	Feed motor phase B output	–	J5-3	
	bit6	–	–		
	bit7	Paper pushing plate motor CCW drive output	–	J4-10	L: CCW
	bit8-15	–	–	–	

Address	bit	Description	Signal	Connector	Remarks
IO-P29 (output)	bit0	Alignment motor phase A output	–	J7-5	
	bit1	Alignment motor phase B output	–	J7-4	
	bit2	Paper folding motor PWM	–		
	bit3	Paper pushing plate motor CW drive output	–	J4-9	L: CW
	bit4	Guide motor phase A output	–	J12-5	
	bit5	Guide motor phase B output	–	J12-4	
	bit6	Guide motor current change	–	–	L: driven
	bit7	Alignment motor current change		–	L: driven
	bit8-15	–	–	–	
IO-P30 (input)	bit0	No. 2 PAPER SENSOR DETECT Signal	2NDPA	J10-3	L: paper present
	bit1	No. 3 PAPER SENSOR DETECT Signal	3RDPA	J10-4	L: paper present
	bit2	STITCHING HP DETECT Signal 2	STCHHP2	J8-10	H: HP
	bit3	STITCHING HP DETECT Signal 1	STCHHP1	J8-3	H: HP
	bit4	PAPER POSITIONING GUIDE PAPER DETECT Signal	PPOSPAR	J6-3	L: paper present
	bit5	TRAY PAPER DETECT Signal	TRYPAR	J6-9	L: paper present
	bit6	No. 1 PAPER SENSOR DETECT Signal	1STPA	J10-2	L: paper present
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P31 (input)	bit0	Alignment plate HP sensor connector connection detection	–	J11-1	H: connected
	bit1	Paper folding HP sensor connector connection detection	–	J18-1	H: connected
	bit2	Delivery door HP sensor connector connection detection	–	J11-7	H: connected
	bit3	Front door open/closed sensor connector connection detection	–	J11-10	H: connected
	bit4	Paper positioning plate HP sensor connector connection detection	–	J6-4	H: connected
	bit5	PAPER FOLD HOME POSITION DETECT Signal	PAFLDHP	J18-2	L: HP
	bit6	–	–	–	
	bit7	–	–	–	
	bit8-15	–	–	–	
IO-P32	bit0-15	–	–	–	

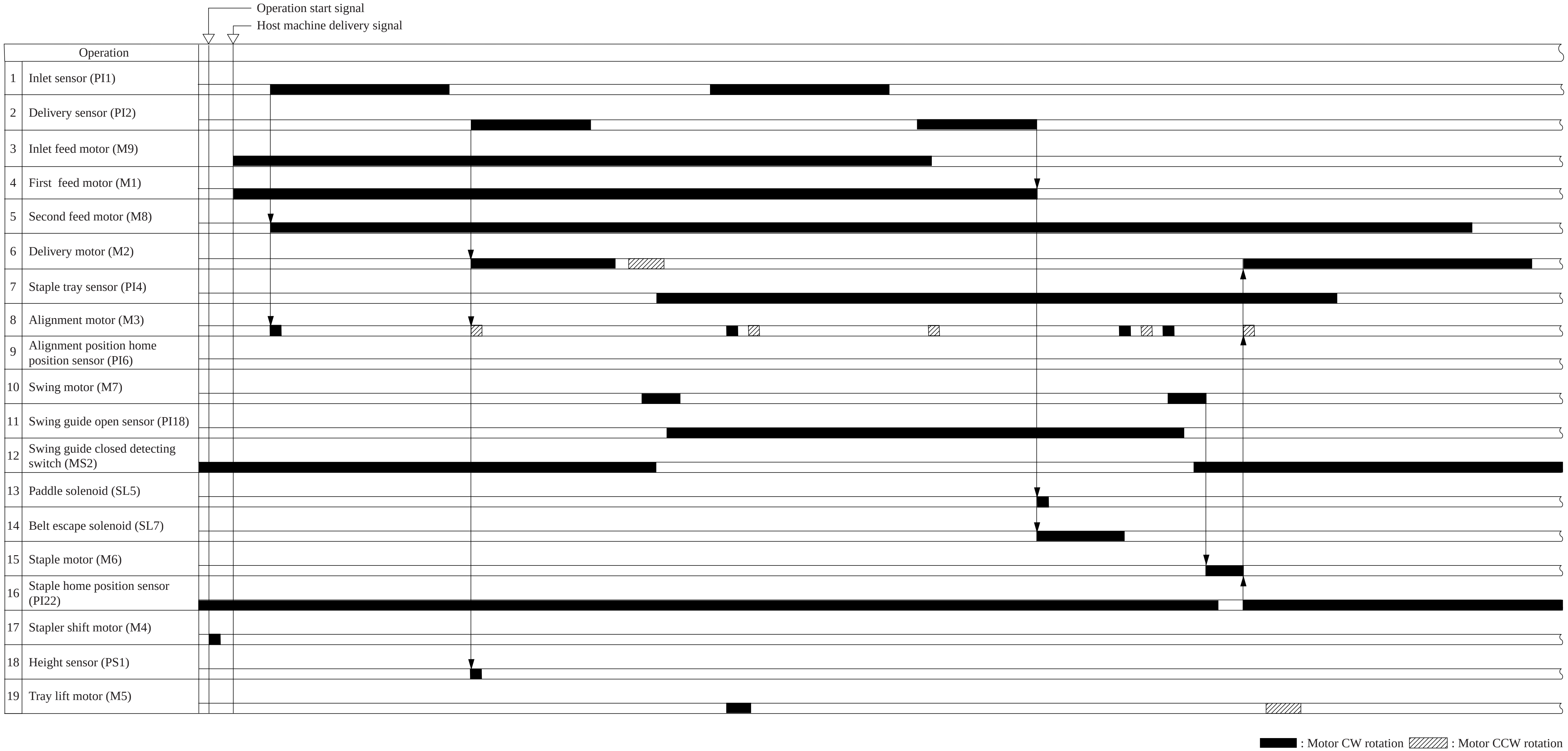
Address	bit	Description	Signal	Connector	Remarks
IO-P33 (input)	bit0	HOOK EMPTY DETECT Signal 2	HKEMP2	J8-8	H: staple present
	bit1	HOOK EMPTY DETECT Signal 1	HKEMP1	J8-1	H: staple present
	bit2	INLET COVER OPEN SWITCH Signal	INLTCVRMS	J4-2	L: closed
	bit3	FRONT DOOR OPEN DETECT SWITCH Signal	FDROPN	J4-4	L: closed
	bit4	DELIVERY COVER OPEN DETECT signal	EJCVR	J11-9	L: closed
	bit5	FRONT DOOR OPEN DETECT Signal	FDR	J11-12	H: closed
	bit6	INLET COVER OPEN DETECT Signal	INLTCVR	J10-8	H: closed
	bit7	DELIVERY DOOR OPEN DETECT SWITCH Signal	DELVMS	J4-6	H: closed
	bit8-15	–	–	–	–
IO-P34 (input)	bit0	DIP SW1 bit 8	–	–	L: ON
	bit1	DIP SW1 bit 7	–	–	L: ON
	bit2	DIP SW1 bit 6	–	–	L: ON
	bit3	DIP SW1 bit 5	–	–	L: ON
	bit4	DIP SW1 bit 4	–	–	L: ON
	bit5	DIP SW1 bit 3	–	–	L: ON
	bit6	DIP SW1 bit 2	–	–	L: ON
	bit7	DIP SW1 bit 1	–	–	L: ON
	bit8-15	–	–	–	–
AD-P08 (analog port)	–	Stitcher (rear) stitching detection	–	–	
AD-P09 (analog port)	–	Stitcher (front) stitching detection	–	–	
AD-P10 (analog port)	–	–	–	–	
AD-P11 (analog port)	–	Inlet cover sensor connector connection detection	–	J10-6	connected if 7F or less (Note1)
AD-P12 (analog port)	–	–	–	–	
AD-P13 (analog port)	–	Guide home position sensor connector connection detection	–	J9-7	connected if 7F or less (Note1)
AD-P14 (analog port)	–	Stitcher housing sensor connector connection detection	–	J13-1	connected if 7F or less (Note1)
AD-P15 (analog port)	–	Paper pushing plate top position sensor connector connection detection	–	J9-13	connected if 7F or less (Note1)

Note1: Expressed as a hexadecimal number.

APPENDIX

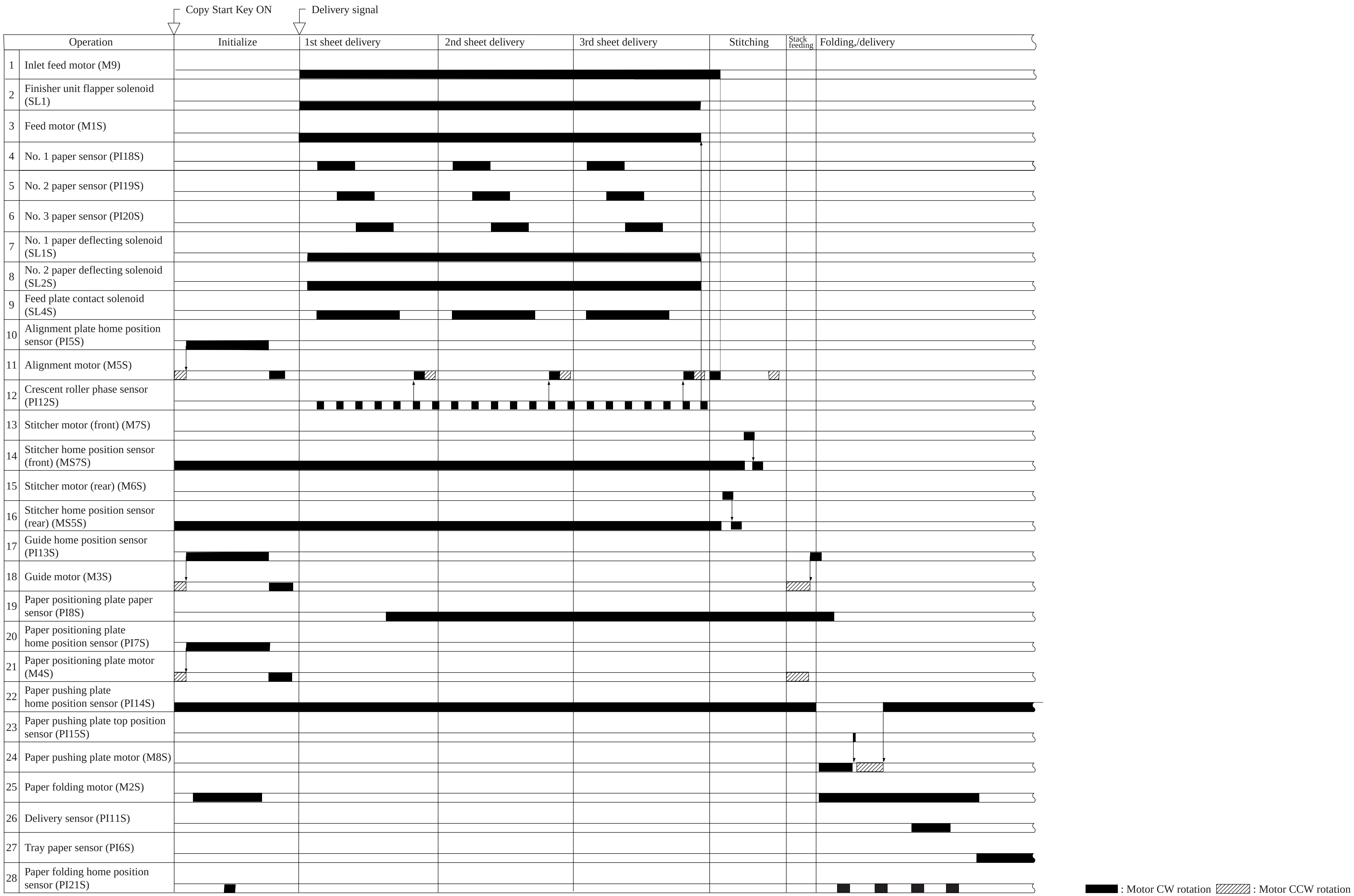
A. FINISHER UNIT GENERAL TIMING CHART

A4, 2 Sheets, 1-Point Stapling (rear), 1 Set



B. SADDLE STITCHER UNIT GENERAL TIMING CHART

A4R, 3 Sheets, Stitching, 1 Set



C. PUNCHER UNIT (option) GENERAL TIMING CHART

A4, 2 Sheets, Punching, Job offset (front)

D. SIGNAL AND ABBREVIATIONS

The following presents the abbreviations of signals used in this manual and in drawings, and the meanings of each signal.

Reference:
Signals enclosed by brackets [ ] are electrical signals. However, the state “1” or “0” of these analog signals cannot be indicated. Otherwise, the state of digital signals “1” or “0” can be indicated.

Finisher unit

BESCPSL	BELT ESCAPE SOLENOID DRIVE Signal
BUFENTR	BUFFER PATH INLET PAPER DETECT Signal
BUFPASS	BUFFER PATH PAPER DETECT Signal
CRTSET	CARTRIDGE DETECT Signal
DELCLK	DELIVERY MOTOR CLOCK DETECT Signal
DROPN	DOOR OPEN DETECT Signal
DRSW	DOOR SWITCH Signal
ENTSL	BUFFER INLET SOLENOID DRIVE Signal
ESCPSL	ESCAPE SOLENOID DRIVE Signal
EXITSL	BUFFER OUTLET SOLENOID DRIVE Signal
FLPSL	FLAPPER SOLENOID DRIVE Signal
FSTTRAY	TRAY 1 PAPER DETECT Signal
HOOKEMP	HOOK EMPTY DETECT Signal
HOOKTOP	HOOK STOP POSITION DETECT Signal
JOGHP	ALIGNMENT PLATE HP DETECT Signal
JOINT	JOINT DETECT Signal
PDEL	DELIVERY DETECT Signal
PDLSL	PADDLE SOLENOID DRIVE Signal
PENT	INLET PAPER DETECT Signal
SFTCLK1	SHIFT MOTOR CLOCK DETECT Signal 1
SFTCLK2	SHIFT MOTOR CLOCK DETECT Signal 2
SHUTCLD	SHUTTER CLOSED DETECT SWITCH Signal
SNDTRAY	TRAY 2 PAPER DETECT Signal
STOPN	SHUTTER OPEN DETECT Signal
STPCON	STAPLER CONNECT DETECT Signal
STPDRHP	STAPLER DRIVE HP DETECT Signal
STPHP	STAPLER HP DETECT Signal
STPTY	STAPLE TRAY PAPER DETECT Signal
SWGCLK	SWING GUIDE CLOCK DETECT Signal
SWGGCLD	SWING GUIDE CLOSED DETECT SWITCH Signal
SWGOPN	SWING GUIDE OPEN DETECT Signal
TRAYSAF	TRAY SAFETY SWITCH Signal
TRYHP	TRAY HOME POSITION DETECT Signal
TRYLIM	TRAY UPPER LIMIT DETECTING SWITCH Signal

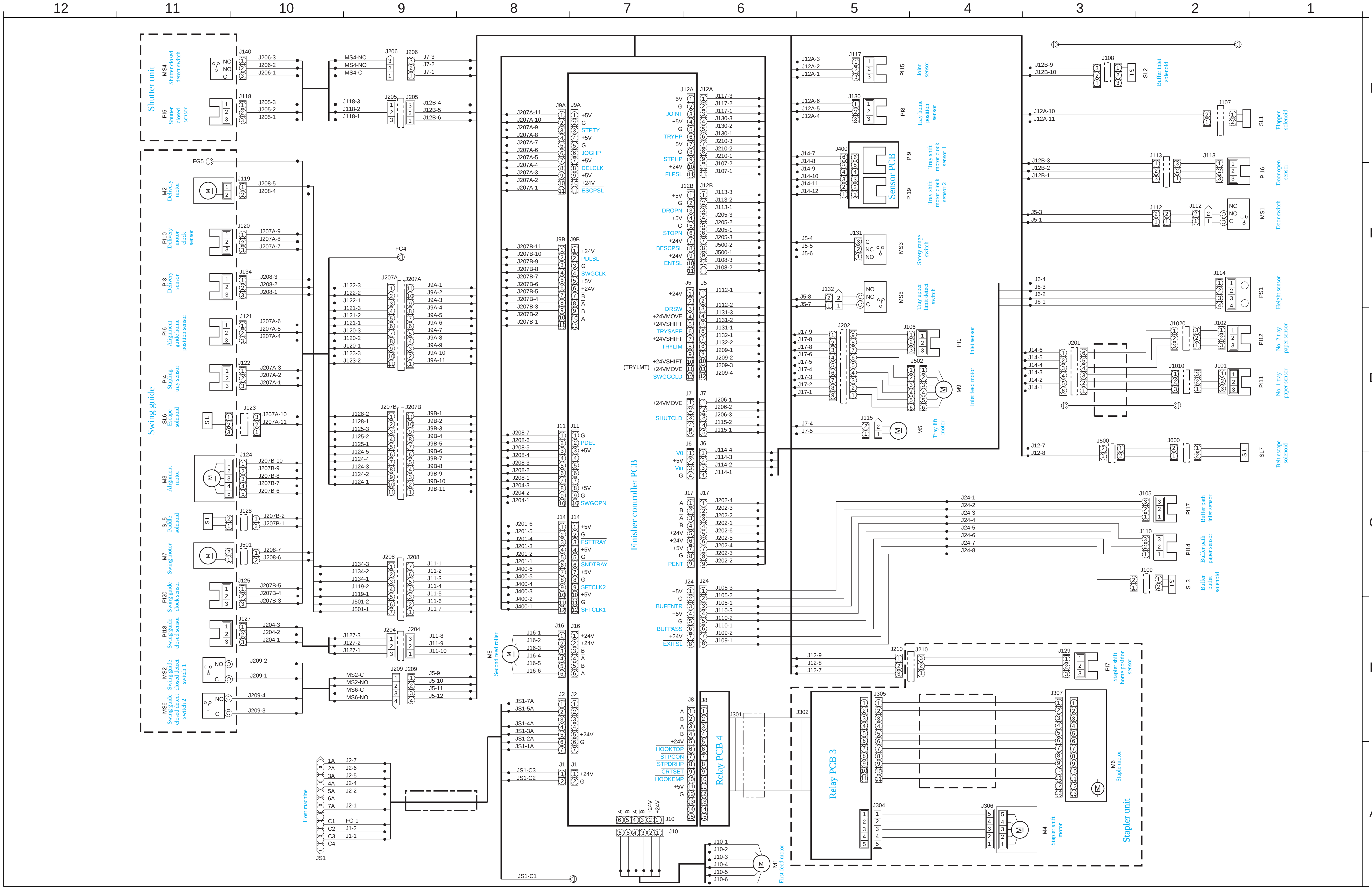
Saddle stitcher unit

1STPA	No.1 PAPER SENSOR DETECT Signal
2NDPA	No.2 PAPER SENSOR DETECT Signal
3RDDPA	No.3 PAPER SENSOR DETECT Signal
DELV	DELIVERY DETECT Signal
DELVMS	DELIVERY DOOR OPEN DETECT SWITCH Signal
EJCVR	DELIVERY DOOR OPEN DETECT Signal
FDR	FRONT DOOR OPEN DETECT Signal
FDRLHP	CRESCENT ROLLER PHASE DETECT Signal
FDROPN	FRONT DOOR OPEN DETECT SWITCH Signal
FLDCLK	FOLD MOTOR CLOCK Signal
FLPSL1	FLAPPER DRIVE Signal 1
FSPSL2	FLAPPER DRIVE Signal 2
GIDHP	PAPER GUIDE HOME POSITION DETECT Signal
HKEMP1	HOOK EMPTY DETECT Signal 1
HKEMP2	HOOK EMPTY DETECT Signal 2
INLTCVR	INLET COVER OPEN DETECT Signal
INLTCVRMS	INLET COVER OPEN SWITCH Signal
JOGHP	ALIGNMENT HP DETECT Signal
LUNGECLK	LUNGE MOTOR CLOCK Signal
LUNGEHP	LUNGE HOME POSITION DETECT Signal
LUNGETOP	LUNGE TOP POSITION DETECT Signal
PAFLDHP	PAPER FOLD HOME POSITION DETECT Signal
PAPPOS	PAPER POSITION PLATE HP DETECT Signal
PPOSPAR	PAPER POSITIONING GUIDE PAPER DETECT Signal
RLNIPSL	FEED PLATE CONTACT SOLENOID DRIVE Signal
STCHHP1	STITCHING HP DETECT Signal 1
STCHHP2	STITCHING HP DETECT Signal 2
STPLHP	STITCHER IN DETECT Signal
TRYPAR	TRAY PAPER DETECT Signal
VPJM	VERTICAL PATH PAPER DETECT Signal

Puncher unit (option)

DFULL	DUST FULL DETECT Signal
FDROPN	FRONT DOOR OPEN DETECT SWITCH Signal
LEDON	LED ON Signal
LEDON1	LED1 ON Signal
LEDON2	LED2 ON Signal
LEDON3	LED3 ON Signal
LEDON4	LED4 ON Signal
LEDON5	LED5 ON Signal
PAEND	PAPER END DETECT Signal
PUNCHHP	PUNCH HOME POSITION DETECT Signal
PUNCHCLK	PUNCH MOTOR CLOCK DETECT Signal
SREG1	SIDE REGISTRATION DETECT Signal 1
SREG2	SIDE REGISTRATION DETECT Signal 2
SREG3	SIDE REGISTRATION DETECT Signal 3
SREG4	SIDE REGISTRATION DETECT Signal 4
SREGHP	SIDE REGISTRATION HOME POSITION DETECT Signal
UDROPN	UPPER DOOR OPEN DETECT SWITCH Signal

E. FINISHER UNIT CIRCUIT DIAGRAM



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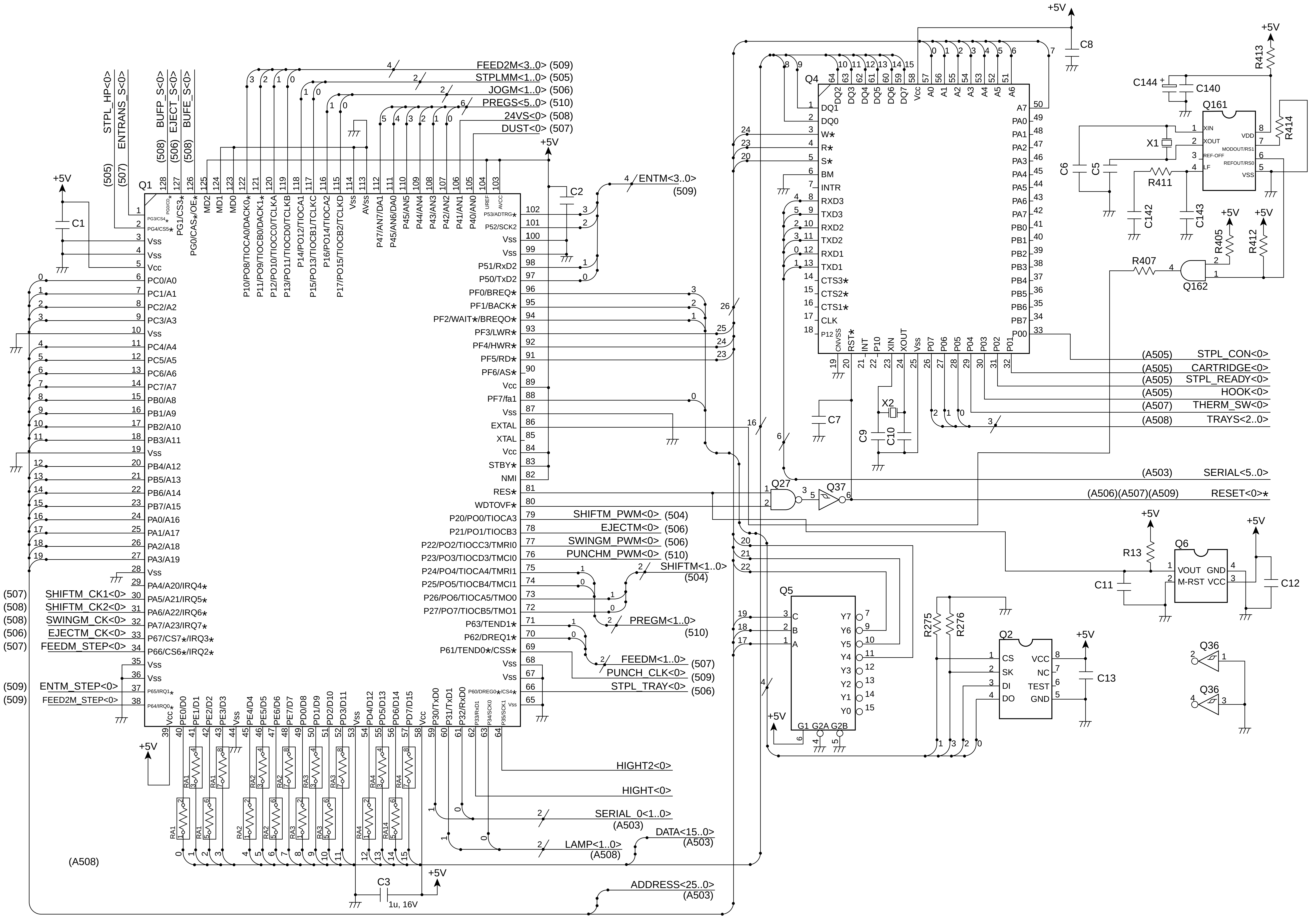

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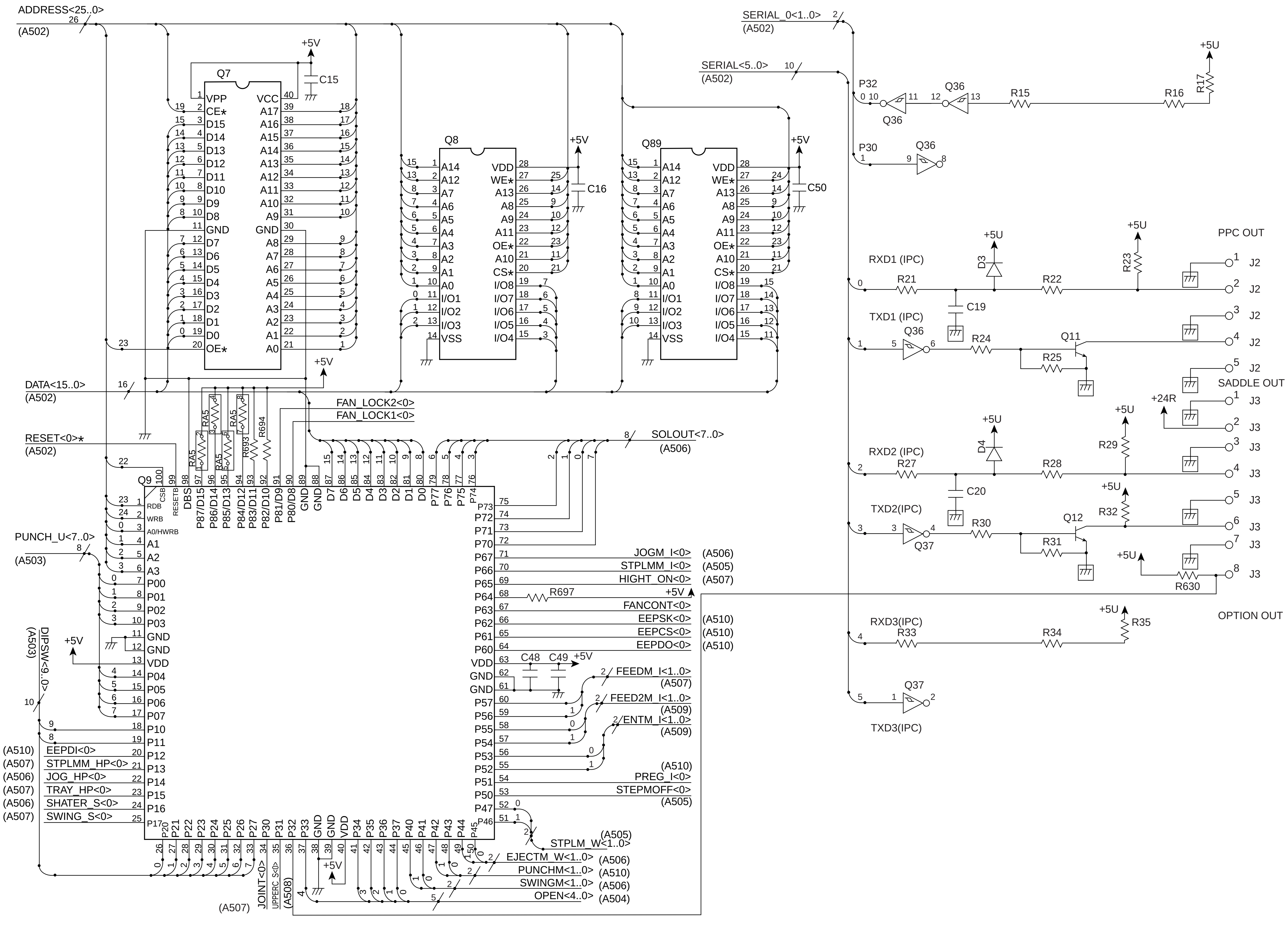
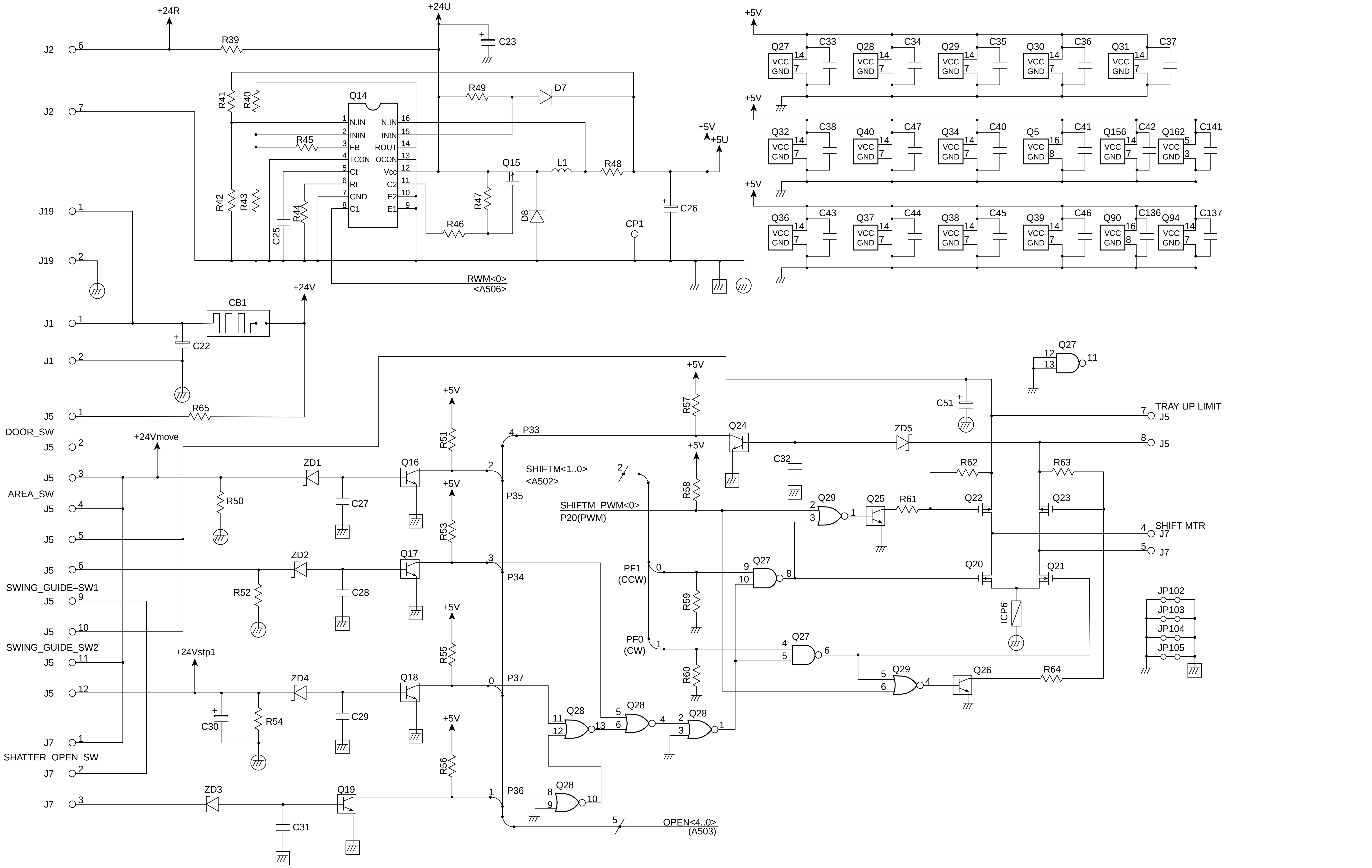
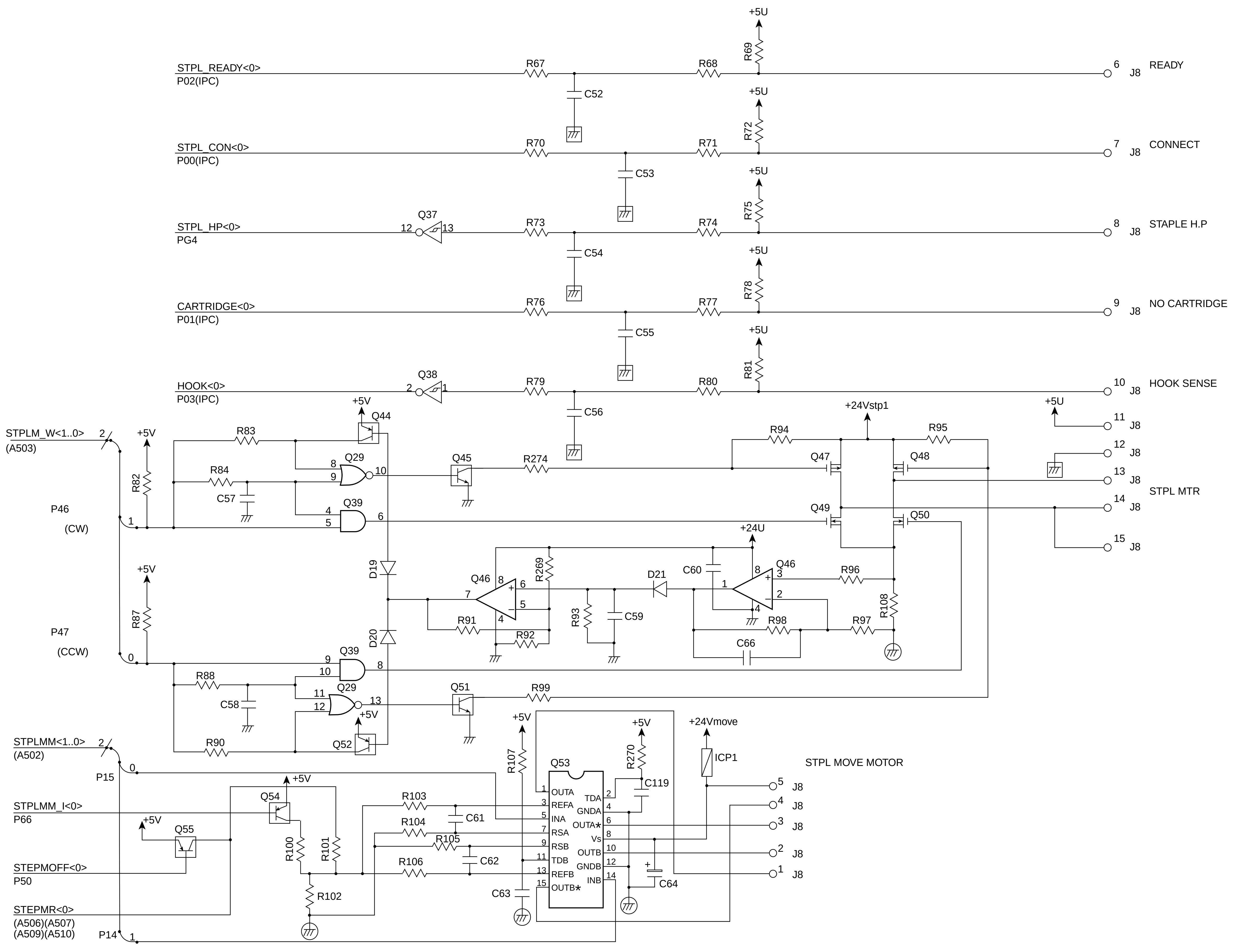


1. Finisher Controller PCB (A504)



1. Finisher Controller PCB (A505)



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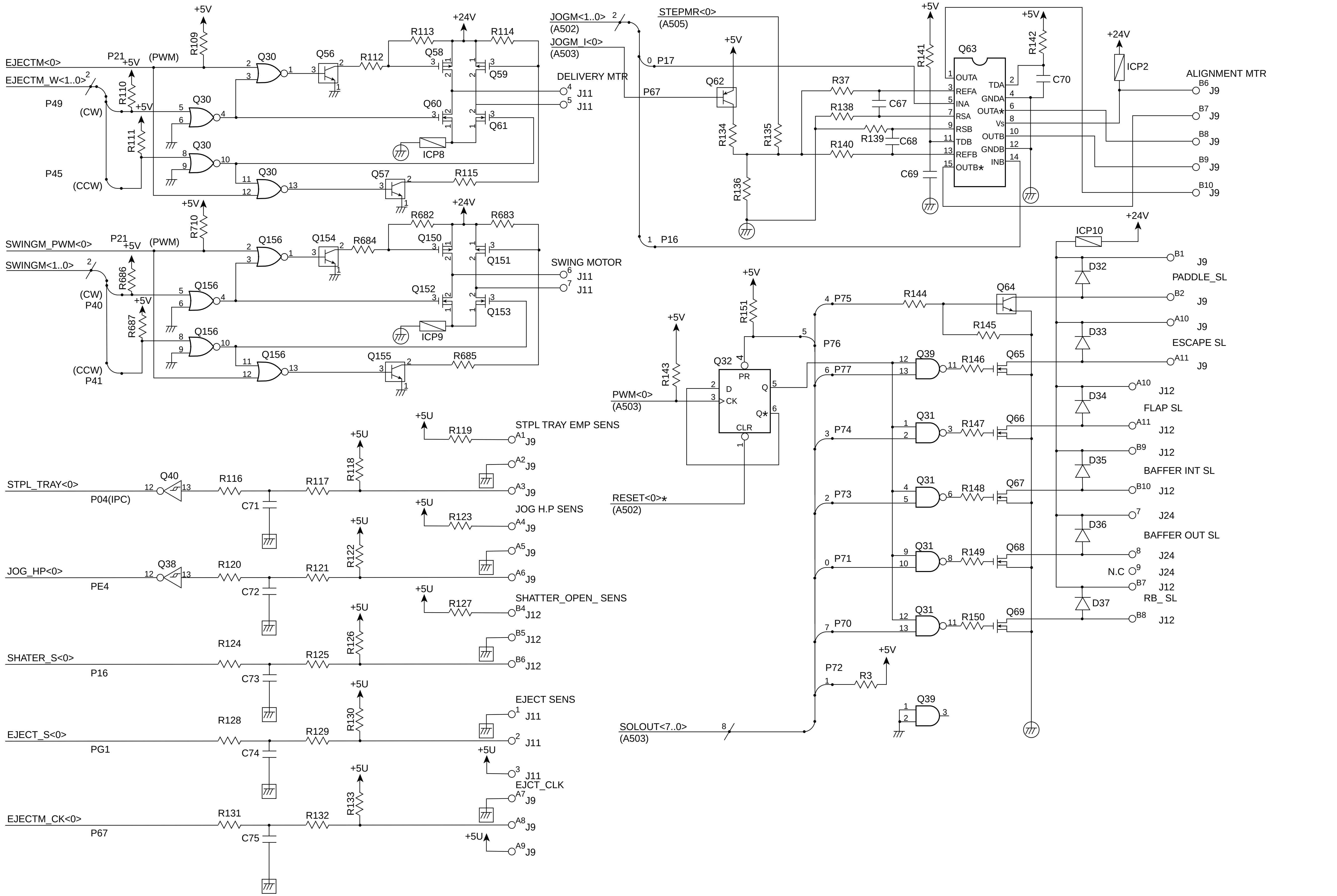

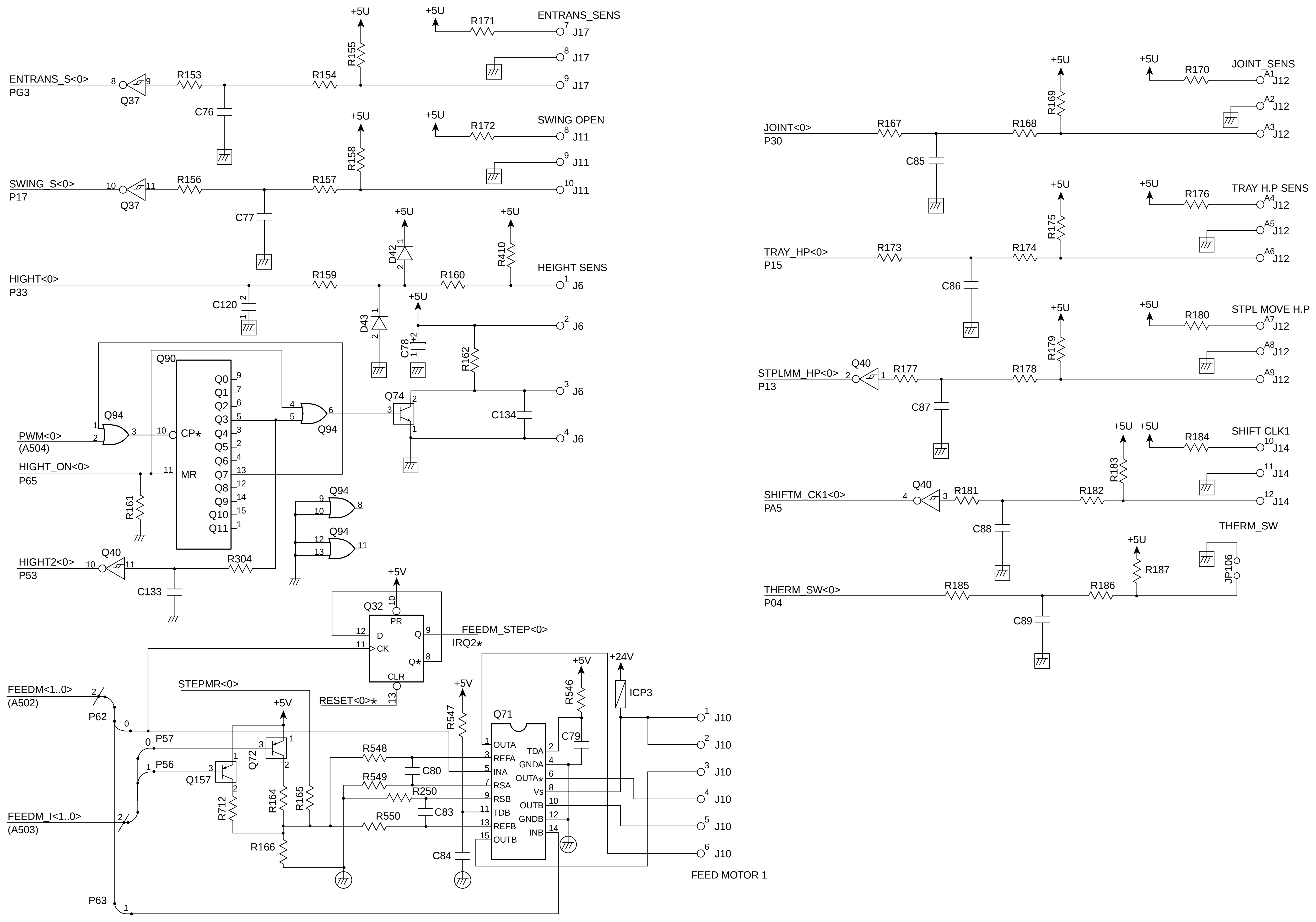
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(A503)
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SWING OPEN
HEIGHT SENS
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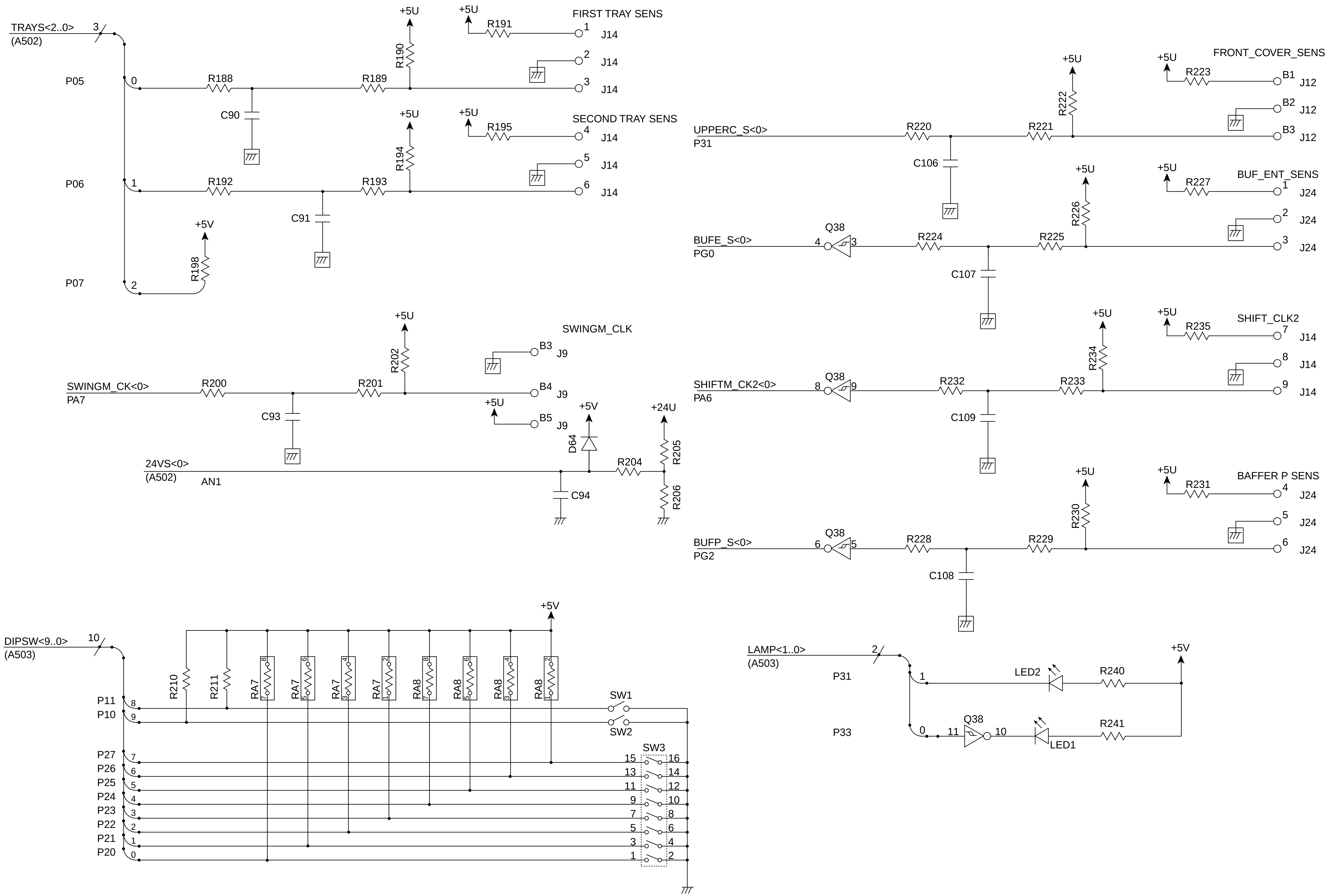
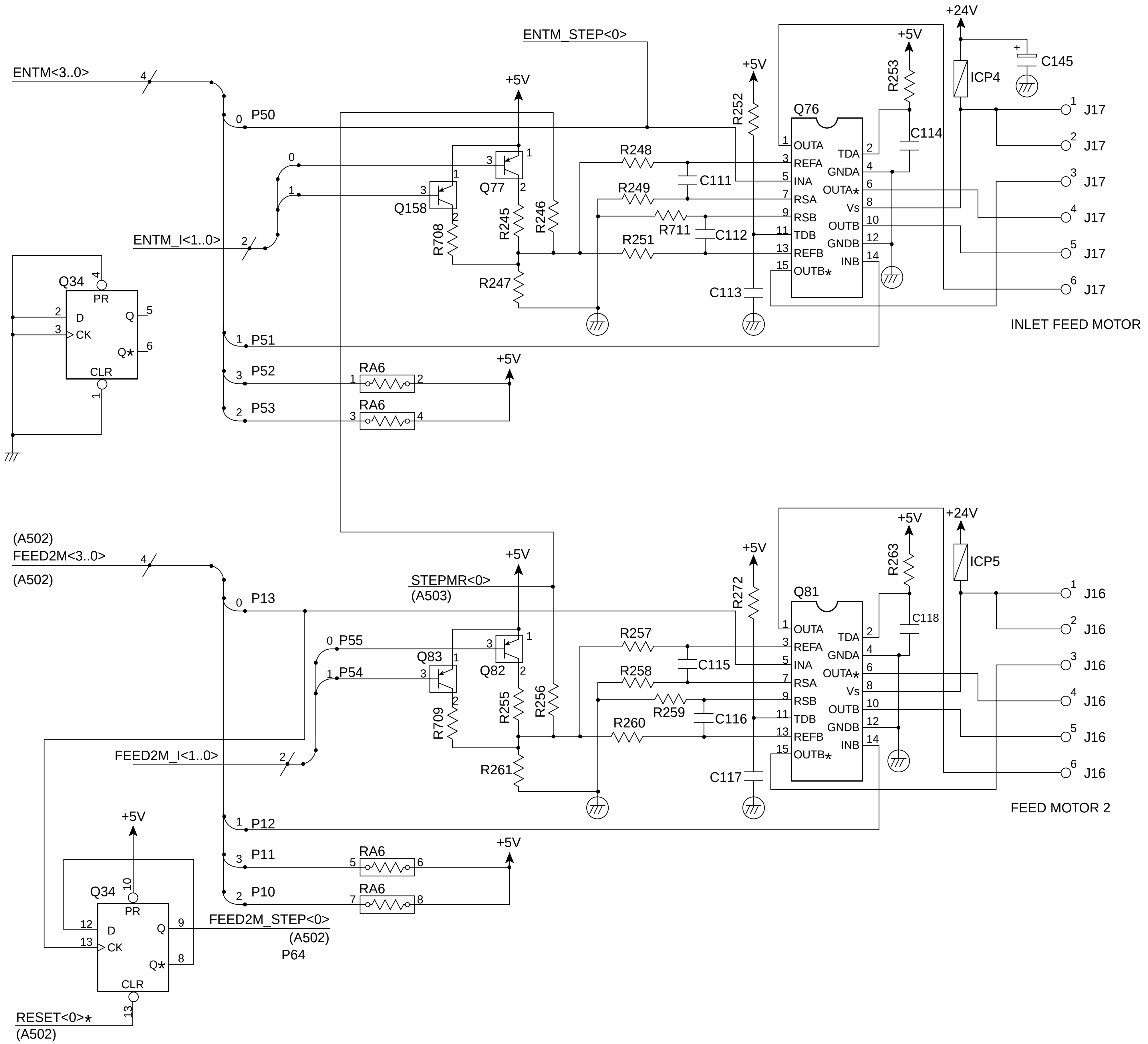
TRAY_HP<0>
P15
STPLMM_HP<0>
P13
SHIFTM_CK1<0>
PA5
THERM_SW<0>
P04
JOINT_SENS
TRAY H.P SENS
STPL MOVE H.P
SHIFT CLK1
THERM_SW
JP106
+5U
+5V
+24V
ICP3
Q71
Q90
Q32
Q94
Q37
Q40
Q74
Q72
Q157
J17
J11
J6
J10
J12
J14

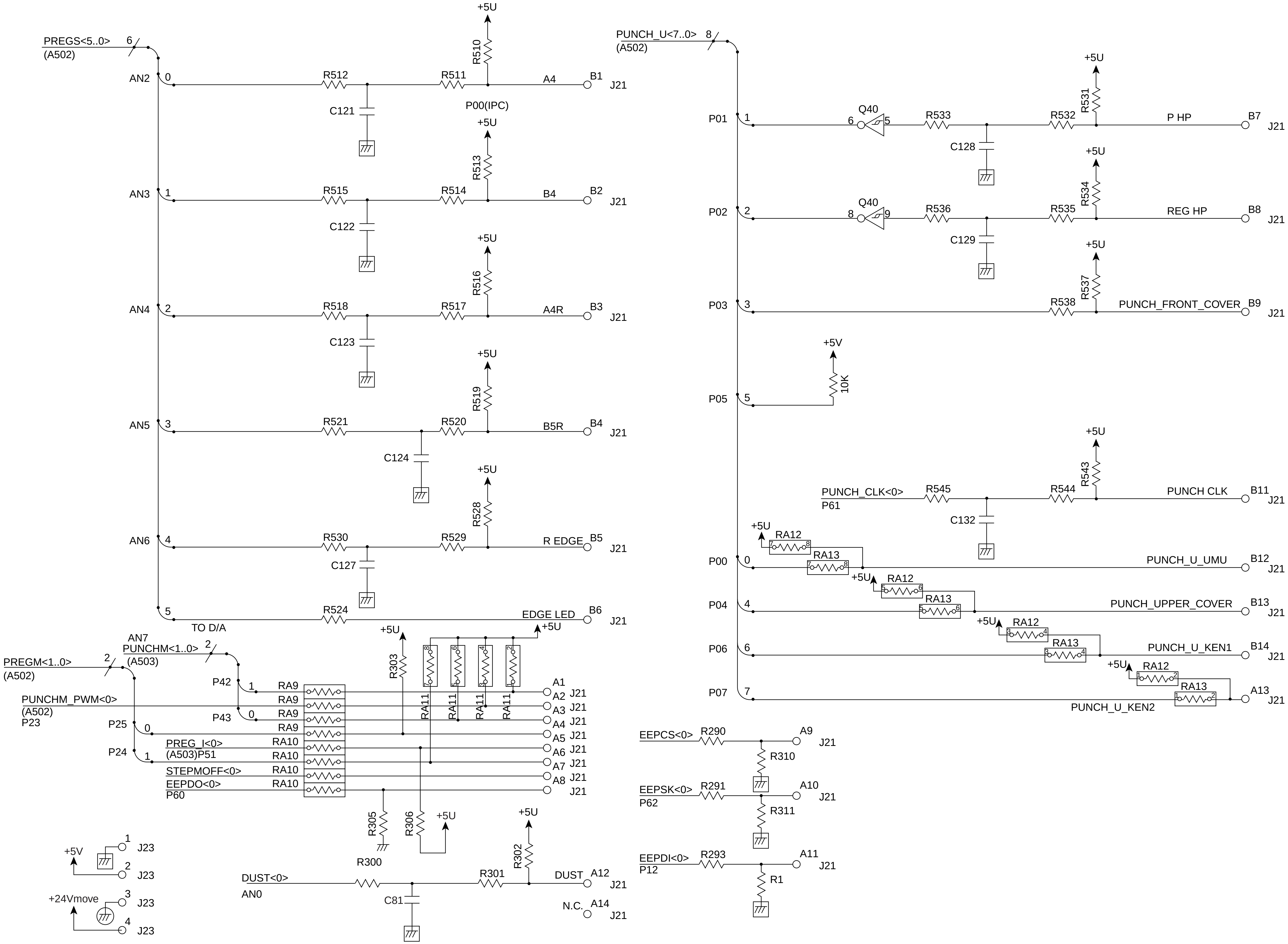
1. Finisher Controller PCB (A508)



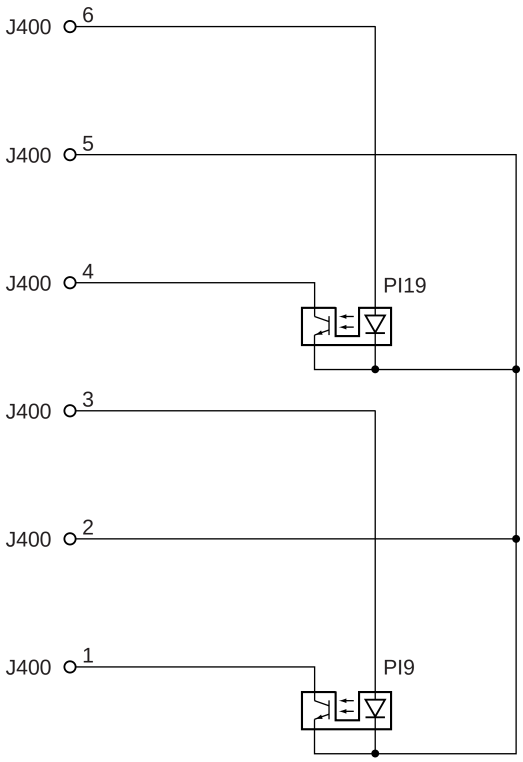
1. Finisher Controller PCB (A509)



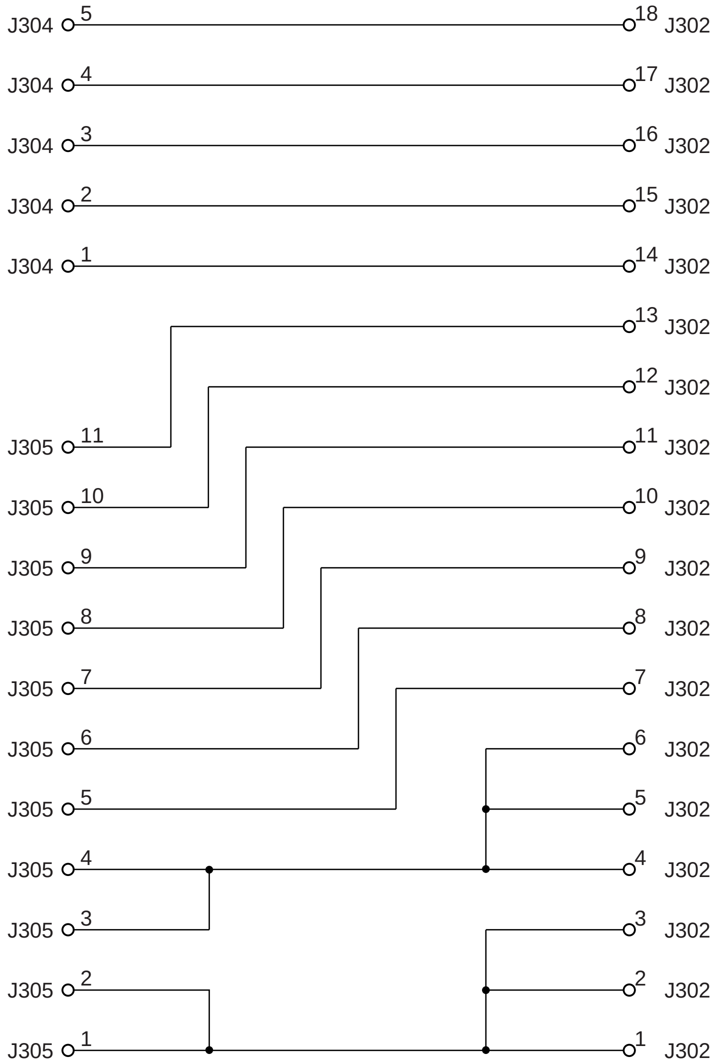
1. Finisher Controller PCB (A510)



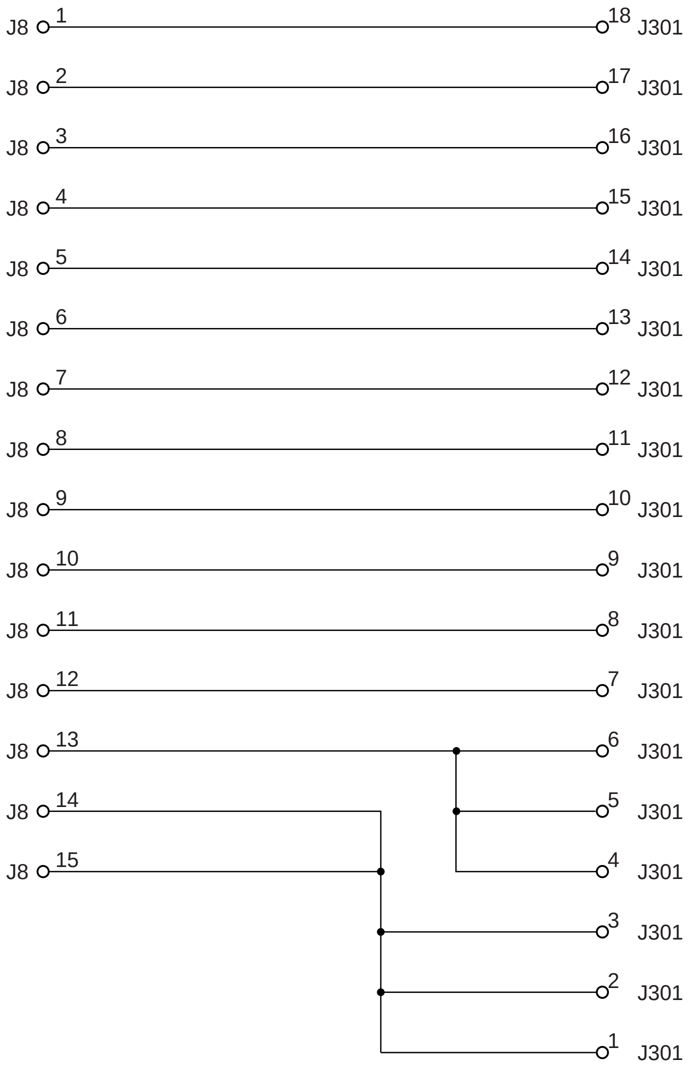
2. Sensor PCB



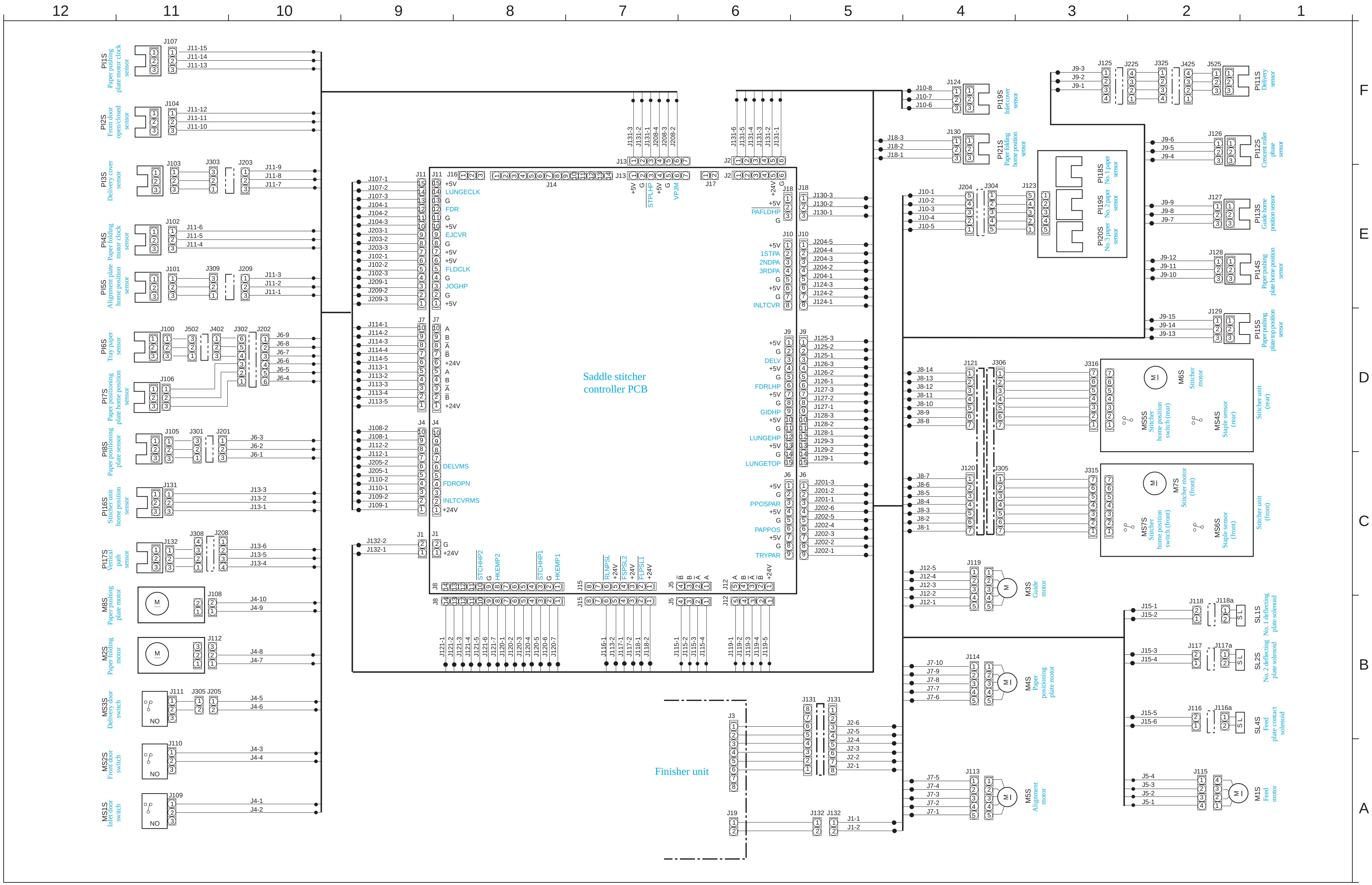
3. Relay PCB 3


J304 5
J304 4
J304 3
J304 2
J304 1
J305 11
J305 10
J305 9
J305 8
J305 7
J305 6
J305 5
J305 4
J305 3
J305 2
J305 1
18 J302
17 J302
16 J302
15 J302
14 J302
13 J302
12 J302
11 J302
10 J302
9 J302
8 J302
7 J302
6 J302
5 J302
4 J302
3 J302
2 J302
1 J302

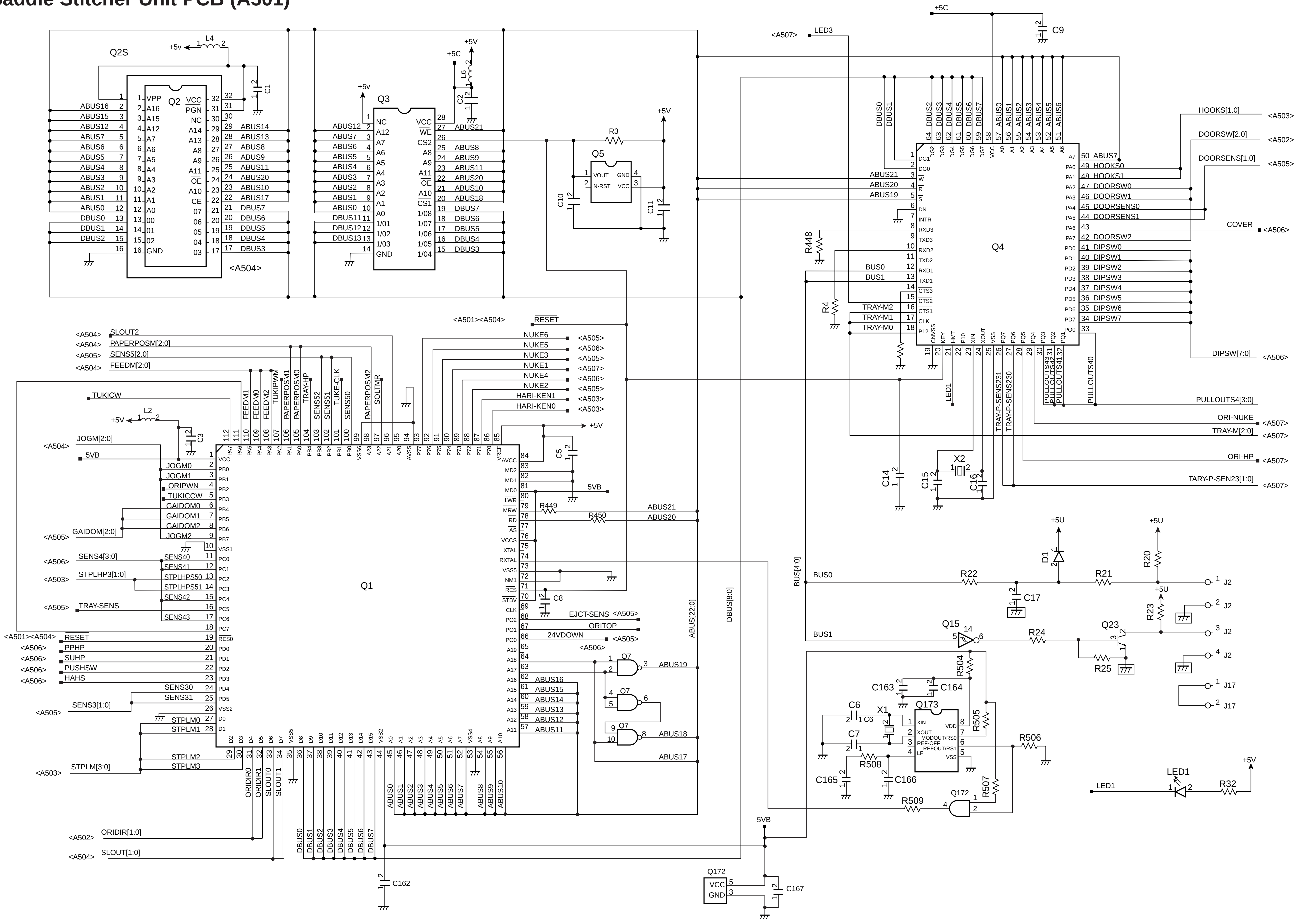
4. Relay PCB 4


J8 1 — 18 J301
J8 2 — 17 J301
J8 3 — 16 J301
J8 4 — 15 J301
J8 5 — 14 J301
J8 6 — 13 J301
J8 7 — 12 J301
J8 8 — 11 J301
J8 9 — 10 J301
J8 10 — 9 J301
J8 11 — 8 J301
J8 12 — 7 J301
J8 13 — 6 J301
J8 14
J8 15
5 J301
4 J301
3 J301
2 J301
1 J301

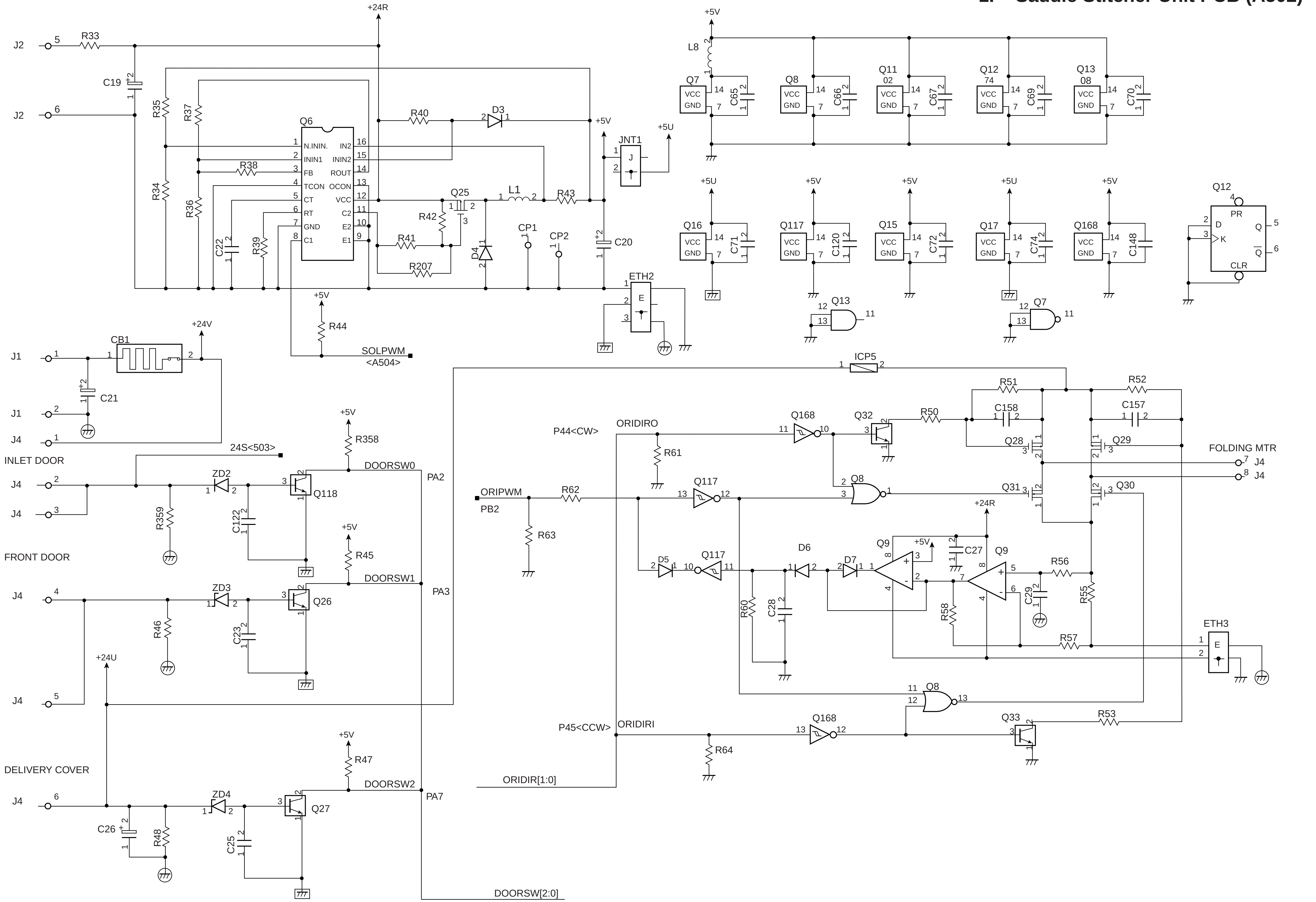
F. SADDLE STITCHER UNIT CIRCUIT DIAGRAM



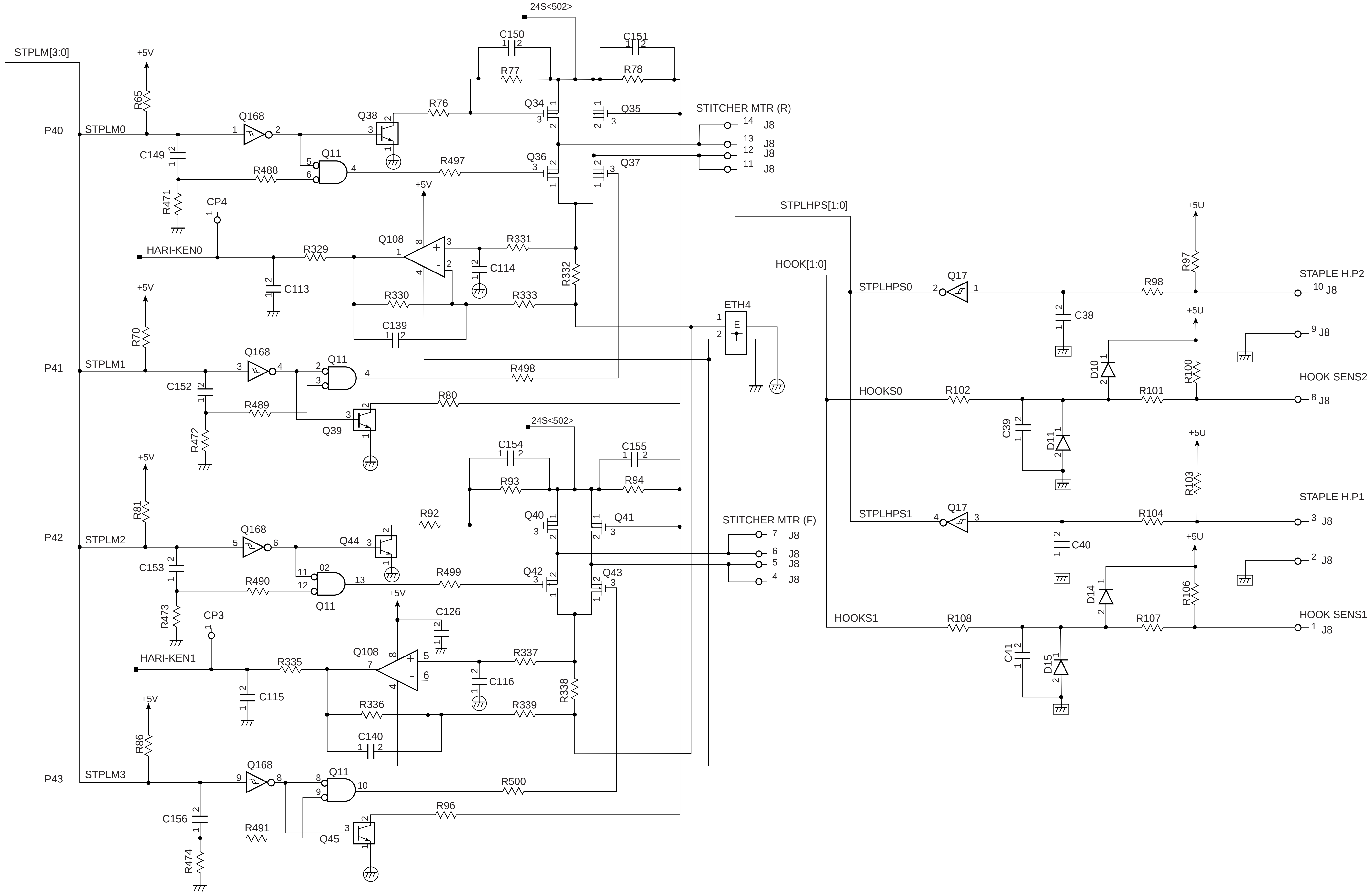
1. Saddle Stitcher Unit PCB (A501)



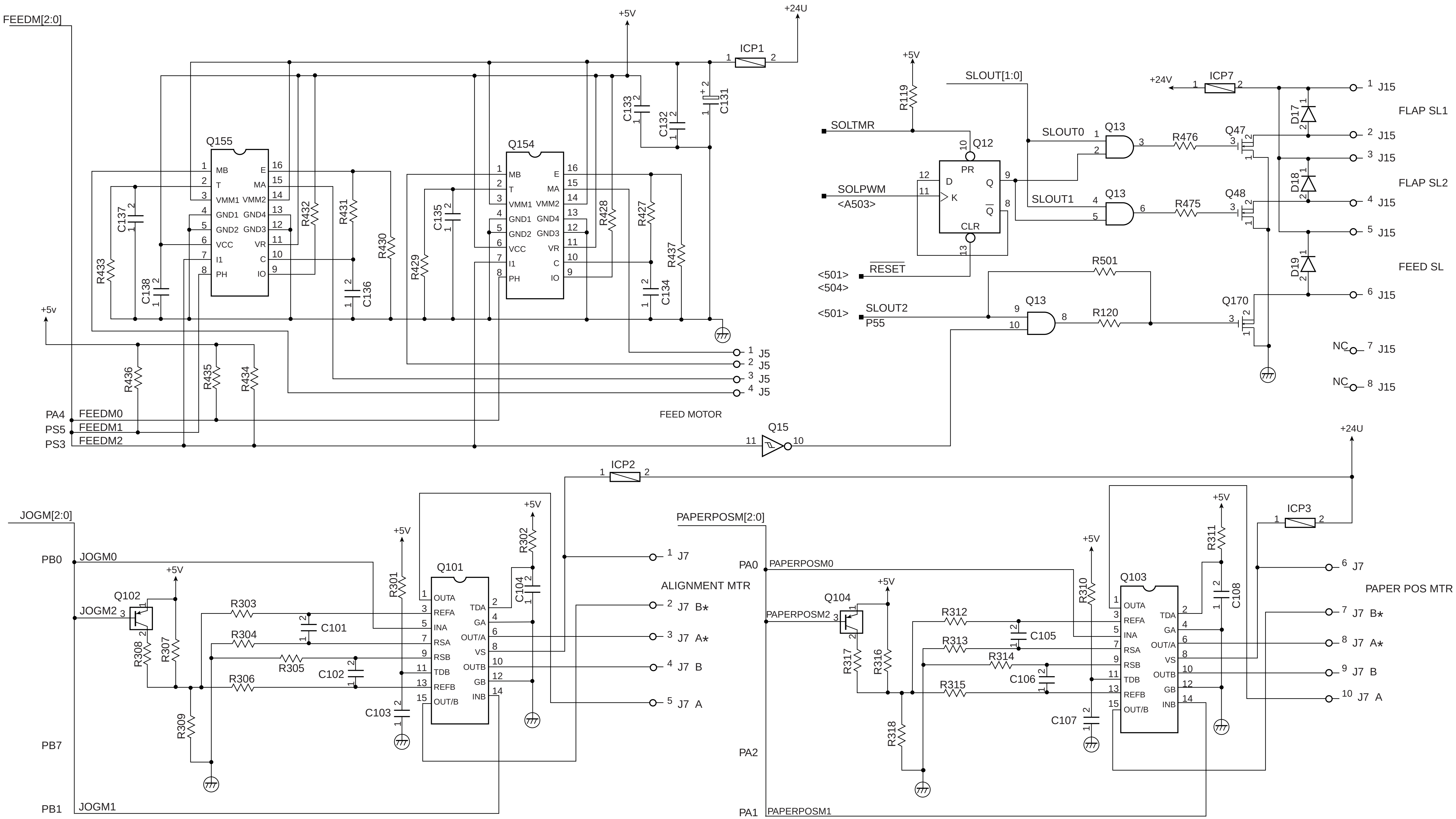
1. Saddle Stitcher Unit PCB (A502)



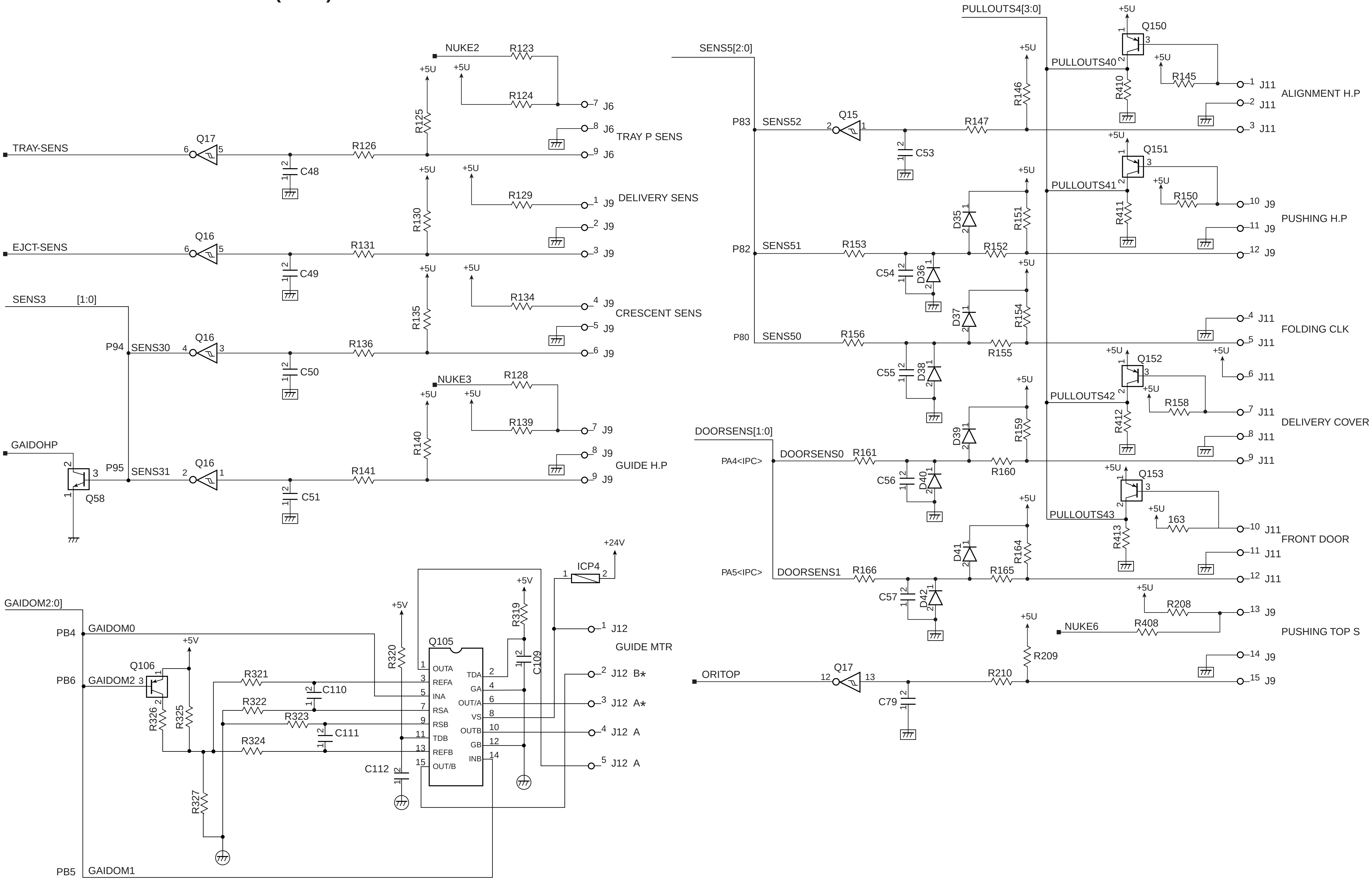
1. Saddle Stitcher Unit PCB (A503)



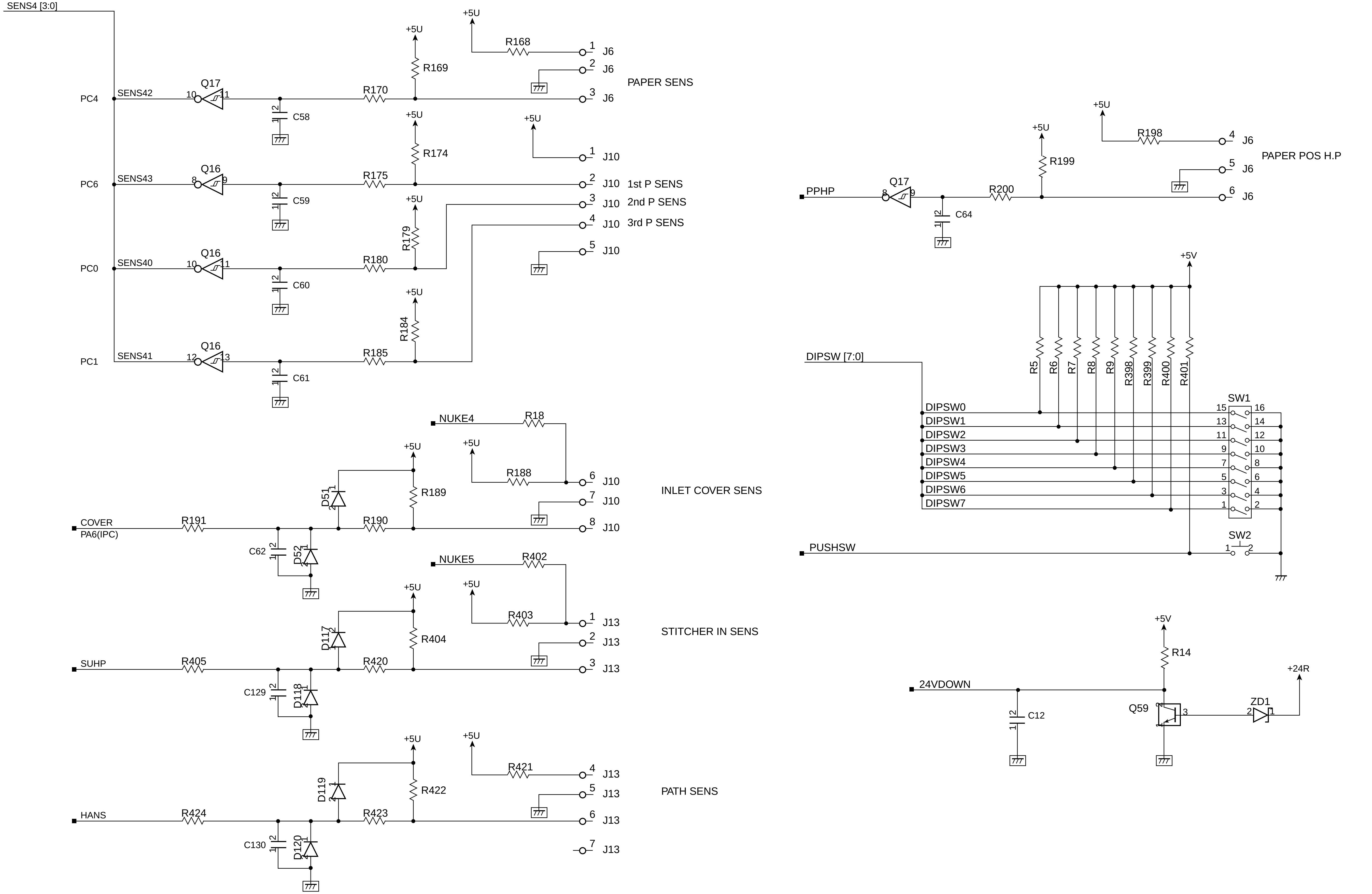
1. Saddle Stitcher Unit PCB (A504)



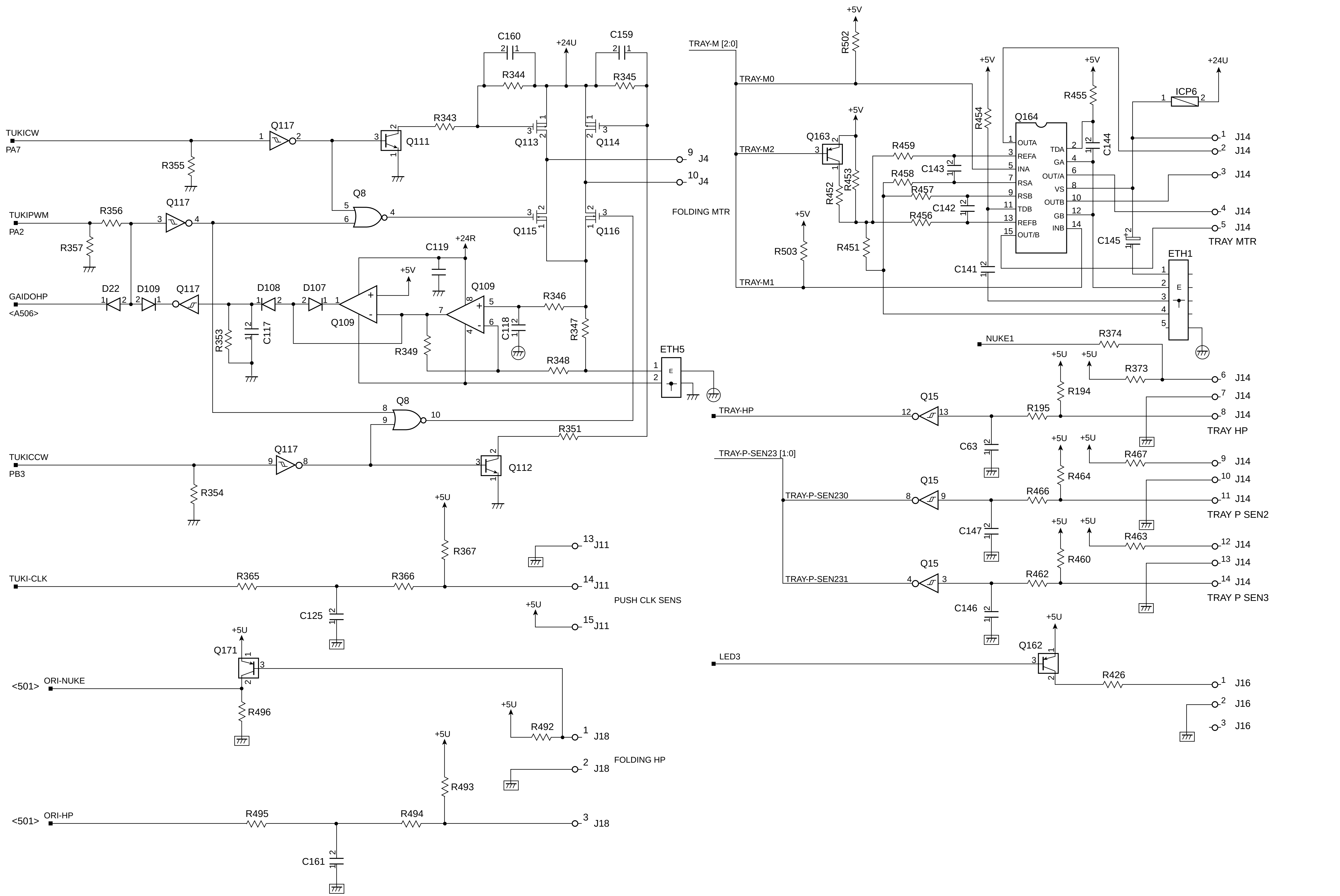
1. Saddle Stitcher Unit PCB (A505)



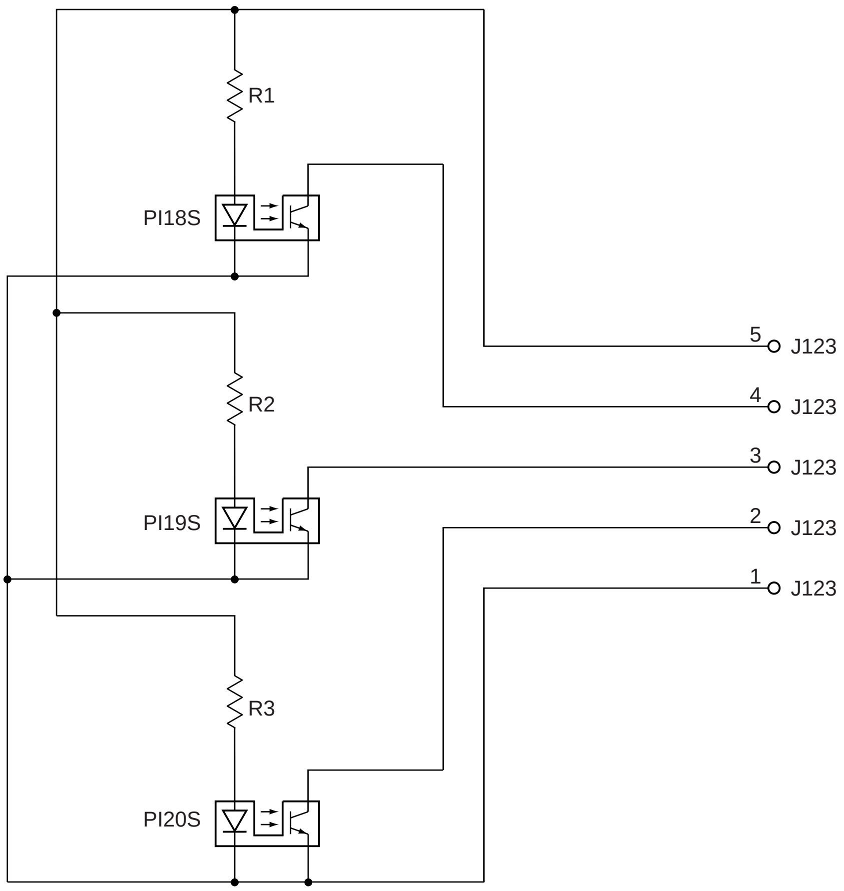
1. Saddle Stitcher Unit PCB (A506)



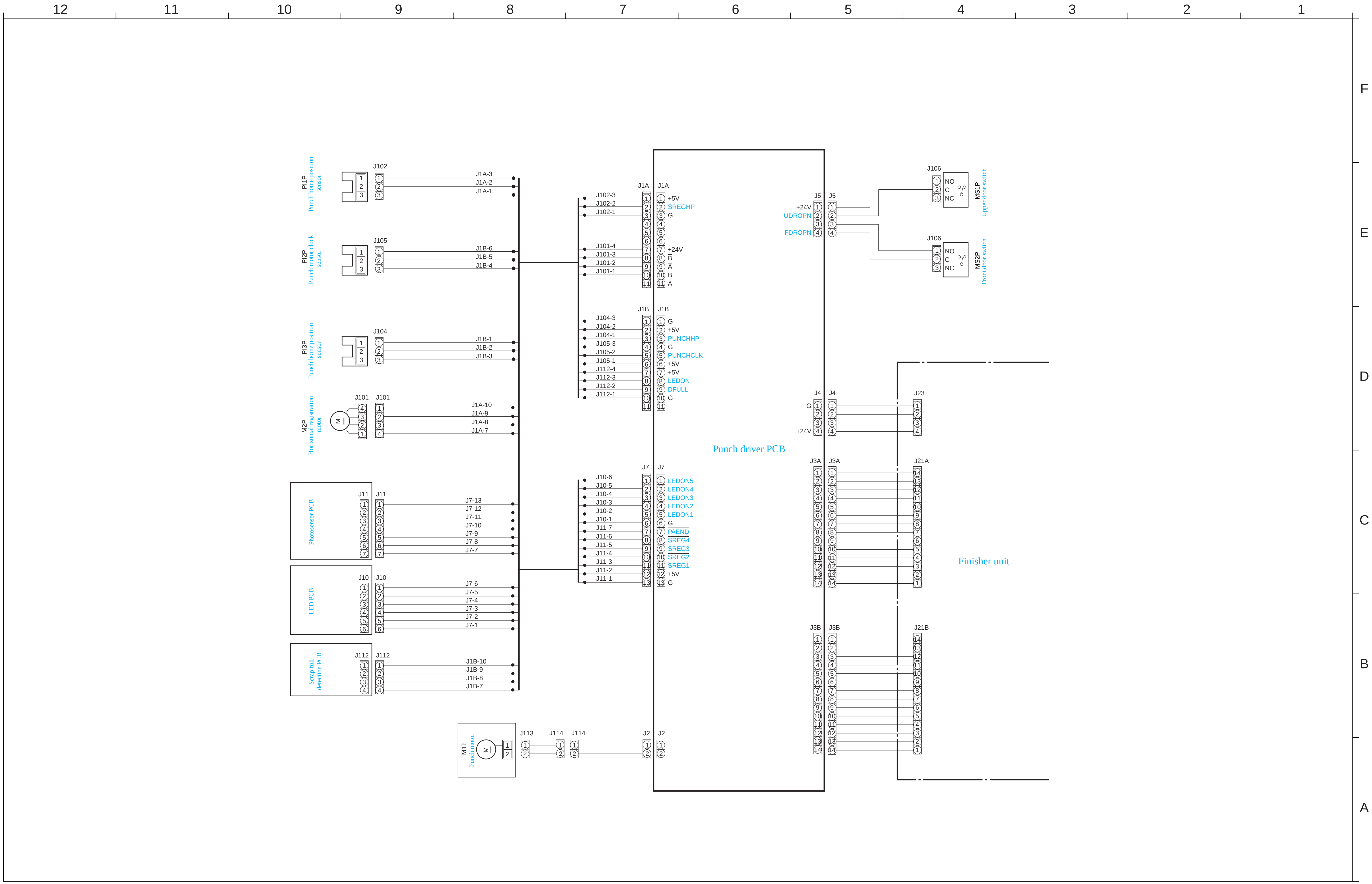
1. Saddle Stitcher Unit PCB (A507)



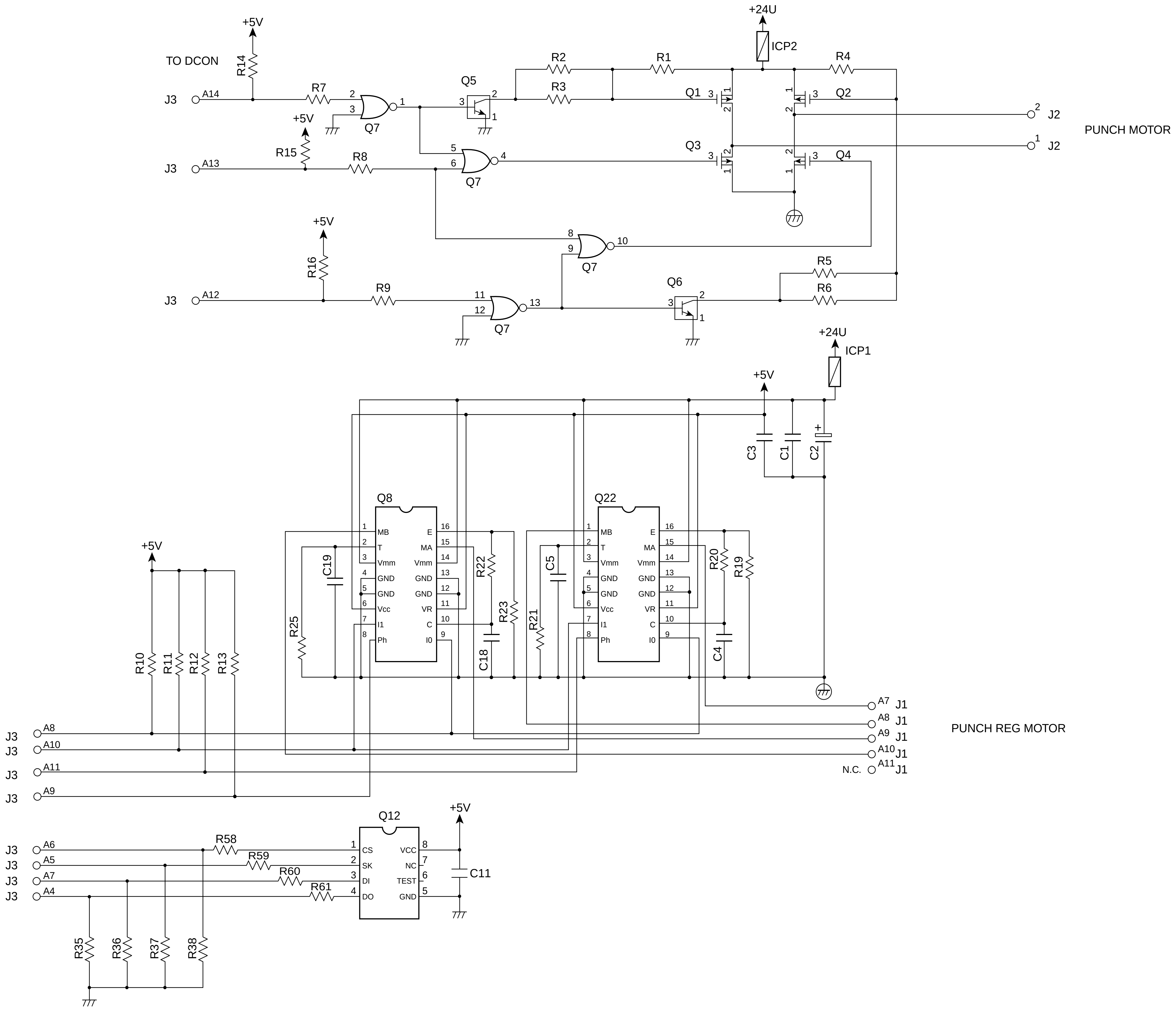
2. Paper sensor PCB

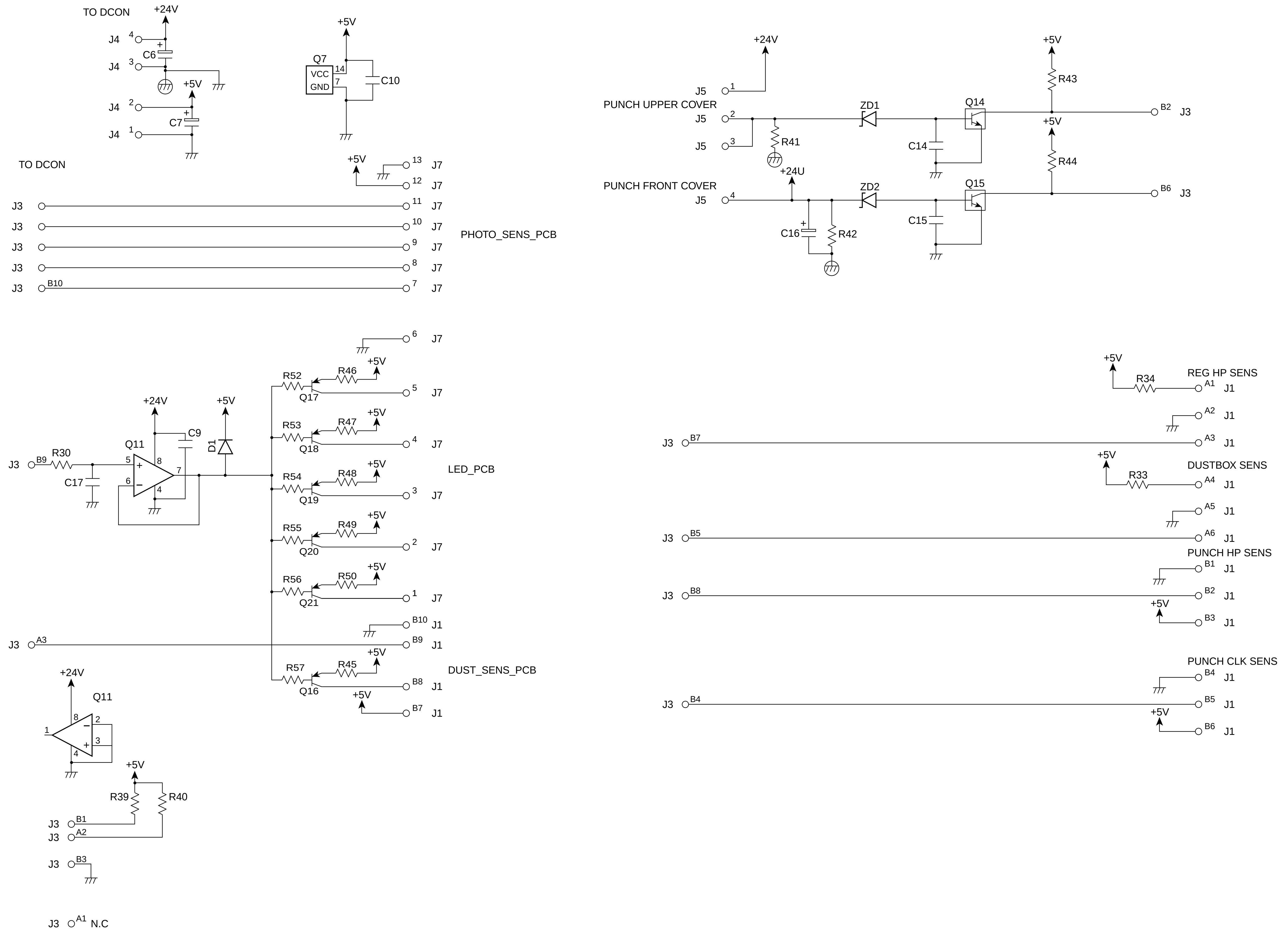


G. PUNCHER UNIT (option) CIRCUIT DIAGRAM

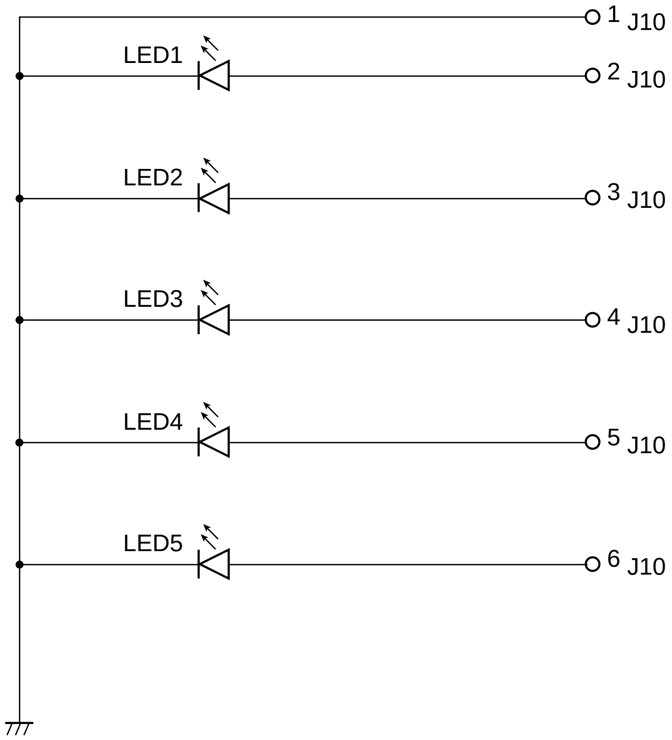


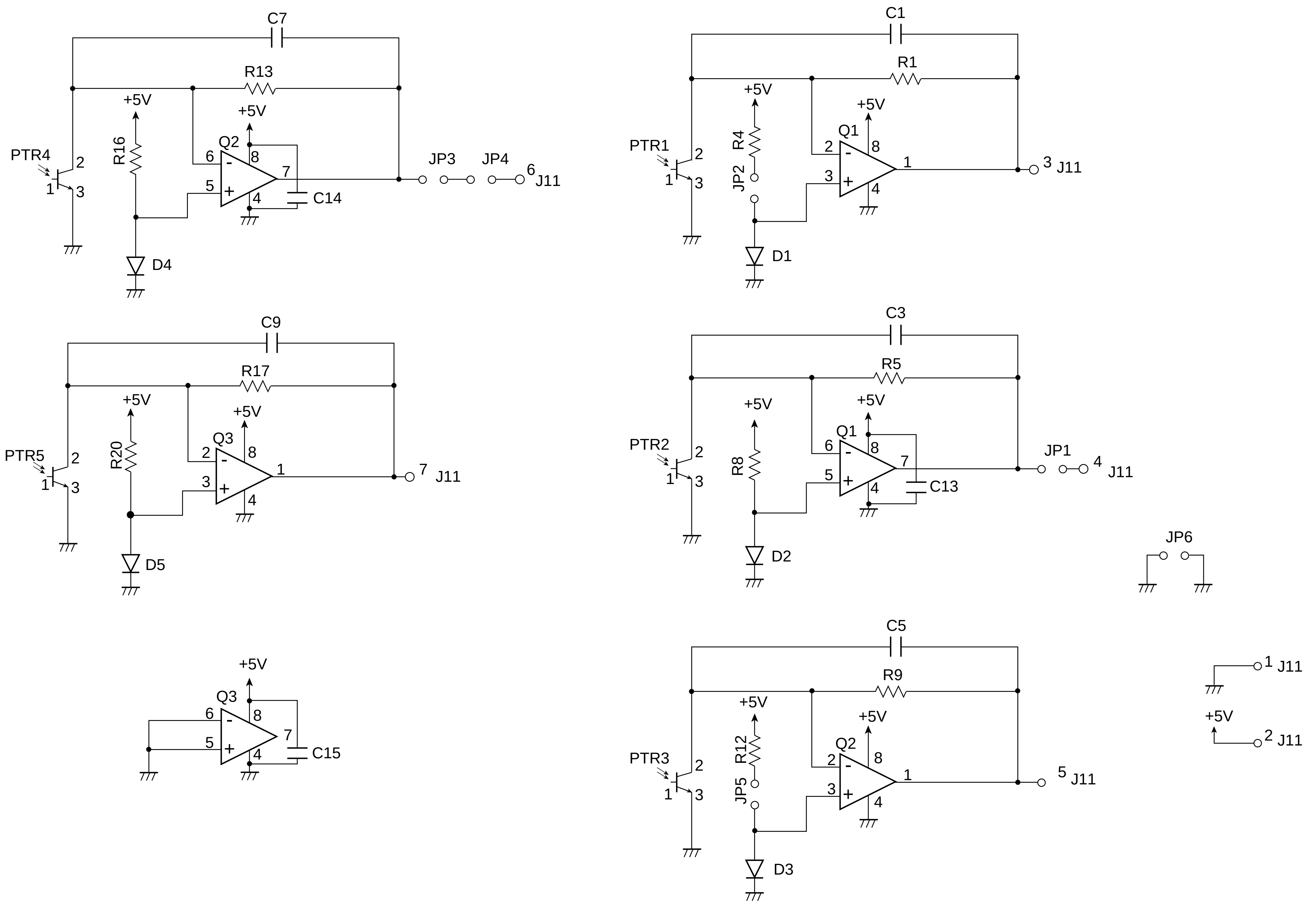
1. Punch Driver PCB (A502)



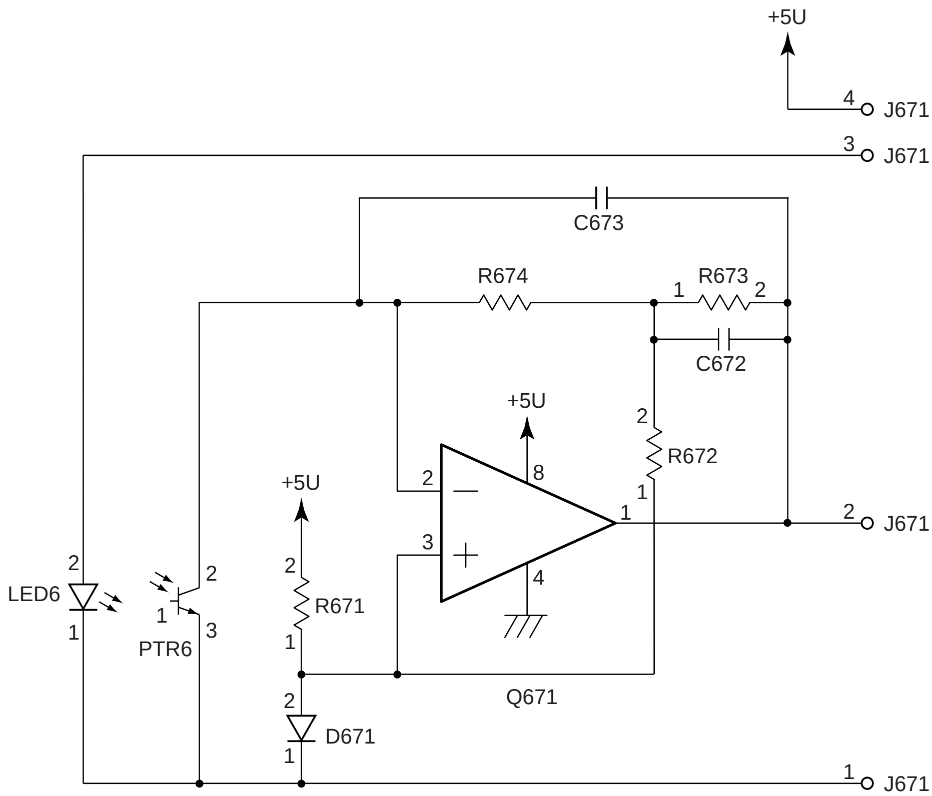

TO DCON
+24V
J4
C6
+5V
C7
Q7
VCC
GND
C10
TO DCON
J3
J7
PHOTO_SENS_PCB
+24V
+5V
Q11
C9
D1
R30
C17
R52
R46
Q17
R53
R47
Q18
R54
R48
Q19
R55
R49
Q20
R56
R50
Q21
LED_PCB
J1
R57
R45
Q16
DUST_SENS_PCB
R39
R40
N.C
J5
PUNCH UPPER COVER
R41
ZD1
C14
Q14
R43
R44
PUNCH FRONT COVER
+24U
ZD2
C16
R42
C15
Q15
REG HP SENS
R34
DUSTBOX SENS
R33
PUNCH HP SENS
PUNCH CLK SENS

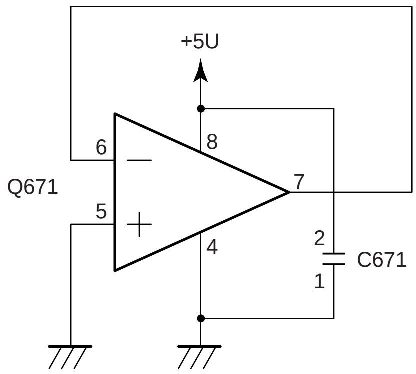
2. LED PCB




C7
R13
+5V
R16
+5V
Q2
PTR4
JP3
JP4
J11
C14
D4
C1
R1
+5V
R4
+5V
Q1
PTR1
JP2
J11
D1
C9
R17
+5V
R20
+5V
Q3
PTR5
J11
D5
C3
R5
+5V
+5V
Q1
PTR2
R8
JP1
J11
C13
D2
JP6
+5V
Q3
C15
C5
R9
+5V
R12
+5V
Q2
PTR3
JP5
J11
D3
J11
+5V
J11

4. Scrap full detector PCB





H. SOLVENTS AND OILS

No.	Name	Description	Composition	Remarks
1	Vic Clean C-17	Cleaning: e.g., glass, plastic, rubber parts, external covers	Hydrocarbon (fluorine family) Alcohol Surface activating agent Water	· Do not bring near fire. · Procure locally. · Isopropyl alcohol may be substituted.
2	Lubricant	Drive, friction parts, lead cam	Silicone oil	· Varmulb G2 (made by Japan Mineral Oils)

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