5 Theory of operation

Chapter contents

Note

This manual is used to service the entire HP color LaserJet 9500 Series printer and to service the HP color LaserJet 9500mfp *print engine* only. To service the ADF/scanner portion of the HP color LaserJet 9500mfp, see your *HP Scanner/ADF Service Manual for the HP LaserJet 9000mfp/9000Lmfp/ 9040mfp/9050mfp/9500mfp* (PN C8549-90955). To service the 2,000-sheet side-input tray, see your *2,000-sheet Side-Input Tray Service Manual* (PN Q1891-90901).

A complete service manual bundle is available by ordering the *Service Bundle for HP Color LaserJet 9500/9500mfp* (PN C8549-99001). The service bundle includes the manuals listed above, this print engine manual, and the *Paper Handling Accessories Service Addendum* (PN C85693-90002).

Throughout this document, the term “printer” is used to refer to both the HP LaserJet 9500 Series printer models *and* the HP LaserJet 9500mfp. Make sure to read the headings and text carefully to understand the context of the term.

Major printer systems

This chapter describes the major printer systems that are common to the HP LaserJet 9500 Series printer and the 9500mfp.

This chapter provides information about the following systems:

- engine control (page 142)
- formatter (page 158)
- laser/scanner (page 160)
- image formation (page 170)
- paper pickup (page 181)

Relationships among the four systems are represented in figure 18:

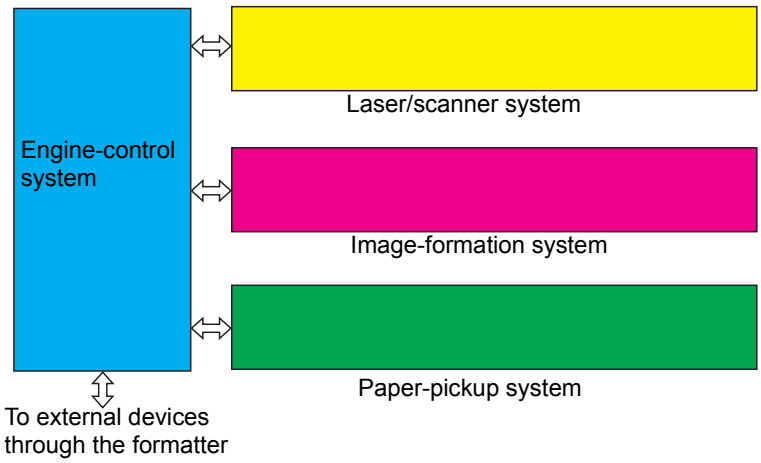

Figure 18. **Printer systems**

Note

In addition to the systems that are described in this chapter the HP color LaserJet 9500mfp model adds the following major printer systems: the scanner/ADF, a finishing device, and a 2,000-sheet side high-capacity feeder. See the *HP Scanner/ADF Service Manual for the HP LaserJet 9000mfp/ 9000Lmfp/9040mfp/9050mfp/9500mfp* (PN C8549-90955), the *2,000-Sheet Side-input Tray Service Manual* (PN Q1891-90901), or the *Paper handling accessories service addendum* (PN Q5693-90002) for information about these systems.

Printer block diagram

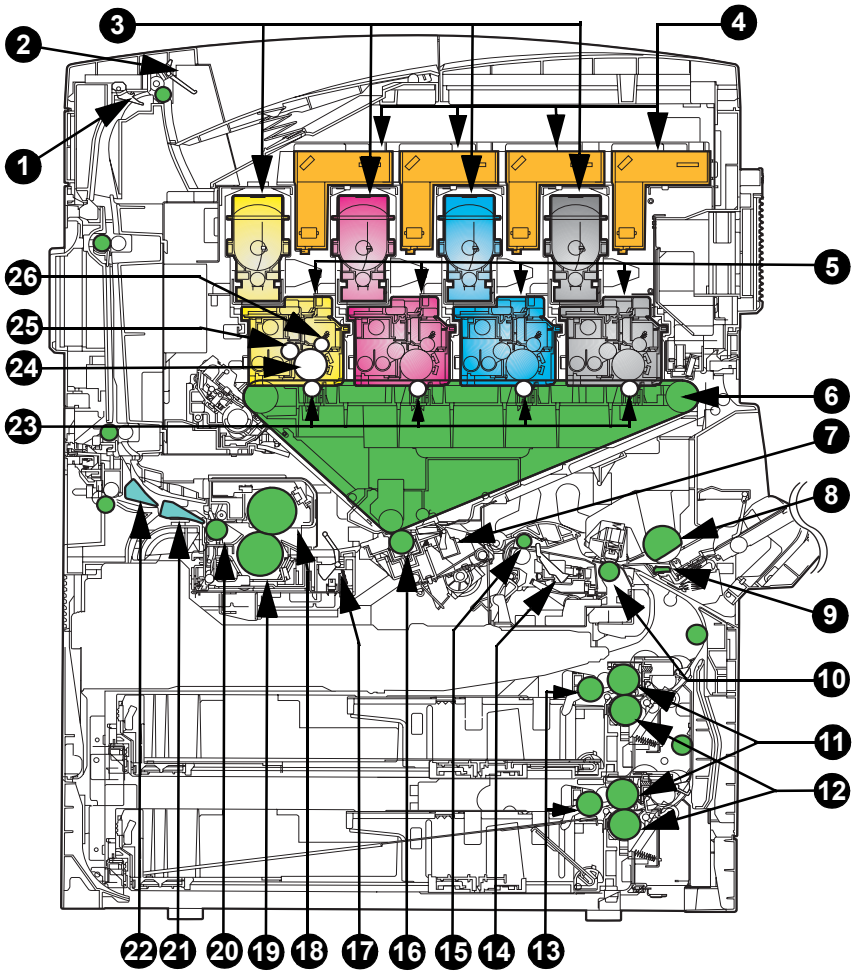

Figure 19. **Printer components**

Table 42. Printer components

Key	Description	Key	Description
1	Face-down tray delivery sensor flag	14	Registration paper sensor flag
2	Face-down tray paper-full sensor flag	15	Registration roller
3	T cartridges (T-CRG; print cartridges)	16	Secondary transfer roller (T2)
4	Laser/scanner assemblies	17	Fusing front paper sensor flag
5	P cartridges (P-CRG; image drums)	18	Fusing roller
6	Intermediate transfer belt (ITB assembly)	19	Pressure roller
7	Secondary transfer assembly	20	Fusing delivery roller
8	Tray 1 pickup roller	21	Duplex deflector
9	Separation pad	22	Face-up deflector
10	Pre-registration roller	23	Primary transfer roller (T1)
11	Feed roller	24	Photosensitive drum
12	Separation roller	25	Developing cylinder
13	Pickup roller	26	Primary charging roller

Sequence of operation

The engine-control system controls the operational sequences. Table 44 describes the sequences. The sequence of operation from the time power is turned on until the printer enters the standby state is described in table 43.

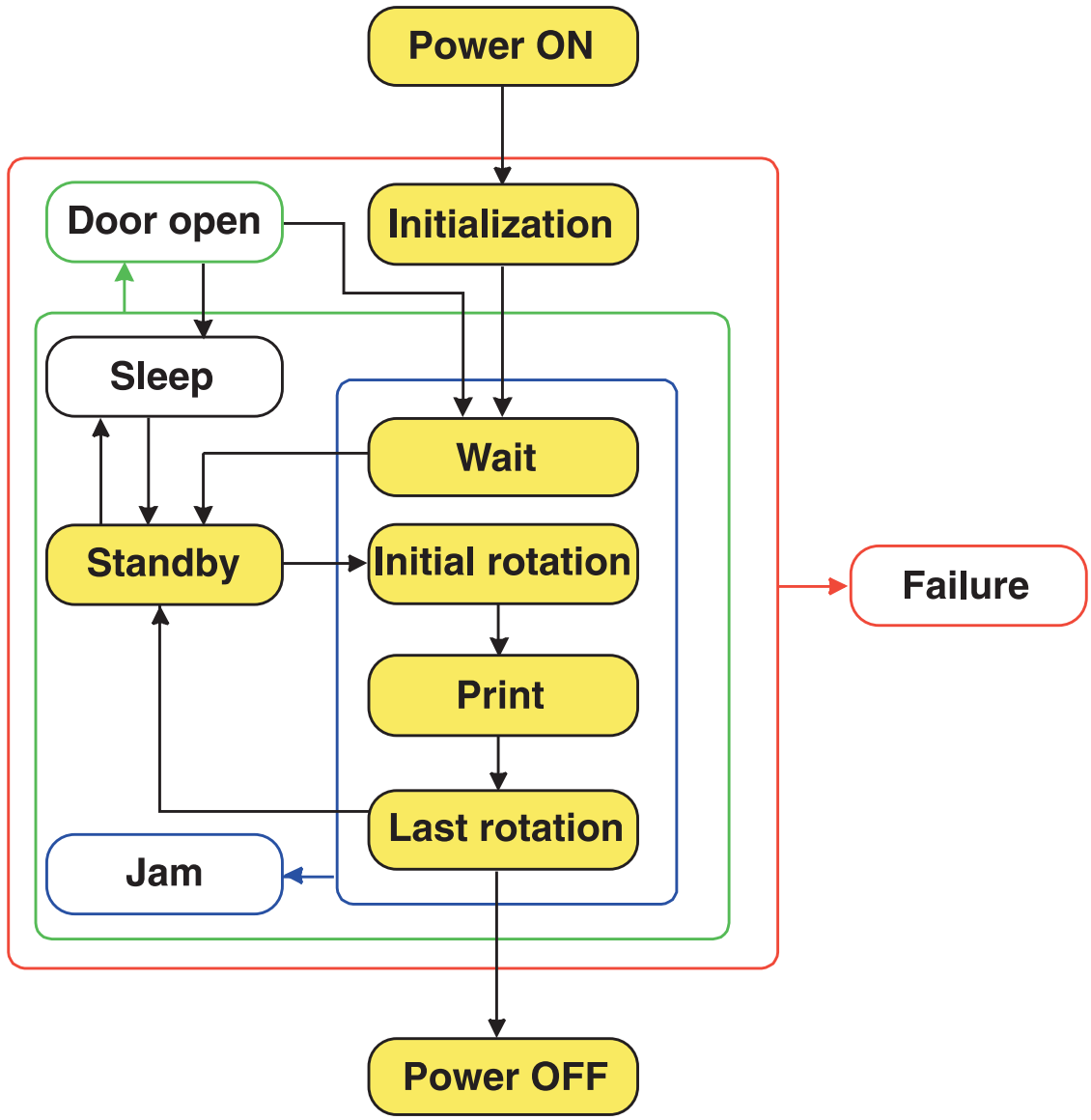

Figure 20. **Power-on block diagram**

Table 43. Power-on sequence

Order	Description	Order	Description
1	Power is turned on	7	Memory tag initializes
2	Main CPU initializes	8	Cartridge memory check occurs
3	Sub-CPU initializes	9	Standby temperature adjustment starts
4	ASIC initializes	10	Residual-paper-jam check occurs
5	All fans turn on	11	High-voltage control check occurs
6	Formatter communication starts	12	Standby mode begins

Table 44. Normal sequence of operation

State	Period	Operation
WAIT	From the time the power is turned on or a door is closed until the secondary transfer roller cleaning is complete	• power on • main CPU, sub CPU, and ASIC initialize • power-supply-fan rotates • memory tags are checked • formatter interface communication starts • high-voltage control sequence (values are set and the secondary transfer roller is cleaned) • adjustment is made to reach the standby temperature • calibrations are performed (D-max, D-half, CPR) • jam/door-open/failure/emergency-stop check is performed
STBY (standby)	From the end of the WAIT or LSTR period until either the print command is sent from the formatter, or the power is turned off	• print-start check is performed (search for print command) • automatic delivery-request check is performed (the formatter commands the feed rollers to eject residual pages in the paper path, and the ITB, fuser, registration, and pickup rollers turn on) • calibrations are performed • door open/failure check is performed
INTR (initial rotation)	From the input of a print reservation command from the formatter until start-up of the primary transfer bias	• motor rotates • fan motors rotate at full speed • laser scanner motor rotates • automatic power control (APC) is adjusted • initial-rotation final check is performed (OPC pre-ghost sequence occurs) • jam/door-open/failure/sleep check is performed
PRINT	From the end of the INTR period until the secondary transfer bias is turned off	• fuser temperature control occurs • TOP signal turns on (engine to formatter output signal) • image control occurs • high-voltage control occurs • paper pickup control occurs • next-page-pickup timing is coordinated • toner is supplied to the drum cartridge • jam/door-open/failure/emergency-stop check
LSTR (last rotation)	From the end of the print operation until the drum motor and the ITB motor stop	• paper pickup control occurs • scanner motor stops • high-voltage control stops • fuser control reverts to standby • fan-motor control occurs

Table 45. Failure sequence of operation

State	Period	Operation

JAM
 	
DOOR OPEN
 	
FAILURE
	From the time the power is turned on until the end of the LSTR period	• TOP signal turns off
		• emergency stops occur:
		  • scanner motor
		  • high-voltage control
		  • fuser control
		  • all motors
		• door-open check occurs

Timing charts

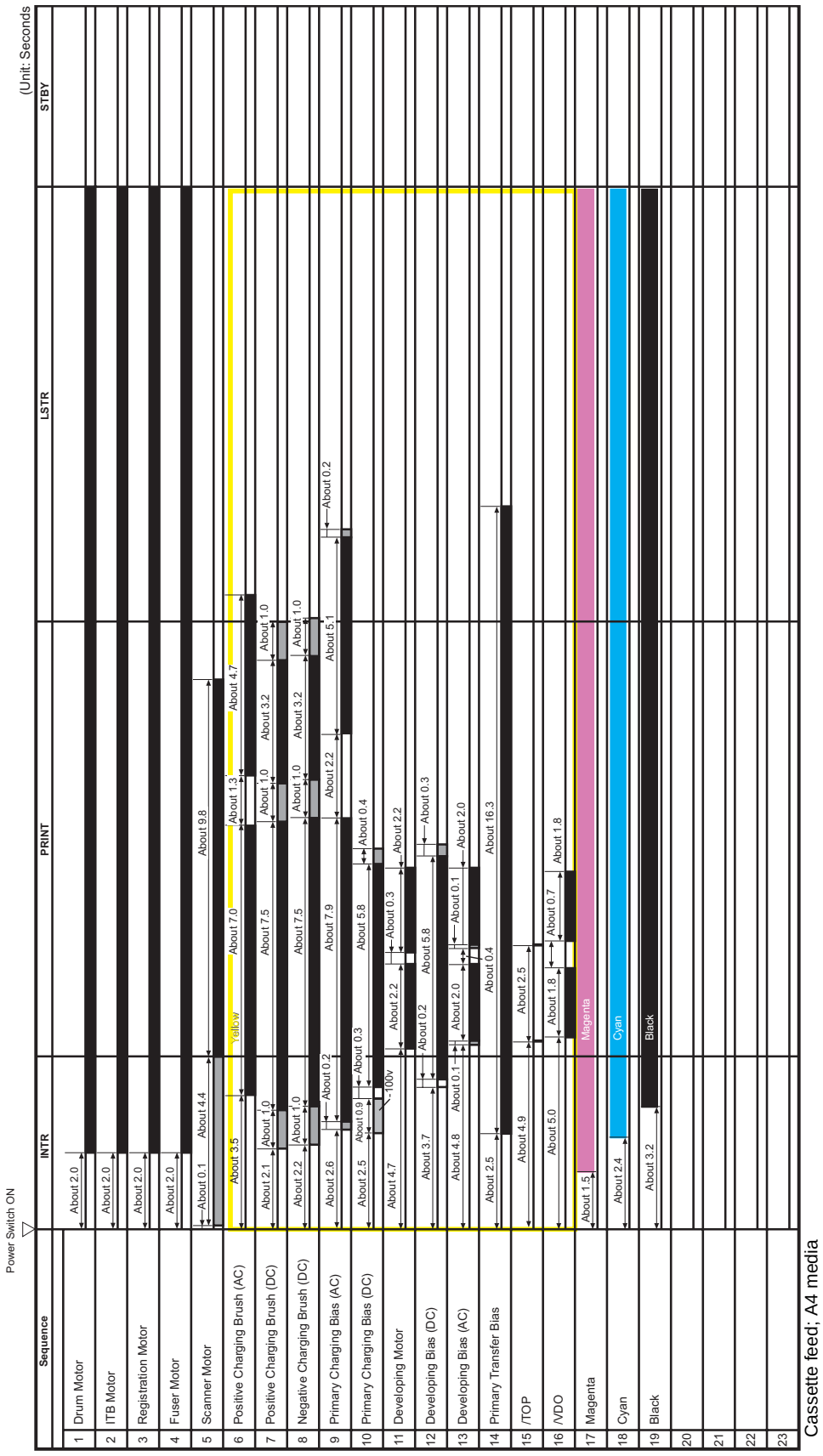

Figure 21. **Timing chart (1 of 2)**

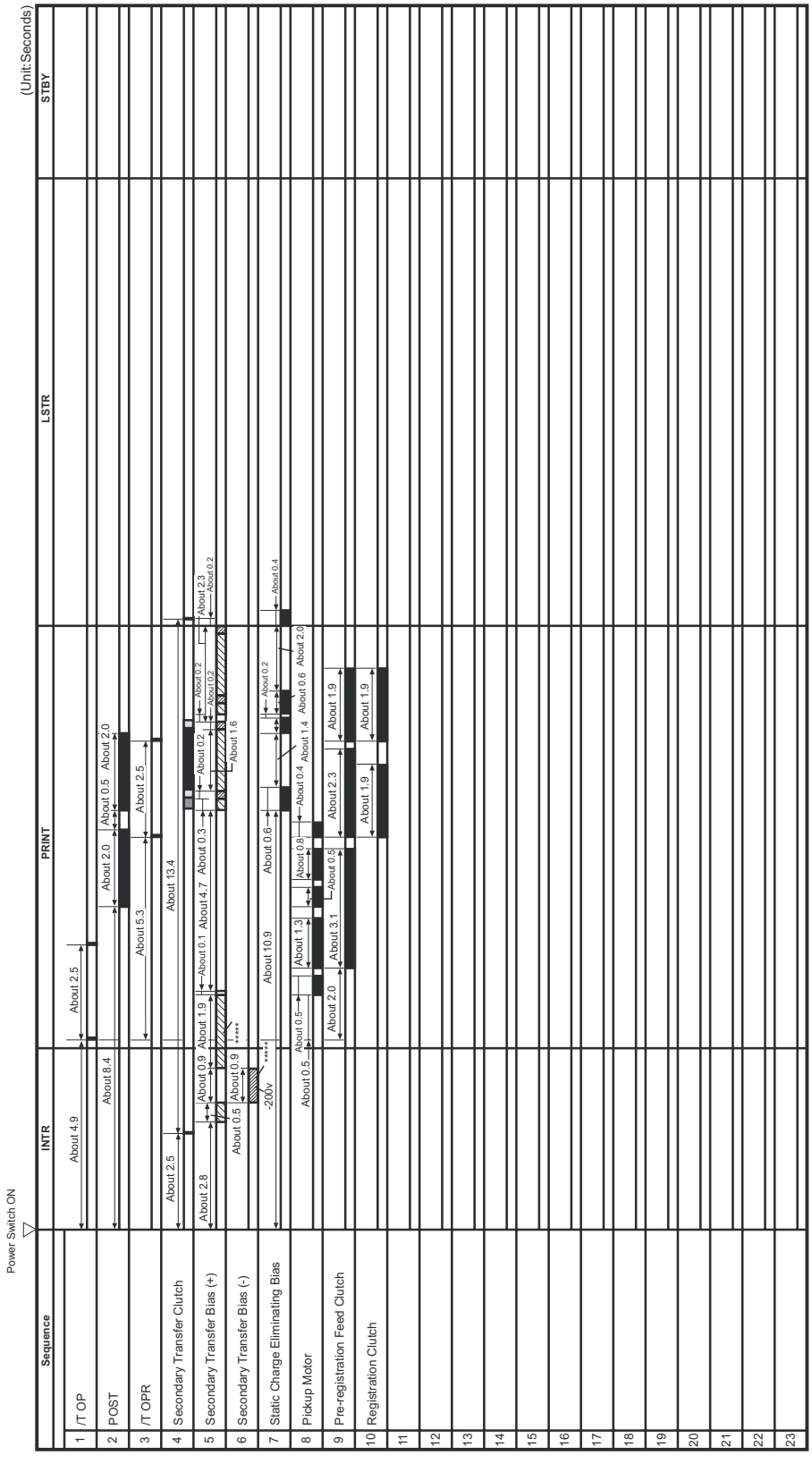

Figure 22. **Timing chart (2 of 2)**

Wiring diagrams

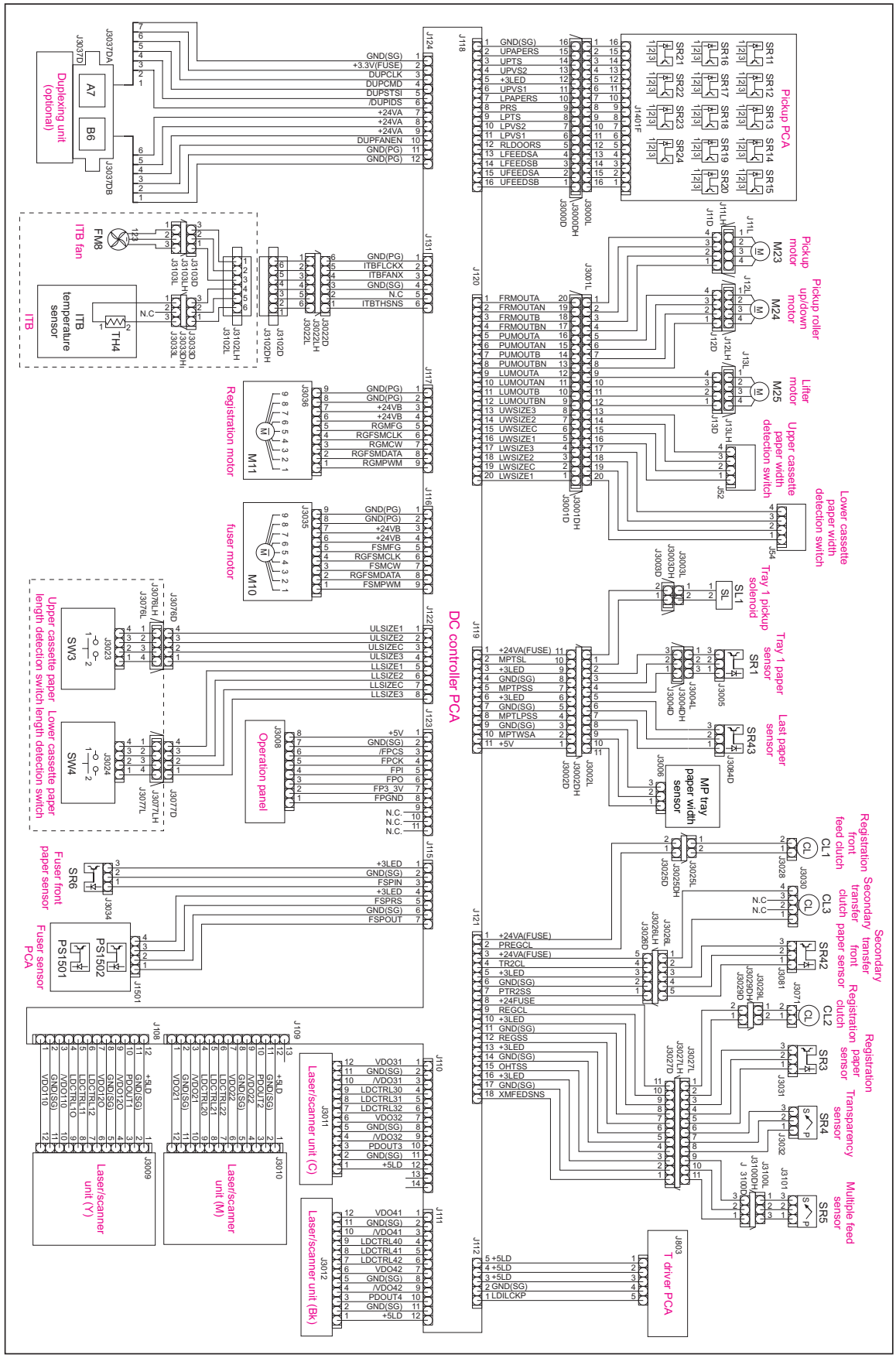

Figure 23. **Wiring diagram (1 of 4)**

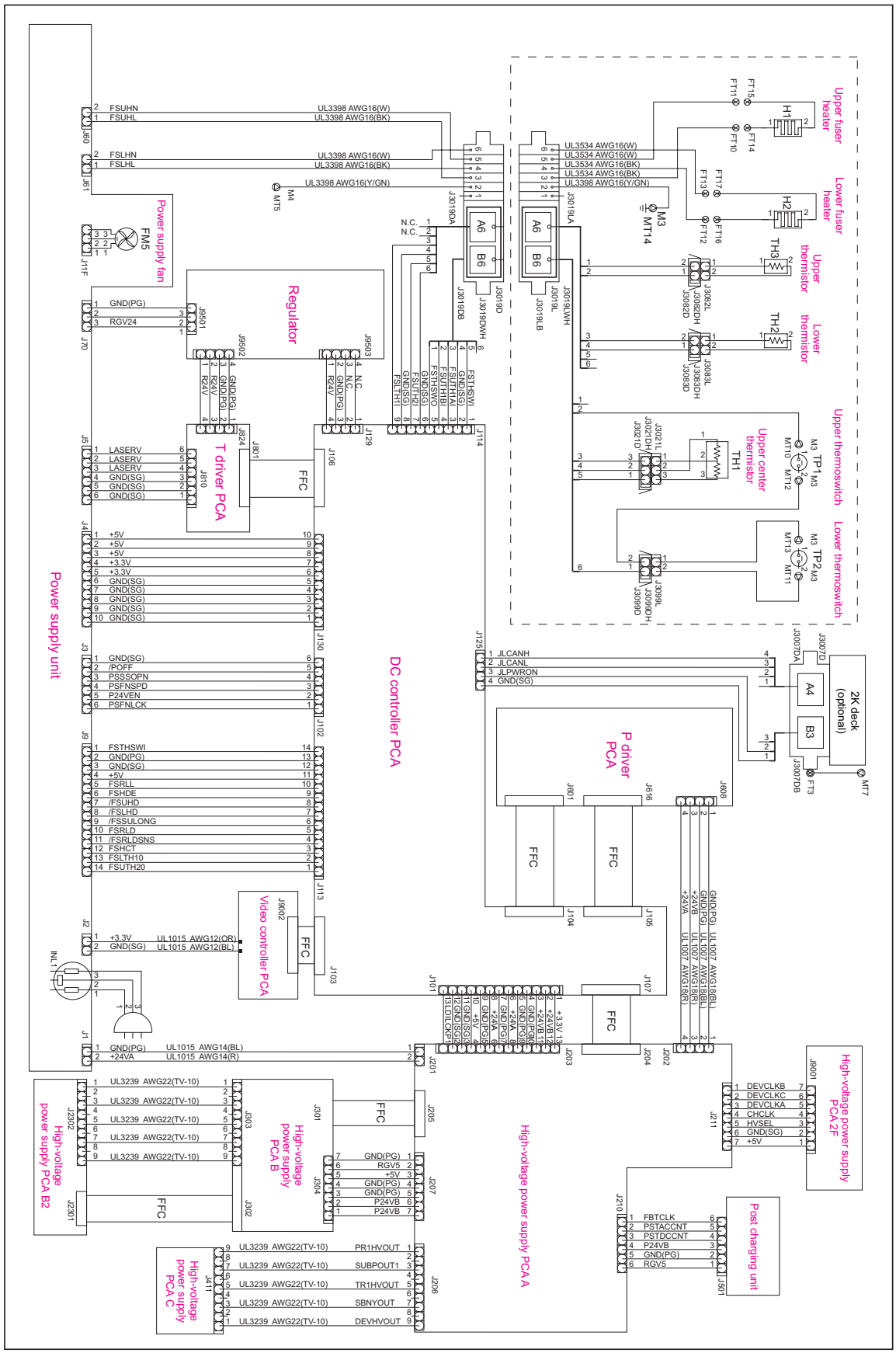

Figure 24. **Wiring diagram (2 of 4)**

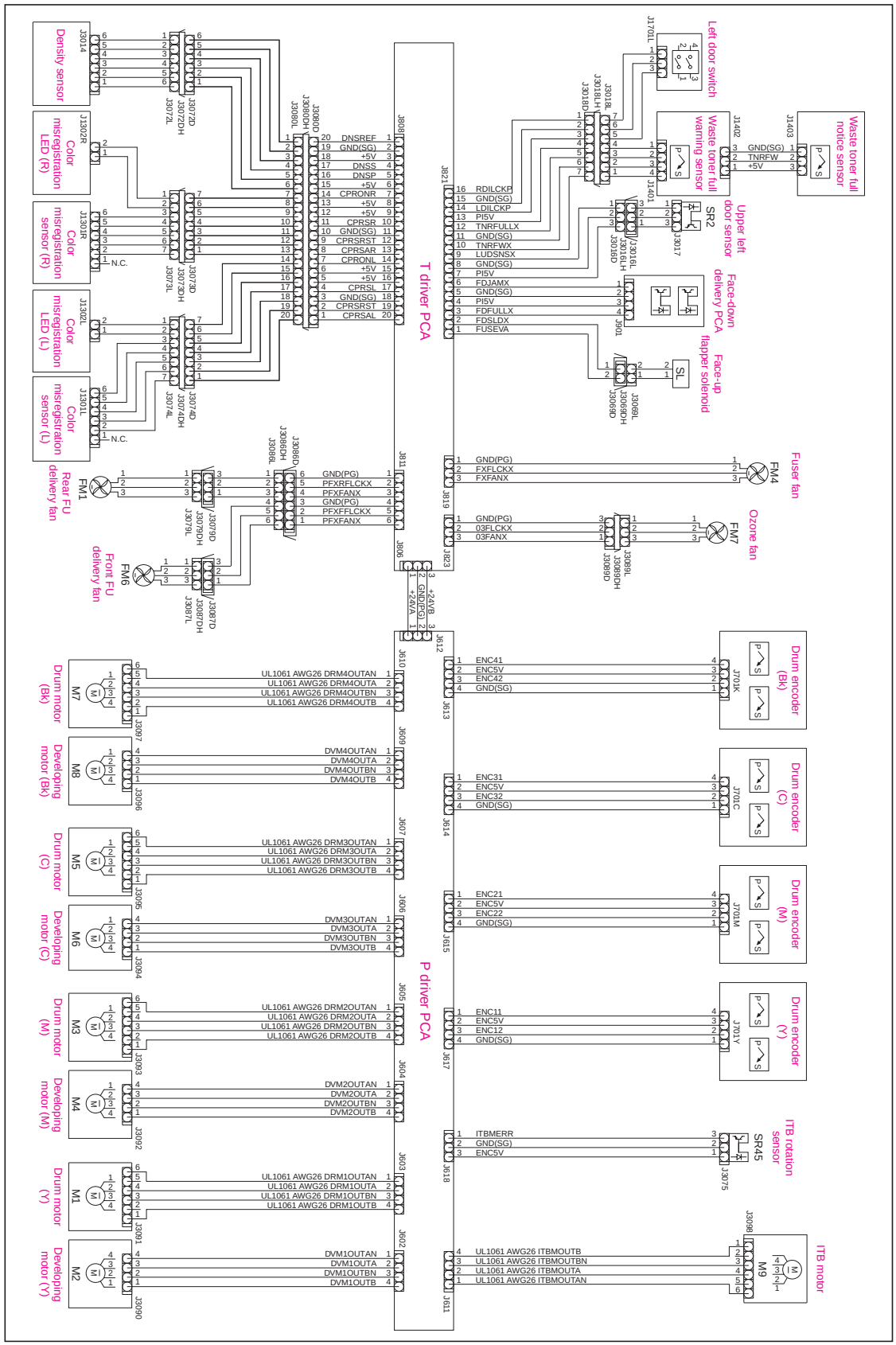

Figure 25. **Wiring diagram (3 of 4)**

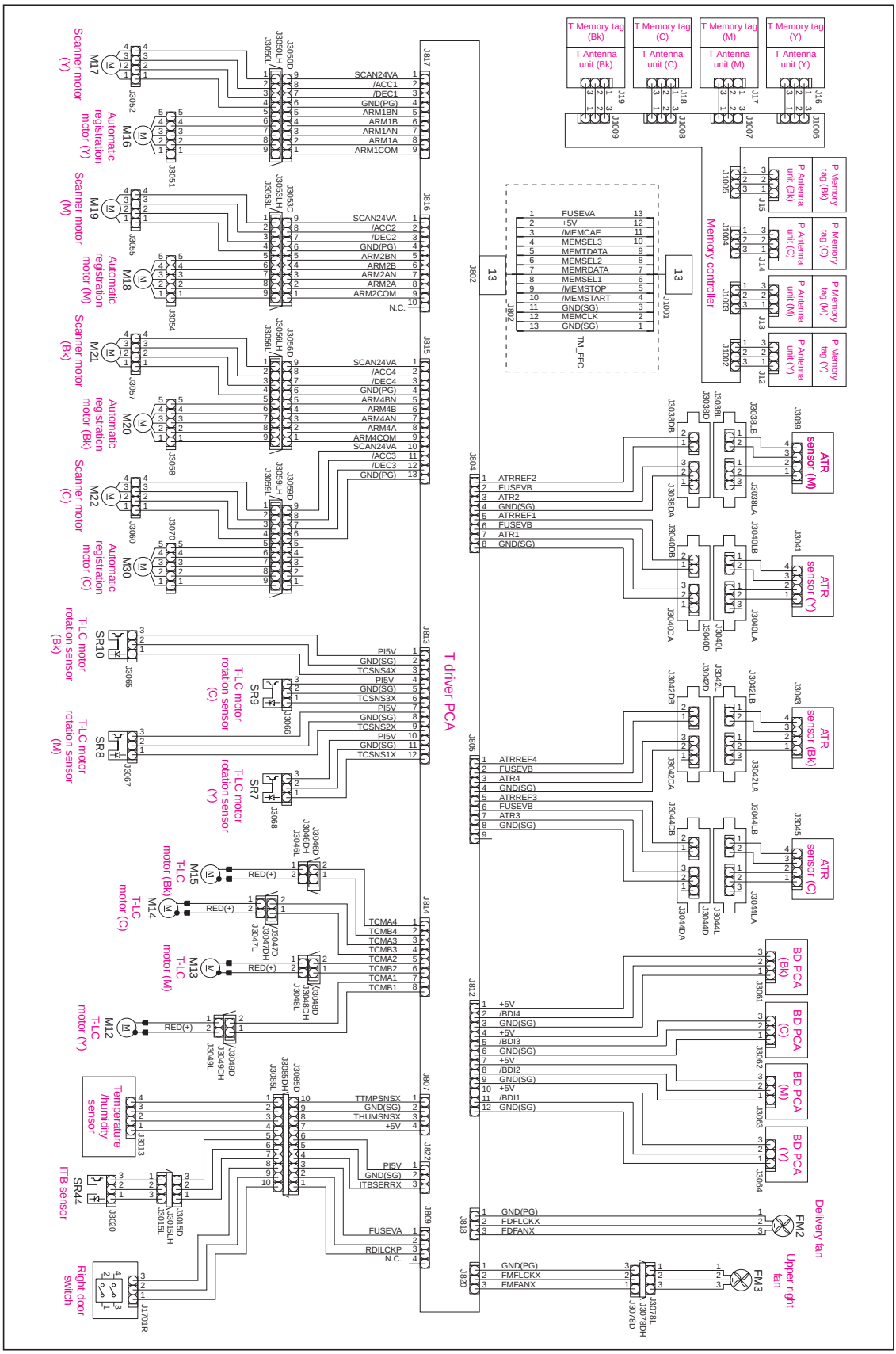

Figure 26. **Wiring diagram (4 of 4)**

Flat flexible cable signals

This table provides information about DC controller connectors, pinouts, and signals. It is also useful for understanding flat flexible cable (FFC) signals that are not detailed on the wiring diagrams.

Table 46. FFC input/output signals on the DC controller

Connector	Pin	Signal name	I/O	Logic	Signal description
J101	1	+3.3 V			
	2	+24 VB			
	3	+24 VB			
	4	GND(PG)			
	5	GND(PG)			
	6	+24 VA			
	7	GND(PG)			
	8	+24 VA			
	9	GND(PG)			
	10	+5 V			
	11	GND(SG)			
	12	GND(SG)			
	13	LDILCKP	O		INTERLOCK RELAY DRIVE signal
J102	1	PSFNLCK	I	High	POWER SUPPLY FAN LOCK DETECTION signal
	2	P24VEN	O		+24 V OUTPUT ENABLE signal
	3	PSFNSPD	O		POWER SUPPLY FAN SPEED SWITCHING signal
	4	PSSSOPN	I	High	SOFT SWITCH OPEN DETECTION signal
	5	/POFF	O	Low	POWER OFF signal
	6	GND(SG)			

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J103	1	FP3_3V			
	2	FPO	O	High	OPERATIONAL PANEL SERIAL DATA OUTPUT signal
	3	FPI	I	High	OPERATIONAL PANEL SERIAL DATA INPUT signal
	4	FPCK	I		OPERATIONAL PANEL SERIAL CLOCK signal
	5	/FPCS	I	Low	OPERATIONAL CONTROLLER CHIP SELECT signal
	6	FPGND			
	7	+5V			
	8	+5V			
	9	GND(SG)			
	10	VDO41	I	High	VIDEO signal
	11	/VDO41	I	High	VIDEO signal
	12	VDO42	I	High	VIDEO signal
	13	/VDO42	I	Low	VIDEO signal
	14	VDO31	I	High	VIDEO signal
	15	/VDO31	I	Low	VIDEO signal
	16	VDO32	I	High	VIDEO signal
	17	/VDO32	I	Low	VIDEO signal
	18	VDO21	I	High	VIDEO signal
	19	/VDO21	I	Low	VIDEO signal
	20	VDO22	I	High	VIDEO signal
	21	/VDO22	I	Low	VIDEO signal
	22	VDO11	I	High	VIDEO signal
	23	/VDO11	I	Low	VIDEO signal
	24	VDO12	I	High	VIDEO signal
	25	/VDO12	I	Low	VIDEO signal
	26	/VDOEN	O	Low	VDO OUTPUT ENABLE signal
	27	GND(SG)			
	28	/TOP	O	Low	VERTICAL SYNCHRONOUS signal
	29	GND(SG)			
	30	/BDO1	O	Low	BD OUTPUT signal
	31	/BDO2	O	Low	BD OUTPUT signal
	32	/BDO3	O	Low	BD OUTPUT signal
	33	/BDO3	O	Low	BD OUTPUT signal
	34	GND(SG)			
	35	/CCRT	O	Low	STATUS CHANGE NOTIFY signal
	36	SC	I/O	HIgh	STATUS COMMAND signal
	37	SCLK	I		SERIAL CLOCK
	38	/PFED	O	Low	PAPER FEED signal
	39	/TOPR	O	Low	TOP OF PAPER signal
	40	/PDVL	O	Low	PAPER DELIVERY signal
	41	JLPWRON	O	High	PAPER DECK POWER ON signal
	42	JLCANH	I/O	High	PAPER DECK COMMUNICATION signal
	43	JLCANL	I/O	Low	PAPER DECK COMMUNICATION signal
	44	GND(SG)			
	45	/VCRST	O	Low	VIDEO CONTROLLER RESET signal

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J104	1	GND(SG)			
	2	+5V			
	3	+5V			
	4	DVM1PHB	O	High	DEVELOPING MOTOR DRIVE signal
	5	DVM1VRB	O	High	DEVELOPING MOTOR DRIVE signal
	6	DVM1VRA	O	High	DEVELOPING MOTOR DRIVE signal
	7	DVM1PHA	O	High	DEVELOPING MOTOR DRIVE signal
	8	DRM1PHB	O	High	DRUM MOTOR DRIVE signal
	9	DRM1VRB	O	High	DRUM MOTOR DRIVE signal
	10	DRM1VRA	O	High	DRUM MOTOR DRIVE signal
	11	DRMPHA	O	High	DRUM MOTOR DRIVE signal
	12	DVM2PHB	O	High	DEVELOPING MOTOR DRIVE signal
	13	DVM2VRB	O	High	DEVELOPING MOTOR DRIVE signal
	14	DVM2VRA	O	High	DEVELOPING MOTOR DRIVE signal
	15	DVM2PHA	O	High	DEVELOPING MOTOR DRIVE signal
	16	DRM2PHB	O	High	DRUM MOTOR DRIVE signal
	17	DRM2VRB	O	High	DRUM MOTOR DRIVE signal
	18	DRM2VRA	O	High	DRUM MOTOR DRIVE signal
	19	DRM2PHA	O	High	DRUM MOTOR DRIVE signal
	20	DVM3PHB	O	High	DEVELOPING MOTOR DRIVE signal
	21	DVM3VRB	O	High	DEVELOPING MOTOR DRIVE signal
	22	DVM3VRA	O	High	DEVELOPING MOTOR DRIVE signal
	23	DVM3PHA	O	High	DEVELOPING MOTOR DRIVE signal
	24	DRM3PHB	O	High	DRUM MOTOR DRIVE signal
	25	DRM3VRB	O	High	DRUM MOTOR DRIVE signal
	26	DRM3VRA	O	High	DRUM MOTOR DRIVE signal
	27	DRM3PHA	O	High	DRUM MOTOR DRIVE signal
	28	DVM4PHB	O	High	DEVELOPING MOTOR DRIVE signal
	29	DVM4VRB	O	High	DEVELOPING MOTOR DRIVE signal
	30	DVM4VRA	O	High	DEVELOPING MOTOR DRIVE signal
	31	DVM4PHA	O	High	DEVELOPING MOTOR DRIVE signal
	32	DRM4PHB	O	High	DRUM MOTOR DRIVE signal
	33	DRM4VRB	O	High	DRUM MOTOR DRIVE signal
	34	DRM4VRA	O	High	DRUM MOTOR DRIVE signal
	35	DRM4PHA	O	High	DRUM MOTOR DRIVE signal
	36	ITBMPHB	O	High	ITB MOTOR DRIVE signal
	37	ITBMVRB	O	High	ITB MOTOR DRIVE signal
	38	ITBMVRA	O	High	ITB MOTOR DRIVE signal
	39	ITBMPHA	O	High	ITB MOTOR DRIVE signal
J105	1	ENC21	I		DRUM ENCODER signal
	2	ENC22	I		DRUM ENCODER signal
	3	ENC31	I		DRUM ENCODER signal
	4	ENC32	I		DRUM ENCODER signal
	5	ENC41	I		DRUM ENCODER signal
	6	ENC42	I		DRUM ENCODER signal
	7	GND(SG)			
	8	GND(SG)			
	9	ENCLON	O		DRUM ENCODER ON signal
	10	ENC11	I	High	DRUM ENCODER signal
	11	ENC12	I	High	DRUM ENCODER signal
J106	1	/DEC1	O	Low	SCANNER MOTOR DECELERATION signal
	2	/ACC1	O	Low	SCANNER MOTOR ACCELERATION signal
	3	/DEC2	O	Low	SCANNER MOTOR DECELERATION signal
	4	/ACC2	O	Low	SCANNER MOTOR ACCELERATION signal
	5	/DEC3	O	Low	SCANNER MOTOR DECELERATION signal
	6	/ACC3	O	Low	SCANNER MOTOR ACCELERATION signal
	7	/DEC4	O	Low	SCANNER MOTOR DECELERATION signal
	8	/ACC4	O	Low	SCANNER MOTOR ACCELERATION signal
	9	/BDI1	I	Low	HORIZONTAL SYNCHRONOUS signal

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J106 continued	10	/BDI2	I	Low	HORIZONTAL SYNCHRONOUS signal
	11	/BDI3	I	Low	HORIZONTAL SYNCHRONOUS signal
	12	/BDI4	I	Low	HORIZONTAL SYNCHRONOUS signal
	13	CPRSL	I		LEFT CPR signal
	14	CPRSR	I		RIGHT CPR signal
	15	+5V			
	16	+5V			
	17	+5V			
	18	GND(SG)			
	19	GND(SG)			
	20	TCCLK	O		T DRIVER SERIAL CLOCK signal
	21	GND(SG)			
	22	TCSTS	1	High	T DRIVER SERIAL DATA signal
	23	/TCTMG	O	Low	T DRIVER TIMING signal
	24	TCCMD	O	High	T DRIVER SERIAL DATA signal
	25	MEMCLK	I		MEMORY CONTROLLER SERIAL CLOCK signal
	26	/MEMSTART	O	Low	MEMORY CONTROLLER OUTPUT START signal
	27	/MEMSTOP	O	Low	MEMORY CONTROLLER OUTPUT STOP signal
	28	MEMSEL1	O		MEMORY CONTROLLER CHANNEL SELECT signal
	29	MEMRDATA	O	High	MEMORY CONTROLLER DATA signal
	30	MEMSEL2	O		MEMORY CONTROLLER CHANNEL SELECT signal
	31	MEMTDATA	O	High	MEMORY CONTROLLER DATA signal
	32	MEMSEL3	O		MEMORY CONTROLLER CHANNEL SELECT signal
	33	/MEMCAE	O	Low	MEMORY CONTROLLER OUTPUT CONTROL signal
	34	DNSS	I		TONER DENSITY SENSOR OUTPUT signal
	35	DNSP	I		TONER DENSITY SENSOR OUTPUT signal
	36	CPRSAR	I		RIGHT CPR SENSOR ANALOG signal
	37	CPRSAL	I		LEFT CPR SENSOR ANALOG signal
J107	1	DCCLK	O		INVETER TRANSFORMER CLOCK signal
	2	GND(SG)			
	3	FBTCLK	O		FLASHBACK TRANSFORMER CLOCK signal
	4	GND(SG)			
	5	CHCLK	O		PRIMARY CHARGING AC BIAS CLOCK signal
	6	GND(SG)			
	7	DEVCLKA	O		DEVELOPING AC BIAS CLOCK signal
	8	DEVCLKB	O		DEVELOPING AC BIAS CLOCK signal
	9	DEVCLKC	O		DEVELOPING AC BIAS CLOCK signal
	10	GND(SG)			
	11	DADATA	O	High	SERIAL D / A CONVERTER DATA signal
	12	DALD	O	Low	SERIAL D / A CONVERTER LOAD signal
	13	DACLK	O		SERIAL D / A CONVERTER CLOCK signal
	14	GND(SG)			
	15	/HVENBL	O	Low	HIGH-VOLTAGE OUTPUT ENABLE signal
	16	CHISNS1	I		PRIMARY CHARGING CURRENT MONITOR signal
	17	CHISNS2	I		PRIMARY CHARGING CURRENT MONITOR signal
	18	CHISNS3	I		PRIMARY CHARGING CURRENT MONITOR signal
	19	CHISNS4	I		PRIMARY CHARGING CURRENT MONITOR signal
	20	TR1ISNS1	I		PRIMARY TRANSFER CURRENT MONITOR signal
	21	TR1ISNS2	I		PRIMARY TRANSFER CURRENT MONITOR signal
	22	TR1ISNS3	I		PRIMARY TRANSFER CURRENT MONITOR signal
	23	TR1ISNS4	I		PRIMARY TRANSFER CURRENT MONITOR signal
	24	GND(SG)			
	25	TR2ISNS	I		SECONDARY TRANSFER CURRENT MONITOR signal

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J108	1	VDO11O	O	High	VIDEO signal
	2	GND(SG)			
	3	/VDO11O	O	Low	VIDEO signal
	4	LDCTRL10	O		LASER CONTROL signal
	5	LDCTRL11	O		LASER CONTROL signal
	6	LDCTRL12	O		LASER CONTROL signal
	7	VDO12O	O	High	VIDEO signal
	8	GND(SG)			
	9	/VDO12O	O	Low	VIDEO signal
	10	PDOOUT1	I		LASER INTENSITY MONITOR signal
	11	GND(SG)			
	12	+5LD			
J109	1	VDO21	O	High	VIDEO signal
	2	GND(SG)			
	3	/VDO21	O	Low	VIDEO signal
	4	LDCTRL20	O		LASER CONTROL signal
	5	LDCTRL21	O		LASER CONTROL signal
	6	LDCTRL22	O		LASER CONTROL signal
	7	VDO22	O	High	VIDEO signal
	8	GND(SG)			
	9	/VDO22	O	Low	VIDEO signal
	10	PDOUT2	I		LASER INTENSITY MONITOR signal
	11	GND(SG)			
	12	+5LD			
J110	1	VDO31	O	High	VIDEO signal
	2	GND(SG)			
	3	/VDO31	O	Low	VIDEO signal
	4	LDCTRL30	O		LASER CONTROL signal
	5	LDCTRL31	O		LASER CONTROL signal
	6	LDCTRL32	O		LASER CONTROL signal
	7	VDO32	O	High	VIDEO signal
	8	GND(SG)			
	9	/VDO32	O	Low	VIDEO signal
	10	PDOUT3	I		LASER INTENSITY MONITOR signal
	11	GND(SG)			
	12	+5LD			
J111	1	VDO41	O	High	VIDEO signal
	2	GND(SG)			
	3	/VDO41	O	Low	VIDEO signal
	4	LDCTRL40	O		LASER CONTROL signal
	5	LDCTRL41	O		LASER CONTROL signal
	6	LDCTRL42	O		LASER CONTROL signal
	7	VDO42	O	High	VIDEO signal
	8	GND(SG)			
	9	/VDO42	O	Low	VIDEO signal
	10	PDOUT4	I		LASER INTENSITY MONITOR signal
	11	GND(SG)			
	12	+5LD			
J112	1	LDILCKP	I		LEFT DOOR SWITCH signal
	2	GND(SG)			
	3	+5LD			
	4	+5LD			
	5	+5LD			
J113	1	FSUTH20	I		FIXING ROLLER TEMPERATURE DETECTION signal
	2	FSLTH10	I		FIXING ROLLER TEMPERATURE DETECTION signal
	3	FSHCT	I		HEATER CURRENT signal
	4	/FSRLDSNS	I	Low	RELAY DRIVE signal
	5	FSRLD	O	High	RELAY DRIVE signal

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J113	6	/FSSULONG	O	Low	SLOW-UP CIRCUIT DRIVE signal
continued	7	/FSLHD	O	Low	PRESSURE ROLLER TEMPERATURE CONTROL signal
	8	/FSUHD	O	Low	FIXING ROLLER TEMPERATURE CONTROL signal
	9	FSHDE	O		INVERTER OUTPUT ENABLE signal
	10	FSRLL	I		RELAY TEST signal
	11	+5V			
	12	GND(SG)			
	13	GND(PG)			
	14	FSTHSWI	I	High	THERMOSWITCH INPUT signal
J114	1	FSTHSWI	I		THERMOSWITCH INPUT signal
	2	GND(SG)			
	3	FSUTH1AI	I		FIXING ROLLER TEMPERATURE DETECTION signal
	4	FSUTH1BI	I		FIXING ROLLER TEMPERATURE DETECTION signal
	5	FSTHSWO	O		THERMOSWITCH OUTPUT signal
	6	GND(SG)			
	7	FSUTH21	I		FIXING ROLLER TEMPERATURE DETECTION signal
	8	GND(SG)			
	9	FSLTH1I	I		PRESSURE ROLLER TEMPERATURE DETECTION signal
J115	1	+3LED			
	2	GND(SG)			
	3	FSPIN	I	High	FRONT FIXING PAPER DETECTION signal
	4	+3LED			
	5	FSPRS	I	High	FIXING PRESSURE DETECTION signal
	6	GND(SG)			
	7	FSPOUT	I	High	FIXING DELIVERY PAPER DETECTION signal
J116	1	GND(PG)			
	2	GND(PG)			
	3	+24VB			
	4	+24VB			
	5	FSMFG	I		FIXING MOTOR SPEED signal
	6	RGFSMCLK	O		MOTOR COMMAND CLOCK signal
	7	FSMCW	O	Low	FIXING MOTOR SELECT signal
	8	RGFSMDATA	O	High	MOTOR COMMAND DATA signal
	9	FSMPWM	O		FIXING MOTOR PWM signal
J117	1	GND(PG)			
	2	GND(PG)			
	3	+24VB			
	4	+24VB			
	5	RGMFG	I		REGISTRATION MOTOR SPEED signal
	6	RGFSMCLK	O		MOTOR COMMAND CLOCK signal
	7	RGMCW	O		REGISTRATION MOTOR SELECT signal
	8	RGFSMDATA	O	High	MOTOR COMMAND DATA signal
	9	RGMPWM	O		REGISTRATION MOTOR PWM signal

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J118	1	GND(SG)			
	2	UPAPERS	I	High	UPPER CASSETTE PAPER OUT DETECTION signal
	3	UPTS	I	High	UPPER CASSETTE PAPER SURFACE LEVEL signal
	4	UPVS2	I	High	UPPER CASSETTE PAPER LEVEL DETECTION signal
	5	+3LED			
	6	UPVS1	I	High	UPPER CASSETTE PAPER LEVEL DETECTION signal
	7	LPAPERS	I	High	LOWER CASSETTE PAPER OUT DETECTION signal
	8	PRS	I	High	PICKUP SHAFT HOME POSITION DETECTION signal
	9	LPTS	I	High	LOWER CASSETTE PAPER SURFACE LEVEL signal
	10	LPVS2	I	High	LOWER CASSETTE PAPER LEVEL DETECTION signal
	11	LPVS1	I	High	LOWER CASSETTE PAPER LEVEL DETECTION signal
	12	RLDOORS	I	High	RIGHT DOOR OPEN DETECTION signal
	13	LFEEDSA	I	High	LOWER CASSETTE PAPER FEED DETECTION signal
	14	LFEEDSB	I	High	LOWER CASSETTE PAPER FEED DETECTION signaL
	15	UFEEDSA	I	High	UPPER CASSETTE PAPER FEED DETECTION signal
	16	UFEEDSB	I	High	UPPER CASSETTE PAPER FEED DETECTION signal
J119	1	+24VA(FUSE)			
	2	MPTSL	O		MULTIPURPOSE TRAY PICKUP SOLENOID DRIVE signal
	3	+3LED			
	4	GND(SG)			
	5	MPTPSS			
	6	+3LED			
	7	GND(SG)			
	8	MPTLPSS	I	High	LAST PAPER DETECTION signal
	9	GND(SG)			
	10	MPTWSA	I	High	MULTIPURPOSE TRAY PAPER WIDTH signal
	11	+5V			
J120	1	FRMOUTA	O		PICKUP MOTOR DRIVE signal
	2	FRMOUTAN	O		PICKUP MOTOR DRIVE signal
	3	FRMOUTB	O		PICKUP MOTOR DRIVE signal
	4	FRMOUTBN	O		PICKUP MOTOR DRIVE signal
	5	PUMOUTA	O		PICKUP ROLLER UP / DOWN MOTOR DRIVE signal
	6	PUMOUTAN	O		PICKUP ROLLER UP / DOWN MOTOR DRIVE signal
	7	PUMOUTB	O		PICKUP ROLLER UP / DOWN MOTOR DRIVE signal
	8	PUMOUTBN	O		PICKUP ROLLER UP / DOWN MOTOR DRIVE signal
	9	LUMOUTA	O		LIFTER MOTOR DRIVE signal
	10	LUMOUTAN	O		LIFTER MOTOR DRIVE signal
	11	LUMOUTB	O		LIFTER MOTOR DRIVE signal
	12	LUMOUTBN	O		LIFTER MOTOR DRIVE signal
	13	UWSIZE3	O		UPPER CASSETTE PAPER WIDTH DETECTION signal
	14	UWSIZE2	O		UPPER CASSETTE PAPER WIDTH DETECTION signal
	15	UWSIZEC	I		UPPER CASSETTE PAPER WIDTH DETECTION signal
	16	UWSIZE1	O		UPPER CASSETTE PAPER WIDTH DETECTION signal
	17	LWSIZE3	O		UPPER CASSETTE PAPER WIDTH DETECTION signal
	18	LWSIZE2	O		LOWER CASSETTE PAPER WIDTH DETECTION signal
	19	LWSIZEC	I		LOWER CASSETTE PAPER WIDTH DETECTION signal
	20	LWSIZE1	O		LOWER CASSETTE PAPER WIDTH DETECTION signal
J121	1	+24VA(FUSE)			
	2	PREGCL	O		PRE-REGISTRATION FEED CLUTCH DRIVE signal
	3	+24VA(FUSE)			
	4	TR2CL	O		SECONDARY TRANSFER CLUTCH DRIVE signal
	5	+3LED			
	6	GND(SG)			
	7	PTRSS	I	High	SECONDARY TRANSFER FRONT PAPER DETECT signal
	8	+24FUSE			
	9	REGCL	O		REGISTRATION CLUTCH DRIVE signal
	10	+3LED			
	11	GND(SG)			
	12	REGSS	I		REGISTRATION PAPER DETECTION signal

Table 46. FFC input/output signals on the DC controller (continued)

Connector	Pin	Signal name	I/O	Logic	Signal description
J121 continued	13	+3LED			
	14	GND(SG)			
	15	OHTSS	I		TRANSPARENCY DETECTION signal
	16	+3LED			
	17	GND(SG)			
	18	XMFEDSNS	I		MULTIPLE FEED DETECTION signal
J122	1	ULSIZE1	I		UPPER CASSETTE PAPER LENGTH DETECTION signal
	2	ULSIZE2	I		UPPER CASSETTE PAPER LENGTH DETECTION signal
	3	ULSIZEC	I		UPPER CASSETTE PAPER LENGTH DETECTION signal
	4	ULSIZE3	I		UPPER CASSETTE PAPER LENGTH DETECTION signal
	5	LLSIZE1	I		LOWER CASSETTE PAPER LENGTH DETECTION signal
	6	LLSIZE2	I		LOWER CASSETTE PAPER LENGTH DETECTION signal
	7	LLSIZEC	I		LOWER CASSETTE PAPER LENGTH DETECTION
	8	LLSIZE3	I		LOWER CASSETTE PAPER LENGTH DETECTION signal
J123	1	+5V			
	2	GND(SG)			
	3	/FPCS	O	Low	OPERATION PANEL CONTROLLER CHIP SELECT signal
	4	FPCK	O		OPERATION PANEL SERIAL CLOCK signal
	5	FPI	O	High	OPERATION PANEL SEIAL DATA signal
	6	FPO	I	High	OPERATION PANEL SERIAL DATA signal
	7	FP3_3V			
	8	FPGND			
	9	N.C.			
	10	N.C.			
	11	N.C.			
J124	1	GND(SG)			
	2	+3.3V(FUSE)			
	3	DUPCLK	O		DUPLEXING UNIT STATUS CLOCK signal
	4	DUPCMD	O	High	DUPLEXING UNIT SERIAL DATA signal
	5	DUPSTSI	I	High	DUPLEXING UNIT SERIAL DATA signal
	6	/DUPIDS	I	Low	DUPLEXING UNIT DETECTION signal
	7	+24VA			
	8	+24VA			
	9	+24VA			
	10	DUPFANEN	O	High	DUPLEXING UNIT FAN ENABLE signal
	11	GND(PG)			
	12	GND(PG)			
J125	1	JLCANH	I/O	High	PAPER DECK SERIAL DATA signal
	2	JLCANL	I/O	Low	PAPER DECK SERIAL DATA signal
	3	JLPWRON	O	High	PAPER DECK POWER ON signal
	4	GND(SG)			
J130	1	GND(SG)			
	2	GND(SG)			
	3	GND(SG)			
	4	GND(SG)			
	5	GND(SG)			
	6	+3.3V			
	7	+3.3V			
	8	+5V			
	9	+5V			
	10	+5V			
J131	1	GND(PG)			
	2	ITBFLCKX	I	High	ITB FAN LOCK DETECTION signal
	3	ITBFANX	O		ITB FAN DRIVE signal
	4	GND(SG)			
	5	N.C.			
	6	ITBTHSNS	I	High	ITB TEMPERATURE DETECTION signal

Connector location

Note See the *HP Scanner/ADF Service Manual for the HP LaserJet 9000mfp/9000Lmfp/9040mfp/9050mfp/9500mfp* (PN C8449-90955) and the *2,000-sheet Side Input Tray Service manual* (PN Q1891-90901) for connector locations in the MFP and 2,000-sheet side-input tray 4.

Note For an MFP, J811 is not used.

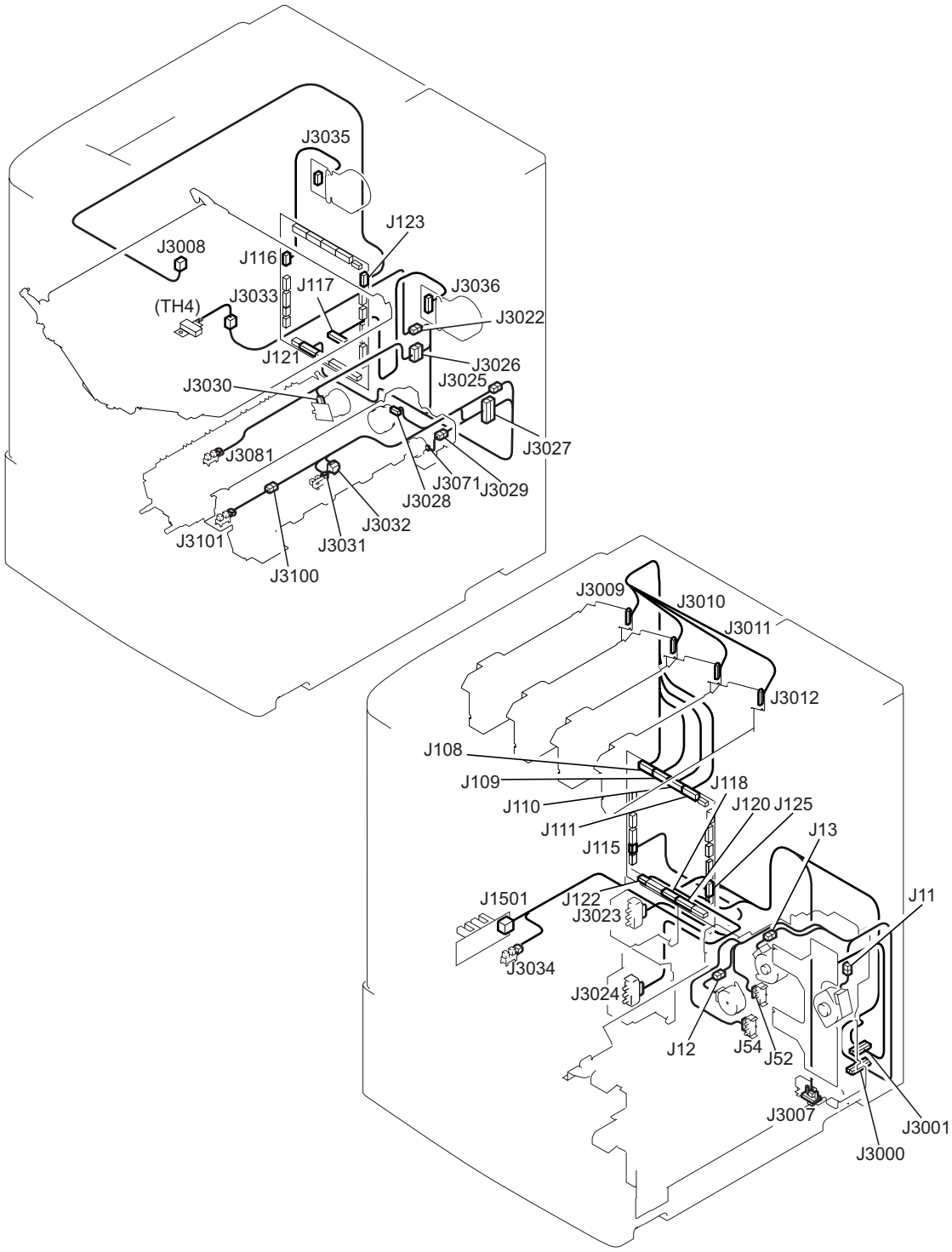

Figure 27. Connector locations for the HP LaserJet 9500 Series printer (1 of 4)

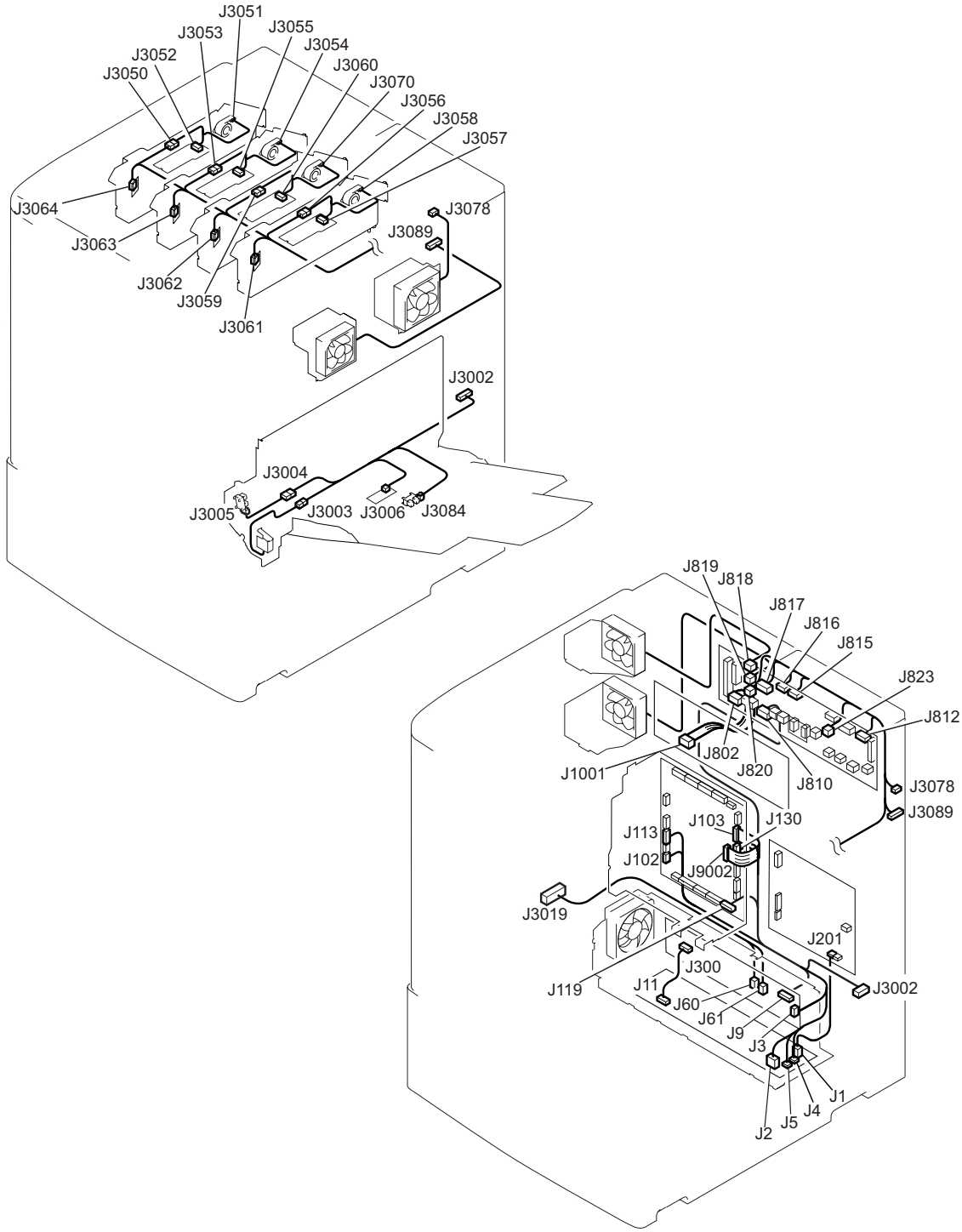

Figure 28. **Connector locations for the HP LaserJet 9500 Series printer (2 of 4)**

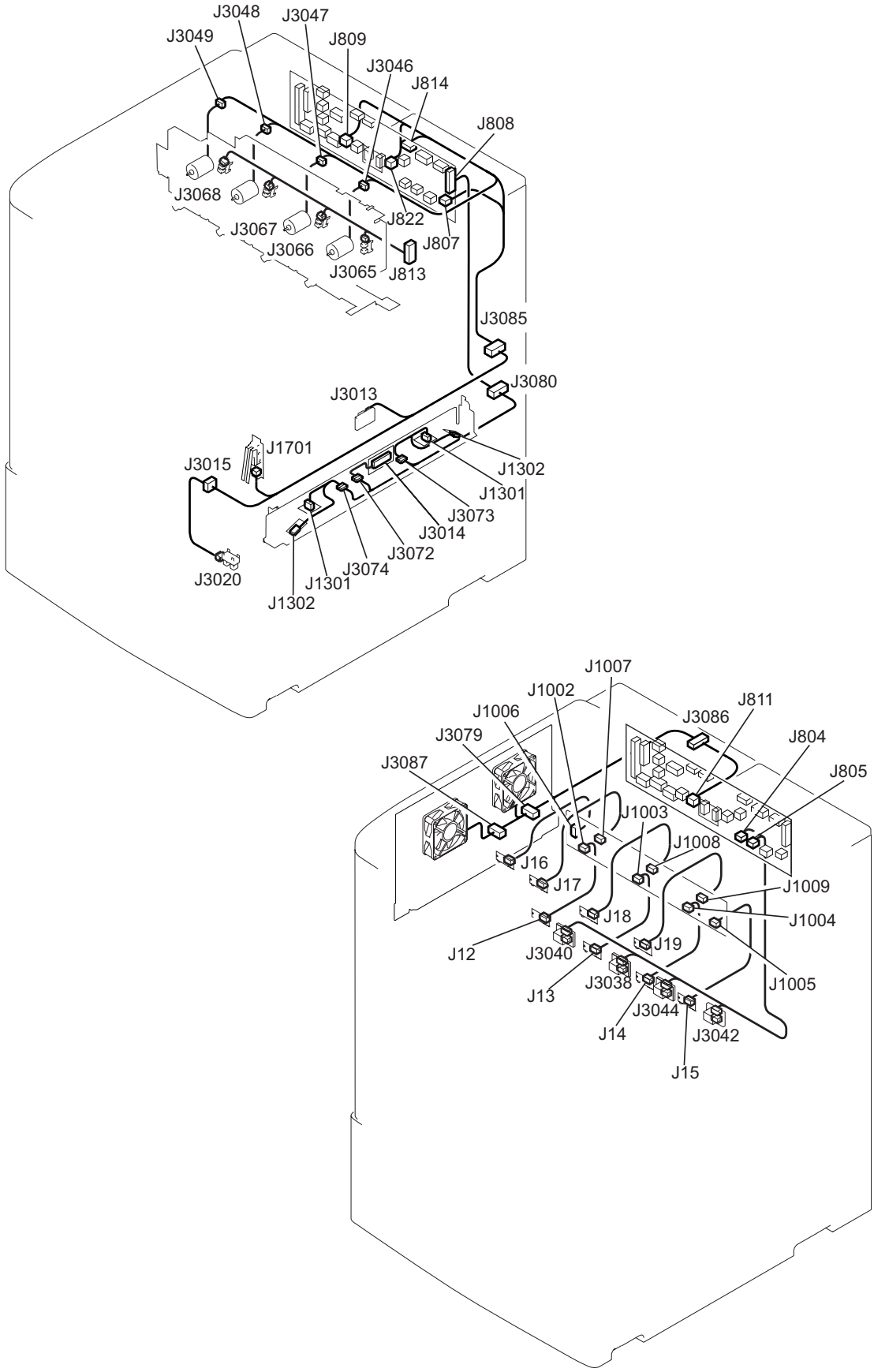

Figure 29. **Connector locations for the HP LaserJet 9500 Series printer (3 of 4)**

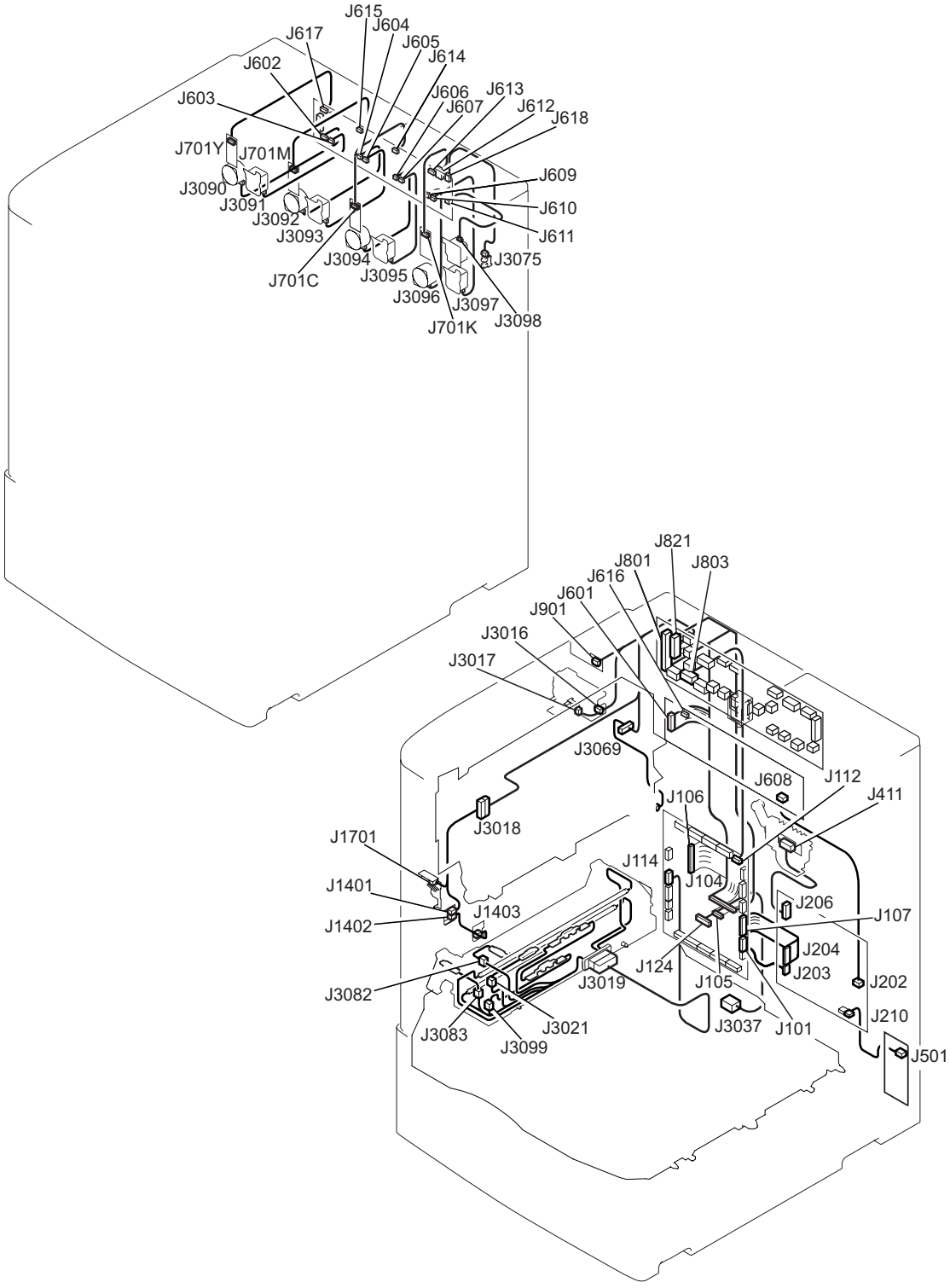

Figure 30. **Connector locations for the HP LaserJet 9500 Series printer (4 of 4)**

Engine-control system

The engine-control system coordinates the laser/scanner, image-formation, and paper-pickup systems according to the instructions it receives from the formatter. The engine-control system consists of the DC controller printed circuit assembly (PCA), the T driver PCA, the high-voltage power-supply PCA, the fuser power supply PCA, and the low-voltage power-supply unit.

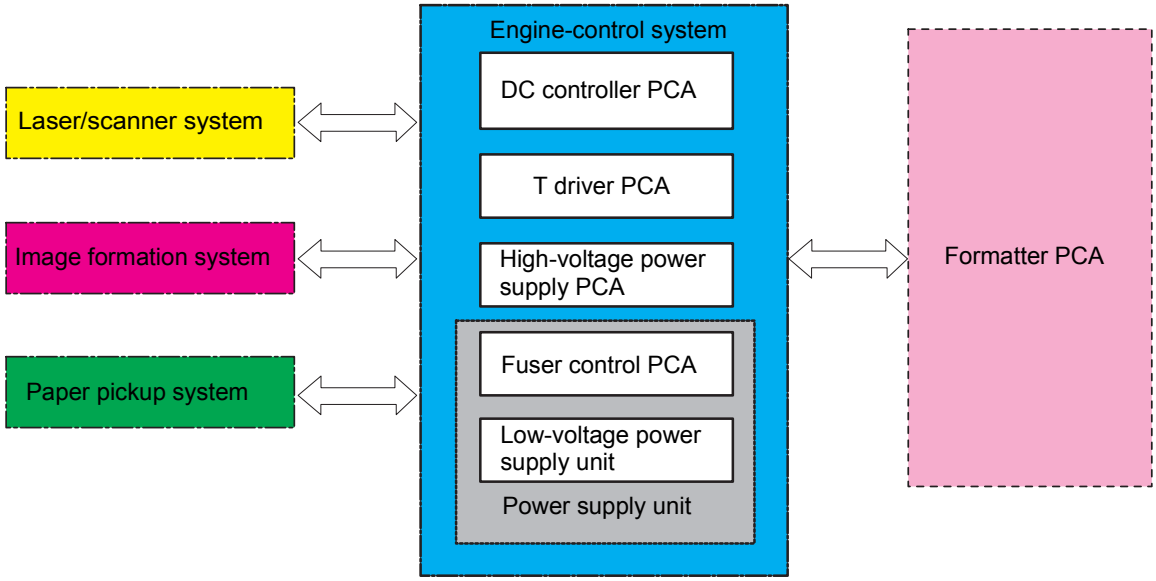

Figure 31. **Engine-control system**

DC controller circuit

The DC controller circuit controls the printer operational sequences. Motors, fans, clutches, solenoids, and sensors are listed in table 47.

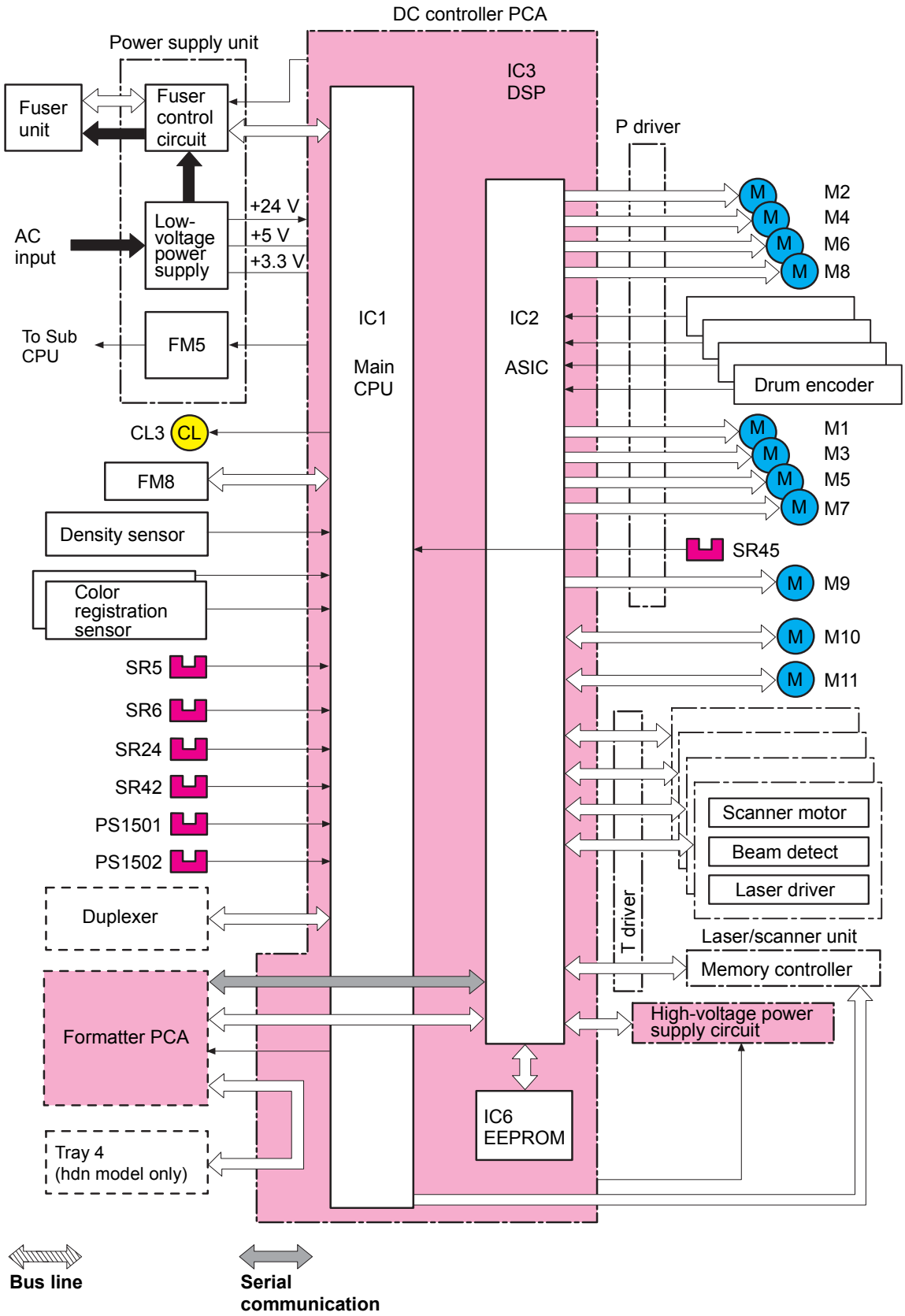

Figure 32. **DC controller circuit (1 of 2)**

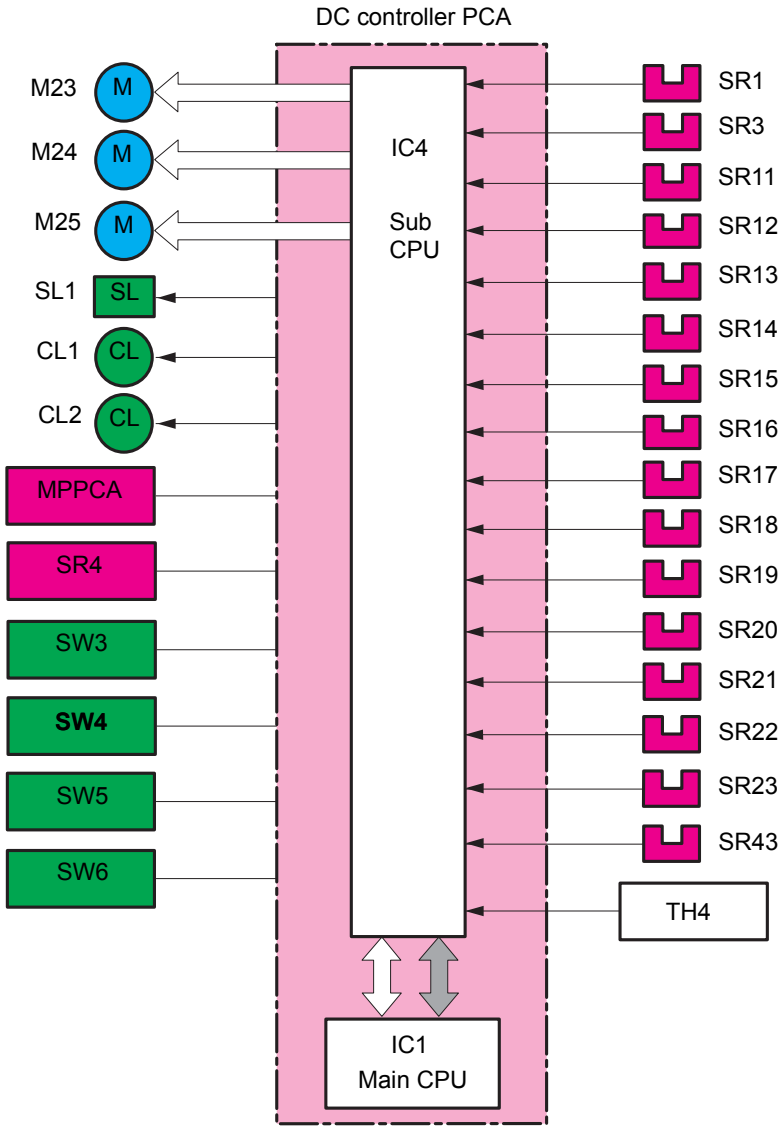

Figure 33. **DC controller circuit (2 of 2)**

Table 47. Motors, fans, clutches, solenoids, and sensors

Number	Description
M1 M3 M5 M7	Drum motor (yellow) Drum motor (magenta) Drum motor (cyan) Drum motor (black)
M2 M4 M6 M8	Developing motor (yellow) Developing motor (magenta) Developing motor (cyan) Developing motor (black)
M9	ITB motor
M10	Registration motor
M11	Fusing motor
M23	Pickup roller up/down motor

Table 47. Motors, fans, clutches, solenoids, and sensors (continued)

Number	Description
M24	Pickup motor
M25	Lifter motor
FM5	Power supply fan
FM8	ITB fan
CL1	Pre-registration feed clutch
CL2	Registration clutch
CL3	Secondary transfer clutch
SL1	Tray 1 pickup solenoid
SR1	Tray 1 paper sensor
SR3	Registration paper sensor
SR4	Transparency sensor
SR5	Multifeed sensor
SR6	Front fusing paper sensor
SR11	Tray 2 feed sensor A
SR12	Tray 2 feed sensor B
SR13	Tray 3 feed sensor A
SR14	Tray 3 feed sensor B
SR15	Tray 2 paper level sensor 1
SR16	Tray 2 paper level sensor 2
SR17	Tray 3 paper level sensor 1
SR18	Tray 3 paper level sensor 2
SR19	Tray 2 paper surface sensor
SR20	Tray 2 paper sensor
SR21	Tray 3 paper surface sensor
SR22	Tray 3 paper sensor
SR23	Pickup roller shaft home-position sensor
SR24	Lower right door sensor
SR42	Front secondary transfer paper sensor
SR43	Last paper sensor
SR45	ITB rotation sensor
PS1501	Fuser delivery paper sensor
PS1502	Engaging/disengaging sensor
SW3	Tray 2 paper length detection switch
SW5	Tray 2 paper width detection switch
SW4	Tray 3 paper length detection switch
SW6	Tray 3 paper width detection switch
MPPCA	Multipurpose tray (tray 1) paper width sensor
TH4	ITB temperature sensor

DC controller operations

- The main CPU (IC1) on the DC controller PCA controls the following printer and MFP operations:
  - sequence of the printer
  - communication with the formatter
  - high-voltage power-supply circuit operation
  - fuser control circuit operation
  - loading and sensor operation
  - communication with the duplexer (if installed)
  - communication with the memory tag
  - communication with the ASIC, sub CPU, and t-CPU
- The ASIC (IC2) on the DC controller PCA controls the following printer operations, according to instructions from the main CPU:
  - laser/scanner operation
  - communication with the formatter
  - high-voltage power-supply circuit operation
  - rotation of the fuser/delivery motor and drum motor
  - operation of the motors and sensors
  - communication with the memory tag
  - communication with the DSP
- The DSP (IC3) controls the following printer operations, through the ASIC:
  - operation of the developing motors (Y, M, C, K)
  - operation of the drum motor (Y, M, C, K)
  - operation of the ITB motor
  - operation of the registration motor
  - operation of the fuser motor
  - operation of the drum encoder
- The sub CPU (IC4) controls the following printer operations, according to instructions from the main CPU:
  - loading
  - operation of the sensors and switches
- The EEPROM (IC6) stores backup data.

T driver circuit

The T driver circuit controls motors and fans according to the main CPU in the DC controller.

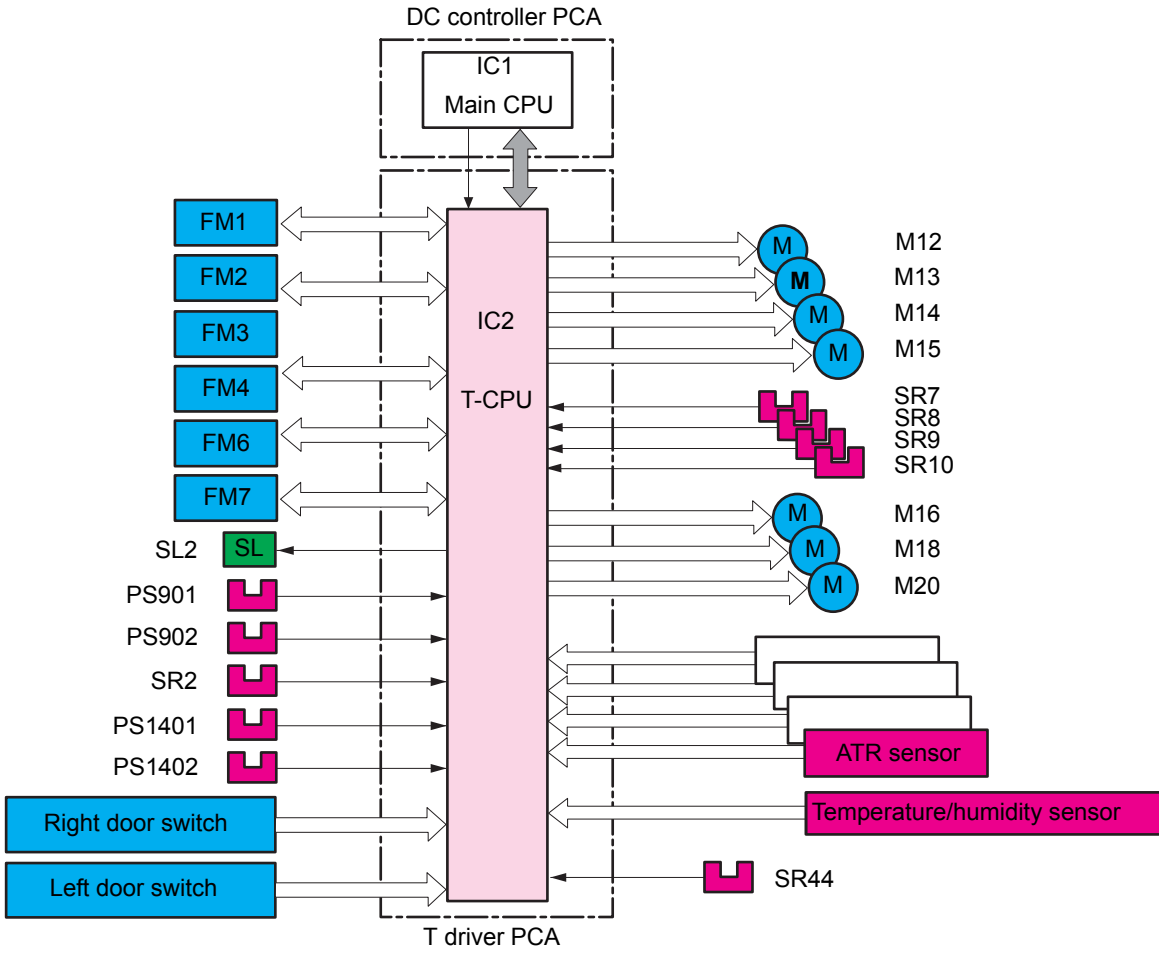

Figure 34. **T driver circuit**

Fuser control circuit

The fuser control circuit consists of the following components:

- two heaters (H1 and H2)
- three thermistors (TH1, TH2, and TH3)
- two thermoswitches (TP1 and TP2)

Note The fuser temperature control circuit and safety circuit control the temperature of the fuser control circuit.

Heater H1 heats the fuser roller and H2 heats the pressure roller. The upper-center thermistor (TH1) monitors the fuser roller surface temperature, the lower-edge thermistor (TH2) monitors the pressure roller surface temperature, and the upper-edge thermistor (TH3) detects temperature increases at one end of the fuser roller.

Two thermal switches guard against the two heaters overheating by turning off power to the heaters when the temperature increases abnormally. The upper thermoswitch (TP1) is in the center of the fuser roller, and the lower thermoswitch (TP2) is in the center of the pressure roller.

Note After turning off the printer or MFP, wait a few seconds before unplugging the power cord to allow fuser-roller alienation. If the printer or MFP is running hot, wait at least five minutes before unplugging the power cord. This allows the fans to cool the fuser control circuit.

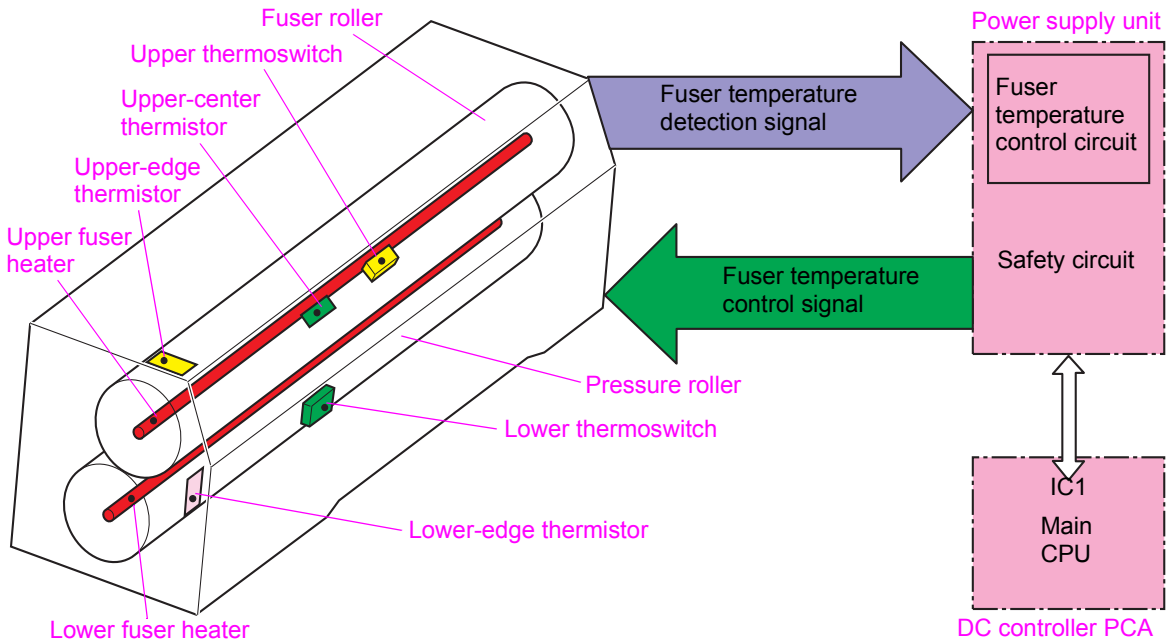

Figure 35. **Fuser control circuit**

Low-voltage power supply

The low-voltage power supply converts AC voltage from the power source to DC voltage when the printer is turned on. The AC power is converted as follows:

- +24 VDC for motors, solenoids, clutches, and the high-voltage power-supply circuit
- +5 VDC for the laser/scanner PCA, the Beam detect PCA, and the formatter
- +3.3 VDC for the formatter, sensors, and the ICs on the DC controller PCA

The +24 VDC consists of the following voltages:

- +24 VA (is constantly supplied from the low-voltage power-supply circuit)
- +24 VB (stops the power supply when the interlock switch is turned off)

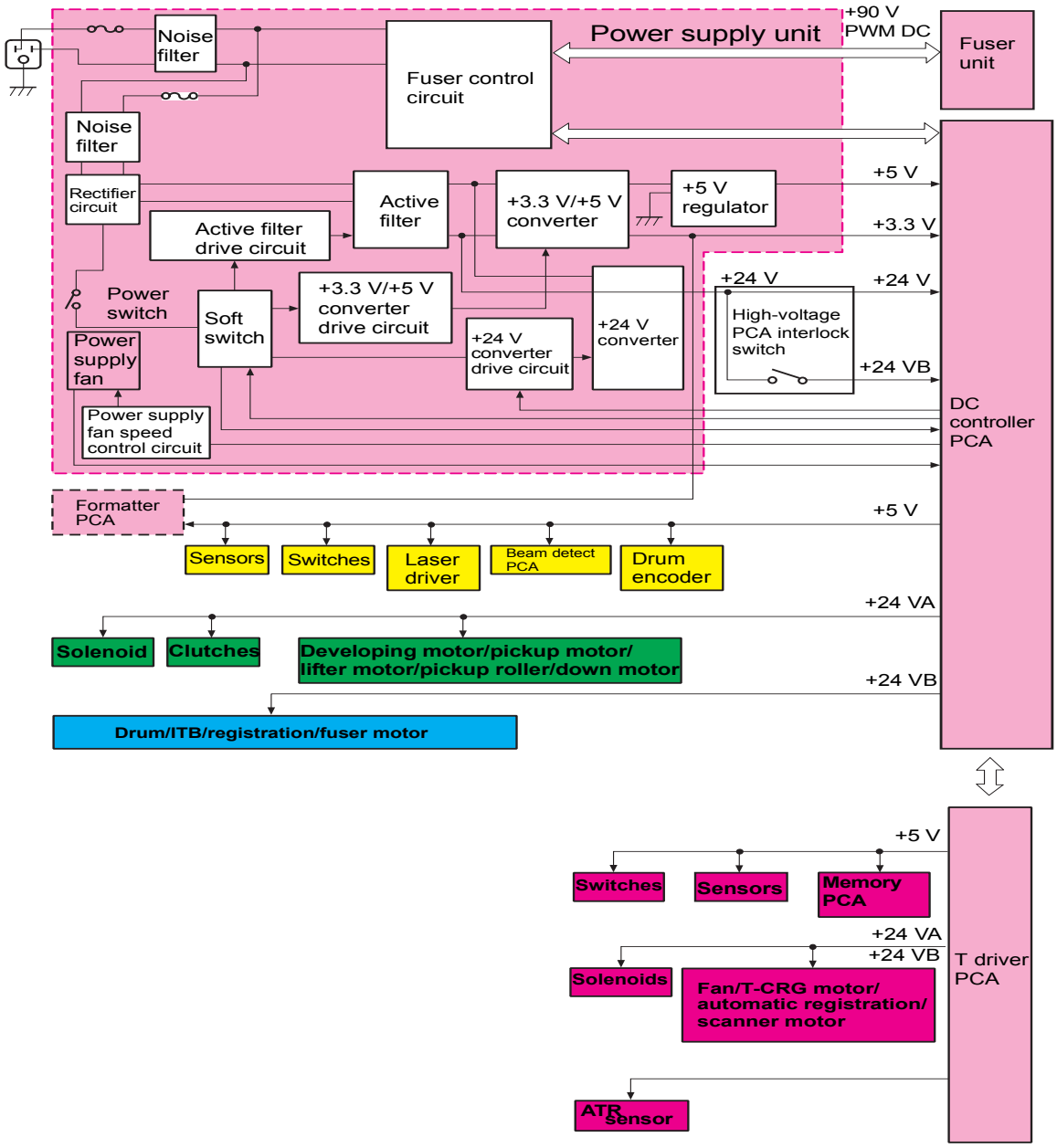

Figure 36. **Low-voltage power supply circuit**

High-voltage power supply circuits

The high-voltage power supply applies a high-voltage bias to the four positive cleaning brushes, the four negative cleaning brushes, the four primary charging rollers, the post charging unit, the four developing cylinders, the four primary transfer rollers, the secondary transfer roller, and the static charge eliminator. The main CPU (IC1) in the DC controller generates the high-voltage bias by controlling the high-voltage power supply PCA through the ASIC (IC2).

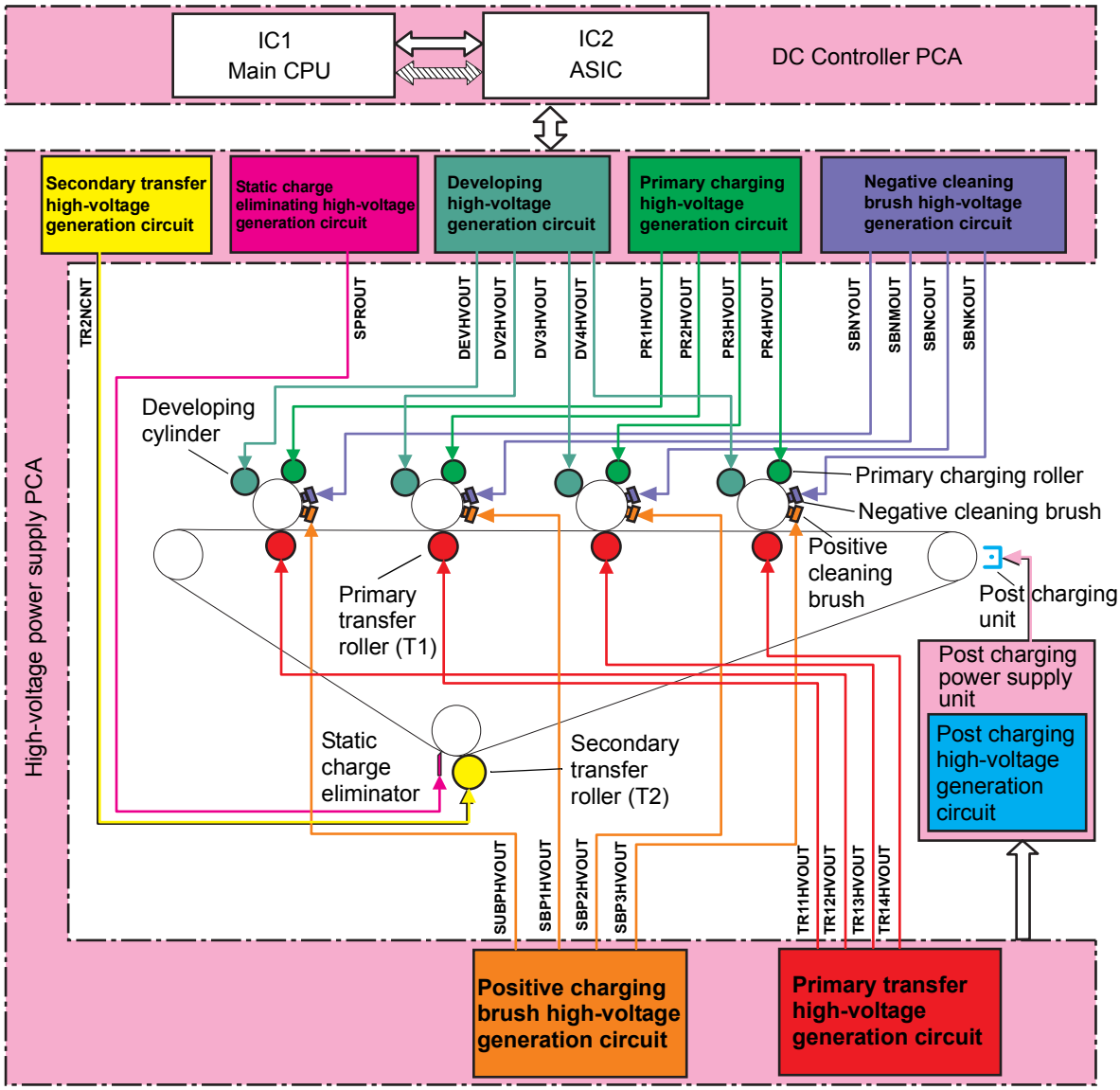

Figure 37. **High-voltage power supply circuit**

Post charger power supply unit

The corona power supply provides high-voltage power to the post charger power supply unit.

Motors and fans

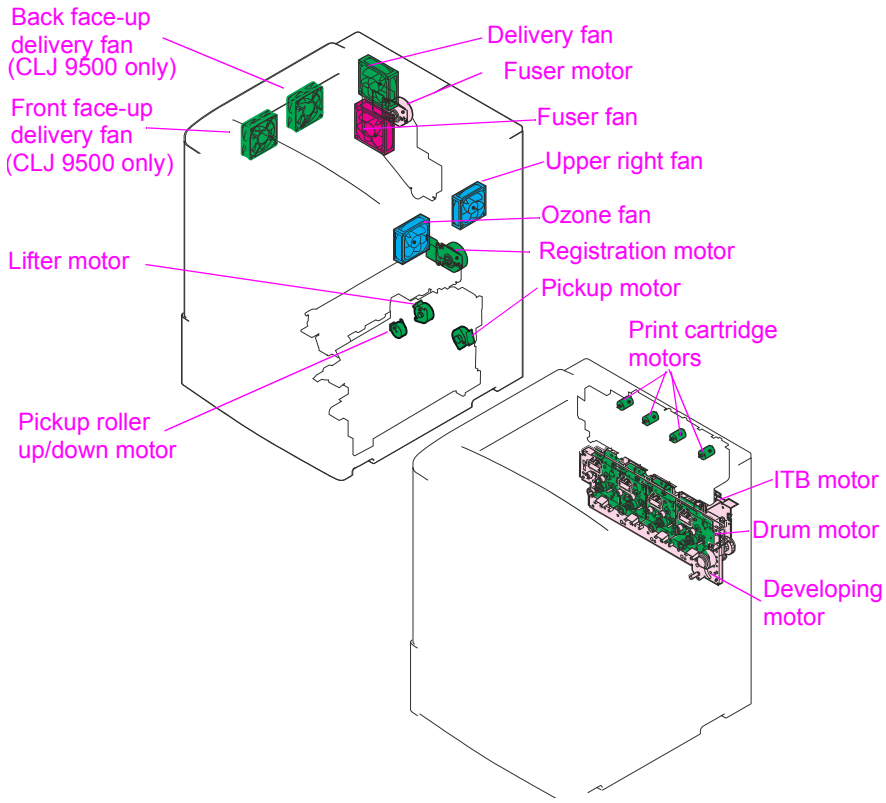

Figure 38. **Motors and fans**

Table 48. Motors and fans

Number	Description	Function	Type	Direction/ speed	Controlled by	Failure detection	Service part number
M1 M3 M5 M7	Y drum motor M drum motor C drum motor K drum motor	Drive the photosensitive drum, primary charging roller, charging brushes, and primary charging roller cleaner.	Stepping motor	• Clockwise • Half- and full-speed	DC controller	By encoder	RG5-6188-000CN
M2 M4 M6 M8	Y developing motor M developing motor C developing motor K developing motor	Drive the developing cylinder and screw.	Stepping motor	• Clockwise • Half- and full-speed	DC controller	By ATR sensor	RG5-6188-000CN
M9	ITB motor	Drives the ITB.	Stepping motor	• Clockwise Half- and full-speed	DC controller	By encoder	RG5-6188-000CN

Table 48. Motors and fans (continued)

Number	Description	Function	Type	Direction/ speed	Controlled by	Failure detection	Service part number
M10	Fuser motor	Drives the fuser rollers and the delivery roller. Also releases the fuser roller pressure by reversing, which makes a cracking noise.	DC motor	• Clockwise and counter-clockwise • Half- and full-speed	DC controller	Yes	RH7-1519-000CN
M11	Registration motor	Drives the secondary transfer roller and the registration roller.	DC motor	• Clockwise • Half- and full-speed	DC controller	Yes	RH7-1518-000CN
M12 M13 M14 M15	Y print cartridge motor M print cartridge motor C print cartridge motor K print cartridge motor	Drive the print cartridges.	DC motor	• Clockwise • One speed	T driver	By rotation sensor	RG5-6022-000CN
M16 M18 M20 M30	Y automatic registration laser motor M automatic registration laser motor K automatic registration laser motor C automatic registration laser motor (not used because it is the reference color)	Drive cam for the automatic registration adjustment of the four laser assemblies.	Stepping motor	• Clockwise and counter-clockwise • One speed	T driver	No	RG5-6181-000CN
M23	Pickup roller up/down motor	Drives the pickup and feed rollers.	Stepping motor	• Clockwise and counter-clockwise • One speed	DC controller	No	RG5-6097-000CN

Table 48. Motors and fans (continued)

Number	Description	Function	Type	Direction/ speed	Controlled by	Failure detection	Service part number
M24	Pickup motor	Drives the pickup roller up-and-down arm.	Stepping motor	• Clockwise and counter-clockwise • One speed	DC controller	No	RG5-6097-000CN
M25	Lifter motor	Drives the tray lifter.	Stepping motor	• Clockwise and counter-clockwise • One speed	DC controller	No	RG5-6097-000CN
FM1 CLJ 9500 only	Back face-up delivery fan	Cools the face-up delivery unit.	DC motor		T driver	Yes	RH7-1546-000CN
FM2	Delivery fan	Cools the delivery unit and the scanner area.	DC motor		T driver	Yes	RH7-1521-000CN
FM3	Upper right fan	Cools the ITB unit.	DC motor		T driver	Yes	RH7-1544-000CN
FM4	Fusing fan	Cools the fuser and print cartridge area.	DC motor		T driver	Yes	RH7-1522-000CN
FM5	Power supply fan	Cools the low-voltage power supply.	DC motor	• Half- and full-speed	DC controller	Yes	RH3-2236-000CN (110 V) RH3-2237-000CN (220 V)
FM6 CLJ 9500 only	Front face-up delivery fan	Cools the face-up delivery.	DC motor		T driver	Yes	RH7-1546-000CN
FM7	Ozone fan	Ventilation for the post charger unit.	DC motor		T driver	Yes	RH7-1564-000CN
FM8	ITB fan	Cools the ITB.	DC motor	• One speed		No	RG5-6180-000CN

Note The HP color LaserJet 9500 duplex unit does *not* have a fan even though it has a fan housing.

Switches, solenoids, clutches, and sensors

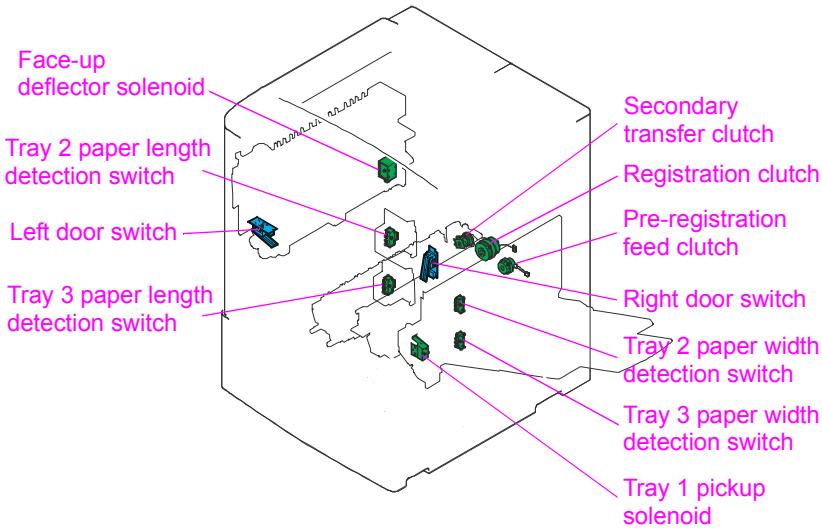

Figure 39. **Switches, solenoids, and clutches**

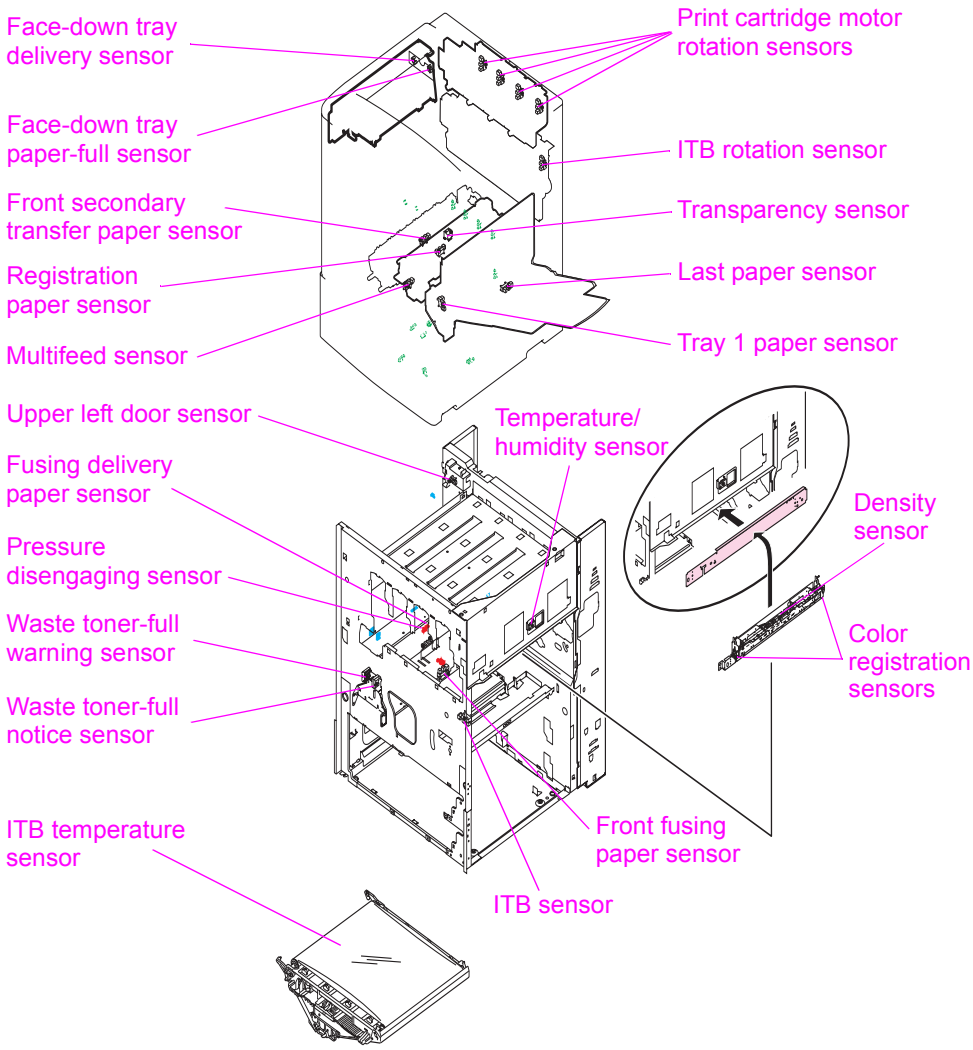

Figure 40. **Sensors**

Table 49. Switches, solenoids, clutches, and sensors

Number	Description	Controlled by	Service part number
SW3	Tray 2 paper length detection switch	DC controller	RG5-6097-000CN Paper pickup assy.
SW4	Tray 3 paper length detection switch	DC controller	RG5-6097-000CN Paper pickup assy.
SW5	Tray 2 paper width detection switch	DC controller	RG5-6097-000CN Paper pickup assy.
SW6	Tray 3 paper width detection switch	DC controller	RG5-6097-000CN Paper pickup assy.
SL1	Tray 1 pickup solenoid	DC controller	RG5-6090-00CN Manual feed paper pickup assy.
SL2	Face-up deflector solenoid	T driver	RG5-6150-000CN Delivery feed assy.
CL1	Pre-registration feed clutch	DC controller	RG5-6016-000CN Registration assy.
CL2	Registration clutch	DC controller	RG5-6016-000CN Registration assy.
CL3	Secondary transfer clutch	DC controller	RG5-6179-000CN Secondary transfer assy.
MPPCA	Multipurpose tray (tray 1) paper width sensor	DC controller	RG5-6090-00CN Manual feed paper pickup assy.
PS901 (CLJ 9500 only)	Face-down bin paper delivery sensor	T driver	RG5-6017-000CN Face-down delivery assy.
PS902 (CLJ 9500 only)	Face-down bin paper-full sensor	T driver	RG5-6017-000CN Face-down delivery assy.
PS1401	Waste toner-full notice sensor	DC controller	RG5-6038-000CN Waste sensor assy.
PS1402	Waste toner-full warning sensor	DC controller	RG5-6038-000CN Waste sensor assy.
PS1501	Fuser delivery paper sensor	DC controller	RG5-6038-000CN Waste sensor assy.
PS1502	Engaging/disengaging sensor	DC controller	RG5-6038-000CN Waste sensor assy.
SR1	Tray 1 paper sensor	DC controller	RG5-6090-000CN M-feed paper pickup assy.
SR2	Upper left door sensor	DC controller	RG5-6152-000CN Paper delivery sensor assy
SR3	Registration paper sensor	DC controller	RG5-6016-000CN Registration assy
SR4	Transparency sensor	DC controller	RG5-6016-000CN Registration assy

Table 49. Switches, solenoids, clutches, and sensors (continued)

Number	Description	Controlled by	Service part number
SR5	Multifeed sensor	DC controller	RG5-6016-000CN Registration assy
SR6	Front fusing paper sensor	DC controller	WG8-5362-00CN Photo interrupter
SR7 SR8 SR9 SR10	Print cartridge motor rotation sensor	DC controller	RG5-6022-000CN Toner cartridge drive assy. OR WG8-5362-000CN Photo interrupter
SR11	Tray 2 feed sensor A	DC controller	RG5-6097-000CN Paper pickup assy.
SR12	Tray 2 feed sensor B	DC controller	RG5-6097-000CN Paper pickup assy.
SR13	Tray 3 feed sensor A	DC controller	RG5-6097-000CN Paper pickup assy.
SR14	Tray 3 feed sensor B	DC controller	RG5-6097-000CN Paper pickup assy.
SR15	Tray 2 paper level sensor 1	DC controller	RG5-6097-000CN Paper pickup assy.
SR16	Tray 2 paper level sensor 2	DC controller	RG5-6097-000CN Paper pickup assy.
SR17	Tray 3 paper level sensor 1	DC controller	RG5-6097-000CN Paper pickup assy.
SR18	Tray 3 paper level sensor 2	DC controller	RG5-6097-000CN Paper pickup assy.
SR19	Tray 2 paper surface sensor	DC controller	RG5-6097-000CN Paper pickup assy.
SR20	Tray 2 paper sensor	DC controller	RG5-6097-000CN Paper pickup assy.
SR21	Tray 3 paper surface sensor	DC controller	RG5-6097-000CN Paper pickup assy.
SR22	Tray 3 paper sensor	DC controller	RG5-6097-000CN Paper pickup assy.
SR23	Pickup roller shaft home-position sensor	DC controller	RG5-6097-000CN Paper pickup assy.
SR24	Lower right door sensor	DC controller	RG5-6097-000CN Paper pickup assy.
SR42	Front secondary transfer paper sensor	DC controller	RG5-6179-000CN Secondary transfer assy.
SR43	Last paper sensor	DC controller	RG5-6090-000CN Manual feed paper pickup assy.
SR44	ITB sensor	DC controller	WG8-5362-000CN Photo interrupter
SR45	ITB rotation sensor	DC controller	RG5-6188-000CN Process cartridge drive assy.

Table 49. Switches, solenoids, clutches, and sensors (continued)

Number	Description	Controlled by	Service part number
TH4	ITB temperature sensor	DC controller	RG5-6180-000CN ITB assy.
N/A	Temperature/humidity sensor	DC controller	RG5-6153-000CN Humidity sensor assy.
N/A	Density sensor	DC controller	RG5-6123-000CN Registration assy.
N/A	Color registration sensor	DC controller	RG5-6123-000CN Registration assy.

Formatter

Note The formatter in the HP LaserJet 9500 Series printer is similar to the formatter in the HP LaserJet 9500mfp, but the formatter is not an interchangeable component. Do not install an LJ 9500 formatter into an LJ 9500mfp or a MFP formatter into an LJ 9500.

The formatter is responsible for the following functions:

- receiving and processing print data from the various printer interfaces
- monitoring control panel inputs and relaying printer status and error information (through the control panel and the bidirectional I/O)
- developing and coordinating data placement and timing with the print engine
- storing font information
- communicating with the host computer through the bidirectional interface
- controlling the PowerSave mode

The formatter continuously monitors the printer through the video interface. When the printer is ready to print, the formatter sends a signal to the DC controller, which turns the laser on or off based on the signal.

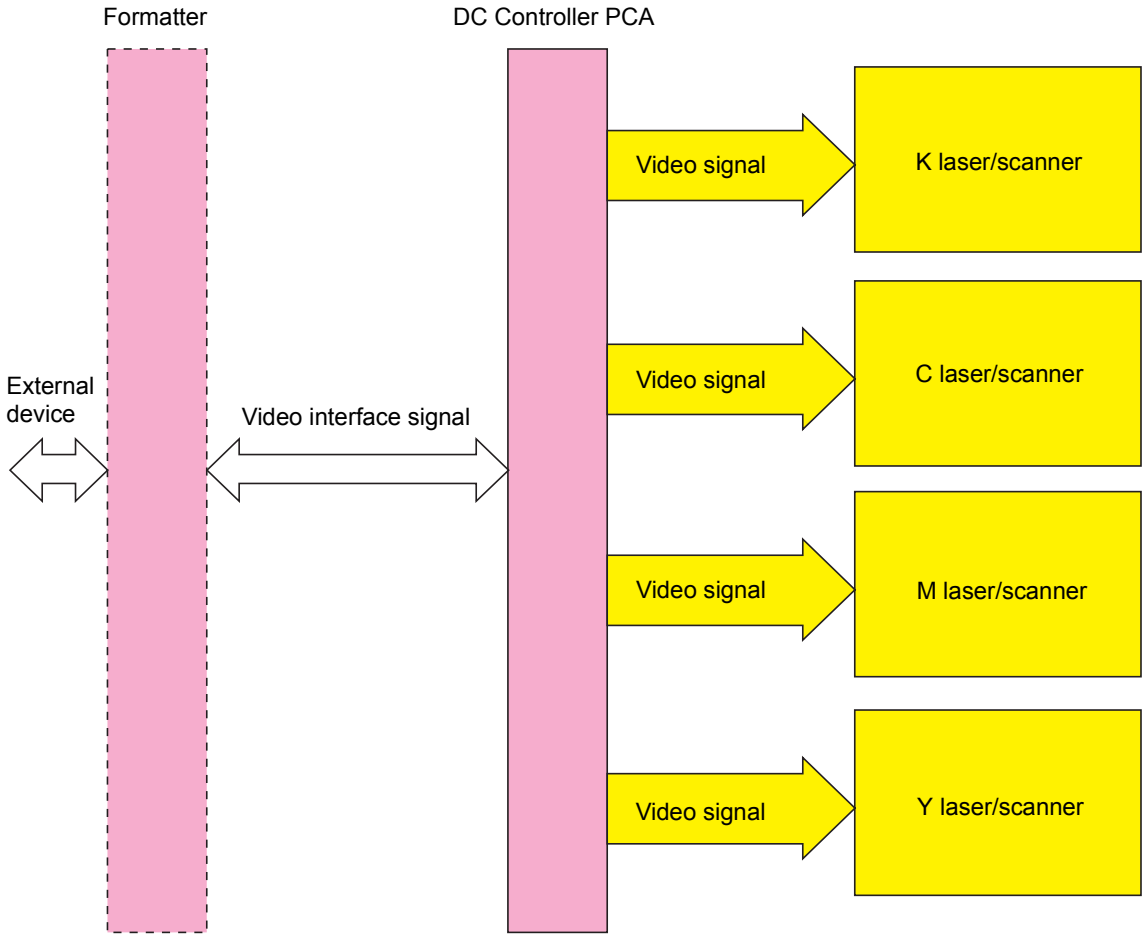

Figure 41. Formatter system

Formatter heartbeat LED

The formatter heartbeat LED indicates that the formatter hardware passed its own initial tests and is operating correctly. See “Formatter heartbeat LED” on page 351 for more information.

Note The formatter heartbeat LED does not indicate that the firmware is operating correctly.

If the formatter heartbeat LED is visible, check other printer systems for problems and consider performing a firmware upgrade. See “Firmware upgrades to the printer or MFP” on page 109.

DIMM slots

The HP LaserJet 9500 formatter has five dual inline memory module (DIMM) slots: J1 (firmware DIMM); J2, J3, and J4 (available for memory upgrades); and J5 (available only for forms and fonts, not memory upgrade). Four of these are 168-pin slots, and one is a 100-pin slot. Only four DIMMs can be loaded at a time, and the fifth DIMM slot (100-pin) is equivalent to the fourth slot (168-pin). If all five slots are filled, a `53.10.05` error appears on the control panel.

Note The MFP version of the HP LJ 9500 printer uses a different formatter and formatter part number. A Compact Flash memory card is used for firmware memory storage in the MFP. The MFP uses a 512 MB RAM DIMM and is not expandable, even though DIMM slots are available on the formatter PCA. The open Compact Flash slots on the formatter are used for fonts or third-party programs.

Laser/scanner system

The laser/scanner system is the laser/scanner unit that forms a latent image on the photosensitive drum based on the VDO and /VDO signals sent from the formatter. This product contains four laser/scanner units (one for each color), and each laser/scanner unit is structured the same.

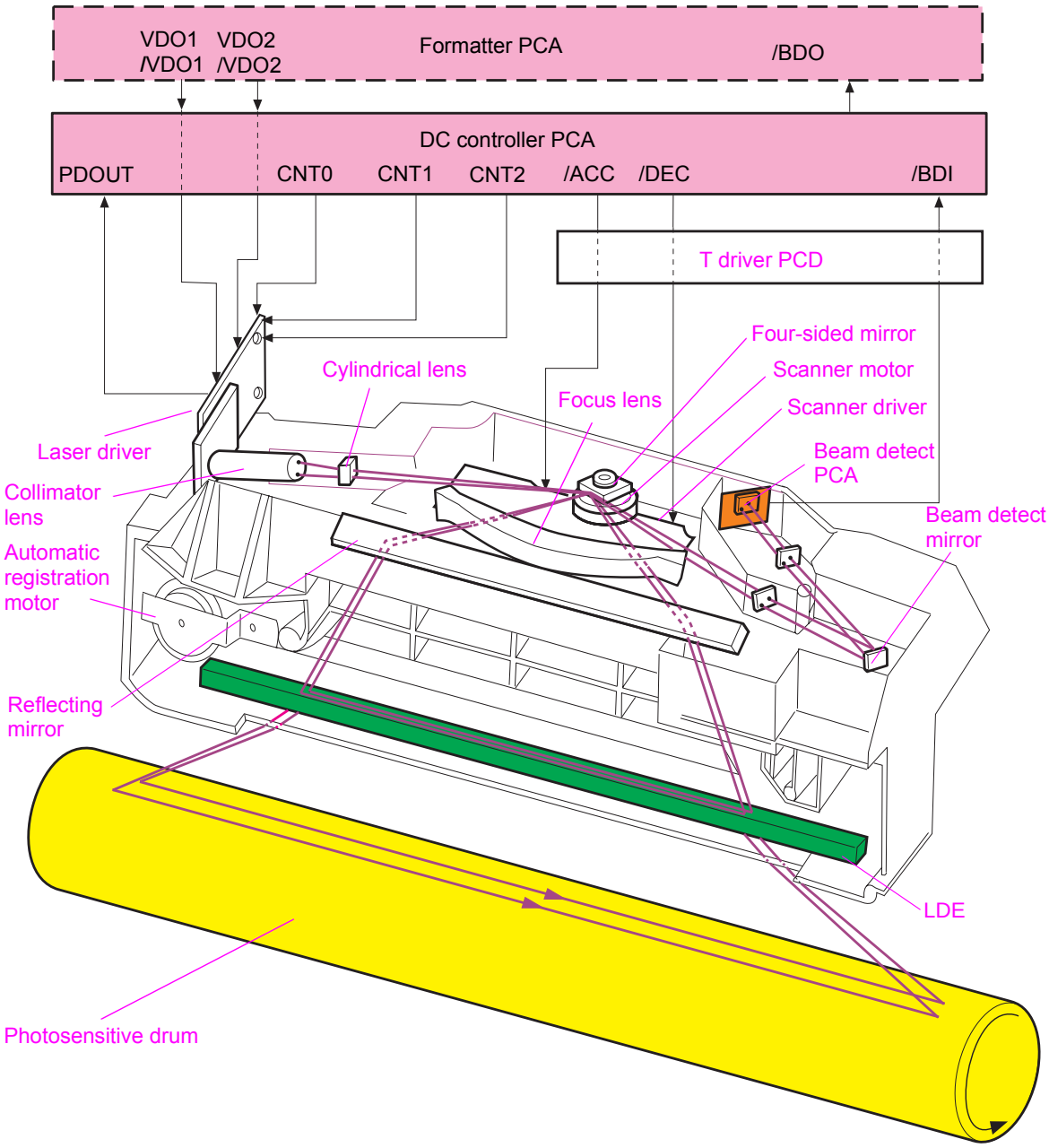

Figure 42. **Laser/scanner system**

Dual-beam method

The laser/scanner unit contains two laser diodes in the laser unit. The printer employs the “dual-beam method,” which scans two lines simultaneously.

Based on signals it receives from the DC controller and the formatter, the laser/scanner PCA in turn signals the two laser diodes to emit laser beams. The beams strike a four-sided mirror that rotates at a constant speed through the collimator lens and cylindrical lens. The beams reflect off of the mirror, pass through a focusing lens and a reflective mirror, and focus on the photosensitive drum.

The scanning mirror, rotating at a constant speed, reflects the laser beams, which scan across the drum at a constant speed. Then, a latent image is formed on the drum surface by constant-speed rotation of the photosensitive drum and constant-speed scanning of the laser beams.

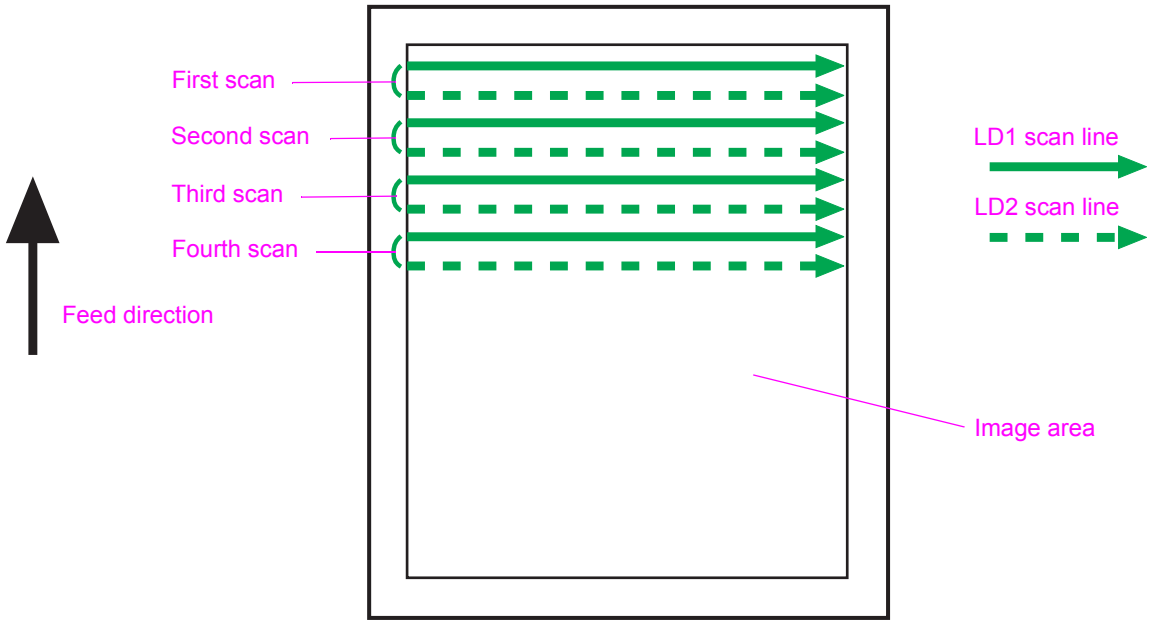

Figure 43. **Dual-beam method**

Laser control

The laser control turns the two laser diodes (LD1 and LD2) on and controls the specific amount of light. The amount of light is based on the video (VDO1, /VDO1, VDO2, and /VDO2) signals that the formatter sends through the DC controller to the laser drive circuit in the laser driver IC.

The laser control (CNT0, CNT1, and CNT2) sends the ASIC (IC2) signals to the logic circuit in the laser driver IC. The laser driver IC then performs the automatic emission control of the laser diodes (APC), the image mask control, and a forced light emission of each laser diode.

The logic circuit performs the following functions:

- starts the print mode when all of the laser control signals are “high”
- turns on or turns off the laser diodes according to the video signals

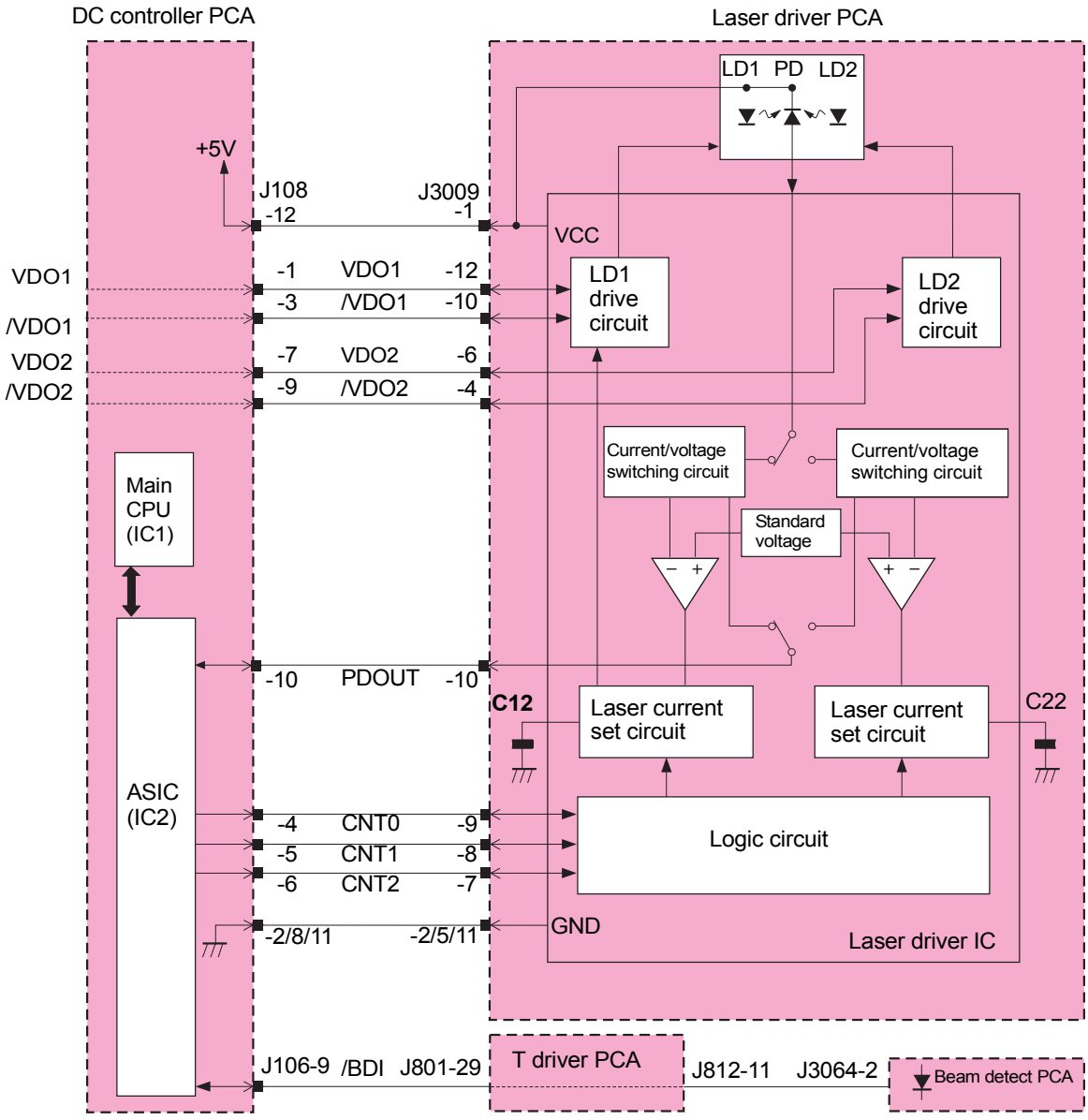

Figure 44. **Laser control**

Laser diode automatic light emission control

The laser diode automatic light emission control (APC) emits a specified amount of light from the laser diodes. This is performed in the laser driver IC, and is based on the laser control signals that the DC controller sends.

Two types of APCs are involved:

- initial APC
  - is performed during primary rotation
  - adjusts the amount of laser light
  - detects laser failures
- between-lines APC
  - is performed during printing
  - performs the laser light amount adjustment for one line before the line begins printing

When the CNT0 signal is low, the CNT1 signal is high, and the CNT2 signal is low, the laser driver IC goes into sample mode for laser diode 1 (LD1) which forces LD1 to emit light. When the CNT0 signal is high, the CNT1 signal is low, and the CNT2 signal is L, the laser driver IC goes into the sample mode for laser diode 2 (LD2), which forces LD2 to emit light. The photo diode (PD) detects the amount of emitted light from each laser diode, and the amount is compared to the standard voltage through the current/voltage convert circuit.

If the amount of light that the laser diodes emit is larger than the standard voltage, the condensers (C12 and C22) discharge to decrease the laser current. If the amount of light that the laser diodes emit is smaller than the standard voltage, C12 or C22 charges to increase the laser current. When the laser light voltage amount equals the standard voltage amount, the emitted laser diode-light amount equals the target laser-light amount.

Note When the CNT0 signal is high, the CNT1 signal is high, and the CNT2 signal is low, LD1 and LD2 are automatically turned off and the sample hold circuit enters the hold state (image mask state). Also, the laser driver IC converts the controlled laser light amount to the C12 and C22 voltages and stores the amounts.

Image mask control

The image mask control is used to avoid the laser beam emission on a non-image area during periods other than the unblanking period.

When the CNT0 and the CNT1 signals are high, and the CNT2 signal is low, all of the signals from the CPT to the laser driver IC, LD1, and LD2 are turned off automatically. The sample-hold circuit then enters the image mask state. During the image mask state, LD1 and LD2 do not emit light even if the VDO1, /VDO1, VDO2, and /VDO2 signals are sent.

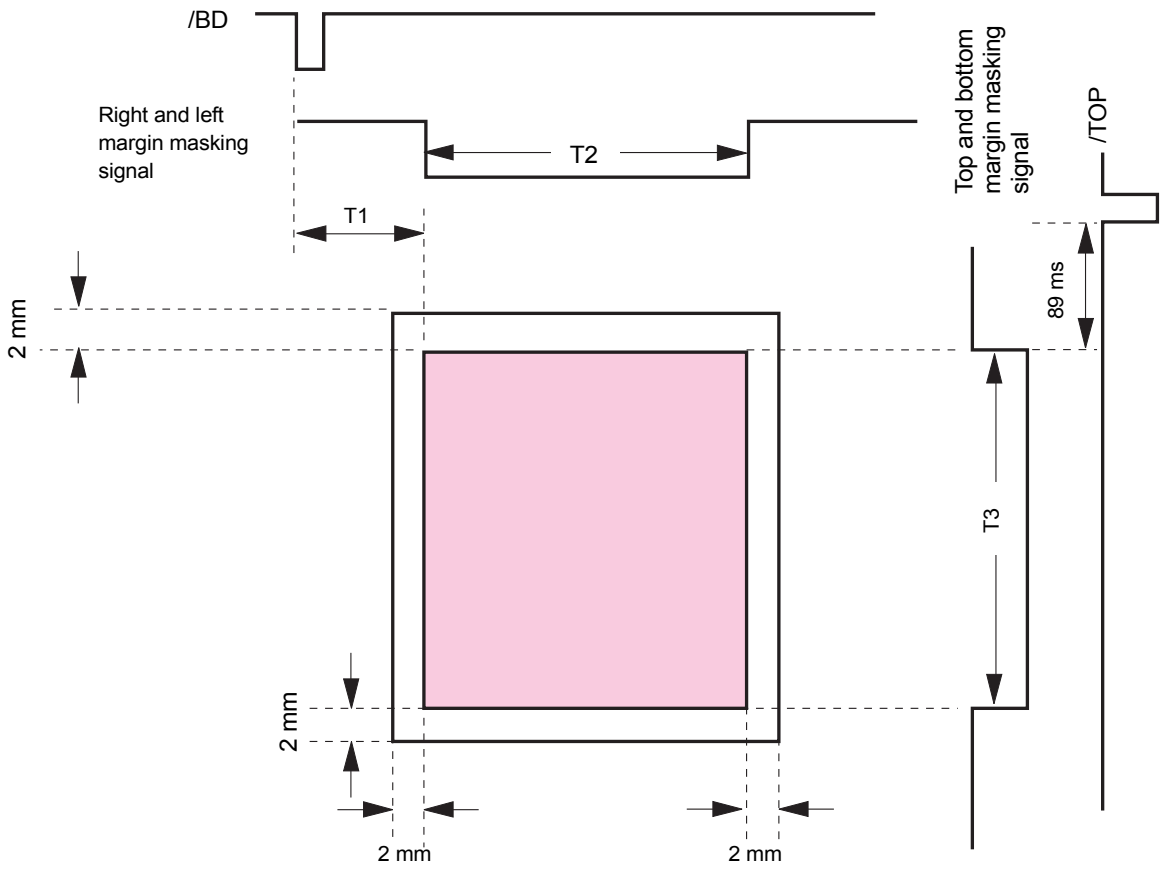

Figure 45. **Image mask control**

Horizontal synchronous control

The horizontal synchronous control aligns the writing position in the image horizontal direction. The ASIC generates the unblanking signal in the main CPU based on the BD input (/BDI) signal that the Beam detect PCA sends. Then, the ASIC controls the laser control signals and forcefully emits light from LD1 and LD2 during the unblanking period.

A small, fixed mirror (Beam detect mirror) is located at the scanning ending position in the optical path of the laser beam. The Beam detect mirror reflects each laser beam and the beams are sent to the Beam detect PCA in the laser/scanner unit. By detecting the laser beam, the Beam detect circuit PCA generates a /BDI signal. Based on the /BDI signal, the ASIC in the DC controller generates a horizontal sync (/BDO) signal. After inputting the /BDO signal, the formatter outputs the video signals to the DC controller to align the starting position in the image horizontal direction.

Laser failure detection

This printer performs a correct laser control by detecting the laser control status from the DC controller. The laser failure detection determines a laser failure, Beam detect failure, and Beam detect error from the ASIC in the DC controller, which monitors the laser current monitor (PDOUT) signal and the /BDI signal.

The CPU determines a laser/scanner failure if the following occur:

- the PDOUT signal is not detected during the APC period
- the /BDI signal is not detected during print operation

The CPU determines a Beam detect error if the following occurs:

- a determined period of the /BDI signal is out of a specified range during a print operation

Scanner-motor control

The scanner-motor control rotates the scanner motor so the laser can strike the laser beam at a correct position on the photosensitive drum.

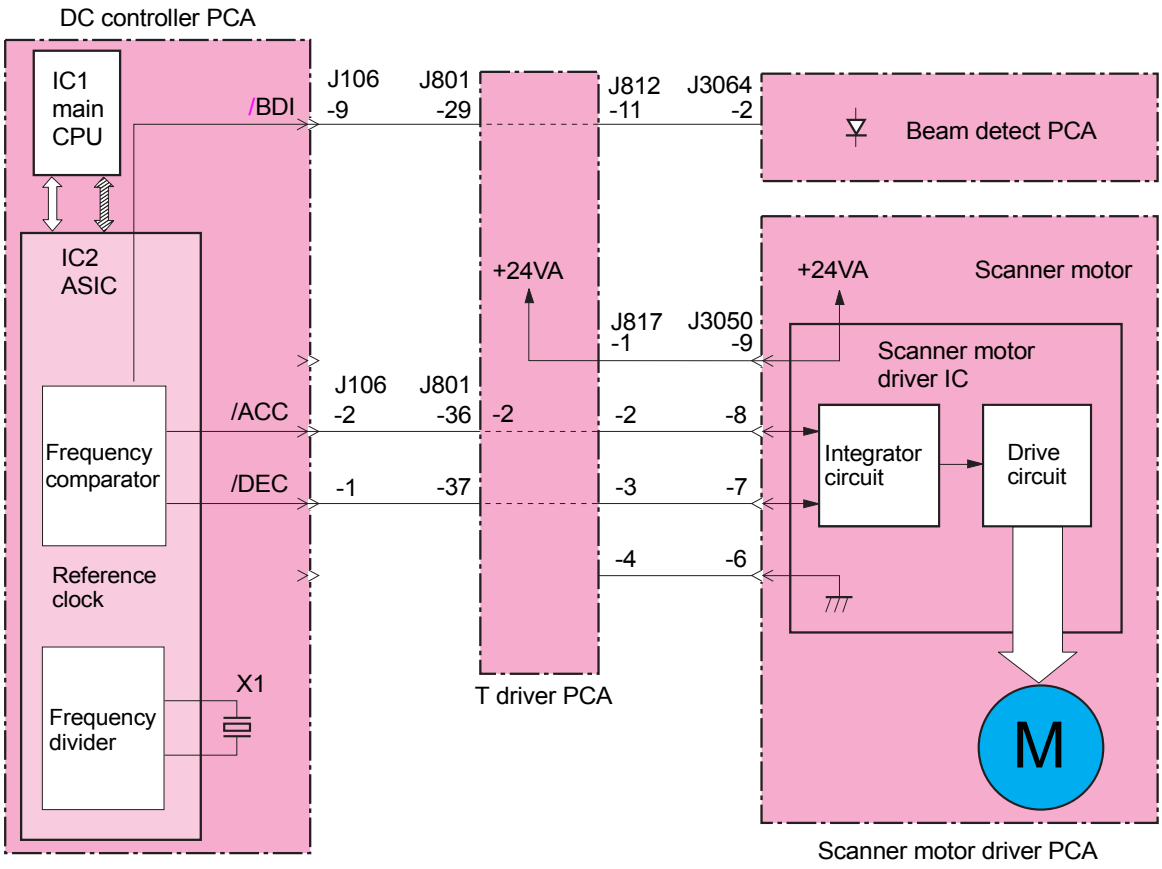

Figure 46. **Scanner motor control**

Scanner-motor-speed control

The scanner-motor-speed control rotates the scanner motor at a constant speed. This control is a function of the DC controller controlling the scanner-motor-driver IC. The scanner motor, which is integrated with the scanner motor drive circuit, is a three-phase, 12-pole, DC, brushless motor with a built-in hall device.

The scanner motor speed control process includes the following functions:

1. When the printer is turned on, the ASIC on the DC controller generates the standard clock based on oscillation frequency of the oscillator through the main CPU.
2. When the main CPU receives a print command, the ASIC sets the scanner motor acceleration (/ACC) signal to low, and then the scanner driver IC rotates the scanner motor. The scanner motor revolutions increase while the /ACC signal is low.
3. When the scanner motor rotates, the DC controller forcefully emits a laser and the /BDI signal is sent from the Beam detect PCA.
4. By using the frequency comparator, the ASIC compares the frequency of the /BDI signal to the frequency of the reference clock.
5. To control the /ACC signal and /DEC signal, the ASIC controls the scanner revolution so that the scanner motor revolution reaches the set rotation counts.
6. The /DEC signal is set to low to decrease the motor revolutions in order for the scanner to stop.

Scanner motor failure detection

The main CPU monitors the /BDI signal that is sent from the beam detect PCA to determine the scanner rotation speed. If the /BDI signal is not detected during print operation, the main CPU has identified a beam detect error and stops the print engine. Then, the main CPU transfers the error information to the formatter.

Color-plane registration calibration control

The color-plane registration (CPR) sensors detect CPR. For each color, the DC controller adjusts the vertical scanning writing position and the vertical scanning skew, and the formatter adjusts the horizontal scanning writing position and horizontal scanning magnification.

The CPR calibration control performs the following functions:

- image CPR range adjustment
- laser-beam-skew calibration

Image CPR adjustment

Image CPR adjustment information is adjusted for each color. This adjustment includes the following functions:

- determination of the horizontal scanning writing position
- determination of the horizontal scanning magnification
- determination of the vertical scanning writing position
- determination of the vertical scanning skew

The DC controller and formatter measure the CPR range in the horizontal and vertical scanning directions. They use the CPR sensors to adjust the CPR based on information from the measurement results. The DC controller writes CPR detection patterns in four colors on the ITB in response to the commands from the formatter when the following occur:

- the printer is turned on
- the P-crg or the ITB is inserted or removed
- temperature change inside the printer is out of the specified range.

The DC controller uses the detection pattern positions that the CPR sensors measure to calculate the CPR range. The DC controller obtains the CPR information, and sends the information for each color to the formatter.

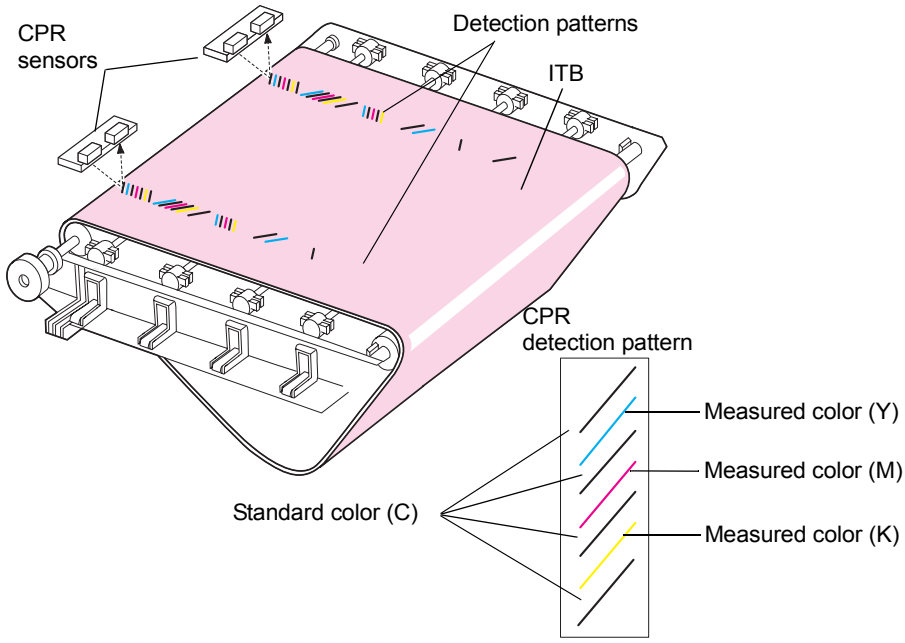

Figure 47. **Color-plane registration (CPR) adjustment**

Laser-beam-skew calibration

To calibrate the laser-beam-skew, the laser beam scanning line (vertical scanning skew) on the photosensitive drum is calibrated. The vertical scanning skew is adjusted by shifting the long diffractive element (LDE) in the laser/scanner unit.

The cam rotates when the automatic registration motor rotates. One end of the LDE is fixed and the other end is pressed against the cam so that the LDE changes its horizontal angle as the cam rotates. The horizontal scanning skew is adjusted by changing an angle of the LDE by rotating the automatic registration motor clockwise or counterclockwise.

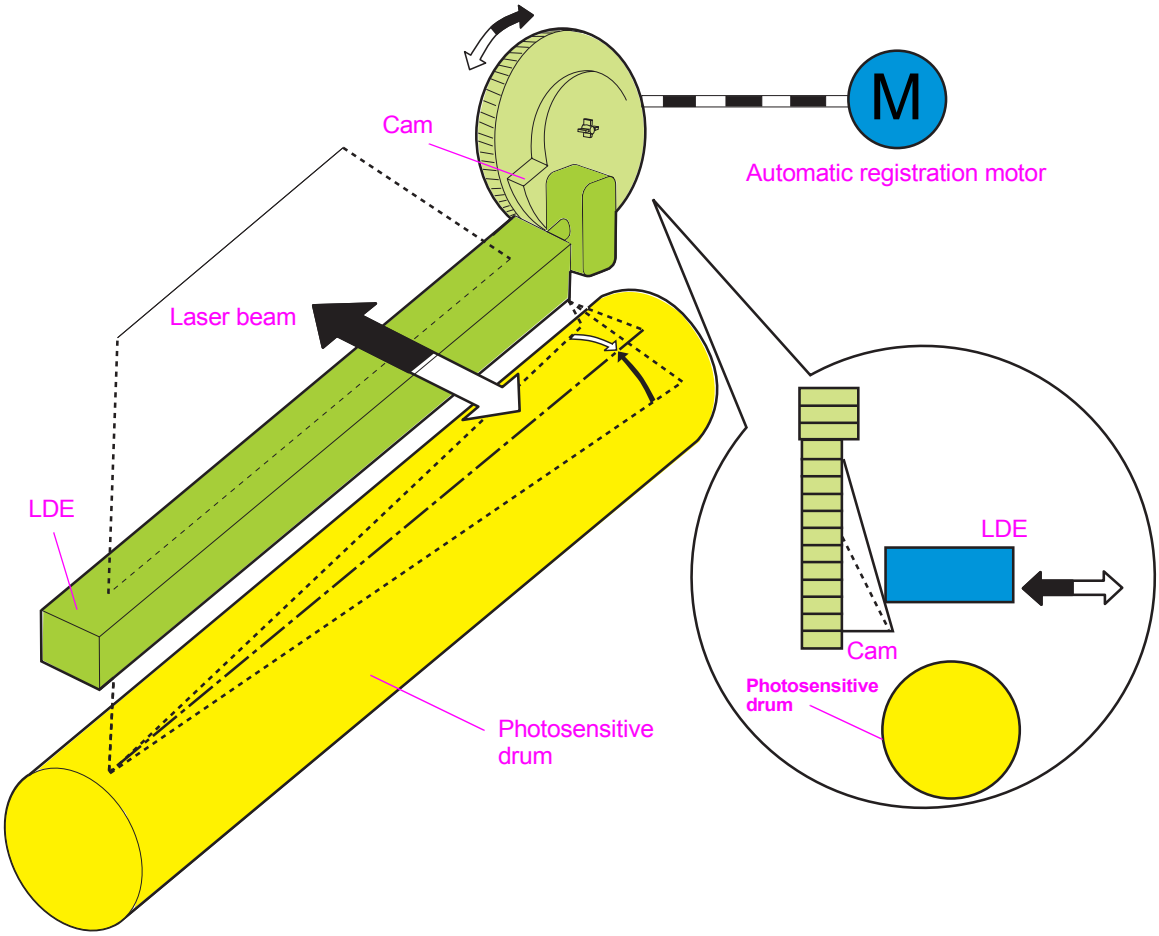

Figure 48. **Laser beam skew calibration**

Laser adjustment

The following two types of alignment that are adjusted manually:

- inter-dot runout (lengthens the scan line)
- parallelism

Note See Adjusting the laser/scanner assemblies (page 237) for more information about these adjustments.

Electrophotographic process

Note

The following are the main components of the electrophotographic (EP) process:

- four lasers
- four print cartridges
- four image drum cartridges
- the ITB
- the post charger
- the secondary transfer roller
- the fuser
- the cleaning blade assembly

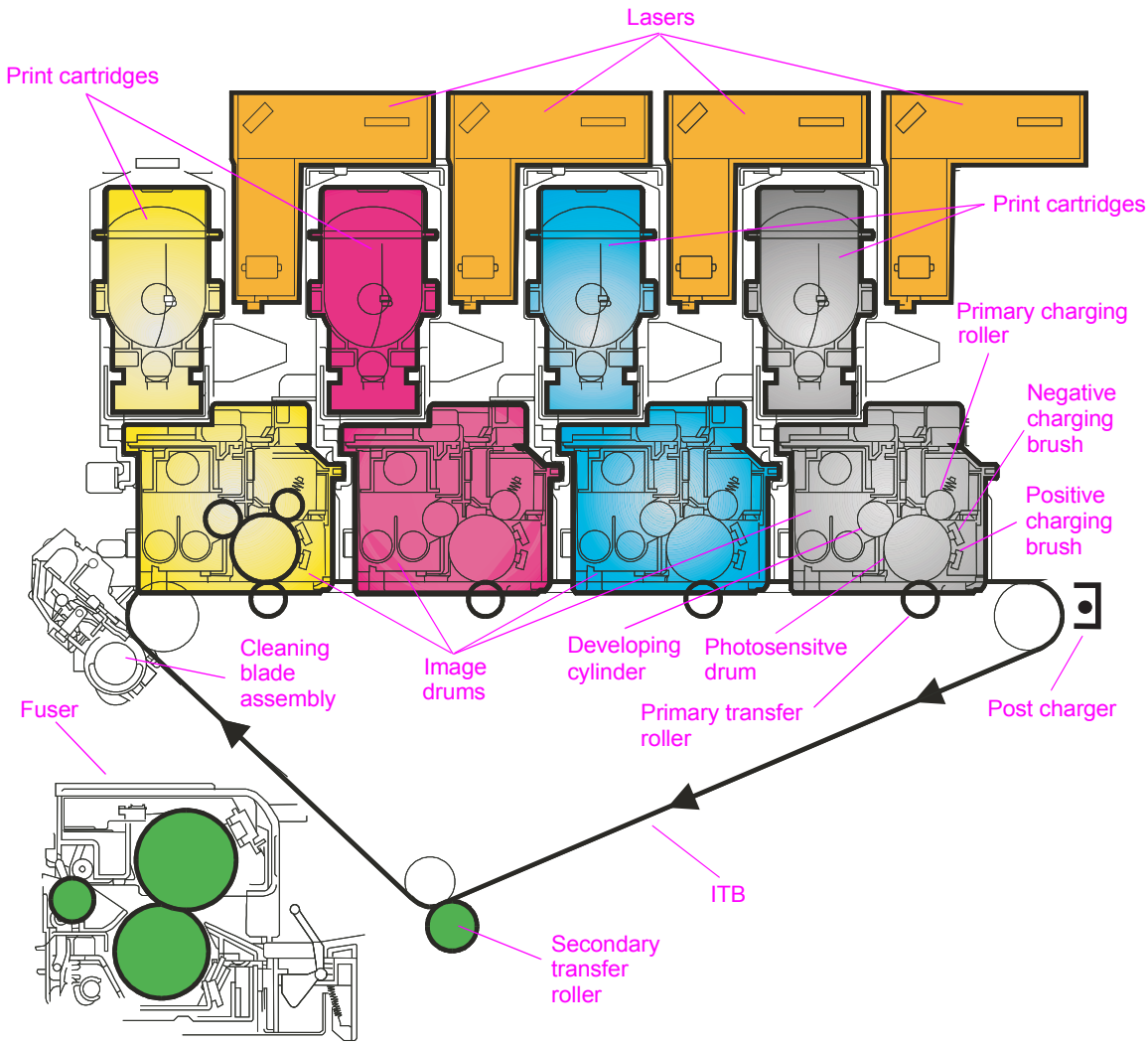

Figure 49. **EP process main components**

Step 1

1 The primary charge roller is given a negative charge.

2 On the image drum, ac bias is applied to replace uneven and previously charged areas with an even, negative charge.

3 The dc bias is applied to control density.

Note This procedure occurs in the same way for all four image drums.

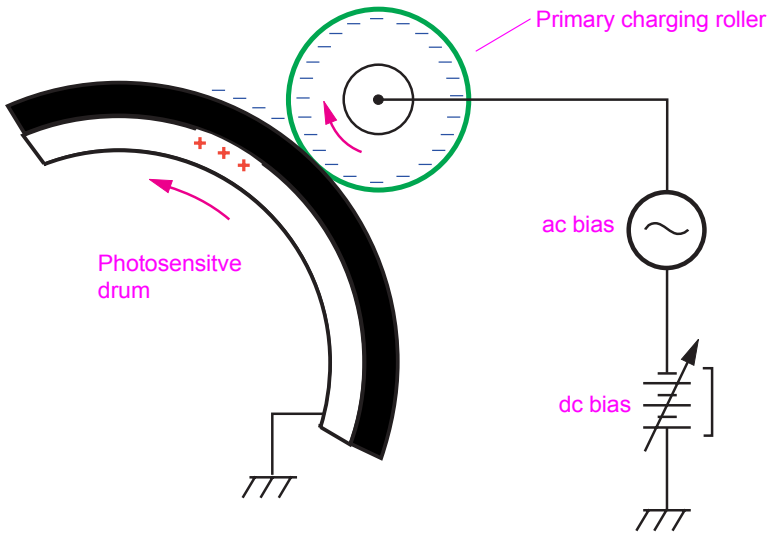

Figure 50. **Primary charging (step 1)**

Step 2

1 A laser beam strikes the charged surface of the OPC to write a latent image.

2 Areas that are exposed to the laser strikes are neutralized and attract toner.

Note This procedure occurs in the same way for all four image drums.

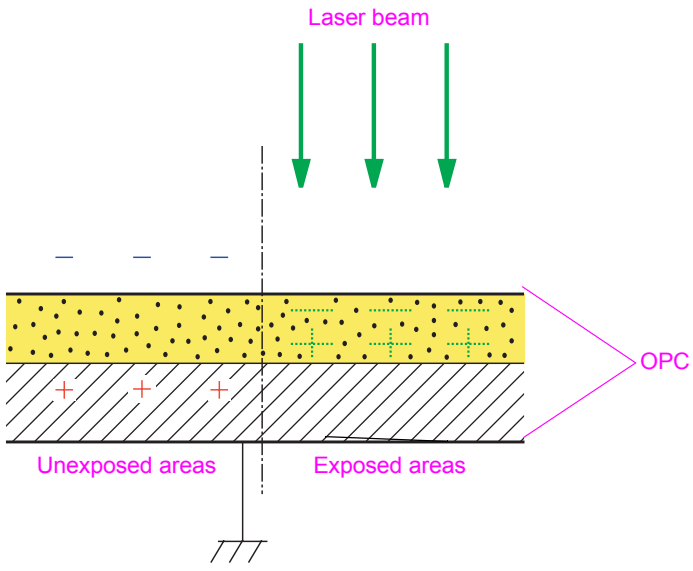

Figure 51. **Laser writing latent image (step 2)**

Step 3

1. The appropriate amount of toner is fed from the print cartridge into the image drum.
2. When in the image drum, the non-magnetic toner is mixed with the magnetic carrier.
3. The mixing process of the two augers applies a negative charge to the toner particles.
4. The magnet inside the developing cylinder and the applied biases attract the magnetic carrier, creating brush-like fibers of magnetic carrier.
5. The developing cylinder rotates the carrier brushes past a doctor blade, which trims the brushes to an even and specified height.
6. Toner is picked up, and then brushed onto the OPC as the developing cylinder rotates.
7. Toner transfers from the brushes to the laser-discharged OPC surfaces.
8. As the toner is used, the automatic toner replenishment (ATR) sensor in the P cartridge detects the toner-to-carrier ratio. The T-cartridge augers turn to feed the amount of toner into the P cartridge.

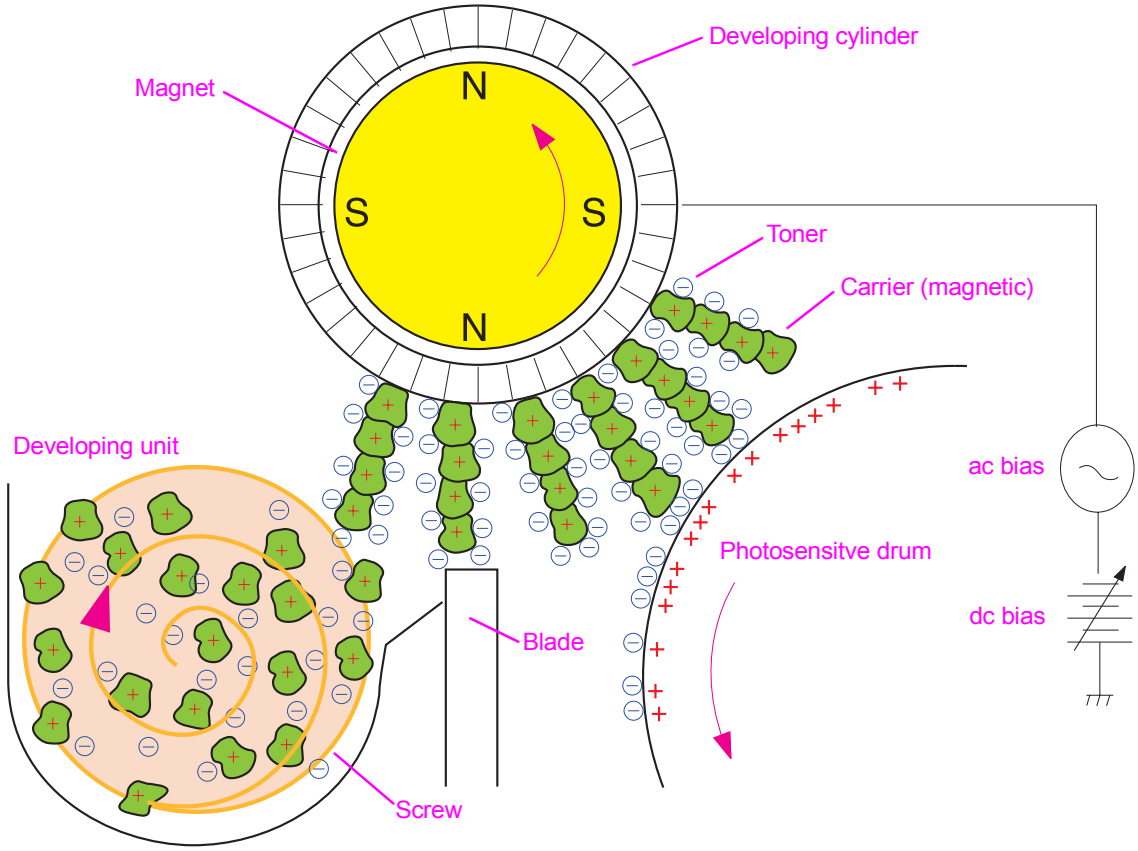

Figure 52. **Developing (step 3)**

Step 4

1. The ITB starts without bias, and then positive bias is applied to the primary transfer roller (T1).
2. Negatively-charged toner on the image drum is attracted to the positive charge on the primary transfer roller and to the ITB surface.
3. After T1 transfer, a static charge eliminator drops the positive charge on the ITB to keep from transferring toner too early at the next T1 station.

Note This procedure is repeated for each primary color in the order of YMCK, and creates piles of four toner colors on the belt.

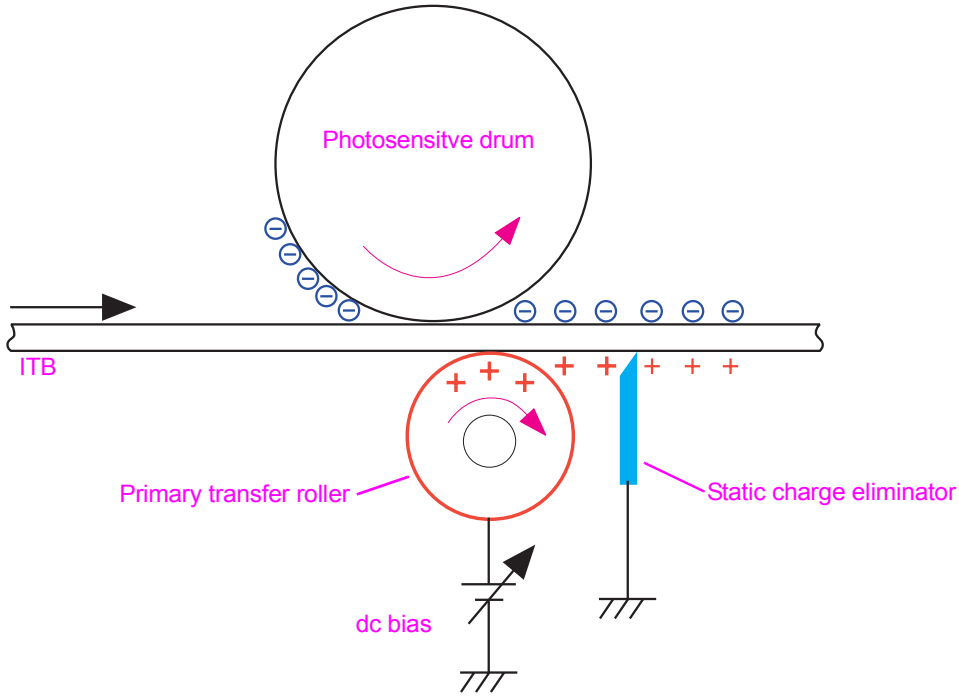

Figure 53. Primary transfer (step 4)

Step 5

1 The post charger applies an increased negative charge and a more even charge to the toner piles.

Note This procedure is similar to what happens in the HP color LaserJet 8550.

The post charger is not used for all printed pages.

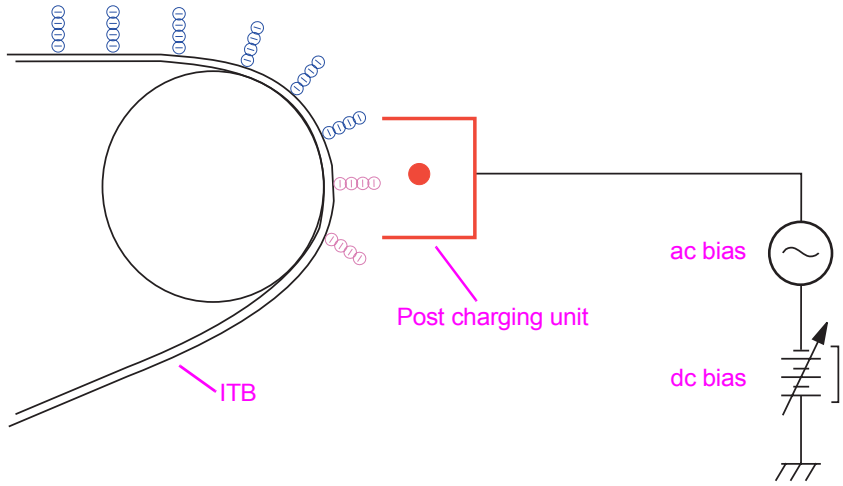

Figure 54. Post charging (step 5)

Step 6

1 Media is fed between a nip that is formed by the ITB, secondary transfer backing roller (T2 backing roller), and the image transfer roller (T2 roller).

2 Positive bias is applied to the T2 roller. This attracts the negatively charged toner piles from the ITB to the media.

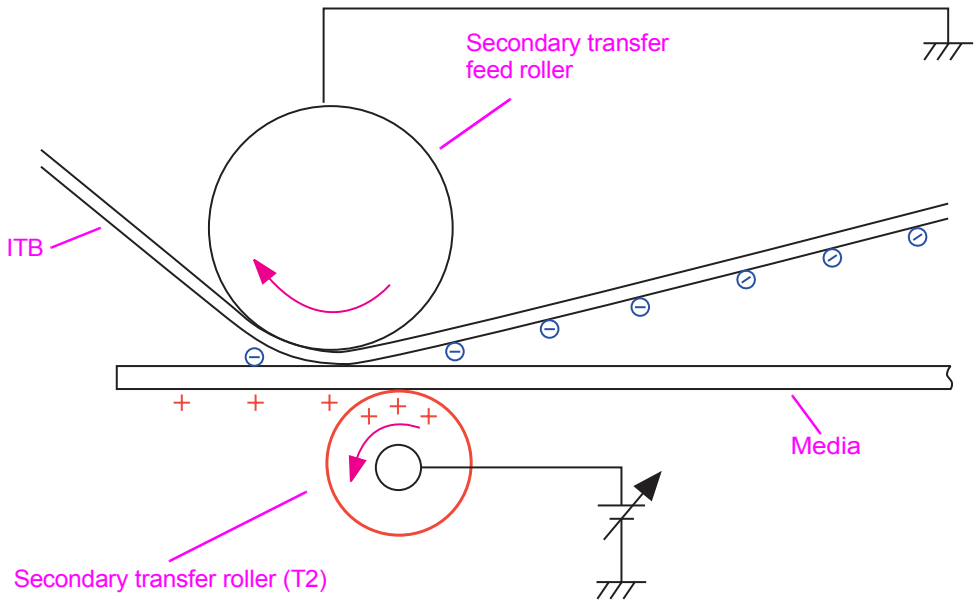

Figure 55. Secondary transfer (step 6)

Step 7

1 The media is separated from the ITB.

2 The static charge eliminator stabilizes the toner on the media before the fusing phase.

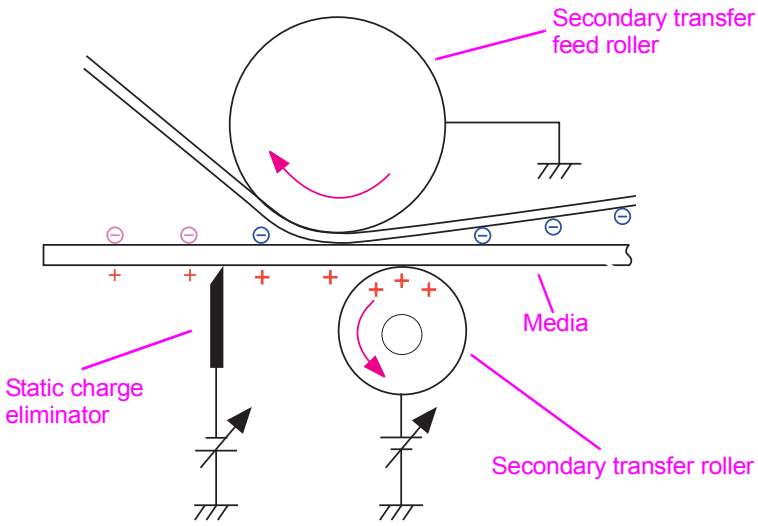

Figure 56. **Separation (step 7)**

Step 8

1 Heat and pressure are applied to melt toner to the media.

Note The two fuser rollers are rubber-coated to handle thick media and for improved gloss levels.

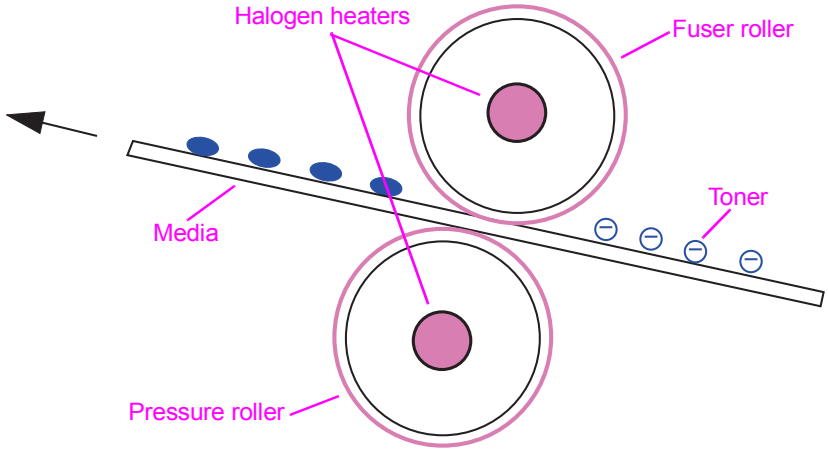

Figure 57. **Fusing (step 8)**

Step 9

1 The cleaning blade rides on the ITB and scrapes off any residual toner remaining from the secondary transfer roller.

2 Falling toner is directed to an auger by the waste toner collection sheet.

3 The auger moves the toner into the toner collection bottle.

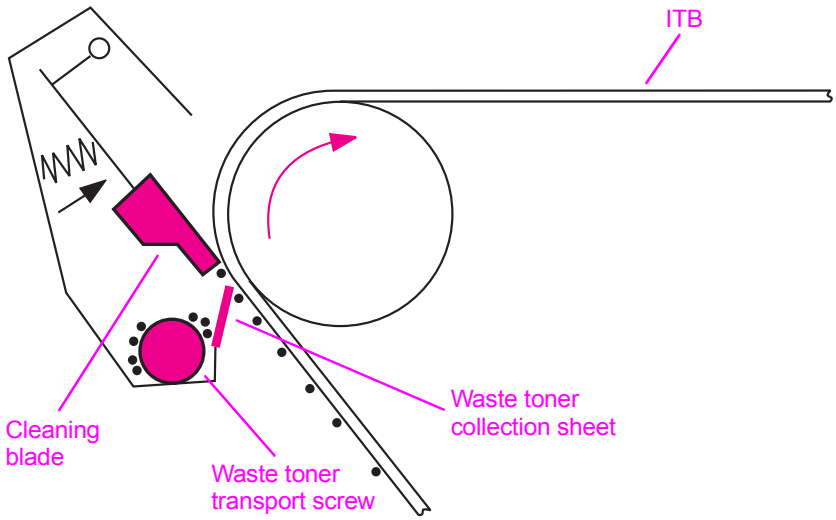

Figure 58. **ITB cleaning (step 9)**

Step 10

1 To clean residual toner from the OPC, two brushes apply charge to the residual toner. The first charge is positive, and the second charge is negative.

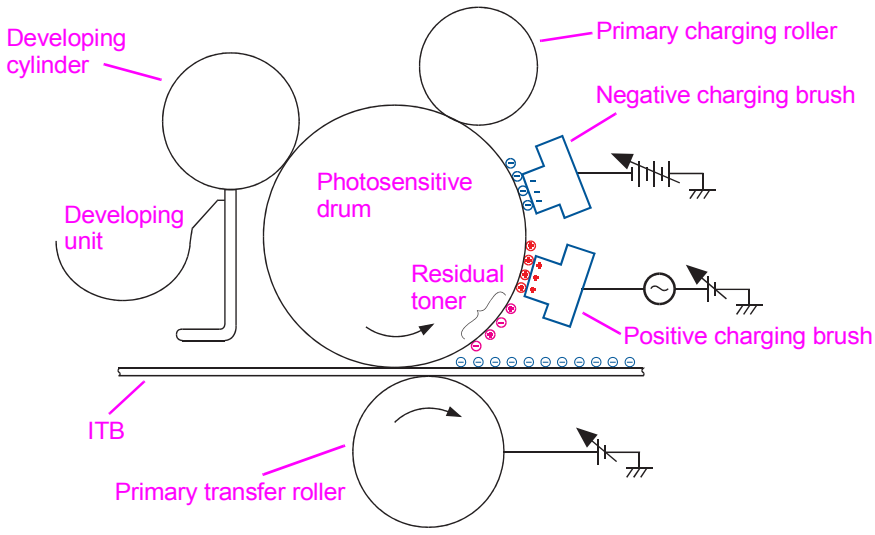

Figure 59. **OPC cleaning**

Step 11

1 Negatively charged toner passes the charging roller where the carrier brushes pick it off of the OPC, and then it is returned to be used again.

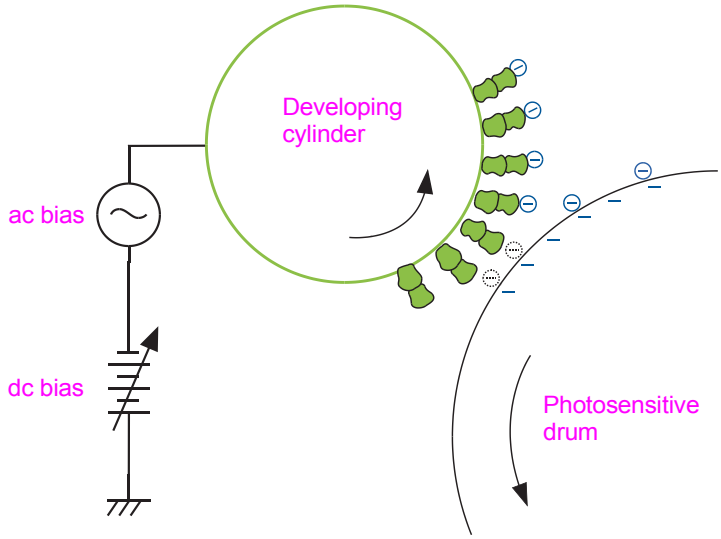

Figure 60. OPC cleaning toner collection (step 11)

Step 12

1 During the OPC cleaning, some positively charged toner that was not charged negatively in step 10 adheres to the primary charging roller (these particles adhere to the primary charging roller).

2 When the particles go around the primary charging roller, the particles are rubbed by the primary charging cleaner and receive a negative charge.

3 The toner particles transfer back to the OPC surface, and are lifted off of the OPC by the carrier brushes (such as step 11).

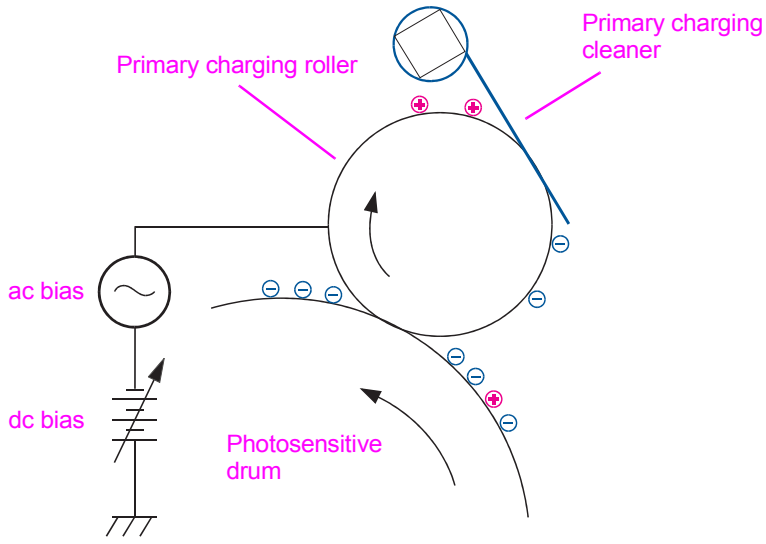

Figure 61. OPC cleaning toner not charged by brushes (step 12)

Image stabilization control

The image stabilization control reduces image density variations (for example, those that result from deteriorations of the photosensitive drum or carrier). Three types of image stabilization control are available:

- environment calibration control
- image-density calibration control (D-max)
- image halftone calibration control (D-half)

Environment calibration control

The DC controller determines the printer environment based on an interior temperature and humidity signal. The DC controller performs the following actions to obtain an optimal image:

- various high-voltage DC bias controls
- ATR sensor control voltage calibration

The environment calibration control is performed at the following times:

- when the printer is turned on
- after replacing the P-crg
- during extreme environmental changes

Image-density-detection control

The image-density-detection control occurs when the density sensor strikes light at the four-color image-density patterns on the ITB, and measures pattern density from the reflected light intensity.

The DC controller controls the density sensor. The sensor is located above the ITB and consists of a LED and a PD.

When the image density is measured, the DC controller emits light from the density sensor. The light strikes the detection patterns. The light receiver PD reads light that is reflected off of the detection patterns and returns it to the DC controller as the image-density detection signal. The two types of image-density control include:

- image-density-calibration control (D-max)
- image-halftone-calibration control (D-half)

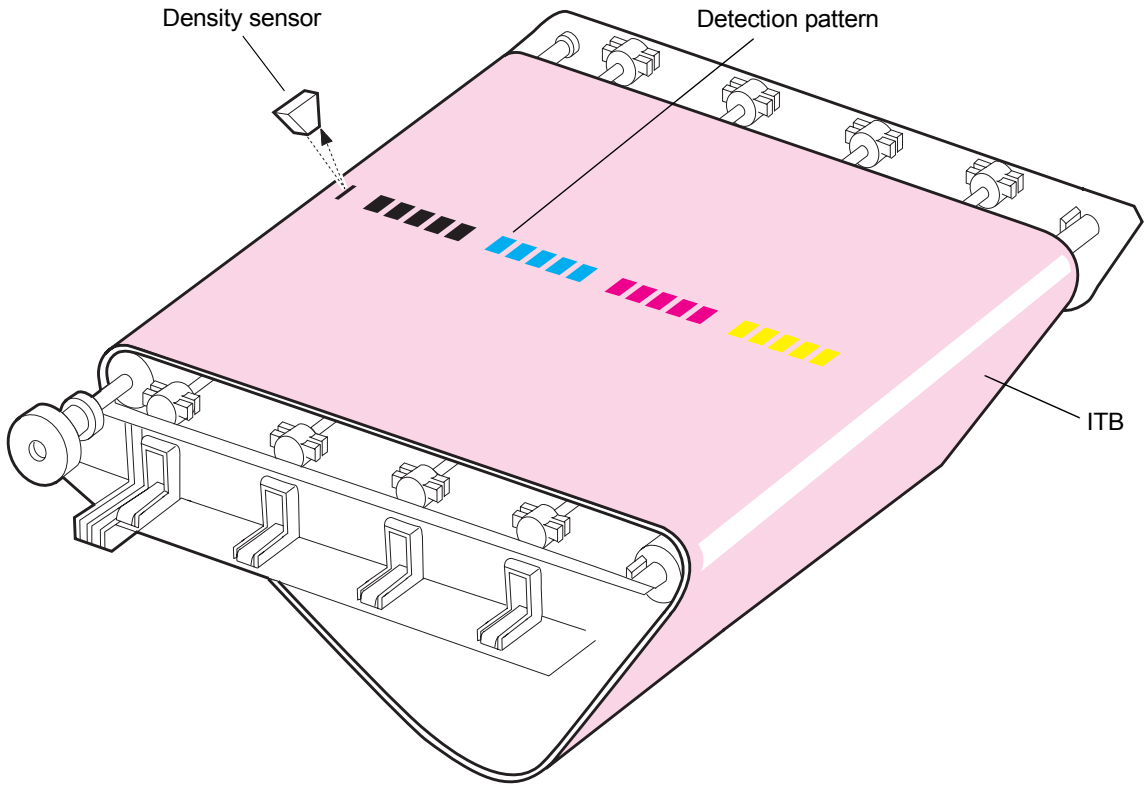

Figure 62. **Image-density-detection control**

Image-density-calibration control

The image-density-calibration control (D-max) stabilizes output-image density. The DC controller performs a D-max as follows when specified conditions are met:

- forms density patterns for colors on the ITB while varying the primary charging bias and the developing bias
- measures the density of the patterns by using the density sensor
- controls the primary charging bias and the developing bias to adjust the four measured density patterns to a correct density

Image density control is performed at the following times:

- the printer is turned on
- the printer is returning from sleep mode
- the printer experienced extreme environmental changes
- the printer is on for a long time
- a specified number of pages have been printed

Image-halftone-calibration control

The image-halftone-calibration control (D-half) occurs when the formatter performs a halftone calibration that is based on the results of the DC controller halftone density measurement. After the D-max is completed, the DC controller and the formatter perform the D-half as follows:

1. The DC controller forms density detection patterns on the photosensitive drum for each color. Optimum primary charging bias and developing bias are determined in the D-max, based on the image data sent from the formatter.
2. The DC controller measures density detection patterns by using the density sensor, and sends the data to the formatter.
3. The formatter performs the halftone calibration, based on the density data, to obtain an ideal halftone image.

Paper-path system

Note The HP LaserJet 9500mfp does not have a face-up delivery tray. The face-up delivery rollers and sensors described in this section will not be found on the MFP.

The paper-path system feeds print media by using different feed rollers. This printer includes three standard paper pickup sources (tray 1, tray 2, and tray 3), and two standard delivery sources (face-up and face-down bins). A tray 4 (2,000-sheet feeder) and optional finishing devices are also available.

The DC controller drives the feed rollers and ITB by controlling four motors, three clutches, and two solenoids. The 10 paper sensors on the paper path detect the reach or the passage of the sheet of media. If the sheet does not reach or pass each sensor within a specified amount of time, the main CPU on the DC controller determines a jam and notifies the formatter.

The paper sensors also detect media in the cassettes and tray 1. The paper-width-detection switch detects the media size in the cassettes, and the paper-width-detection PCA detects the media size in tray 1.

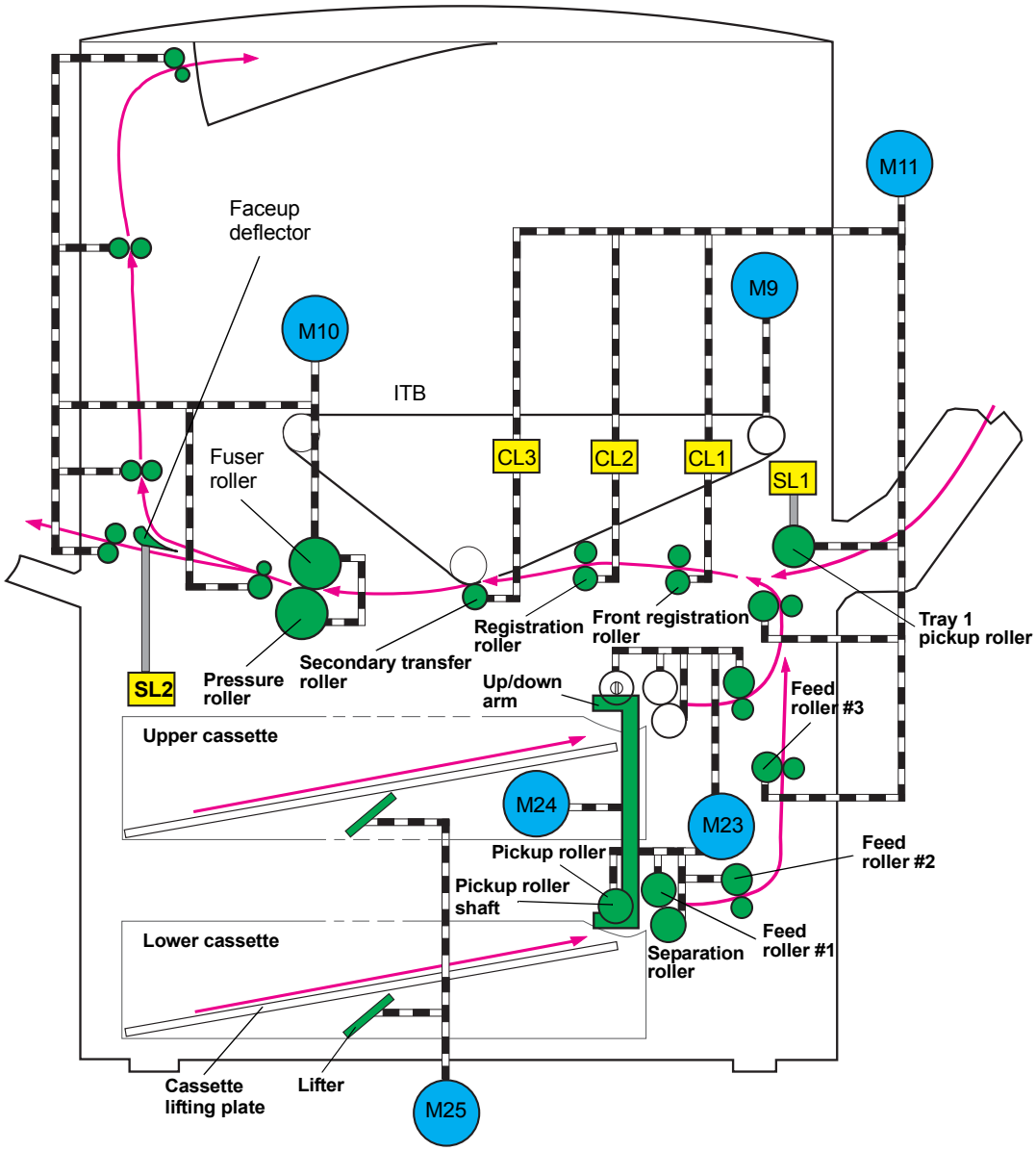

Figure 63. Paper-path system motors, clutches, and solenoids

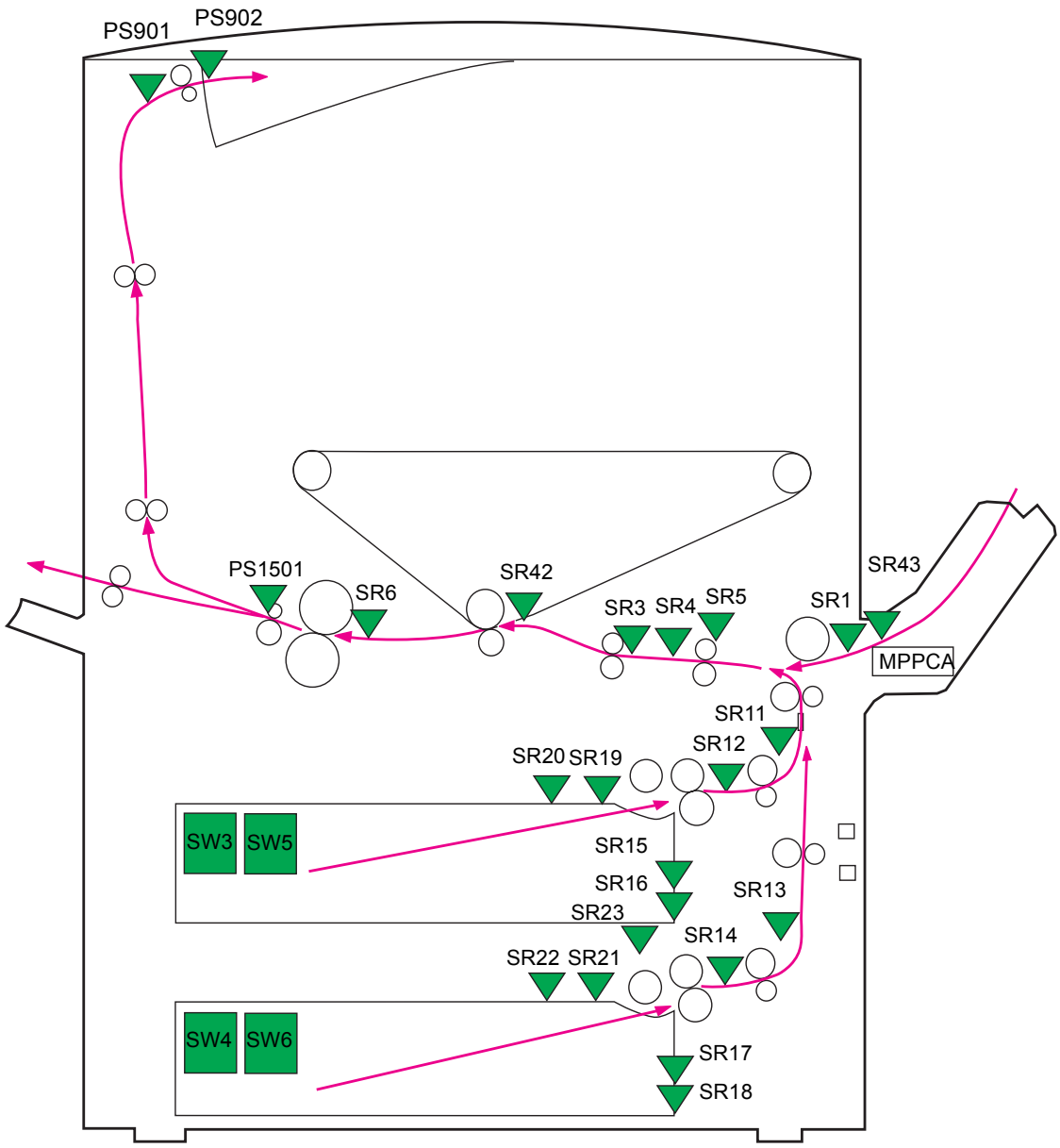

Figure 64. **Paper-path system switches, sensors, and PCA**

Note For more information about the paper-path system, see "Switches, solenoids, clutches, and sensors" on page 154.

Pickup/feed unit

The pickup/feed unit feeds the sheets of media individually from the tray into the printer, and transports each sheet to the fuser. The main mechanisms used in tray pickup and paper feeding are cassette pickup, tray 1 paper pickup, and paper feeding.

Cassette paper size detection/cassette paper detection

This printer utilizes the two universal cassettes: upper cassette and lower cassette. Each cassette determines media size by detecting the length and width of media.

Cassette paper size detection

The DC controller determines media size as standard size when the custom-size lever on the side of the cassette is up. When the lever is down, it is determined as custom size.

- **Standard-sized media:** Media size in the cassette is detected by the paper-width-detection switch and paper-length-detection switch located in the cassette. The DC controller detects statuses of these switches and determines media size. If standard-sized media is not present, the DC controller notifies an incorrect paper size to the formatter.
- **Custom-sized paper:** The DC controller detects the width and length of custom-sized media by utilizing the paper-width-detection switches and registration paper sensor based on the media size specified by the formatter. The length is detected by monitoring the registration paper sensor during a print operation. If the media size differs from the one specified by the formatter, the DC controller notifies an incorrect media size to the formatter after completing a print operation.

Cassette detection

The cassette detection is performed with the paper-width-detection switch. If the cassette is not installed in the printer, all of these switches become “H” and the DC controller determines a cassette absence.

Media size	**Paper-length-detection switches (SW3 and SW4)**			**Paper-width-detection switches (SW5 and SW6)**		
	SIZE 1	SIZE2	SIZE3	WSIZE 1	WSIZE2	WSIZE3
A4 (landscape)	H	H	H	L	H	H
LTR (landscape)	H	H	H	L	L	H
A5 (landscape)	H	H	H	H	L	L
B5 (portrait)	L	L	H	H	L	L
Executive (portrait)	H	L	H	H	L	L
LTR (portrait)	H	L	L	H	L	L
A4 (portrait)	H	H	L	H	L	L
A3	L	H	L	L	L	L
Ledger	L	H	L	L	L	H
B4	L	H	L	H	L	H
Legal	L	H	L	H	L	L
Custom size	L	L	L	-	-	-
No cassette	-	-	-	H	H	H

Cassette pickup

When printing from tray 2 or tray 3, sheets of media are fed into the printer individually. The cassette pickup sequence includes the following:

1. When the printer is turned on, the cassette lifting plate shifts up to the pickup position.
2. The DC controller rotates the pickup roller up/down motor (M23) when the formatter inputs a print command.
3. The M23 rotates clockwise to lower the up/down arm. This allows the pickup roller shaft to descend until it reaches the surface of the media stack.
4. The pickup motor (M24) drives the pickup roller, feed roller, and separation roller so that each rotates.

Note When the rollers rotate clockwise, the M24 drives the pickup roller, feed roller, and separation roller for tray 2 and performs a pickup operation from tray 2. When the rollers rotate counterclockwise, the M24 drives the pickup roller, feed roller, and separation roller for tray 3 and performs a pickup operation from tray 3.

5. The sheets in tray 2 or tray 3 are fed into the printer individually as the pickup roller, feed roller, and separation roller rotate.
6. After a pickup operation is completed, the M24 stops as the M23 begins rotating counterclockwise. The M23 lifts the pickup roller to the pickup position and stops rotating.

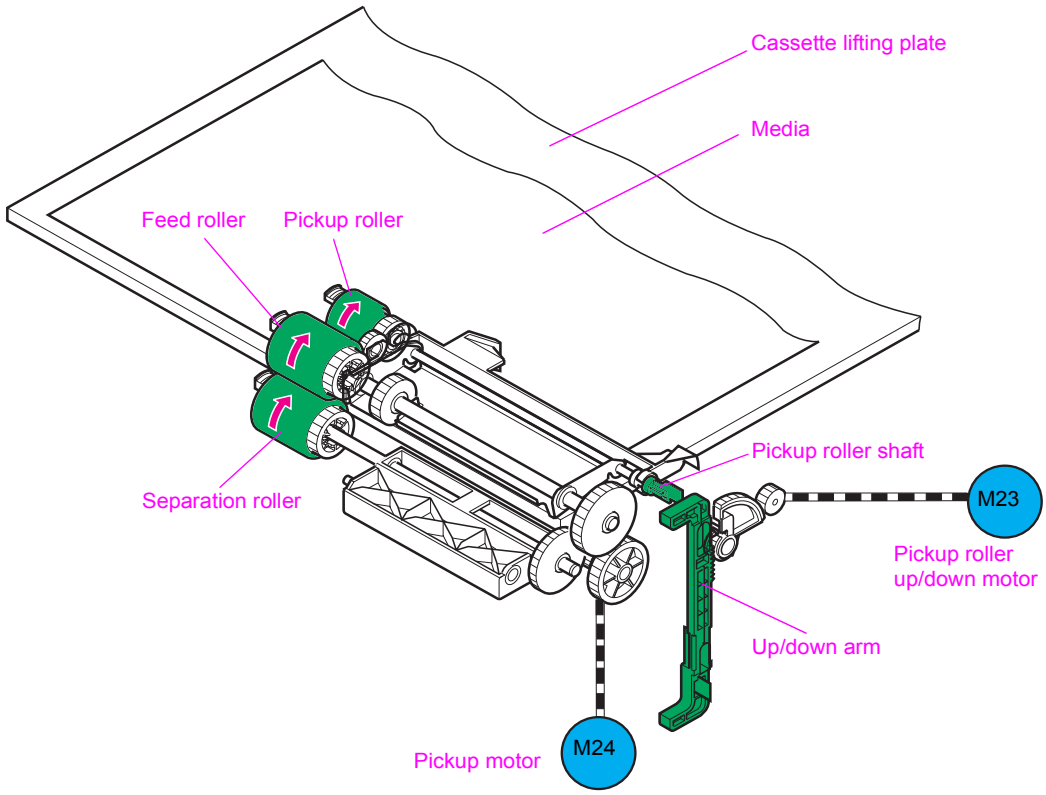

Figure 65. Cassette pickup

Lifting-up operation

The lifting-up operation keeps the surface of the print media stack at a specified position. This stabilizes the pickup operation for any print-media size that the tray holds.

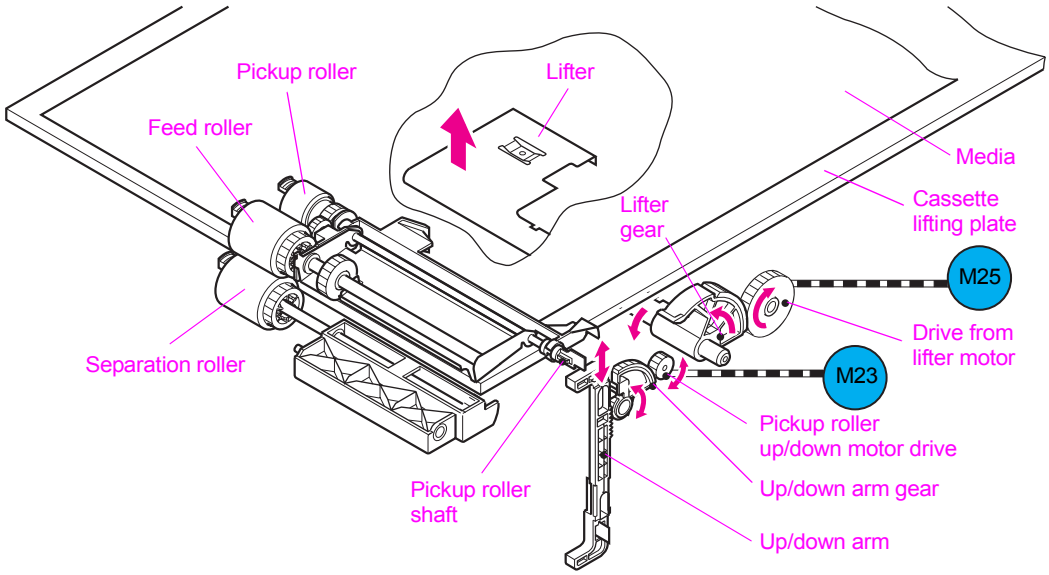

Figure 66. **Lifting-up operation**

Tray 1 paper pickup

When printing from tray 1, pages in the tray are fed individually. The tray 1 pickup operation includes the following steps:

1. The tray 1 paper sensor (PS1301) detects media in tray 1.
2. After a print command is input from the formatter, the DC controller rotates the registration motor (M11).
3. When the DC controller signals the tray 1 pickup solenoid (SL1) to move, the lifting plate (which is now loaded with media) moves up and the media contacts the tray 1 pickup roller.
4. The rotating pickup roller picks up a single page.
5. The single page feeds into the printer after the separation pad clears any multifeed pages.

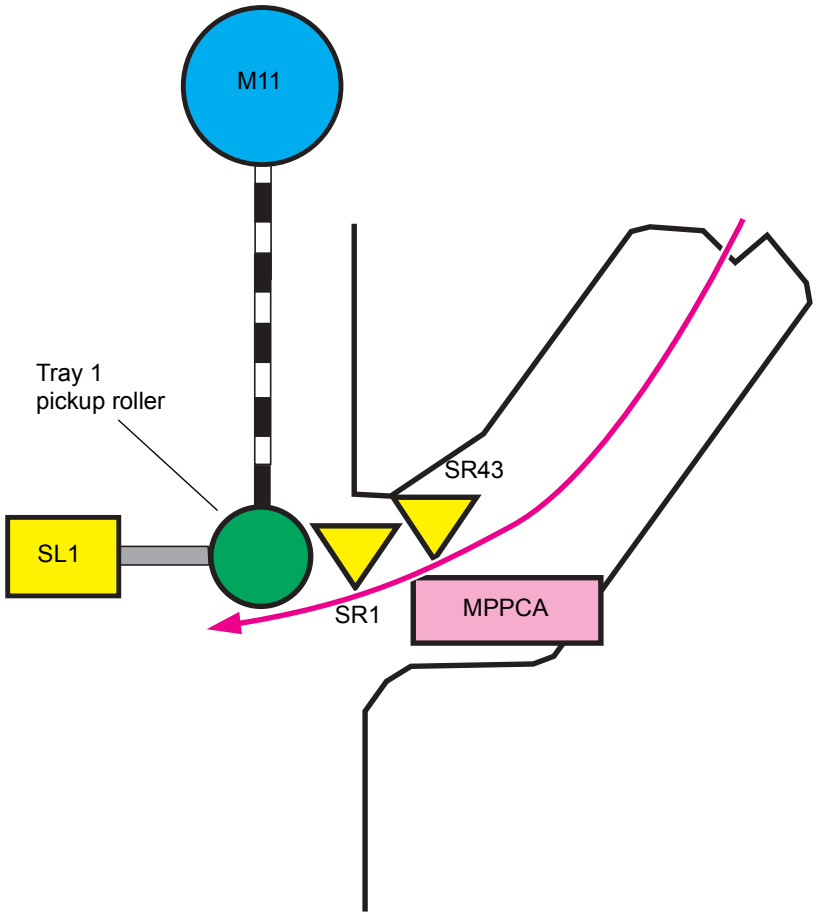

Figure 67. **Tray 1 paper pickup**

Tray 1 paper-width detection

The DC controller detects the paper width by using the tray 1 paper width-detection PCA (MPPCA) in tray 1. The MPPCA has a variable resistor, and the document width is detected by variations in the variable resistor that is interlocked to the document size guide.

If the detected width differs from the width that is specified by the formatter, the DC controller determines a paper-size discrepancy, indicates this to the formatter, and stops the printer.

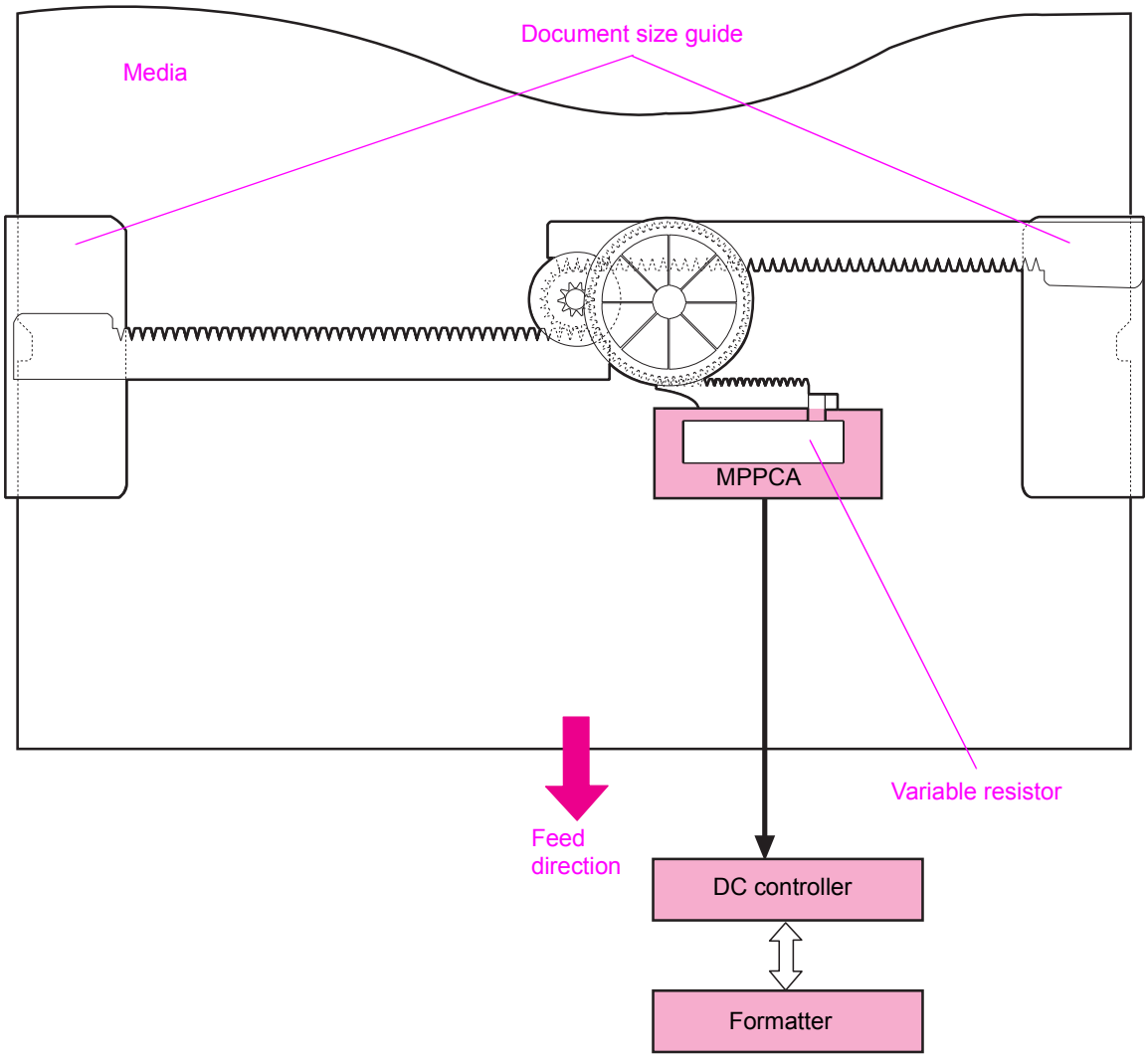

Figure 68. **Tray 1 paper-width detection**

Tray 1 last-paper detection

This printer can detect if the last sheet of paper in the tray is the next to be fed.

The feed distance between the tray 1 paper sensor and the registration roller is short. If the last page is fed during continuous printing, the DC controller begins to write the next image before it detects that tray 1 is out of paper. Because of this, the tray 1 last-paper detection detects that the tray is out of paper before image writing to avoid soiling the photosensitive drum and the ITB. This detection is performed with the last paper sensor (SR43) monitoring rotations of the last-paper-detection roller located on tray 1.

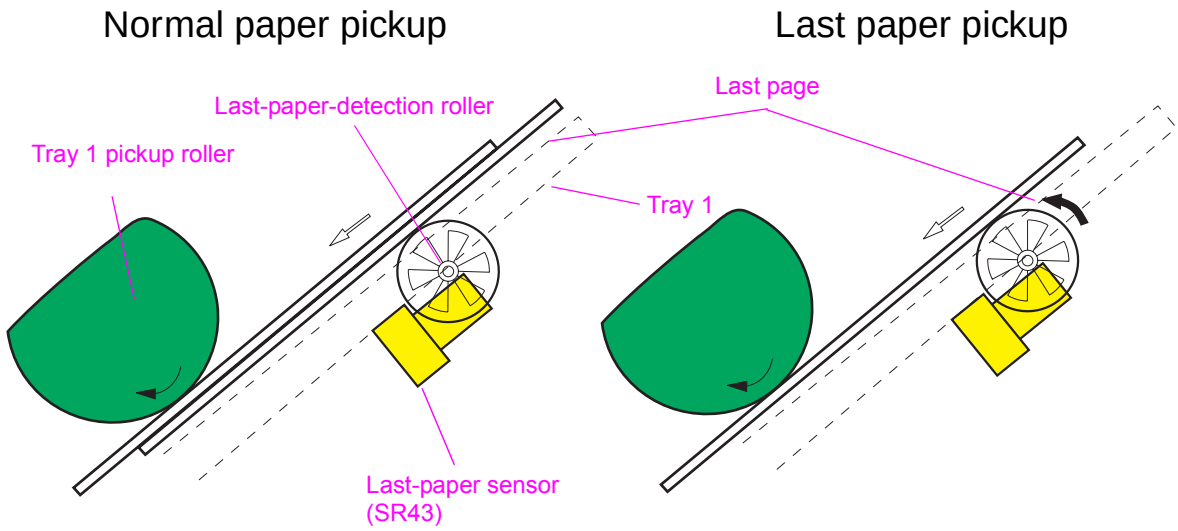

Figure 69. **Tray 1 last-paper detection**

Paper pickup and feed

The diagram indicates the paper path from the internal trays to the registration, secondary transfer, and fuser. It also indicates the drive relationships between the clutches and the paper path motors.

Note The preregistration motor does *not* provide any registration function.

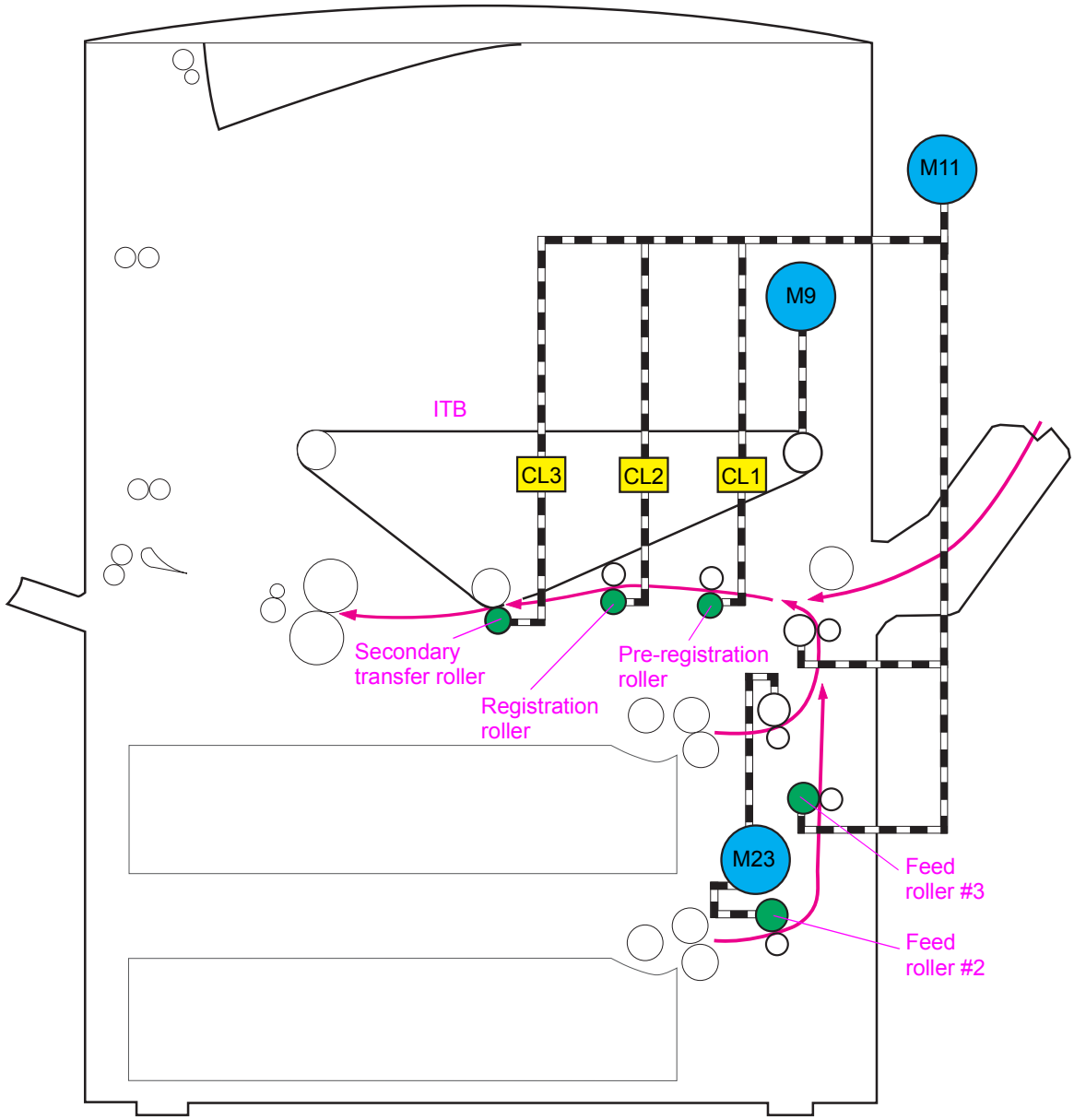

Figure 70. **Tray 1 paper feed**

Jam detection

The following paper sensors detect the presence of media and whether it is fed correctly:

- Tray 2 feed sensor A/B (SR11; SR12)
- Tray 3 feed sensor A/B (SR13;SR14)
- Registration paper sensor (SR3)
- T2 input sensor (SR42)
- Fuser input sensor (SR6)
- Fuser output sensor (PS1501)
- Face-down bin output sensor (PS901)
- Duplexer media reverse sensor (SR33)
- Duplex media path sensor (SR31)
- Duplexer media refeed sensor (SR30)
- Multifeed sensor (SR5)

The main CPU in the DC controller determines if a paper jam has occurred by using the timing stored in the main CPU to check for the presence of media at the sensor. If the main CPU identifies a paper jam, the main CPU stops the print operation and communicates a jam to the formatter.

The printer detects jams according to the following conditions:

- **Pickup delay jam 1.** Media does not reach the SR11 or the SR13 within a specified period after paper pickup begins.
- **Pickup delay jam 2.** Media does not reach the SR3 within a specified period after paper pickup begins.
- **ITB wrapping jam.** Media does not reach the SR6 within a specified period after paper pickup begins.
- **Fuser delivery delay jam.** Media does not reach the PS1501 within a specified period after paper pickup begins.
- **Fuser delivery stationary jam.** Media does not clear the PS1501 within a specified period after it reaches the PS1501.
- **Face-down delivery delay jam.** The leading edge of the media does not reach the face-down bin paper delivery sensor (PS901) within a specified period after paper pickup begins.
- **Face-down delivery stationary jam.** The leading edge of the media does not clear the PS901 within a specified time after it has reached the PS901.
- **Door open jam.** Any of the following sensors detect media upon opening or closing the door:
  - Tray 2 feed sensor A (SR11)
  - Tray 2 feed sensor B (SR12)
  - Tray 3 feed sensor A (SR13)
  - Tray 3 feed sensor B (SR14)
  - Registration paper sensor (SR3)
  - Fuser delivery paper sensor (PS1501)
  - Face-down bin paper delivery sensor (PS901)

- **Residual-paper jam.** Any of the following conditions determine a residual-paper jam if the listed sensors detect the media:
  - The printer is turned on.
  - The printer is returning from SLEEP mode.
  - A door is closed after a jam occurs.
    - Tray 2 feed sensor A (SR11)
    - Tray 3 feed sensor A (SR13)
    - Front fusing paper sensor (SR6)
    - Front secondary transfer paper sensor (SR42)
    - Fuser delivery paper sensor (PS1501)
- **Paper undeliverable jam.** The SR3 detects that the media that is longer than what the formatter specified.
- **Fuser unit wrapping jam.** Media reaches the PS1501 within a specified period after the paper pickup, and the PS1501 detects paper-out within the minimum specified period after detecting the media.

Tray 4 for the HP LaserJet 9500 Series printer

Note The MFP uses a 2,000-sheet side-input feeder as tray 4. For information about the MFP feeder, see the *2,000-Sheet Side-input Tray Service Manual* (PN Q1891-90901).

Tray 4 is a 2000-sheet feeder that picks up and feeds media into the printer. It is available only for the HP color LaserJet 9500hdn printer.

Tray 4 driver PCB

A driver PCB in the tray holds a 16-bit microcomputer (IC1) that controls its operational sequence and serial communications with the formatter. The driver PCB drives the motors and clutch according to commands sent from the formatter.

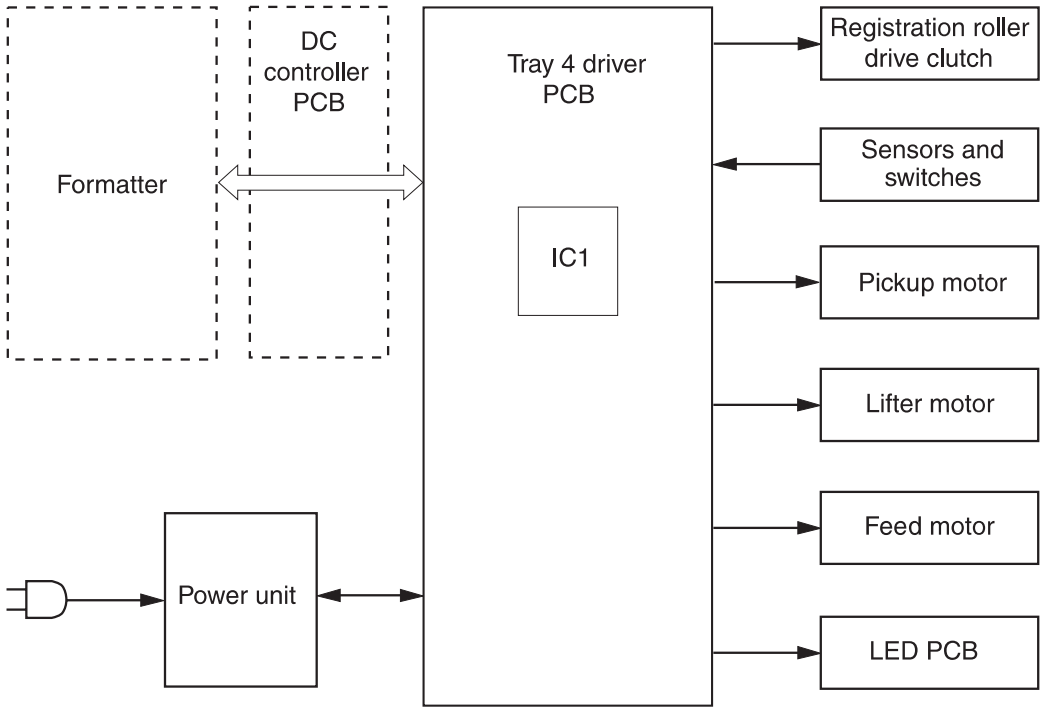

Figure 71. **Tray 4 block diagram (LJ 9500hdn)**

Power supply

Tray 4 employs a remote switch method for the power supply unit. The formatter sends a power-on signal to the power supply unit through the driver PCB. When the signal is received, the power supply unit supplies +24VDC and +5VDC to the driver PCB. +24V is then supplied to the lifter, feed, and pickup motors to drive them. The +5V is supplied to the sensors and also to the ICs on the driver PCB.

The power unit utilizes a stand-alone switch so that tray 4 can be powered on without turning on the printer. This switch is used for stand-alone diagnostics. See "Tray 4 standalone running test (LJ 9500)" in chapter 7.

Sequence of operation

When tray 4 is loaded with paper and closed, the paper deck starts lifting the paper to the pickup position. When the formatter instructs tray 4 to deliver paper, the drive rollers pick up a sheet of paper and feed it to the registration assembly. The tray 4 registration assembly adjusts the skew and transports the paper to the printer.

Pickup and feed

The formatter sends a signal to the driver PCB to start driving the pickup and feed motors. Rotated by the rollers, the pickup roller picks up a sheet of paper, the separation roller removes any excessive sheets, and the feed roller transports the paper to the registration roller unit.

After the paper enters the registration roller unit, the registration roller corrects the paper skew and the second feed roller feeds the paper to the printer.

When the paper reaches the merge-point in the printer, the driver PCB checks for a merge-point permission command sent from the formatter. If the signal is detected, tray 4 will continue feeding paper to the printer. If the signal is not detected, tray 4 stops feeding paper until the signal is received.

Media level and size detection

The paper level is detected by the paper level sensors (PS21 to 23) on the paper level sensor PCB. The combination of these sensors determines the level of the print paper loaded in the tray.

The paper size is detected by the paper size detection switches (SW11 to 15) on the paper size detection switch PCB. The combination of these switches determines the paper size.

The tray sends the size and level information to the printer formatter.

Jam detection

The tray determines a jam by monitoring the presence of paper in the sensor areas at specific times stored in the CPU. If the CPU determines a jam under the following conditions, the tray stops feeding operations and notifies the formatter.

- **Residual jam**. The registration paper sensor (PS11) or jam sensor (PS103) detects paper during the warm-up period.
- **Pickup delay jam**. The between page sensor (PS12) does not detect paper after receiving a print command or the PS12 sensor detects paper, but the registration paper sensor (PS11) does not.
- **Pickup stationary jam**. The edge does not clear the registration paper sensor (PS11) after the between page sensor (PS12) detects the trailing edge of the paper.
- **Feed delay jam**. The jam sensor (PS103) does not detect paper after the start of the registration rollers.
- **Feed stationary jam**. The trailing edge of the paper does not pass through the jam sensor (PS103) after the registration rollers are turned off.