DUPLEXING UNIT

for LBP-NX PCB

SERVICE MANUAL

REVISION 0

Canon

SEPT. 1991

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Prepared by

PERIPHERAL PRODUCTS QUALITY PLANNING DIV.
PERIPHERAL PRODUCTS TECHNICAL DOCUMENTS DEPT.

CANON INC.

30-2 Shimomaruko 3-chome, Ohta-ku, Tokyo 146, Japan

PREFACE

This Service Manual contains basic information required for after-sales service of the DUPLEXING UNIT for LBP-NX PCB laser beam printer. This information is vital to the service technician in maintaining the performance of the duplexing unit.

Chapter 1: General Description
Specifications

Chapter 2: Operations and Timing
A description of the principles of operation of the electrical and mechanical systems, their functions, and timing of operations

Chapter 3: The Mechanical System
Explanation of mechanical operation, disassembly, reassembly, and adjustment procedures

Chapter 4: Maintenance and Servicing
Parts replacement schedule

Chapter 5: Troubleshooting
Reference values and adjustments; troubleshooting procedures

Appendix: General timing chart, general circuit, etc.

Information in this manual is subject to change as the product is improved or redesigned. All relevant information in such cases will be supplied in Service Information Bulletins.
A thorough understanding of this duplexing unit, based on information in this Manual and Service Information Bulletins, is required for maintaining its performance and for locating and repairing the causes of malfunctions.

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CHAPTER 2 OPERATION AND TIMING

CHAPTER 3 THE MECHANICAL SYSTEM

CHAPTER 4 MAINTENANCE AND SERVICING

CHAPTER 5 TROUBLESHOOTING

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CHAPTER 1

GENERAL DESCRIPTION

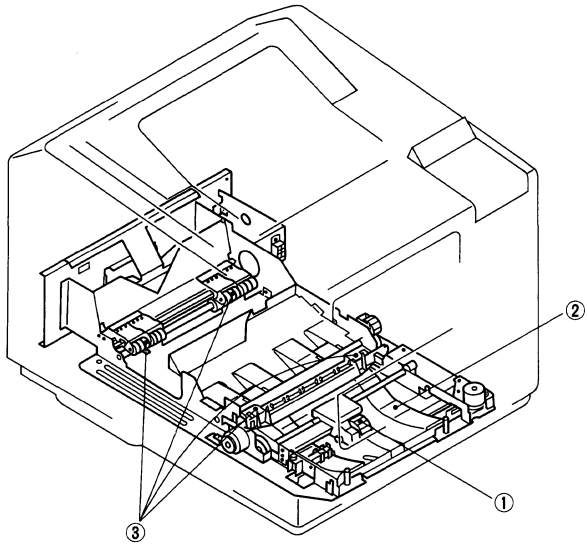
I. SPECIFICATIONS

1. Type	
2. Paper	Plain paper of Legal, A4, Letter, and Executive size (CANON-approved paper, 60g/m² - 90g/m²), and colored paper.
3. Operating environment	
Temperature	10°C to 32.5°C (50°F to 91°F)
Humidity	20% to 80% RH
4. Power supply	DC24V 1.2A (Supplied by the printer)
5. Power consumption	30W max
6. Noise level	Under 60dB(A) (PRINTING)
(including noise from printer)	Under 50dB(A) (STANDBY)
7. Dimensions (W × L × H)	365.5mm × 537mm × 120mm (Duplexing unit)
8. Weight	About 4kg (8.8lbs)

Specification are subject to change with product improvement.

II. PARTS OF THE DUPLEXING

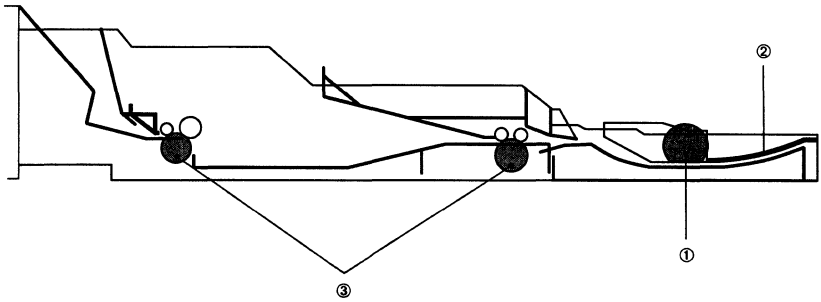
A. External View



① Switchback roller ③ Duplex feed roller
② Horizontal registration guide

Figure 1-1

B. Cross Sectional View



① Switchback roller ③ Duplex feed roller
② Horizontal registration guide

Figure 1-2

CHAPTER 2

OPERATION AND TIMING

1. This chapter describes the duplexing unit functions, the relationships between mechanisms and circuits, and timing of operations. Mechanical linkages are indicated by striped conduits (▬▬▬), control signals by arrows (⟶), and groups of signals by thick arrows (⟹).
2. The signals in digital circuits are identified as "H" for HIGH and "L" for LOW. The voltage for LOW is very close to 0V; the voltage for HIGH depends on the circuit. If a signal name has no bar over it (e.g., DUPRD, "H" is a "TRUE" signal. If a signal name has a bar over it (e.g., /DUSI), "L" is a "TRUE" signal. (A "TRUE" signal will usually cause and action to occur, etc.; a "FALSE" signal will normally prevent the operation).

I. BASIC OPERATION

A. Outline of the Electrical System

Operations of this duplexing unit are controlled by the microprocessor (IC401) on the duplex driver PCB.

This microprocessor controls sequences and serial communications with the printer.

Figure 2-1 is a block diagram of the relation between the duplexing unit and the printer. The power is supplied from the printer. The duplex driver PCB divides the power into 24 VDC and 5 VDC and supplies the appropriate one to each element.

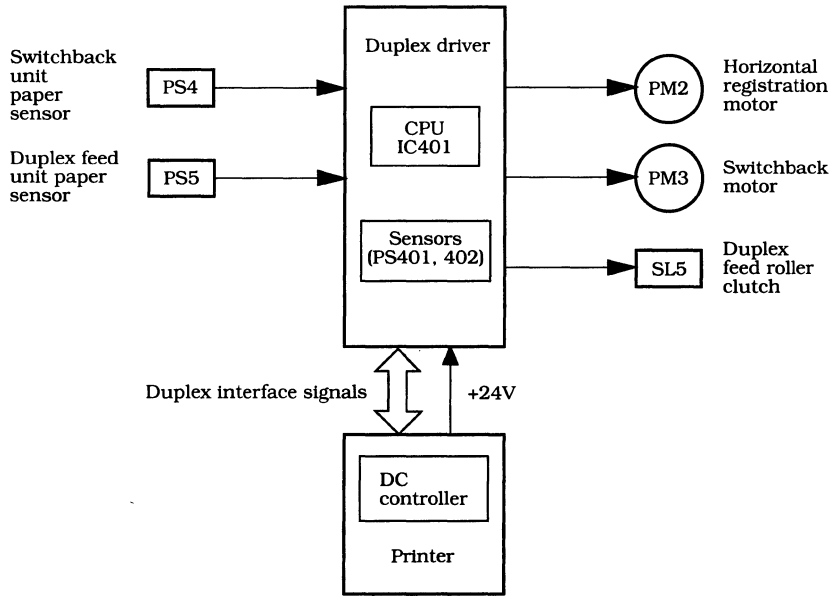


Figure 2-1

B. Duplex Driver Input/Output Signals

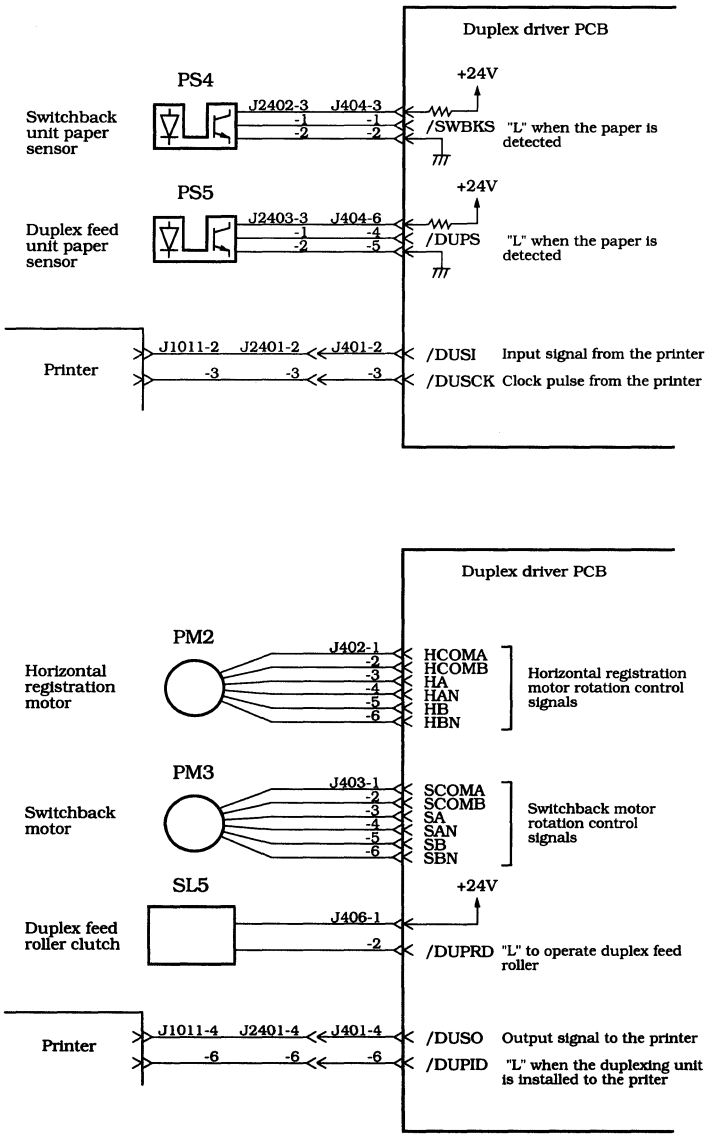


Figure 2-2

II. PICK-UP/FEED SYSTEM

A. Outline of Operations

1. Summary

The paper sent into the duplexing unit is fed by the duplex feed roller and the switchback roller and after the horizontal registration guide adjusts the horizontal registration, the paper is sent to the printer.

The duplex feed roller is driven by the printer. The duplex feed roller clutch (SL5) is goes ON and OFF to control the rotation of this roller.

The switchback roller is driven forward and reverse by the switchback motor (PM3, a pulse motor) to change the direction the paper is fed.

The horizontal registration guide moves each time the paper is switched back in order to align the paper. The distance the horizontal registration guide moves is determined by the paper size information from the printer.

The horizontal registration guide is driven by the horizontal registration motor (PM2, a pulse motor) to match the size of the paper.

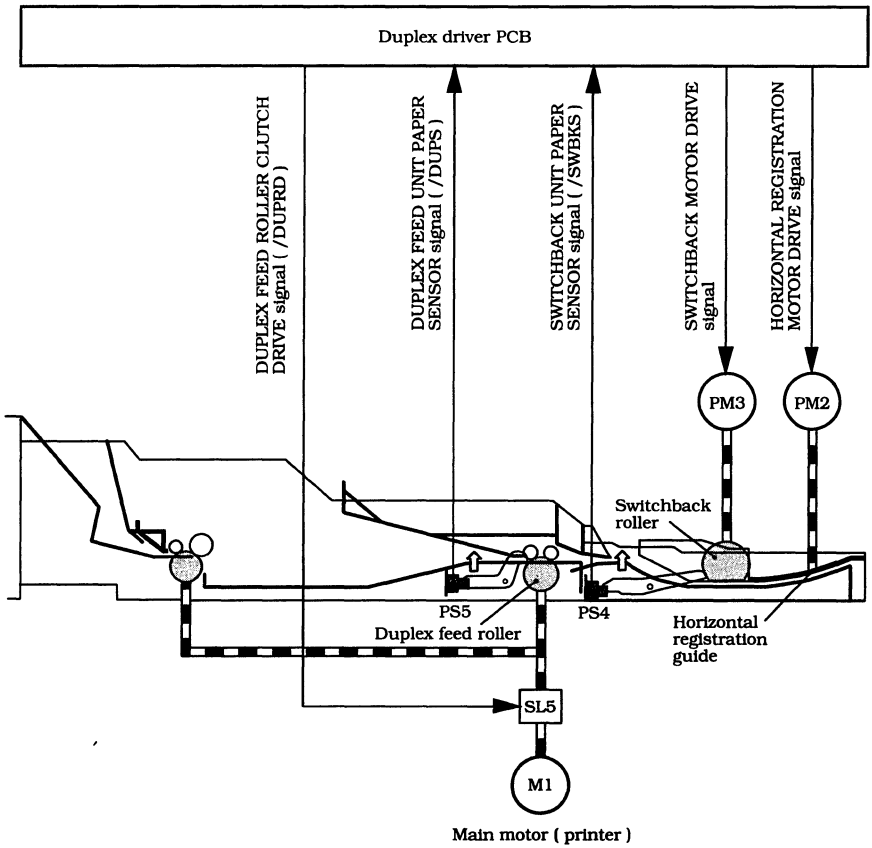


Figure 2-3

2. Duplex feed

When the duplexing unit is selected as the paper destination by a command from the video controller, about two seconds after the /VSYNC signal for the first page sends from the video controller, the printer's DC controller goes ON the duplex ON solenoid (SL6) and feeds the paper into the duplexing unit. About 0.13 second after the trailing edge of the paper clears the delivery unit paper sensor (PS151), the DC controller goes OFF the duplex ON solenoid.

About 4.8 seconds after the DC controller receives this /VSYNC signal, it sends the data to the duplex driver via the duplex interface and goes ON the duplex feed clutch (SL5), thus rotating the duplex feed roller. Then, about 0.06 second after the trailing edge of the final paper clears the duplex feed unit paper sensor (PS5), the duplex feed roller is stopped.

About 0.07 second after the trailing edge of the paper clears the duplex feed unit paper sensor (PS5), the duplex driver drives the switchback motor to rotate the switchback roller one rotation forward (the direction for pulling the paper out of the duplex feed roller). Then, it drives this roller 3 rotations in reverse (the direction for feeding the paper to the second-pass pick-up roller) and feeds the paper to the second-pass pick-up roller.

During duplex feed, if the previous sheet of paper is in the midst of the switchback operation, about 0.2 second after the paper being duplex fed clears the duplex feed unit paper sensor (PS5), the duplex driver stops the duplex feed roller to stop the paper until the switchback operation of the previous sheet of paper is complete.

About 0.9 second after the switchback roller starts to rotate in reverse, the second-pass pick-up roller starts to rotate and stops about 1.2 second later. At this time, if a video controller command specifies second-pass pick-up and if the /PRNT signal is "true", the printer goes right into the pick-up and print operations. If not, the paper stops at that position and waits for the /PRNT signal to be "true" in the second-pass pick-up specification.

3. Horizontal registration adjustment operation

For duplex printing, in order to feeding the paper in such a way that its edge touches this horizontal registration guide aligns the center of the horizontal scanning direction for the second page with the center of the printable area on the drum, horizontal registration adjustment is operated.

When the power is switched ON, in order to return the horizontal registration guide and the switchback roller to the home position, the duplex driver drives the horizontal registration motor and the switchback motor. If the horizontal registration guide is in the home position to start with, the duplex driver first moves the horizontal registration guide to the letter size position, then returns it to the home position.

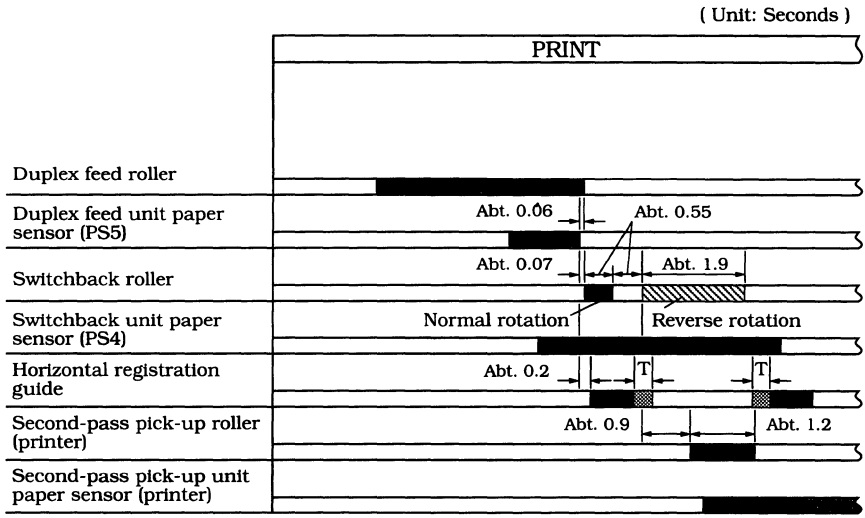
The duplex driver drives the horizontal registration motor a few of the regulation pulses based on the paper size information from the DC controller in order to move the horizontal registration guide. The microprocessor on the DC controller sends the horizontal registration guide drive command to the duplex driver at the timing mentioned above. The horizontal registration adjustment starts approximately 0.2 second after the end tip of the printing paper has passed the paper detection sensor (PS5) in the duplex conveyor section, and is completed before the roller starts rotating in the reverse direction.

The horizontal registration guide is held there until the paper has been picked up into the printer on the second pass and has reached the registration roller and the /VSYNC signal for the second page is sent from the video controller to the DC controller. After that, it returns to the home position.

The horizontal registration guide is driven by a pulse motor, but in order to carry out the home position detection and horizontal registration operations reliably, while the home position is detected, the speed of the guide is reduced. Also, in order to position

the horizontal registration guide precisely, it is pressed against the positioning guide during home position detection. Furthermore, the movement of the horizontal registration guide is controlled with pulse control, not with time control.

4. Sequence of Operation



Note:
Time T indicates the horizontal registration adjustment period and vary according to the paper size.

Figure 2-4

B. Paper Jam Detection

To detect presence of the paper and whether or not the paper has been normally fed, the following paper sensors are provided:

- Duplex feed unit paper sensor (PS5)
- Switchback unit paper sensor (PS4)
- Second-pass pick-up unit paper sensor (PS2, printer)

The microprocessor on the DC controller of the printer determines whether paper is jammed by checking whether paper is present or absent at the sensor at times stored in memory. If it detects a jam, the microprocessor immediately stops printing, and send a signal to the video controller to notify the jam.

The microprocessor detects a jam in any of the following conditions:

1. Duplexing unit delay jam

If the paper does not reach the duplex feed unit paper sensor (PS5) within the required time

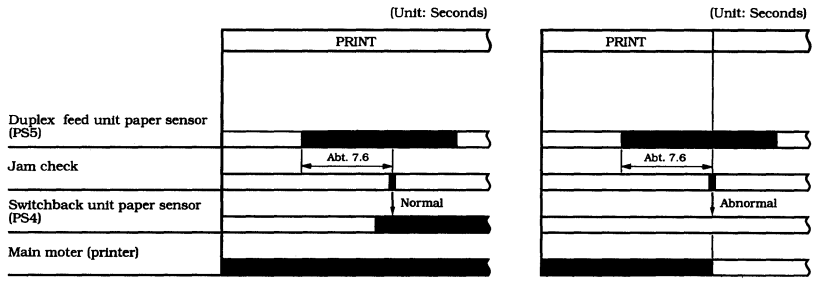
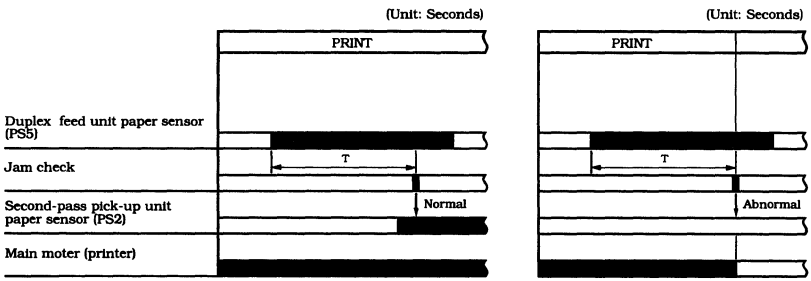


Figure 2-5

2. Duplexing unit stationary jam

If the paper does not clear the duplex feed unit paper sensor (PS5) within the required time



T = 1.86 (A4)
= 1.78 (Letter)
= 2.14 (Legal)

T = 1.72 (Executive)

Figure 2-6

3. Switchback unit delay jam

If the paper does not reach the switchback unit paper sensor (PS4) within the required time

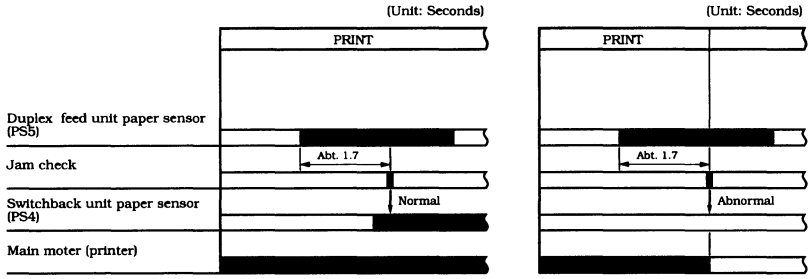


Figure 2-7

4. Second-pass pick-up unit delay jam

If the paper does not reach the second-pass pick-up unit paper sensor (PS2) within the required time

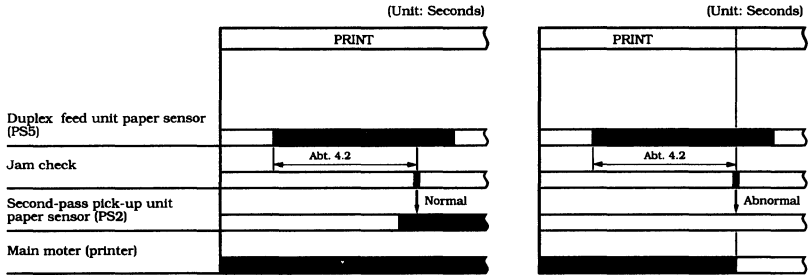


Figure 2-8

CHAPTER 3

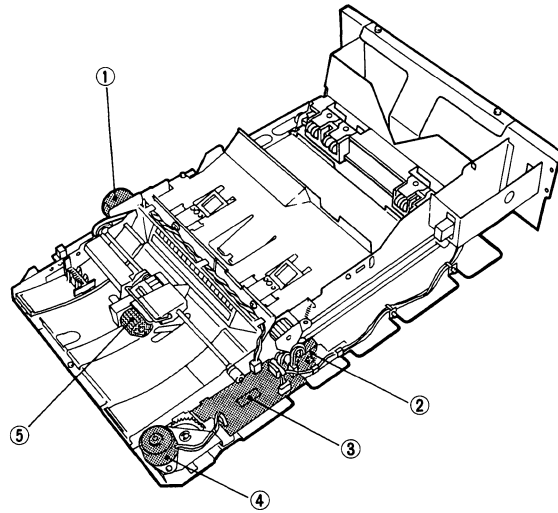
THE MECHANICAL SYSTEM

This chapter explains mechanical operation, and disassembly and reassembly of the duplexing unit.
Note the following precautions during disassembly or reassembly.

1. ⚠ **CAUTION: Disconnect the printer from the wall outlet before servicing it.**
2. Note the lenghts, diameters, and locations of screws. Use them in their original locations when reassembling the duplexing unit.
3. Do not operate the duplexing unit with any part removed.
4. Assembly is the reverse of disassembly unless specifically noted.

I. EXTERNALS

1. Configuration

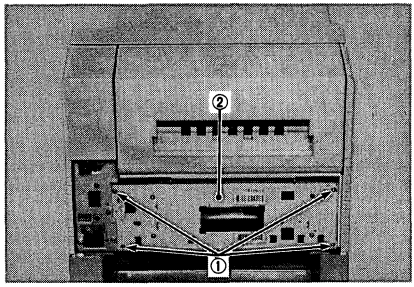


① Switchback motor
② Duplex feed roller clutch
③ Duplex driver PCB
④ Horizontal registration motor
⑤ Switchback roller

Figure 3-1

2. Removing the duplexing unit from the printer

1) Remove the rear lower cover from the printer.
2) Remove the four screws, then pull off the duplexing unit.



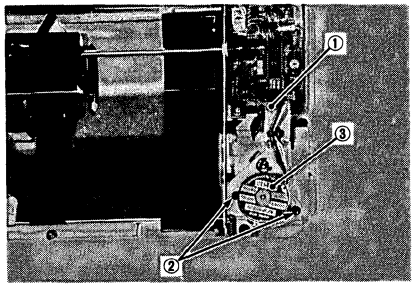
① Screws ② Duplexing unit

Figure 3-2

II. DRIVE SYSTEM

A. Horizontal Registration Motor

1) Remove the duplexing unit from the printer.
2) After removing the connector and the two screws, remove horizontal registration motor.

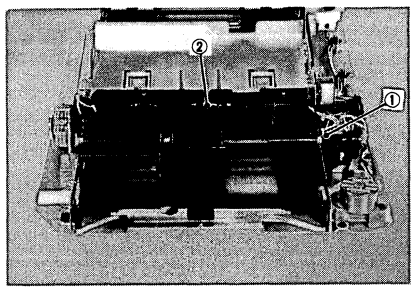


① Connector ② Screws
③ Horizontal registration motor

Figure 3-3

B. Switchback motor

1) Remove the duplexing unit from the printer.
2) Remove the one connector, then remove the cable from the guide.

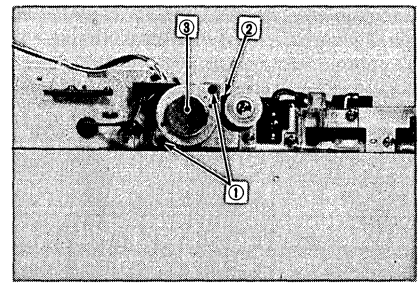


① Connector ② Cable

Figure 3-4

C. Switchback motor

1) Remove the two screws and remove the timing belt from the motor, then remove the switchback motor.



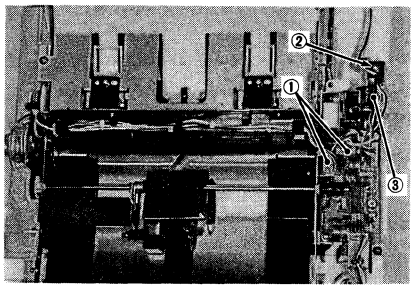
① Screws ② Timing belt
③ Switchback motor

Figure 3-5

III. PAPER TRANSPORT SYSTEM

A. Duplex Feed Roller Clutch

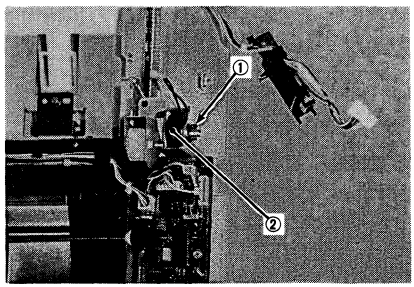
1) Remove the duplexing unit from the printer.
2) Remove the two connectors from the duplex driver PCB.
3) Remove the screw, then remove the cable guide.



① Connectors ② Screw
③ Cable guide

Figure 3-6

4) Loosen the setscrew that secures the clutch to the feed roller shaft, then remove the duplex feed roller clutch.

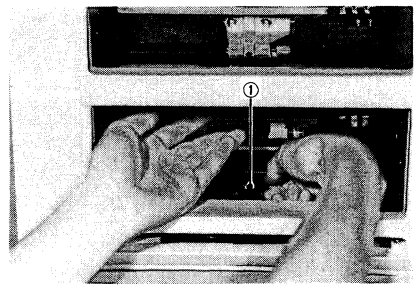


① Set screw
② Duplex feed roller clutch (electromagnetic clutch)

Figure 3-7

B. Switchback Roller

1) Take hold of the switchback roller handle and remove the switchback roller.



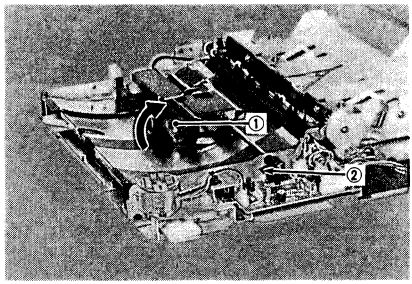
① Switchback roller

Figure 3-8

IV. ELECTRICAL COMPONENTS

A. Duplex Driver PCB

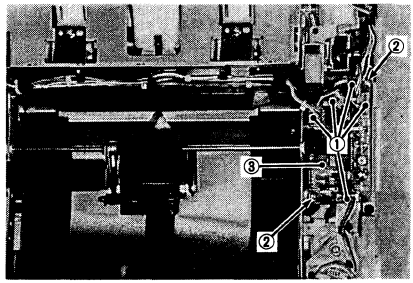
1) Remove the duplexing unit from the printer.
2) Turn the switchback roller in the direction of the arrow and remove the light blocking plate from the sensor.



① Switchback roller ② Light blocking plate

Figure 3-9

3) Remove the five connectors and the two screws, then remove the duplex driver PCB.



① Connectors ② Screws
③ Duplex driver PCB

Figure 3-10

CHAPTER 4

MAINTENANCE AND SERVICING

I. PARTS REPLACEMENT SCHEDULE

The parts listed below should be replaced at regular intervals, even though they may be functioning properly and shown no sign of wear. (Failure of these parts would seriously affect system performance.)
These parts should be replaced be during the regular service visit closest to the end of the service life of the part.

Table 4-1

As of Sept. 1991

No.	Part name	Part No.	Q' ty	Service life (number of prints)	Remarks
1	Switchback roller	RF5-0081-000	1	200,000	

Note: These values above are estimates only, and may be changed with experience.

II. CONSUMABLES

None.

III. PERIODIC SERVICE SCHEDULE

The list of periodic services is shown below. When servicing, only the specified solvents and oils should be used.

Table 4-2

△: Cleaning ●: Replacement ×: Lubrication □: Adjustment ◎: Checking

As of Sept. 1991

Part name	Every 200,000 prints	Every 1,000,000 prints	Remarks
Switchback roller	●		

Note: These values above are estimates only, and may be changed with experience.

CHAPTER 5

TROUBLESHOOTING

When a problem occurs in the duplexing unit, check whether the printer is operating correctly; if it is not, see the troubleshooting procedures for the printer.

I. INTRODUCTION

A. Initial Check

The following requirements should be met when installing the duplexing unit:

a. The line voltage does not vary more than ±10% from the voltage shown on the rating plate.
b. The room temperature is kept between 10°C and 32.5°C, and the relative humidity, between 20% and 80%.
c. The duplexing unit is not exposed to ammonia gas, and is not located in a hot or humid area (such as near a water faucet, or humidifier), near open flames, or in a dusty place.
d. The duplexing unit is not exposed to direct sunlight. (If it has to be placed somewhere sunny, the window should be curtained.)
e. The room is well ventilated.

B. Basic Procedure

When a problem occurs in the duplexing unit, make an initial check and troubleshoot the duplexing unit as described in section III of this chapter to find the cause and solve the problem.

II. MEASUREMENT AND ADJUSTMENT

A. Mechanical Adjustment

1. Position adjustment of the horizontal registration guide

1) Confirm that the figure "4" for the adjustment pin of the duplexing unit faces upward.

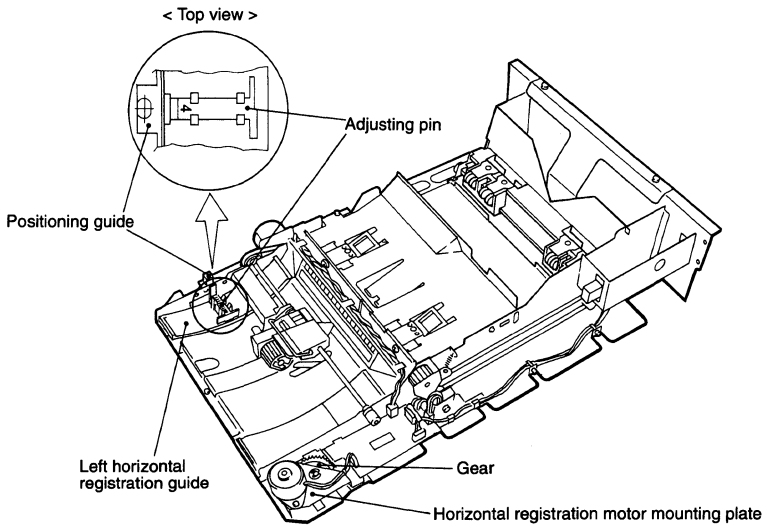


Figure 5-1

2) Remove two screws and one E-ring. Remove the horizontal registration motor mounting plate and the gear.
3) Push the left horizontal registration guide to the positioning guide.
4) Install the gear while aligning the ø4 hole of the rack and the ø4 hole of the bottom plate.
5) Install the horizontal registration motor mounting plate.

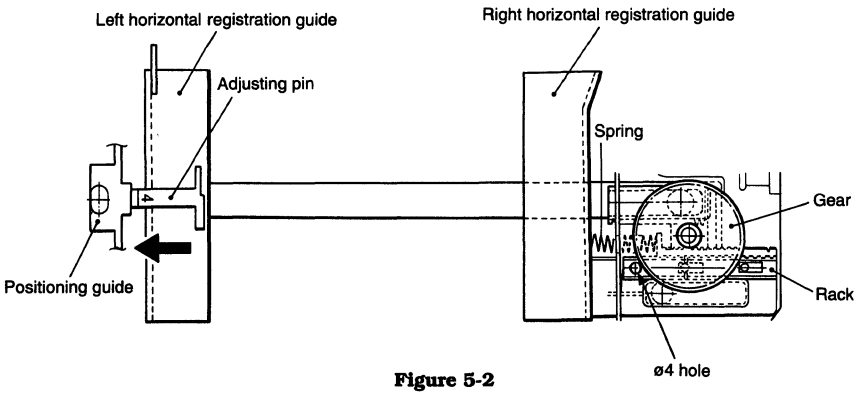


Figure 5-2

2. **Position relationship of the light blocking plate and the switchback roller**
   Install the light blocking plate and the switchback roller so that the relationship of their positions is as shown in the figure below.

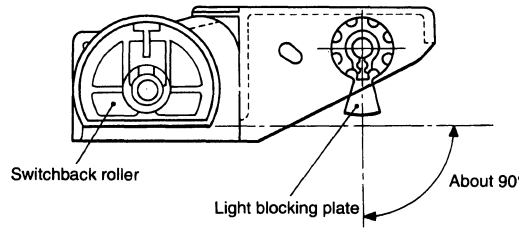


Figure 5-3

III. TROUBLESHOOTING MALFUNCTIONS

When troubleshooting malfunctions as described in this section, note the following:

1. **Before measuring the voltage between specified connector pins, check that the connectors are making good contact.**
2. **Unless otherwise specified, perform the following procedures with the duplexing unit mounted on the printer.**

M-1 No DC Power

Possible cause	Step	Check	Result	Measure
Printer power supply failure	1	Remove the duplexing unit from the printer. Set the multimeter to the 200 V range. When the printer power is switched ON, is the voltage between connector pins J2401-1 (+24 VA) and J2401-5 (GND) of the printer about 24 VDC?	NO	Repair the power supply of the printer.
Duplex driver PCB			YES	Replace the duplex driver PCB.

M-2 Faulty Switchback Motor

Possible cause	Step	Check	Result	Measure
Connector	1	Is connector J403 on the duplex driver PCB making good contact?	NO	Reconnect the connector.
Switchback motor	2	Set the multimeter to the 200Ω range.	NO	Replace the switchback motor.
Duplex driver PCB		Disconnect the connector J403 on the duplex driver PCB. Measure the resistance at connector J403 on the switchback motor side with the multimeter. Is the reading as follows?	YES	Replace the duplex driver PCB. If the problem persists after replacing the PCB, replace the DC controller PCB of the printer.

	"Nippon servo" made (±10%)	"Canon seiki" made (±7%)
J403-1 and J403-3	About 60Ω	About 80Ω
J403-1 and J403-4	About 60Ω	About 80Ω
J403-2 and J403-5	About 60Ω	About 80Ω
J403-2 and J403-6	About 60Ω	About 80Ω

M-3 Faulty Horizontal Registration Motor

<table>
<tr><th>Possible cause</th><th>Step</th><th>Check</th><th>Result</th><th>Measure</th></tr>
<tr><td>Connector</td><td>1</td><td>Is connector J402 on the duplex driver PCB making good contact?</td><td>NO</td><td>Reconnect the connector.</td></tr>
<tr><td>Horizontal registration motor</td><td>2</td><td>Set the multimeter to the 200Ω range.</td><td>NO</td><td>Replace the horizontal registration motor.</td></tr>
<tr><td>Duplex driver PCB</td><td></td><td>Disconnect the connector J402 on the duplex driver PCB. Measure the resistance at connector J402 on horizontal registration motor side with the multimeter. Is the reading as follows?
<table><tr><td>J402-1 and J402-3</td><td>About 180Ω</td></tr><tr><td>J402-1 and J402-4</td><td>About 180Ω</td></tr><tr><td>J402-2 and J402-5</td><td>About 180Ω</td></tr><tr><td>J402-2 and J402-6</td><td>About 180Ω</td></tr></table></td><td>YES</td><td>Replace the duplex driver PCB.
If the problem persists after replacing the PCB, replace the DC controller PCB of the printer.</td></tr>
</table>

IV. PAPER TRANSPORT TROUBLESHOOTING

If the paper jams frequently, carry out the following procedure.

Possible cause	Step	Check	Result	Measure
Duplex feed roller solenoid	1	Is the duplex feed roller turning?	NO	Replace the duplex feed roller solenoid. If this does not solve the problem, replace the duplex driver PCB.
Duplex driver PCB	2	Is the switchback roller at the home position?	NO	Replace the duplex driver PCB.
Switchback motor	3	Does the switchback motor turn smoothly?	NO	Replace the switchback motor. If this does not solve the problem, replace the duplex driver PCB.
Switchback roller	4	Is the switchback roller deformed or worn?	YES	Replace the switchback roller.
Horizontal registration guide, feed guide	5	Does the horizontal registration guide move smoothly?	YES	Check the horizontal registration guide and feed guide for foreign objects, burrs, etc. If it is good, check the second-pass pick-up unit of the printer.
Horizontal registration motor			NO	Replace the horizontal registration motor. If this does not solve the problem, replace the duplex driver PCB.

V. LOCATION OF ELECTRICAL PARTS/FUNCTION

A. Photointerrupters, Solenoids, Motors, and PCBs

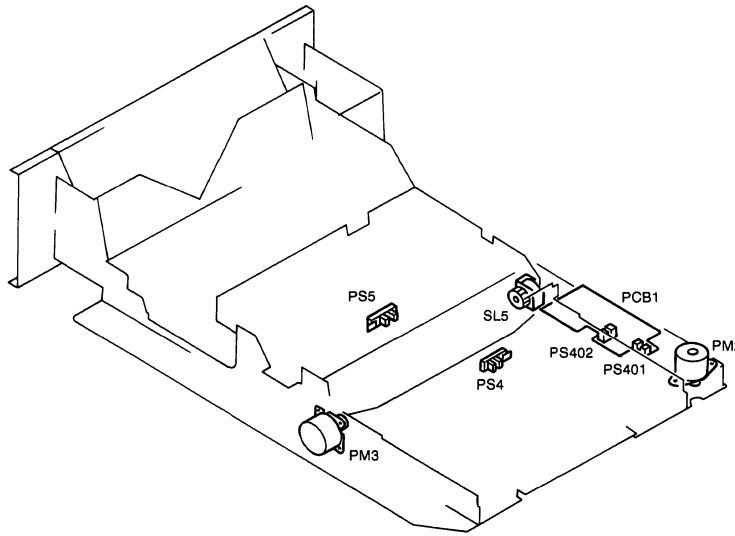


Figure 5-4

Table 5-1

Symbol	Name	Code	Function
	Photointerrupter	PS4	Detects paper in switchback unit
		PS5	Detects paper in duplex feed unit
		PS401	Detects home position of horizontal registration guide
		PS402	Detects home position of switchback roller
	Clutch	SL5	Operating feed roller
	Motor	PM2	Operating the horizontal registration guide
		PM3	Operating the switchback roller
	Duplex driver PCB	PCB1	Operating motors, solenoid, and sensors

B. Connectors

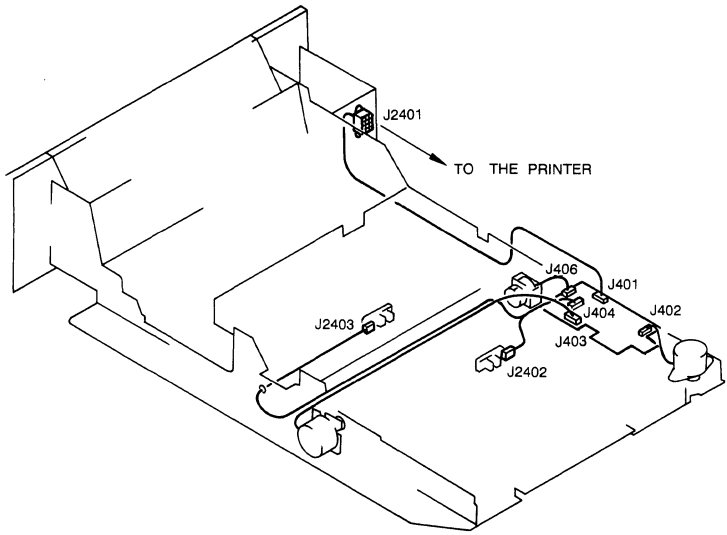


Figure 5-5

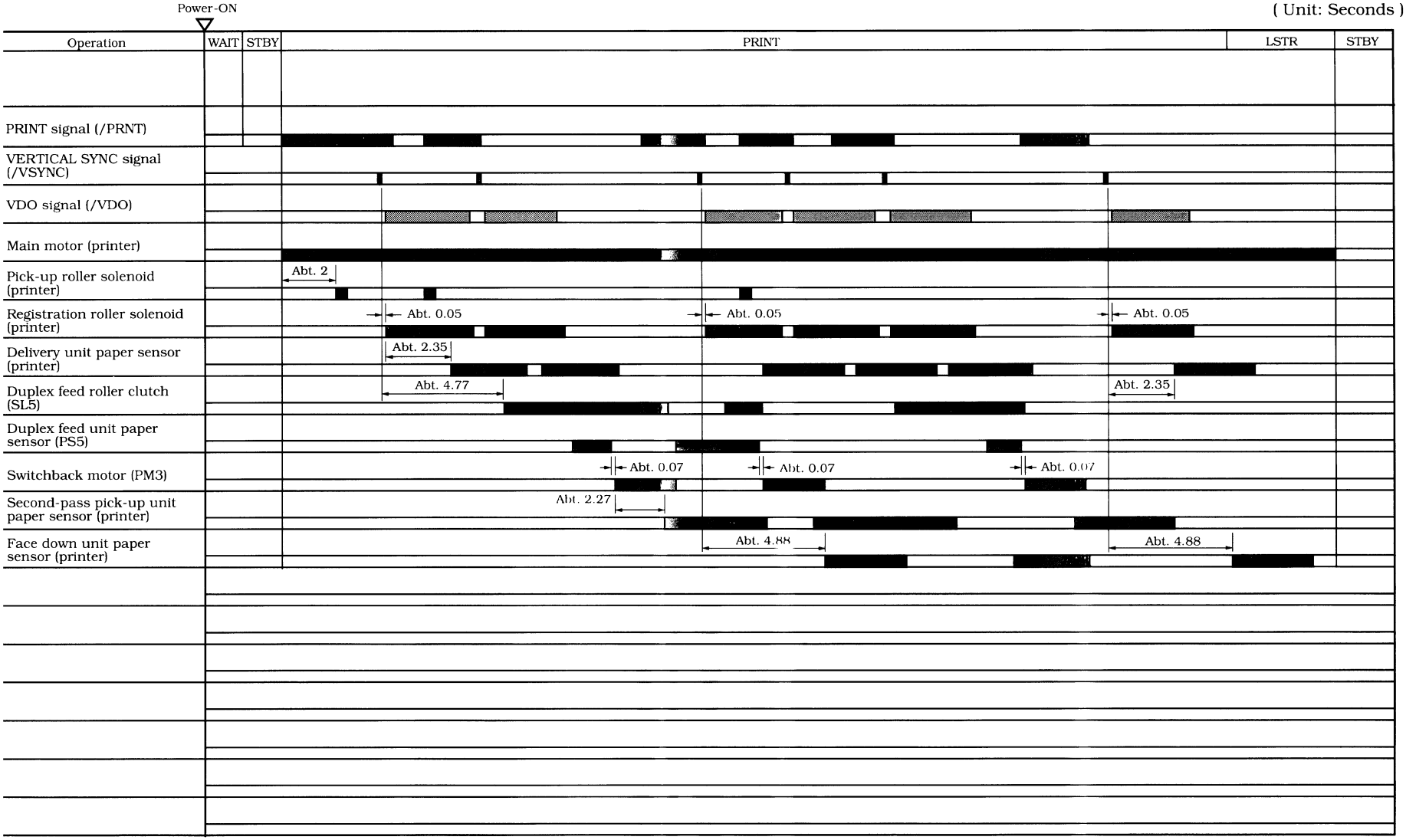
Table 5-2

Code	Pins	Connection
J401	7	Printer
J402	6	Horizontal registration motor (PM2)
J403	6	Switchback motor (PM3)
J404	6	Sensors (PS401, PS402)
J406	2	Duplex feed roller clutch (SL5)
J2401	8	Printer
J2402	3	Switchback unit paper sensor (PS402)
J2403	3	Duplex feed unit paper sensor (PS401)

APPENDIX

Timing chart for three consecutigve double-side prints on A4 paper

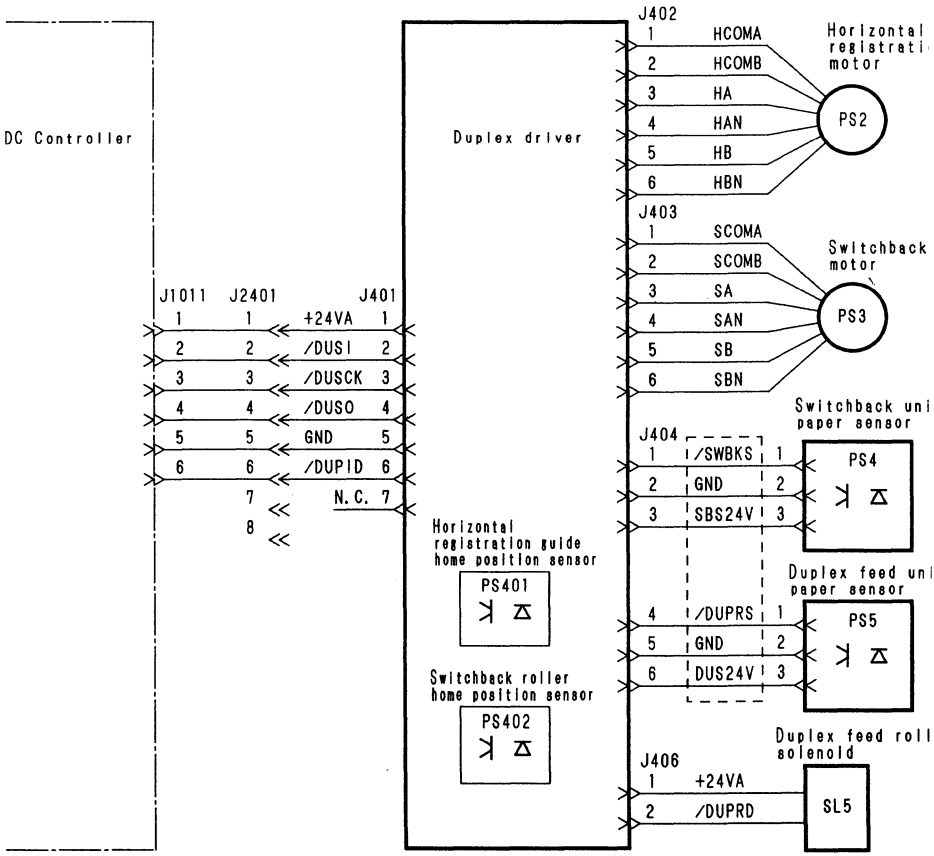
(Unit: Seconds)

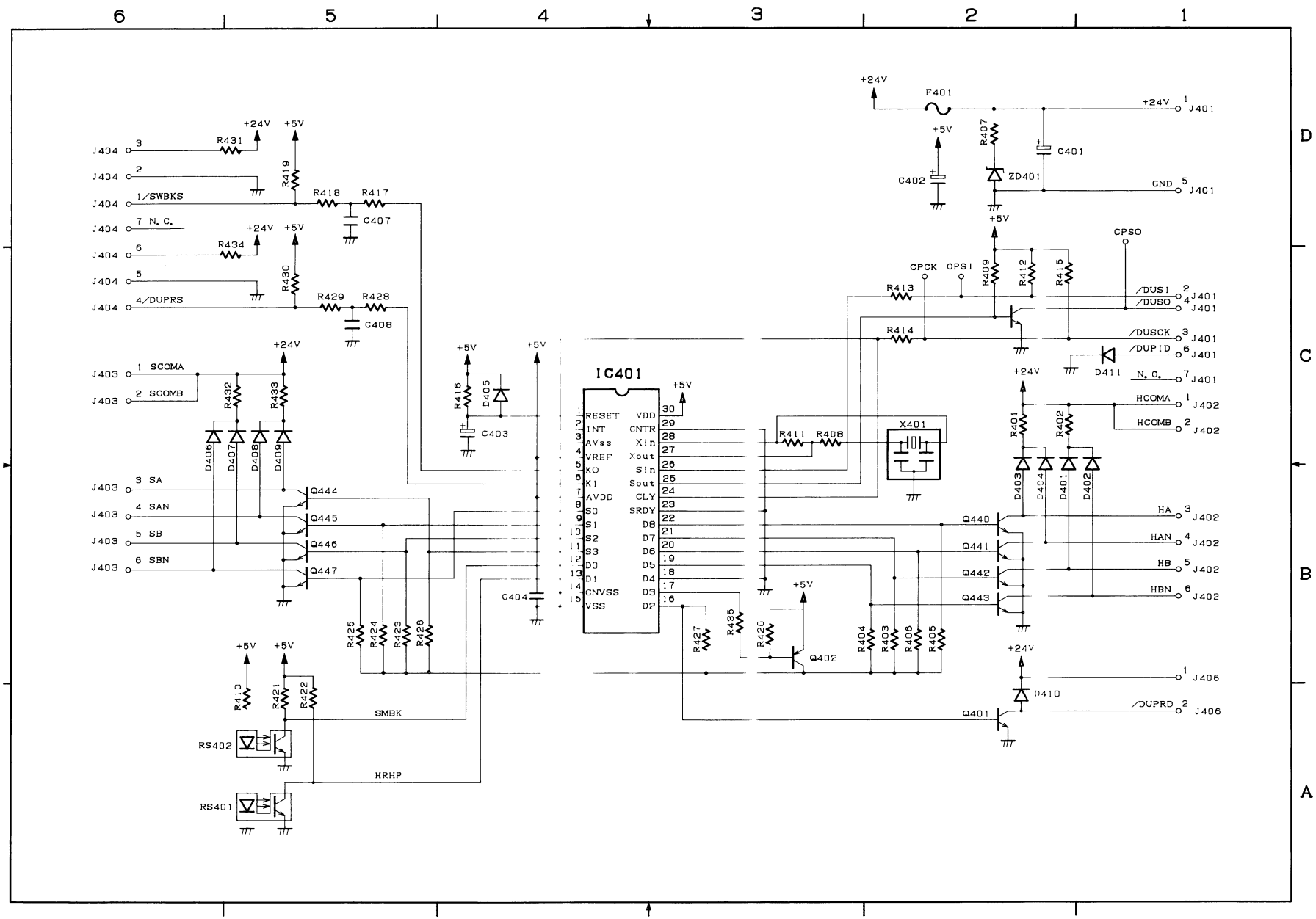


II. LIST OF SIGNALS/ABBREVIATIONS

Abbreviation	Signal Name
/DUPID	DUPLEXING UNIT INSTALLATION DETECT signal
/DUPRD	DUPLEX FEED ROLLER DRIVE signal
/DUPRS	DUPLEX SENSOR signal
/DUSCK	DUPLEX CLOCK signal
/DUSI	DUPLEX SERIAL INPUT signal
/DUSO	DUPLEX SERIAL OUTPUT signal
HA	HORIZONTAL REGISTRATION MOTOR signal A
HAN	HORIZONTAL REGISTRATION MOTOR signal A negative
HB	HORIZONTAL REGISTRATION MOTOR signal B
HBN	HORIZONTAL REGISTRATION MOTOR signal B negative
HCOMA	HORIZONTAL REGISTRATION MOTOR COMMON signal A
HCOMB	HORIZONTAL REGISTRATION MOTOR COMMON signal B
SA	SWITCHBACK MOTOR signal A
SAN	SWITCHBACK MOTOR signal A negative
SB	SWITCHBACK MOTOR signal B
SBN	SWITCHBACK MOTOR signal B negative
SCOMA	SWITCHBACK MOTOR COMMON signal A
SCOMB	SWITCHBACK MOTOR COMMON signal B
/SWBKS	SWITCHBACK SENSOR signal

III. GENERAL CIRCUIT DIAGRAM




6
5
4
3
2
1
D
C
B
A
+24V
F401
J401
+5V
C402
R407
C401
ZD401
GND
CPSO
CPCK
CPSI
R409
R412
R415
R413
R414
/DUS1
/DUSO
/DUSCK
/DUPID
D411
N. C.
IC401
RESET
INT
AVss
VREF
KO
K1
AVDD
S0
S1
S2
S3
D0
D1
CNVSS
VSS
VDD
CNTR
Xin
Xout
Sin
Sout
CLY
SRDY
D8
D7
D6
D5
D4
D3
D2
X401
R411
R408
HCOMA
HCOMB
R401
R402
D403
D404
D401
D402
HA
HAN
HB
HBN
Q440
Q441
Q442
Q443
Q402
Q401
D410
/DUPRD
J406
J404
3
2
1/SWBKS
7 N. C.
6
5
4/DUPRS
R431
R434
R419
R430
R418
R417
R429
R428
C407
C408
R416
D405
C403
C404
J403
1 SCOMA
2 SCOMB
3 SA
4 SAN
5 SB
6 SBN
R432
R433
D406
D407
D408
D409
Q444
Q445
Q446
Q447
R425
R424
R423
R426
R427
R435
R420
R404
R403
R406
R405
R410
R421
R422
SMBK
HRHP
RS402
RS401

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