Combined Service Manual

L A S E R P R I N T E R S

Ecosys FS-1700
Ecosys FS-1700+
Ecosys FS-3700
Ecosys FS-3700+

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Status page

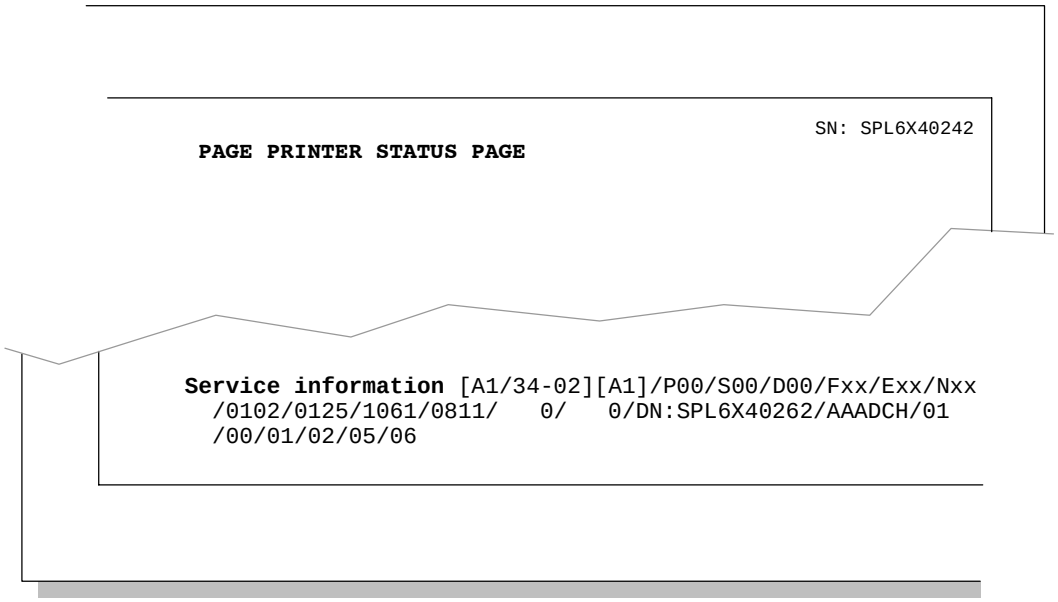
A status page can be obtained by pressing the printer's STATUS key when the printer is *Ready*. The format for status page is identical among all emulation modes except KPDL. Status page allows checking useful service information as explained below as well as the printer's currrent status, including available memory space, option settings, etc.

Service information

This appendix shows examples and explanations on items regarding service information for the printer which is presentede under section *Service information* at the bottom of the status page. (This section does not cover other regular information such as temporary parameters. For details on general discussions on status page, refer to chapter 2 in the printer's *User's Manual*.)

The figure below shows an example of the service information on status page:

SAMPLE STATUS PAGE



"/" is used as a separator.

Example	Definition	Meaning
Top of page		
SPL6X40242	Sereial number of printer	
Top row under Service information		
[A1	Version of engine ROM	
34	Version of engine flash memory	
-02]	Printer id.	01=FS-1700, 02=FS-3700
[03]	Version of front panel ROM	
/P00	Current mode of parallel interface	00=normal, 01=high-speed
/S00	Error code of serial interface	
/D00	Status of downloading in engine flash memory	
/Fxx	Status of front panel locking	

Example	Definition	Meaning
/Exx	Error code of option interface	
/Nxx	Error code of engine flash memory	
Middle row under Service information		
/0102	Top margin offset	inch+fraction of inch (FRPO L1/L2)
/0123	Left margin offset	inch+fraction of inch (FRPO L3/L4)
/1061	Page length	inch+fraction of inch (FRPO L5/L6)
/0811	Page width	inch+fraction of inch (FRPO L7/L8)
/0	Left margin offset for 1st option feeder	Unit in 1/600 inches
/0	Left margin offset for 2nd option feeder	Unit in 1/600 inches
/DN:SPL6X40262	Serial number for drum	A=0, B=1, C=3, …
/AAADCH	Printed page count on drum	A=0, B=1, C=3, …
/01		
Bottom row under Service information		
/00/01/02/05/06	Installed emulation modes	00=Line printer, 01=IBM, 02=Diablo, 05=Epson, 06=HP, 09=KPDL (if installed)

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Appendix A C O N T E N T S

Parallel interface

The printer uses a bi-directional parallel interface for high-speed data transmission for the host computer. This interface includes the buffers which are compatible with the IEEE 1284 standards. The parallel interface provides support for the ECP and nibble modes in this standards.

Port pin assignment

The pins of the parallel interface connector carry the signals listed below.

No.	Terminal	Signal	No.	Terminal	Signal
1	nStrobe	(STBIN1/2*)	19	Ground	GND
2	Data1	(PAD0)	20	Ground	GND
3	Data2	(PAD1)	21	Ground	GND
4	Data3	(PAD2)	22	Ground	GND
5	Data4	(PAD3)	23	Ground	GND
6	Data5	(PAD4)	24	Ground	GND
7	Data6	(PAD5)	25	Ground	GND
8	Data7	(PAD6)	26	Ground	GND
9	Data8	(PAD7)	27	Ground	GND
10	nAck	(ACKOUT)	28	Ground	GND
11	Busy	(BUSYOUT)	29	Ground	GND
12	PError	(PERROR)	30	Ground	GND
13	Select	(SELECT)	31	nInit	(INIT*)
14	nAutoFd	(AUTOFD*)	32	nFault	(FAULT*)
15	Not defined	NC	33	Not defined	Pull-up (1kΩ)
16	Logic ground	GND	34	Not defined	NC
17	Chssis ground	(GND)	35	Not defined	Pull-up (1kΩ)
18	Peri-logic H	(VCC)	36	nSelect In	(SELECTI*)

*: Negative logic

**: Maximum rated current for pin 18 is 0.25A (fused).

***: Pin 17 is grounded through a chip bead or a chip resistor.

Parallel interface connection

Detailed descriptions of the parallel interface signals follow.

Signal	Meaning
Strobe* [nStrobe] (Pin 1)	A negative-going Strobe* pulse causes the printer to read and latch the data on the Data 0 [1] to Data 7 [8] signal lines.
Data 0 [1] to Data 7 [8] (Pins 2 to 9)	These eight signals form the data byte sent from the host computer to the printer. Data 7 [8] is the most significant bit.
Acknowledge* [nAck] (Pin 10)	This negative-going pulse acknowledges the previous character received by the printer. Acknowledge* pulses are sent only when Busy is low.
Busy [Busy] (Pin 11)	This signal is high when the printer is busy and low when it is able to accept more data. Every high-to-low transition is followed by an Acknowledge* pulse.
Paper Empty [PError] (Pin 12)	This signal goes high when the printer runs out of paper.
On-Line [Select] (Pin 13)	This signal is high when the printer is on-line and low when the printer is off-line. It goes low when the upper unit is raised, or when the ON LINE key is pressed to set the printer off-line. *Note* - The Paper Empty and On-Line signals are not used unless enabled by the FRPO command (O2 parameter).
Auto-Feed [nAutoFd] (Pin 14)	This signal is used in the Epson version of the Centronics interface to receive a carriage return. In high-speed mode, it is used as an interrupt.
+5V DC (pin 18)	This line is connected to the printer's +5V DC line (+5V±0.5V, 250 mA maximum, fused).
Prime [nInit] (Pin 31)	This signal is used in the standard Centronics interface to enable the computer to reset the printer. It is ignored by the printer.
Error* [nFault] (Pin 32)	When the high-speed parallel line control is on (FRPO O2=2), this line returns error status.
Auxiliary output 1 (Pin 33)	This signal line is not used.
Power Ready (Pin 35)	This signal is high when the printer's power is on.
Select In [NSelectIn] (Pin 36)	This signal is used in some versions of the Centronics interface to enable the computer to force the printer on-line. In high-speed mode, it is used as an interrupt.

Serial interface

The printer is equipped with a serial port whose circuitry duplicates the option interface card IB-9. The device responsible for controlling the serial interface is integrated in the gate array in the controller system. The serial interface supports both protocols of RS-232C and RS-422A.

In the RS-232C protocol, CTS and DSR signals are included to support SNMP (Simple Network Management Protocol) protocol (used typically for Windows 95's plug-and-play function). Toggling the protocol between RS-232C and RS-422A is made by a shorting jumper socket that is accessible on the controller board. (The jumper wire arrangement, that used to be provided for the succeeding models to switch the DTR polarity is not used with these models.) To change the serial interface prorocol, refer to *Changing the serial interface configuration* section which follows.

A 25-pin D-sub connector is used for the serial interface. The extra signals used for RS-422A are assigned to these pins that are not used for RS-232C according to the IBM pin assignment scheme.

Changing the serial interface configuration

To change the serial interface protocol from RS-232C to RS-422A, or vice versa, the main controller board must be taken out of the printer. Protect the electronics by taking these precautions:

Before touching the main circuit board, touch a water pipe or other large metal object to discharge yourself of static electricity. While doing the work, it is recommended that you wear an antistatic wrist strap.

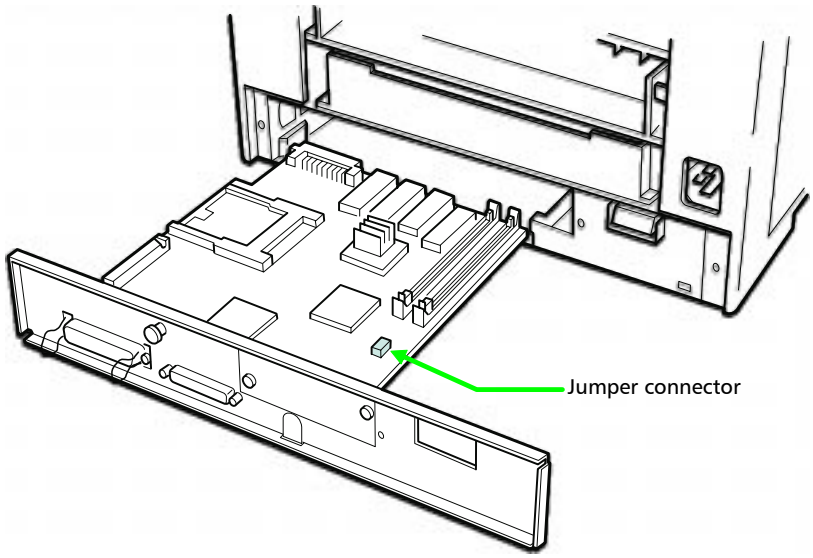
Touch the main circuit board only by the edge.

Be sure to remove the memory card first if inserted in the printer's memory card slot.

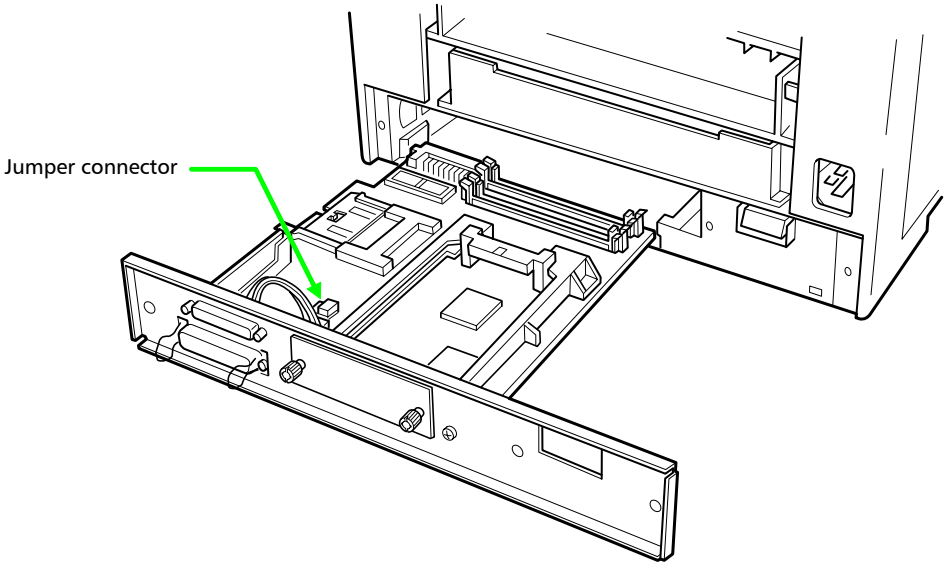
Refer to chapter 3 and remove the main circuit board out of the printer.

Depending on model, locate the jumper connector.

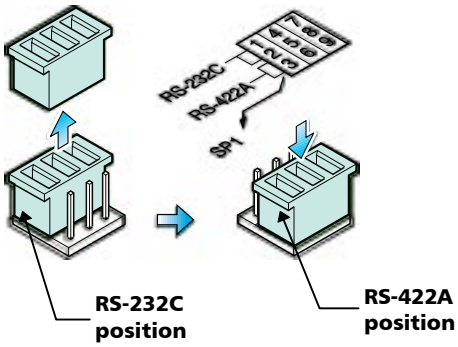
FS-1700/3700



Plus-series



To change the serial protocol from RS-232C to RS-422A, for example, carefully remove the jumper connector from the main circuit board, and reconnect to the pin position shown in the diagram.



Replace the main controller board back into the printer. Secure the board by the three screws.

Serial port pin assignment

The pins of the parallel interface connector carry the signals listed below. The RS-422A specific signals are noted in the *Definition*.

No.	Signal	Flow	Definition
1	FG		Frame ground
2	TxD	Printer ➲ host	Transmit data: RS-232C
3	RxD/RDA	Host ➲ Printer	Receive data/receive data (Reversed)
4	RTS	Printer ➲ host	Transmit request
5	CTS	Host ➲ printer	Transmit permitted
6	DSR	Host ➲ printer	Data-set-ready
7	SG		Signal ground
9	SDA	Printer ➲ host	Transmit data (Reversed): RS-422A
10	SDB	Printer ➲ host	Transmit data: RS-422A
18	RDB	Host ➲ printer	Receive data: RS-422A
20	DTR	Printer ➲ host	Data-terminal-ready
Other	Not connected		Undefined

Parallel interface connection

Detailed descriptions of the parallel interface signals follow.

Signal	Meaning
FG (Pin 1)	This pin is connected directly to the printer frame.
T_XD (Pin 2)	RS-232C only: This output carries asynchronous data sent by the printer to the computer. It is used mainly in handshaking protocols.
R_XD/RDA (Pin 3)	This input carries serial asynchronous data sent by the computer to the printer. In RS-422A, this carries the inversed differential data (RDA).
RTS (Pin 4)	This output is always held high (above 3 V).
CTS (Pin 5)/DSR (Pin 6)	Unused.
SG (Pin 7)	All signals can transmit between the printer and the host computer to send each signals with a signal ground.
SDA (Pin 8)	This output transmits asynchronous inversed form of differential data from the printer to the computer.
SDB (Pin8)	This output carries asynchronous non-inversed form of differential data from the cmputer to the printer.
DTR - Data Terminal Ready (Pin 20)	This output is used as a buffer nearly-full handshake line. It is held high (above 3 V) when the buffer can accept more data.

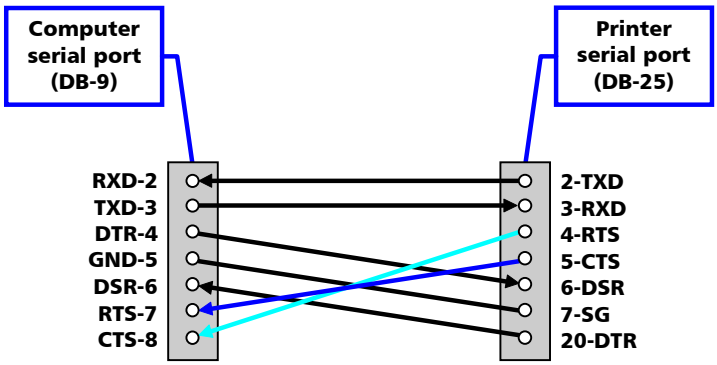
RS-232C interface voltage levels

The voltage levels of the RS-232C signals conform to EIA RS-232C specifications. FALSE is from 3 volts to 15 volts. TRUE is from -3 volts to -15 volts. Voltages between -3 volts and 3 volts are undefined. The voltage levels of the RS-422A signals are equivalent to those of the RS-232C signals except the signals used for transmission and reception.

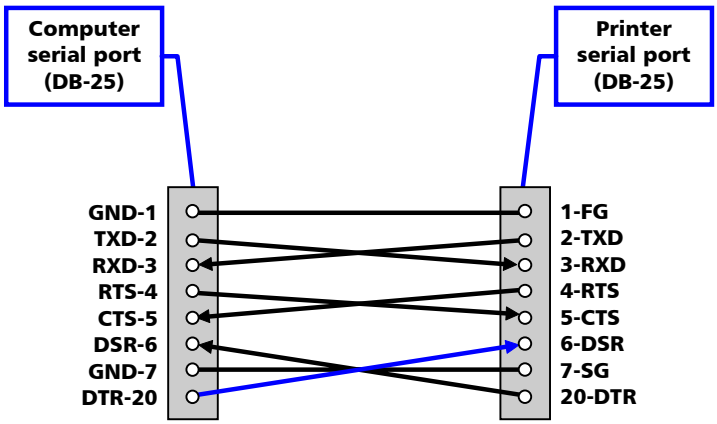
Connector configurations

The printer uses a DB-25 connector for the serial interface. Depending on the computer configuration for serial interface, use either of the appropriate configurations. A special cable must be prepared or obtained for the RS-422A configuration by referring to the diagram (last) below.

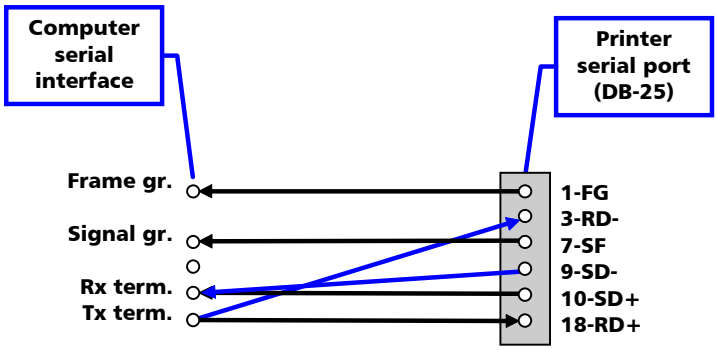
RS-232C - FOR COMPUTERS WITH A DB-9 CONNECTOR:



RS-232C - FOR COMPUTERS WITH A DB-25 CONNECTOR:



RS-422A



On the computer serial port, investigate pin assignments depending on the computer manufacturer's instruction. Since the RS-422A configuration does not employ control lines except for data transmisstion/reception, select a mode in which signals such as DTR are not used.

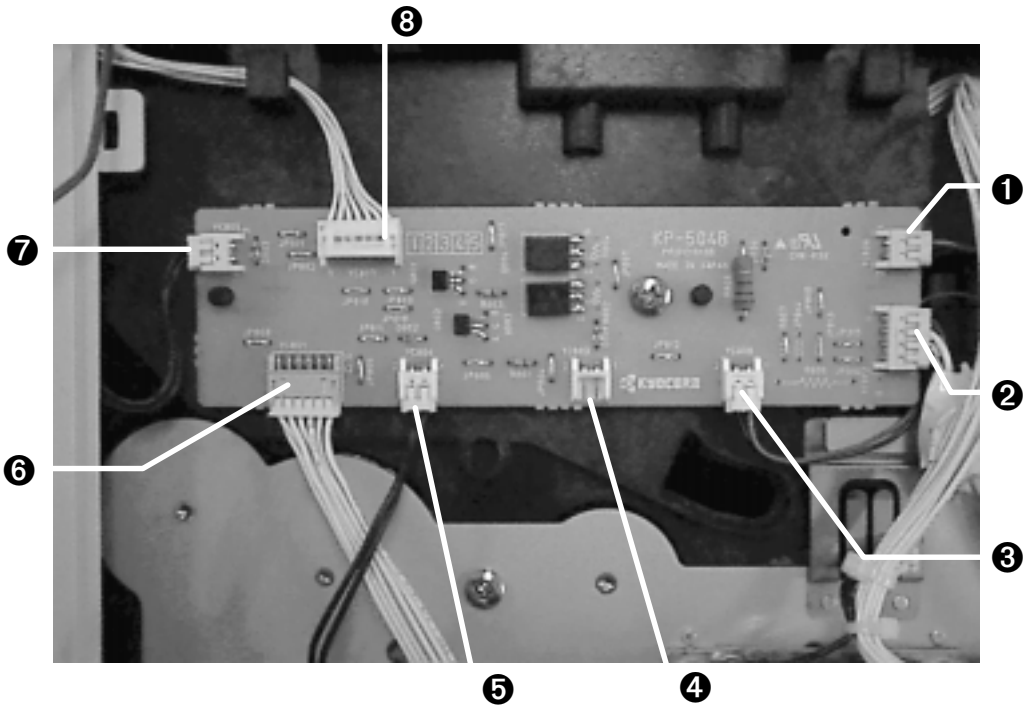
RS-232C protocol

The serial interface supports the full baud rates of: 300, 600, 1,200, 2,400, 4,800, 9,600, and 19,200, 38,400, 57,600, and 115.2k (bps). For adjusting serial interface parameters including baud rate, parity, etc., refer to chapter 7 in the printer's *User's Manual*.

Chapter Six T R O U B L E S H O O T I N G 6-1

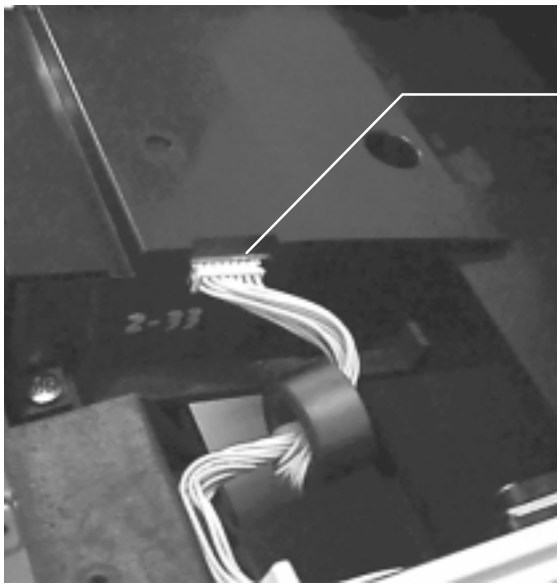
Board layouts

Liaison board/KP-504

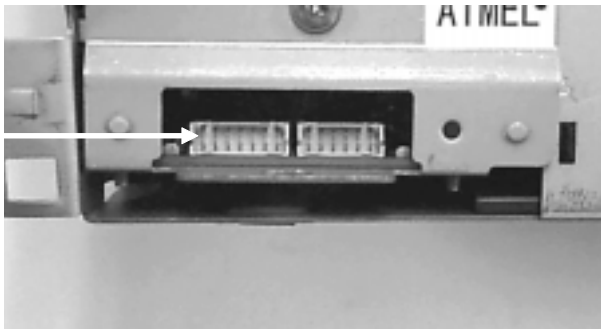


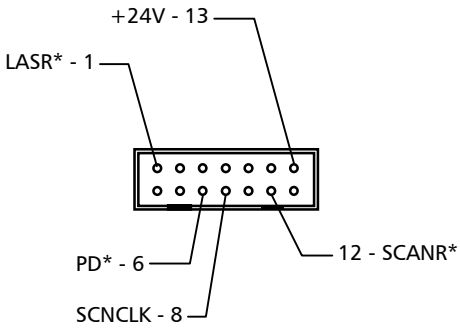
Symbol (above)	Connector	Connected to:	Check point
❶	YC806	Fan (large)	
❷	YC802	Main motor	E1, Pin 3 (MOTOR*)/Pin 1 (+24V)
❸	YC808	Fan (small)	
❹	YC803	Registration clutch	
❺	YC804	Paper feed clutch	
❻	YC801	Engine board	E1, Pin 12 (MOTOR*)
❼	YC805	Manual feed clutch	
❽	YC807	Front operator panel	

Scanner interface board/KP-488

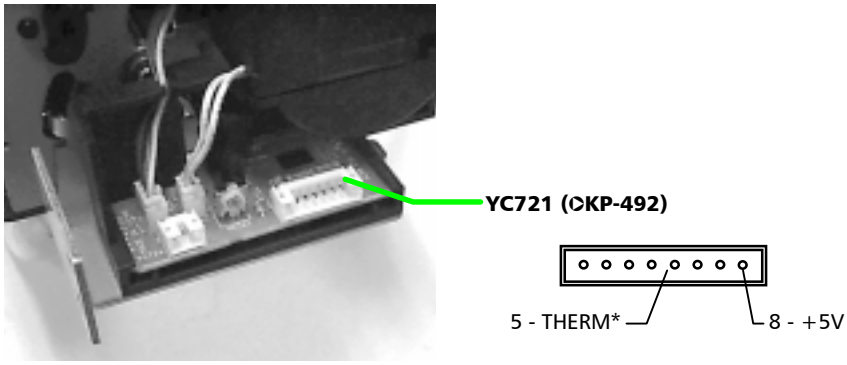


Engine board connectors/KP-535

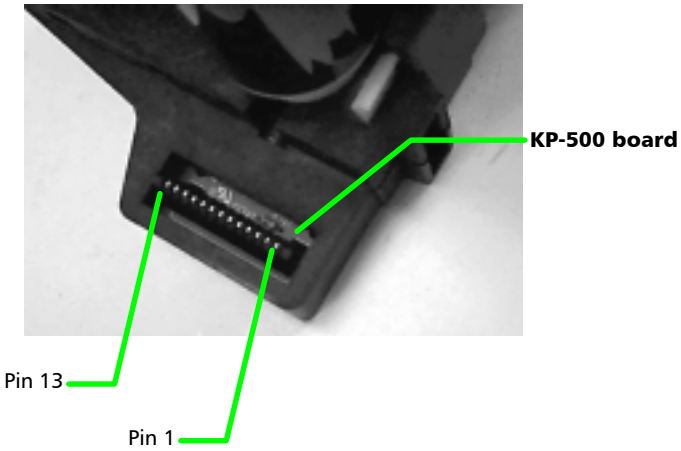




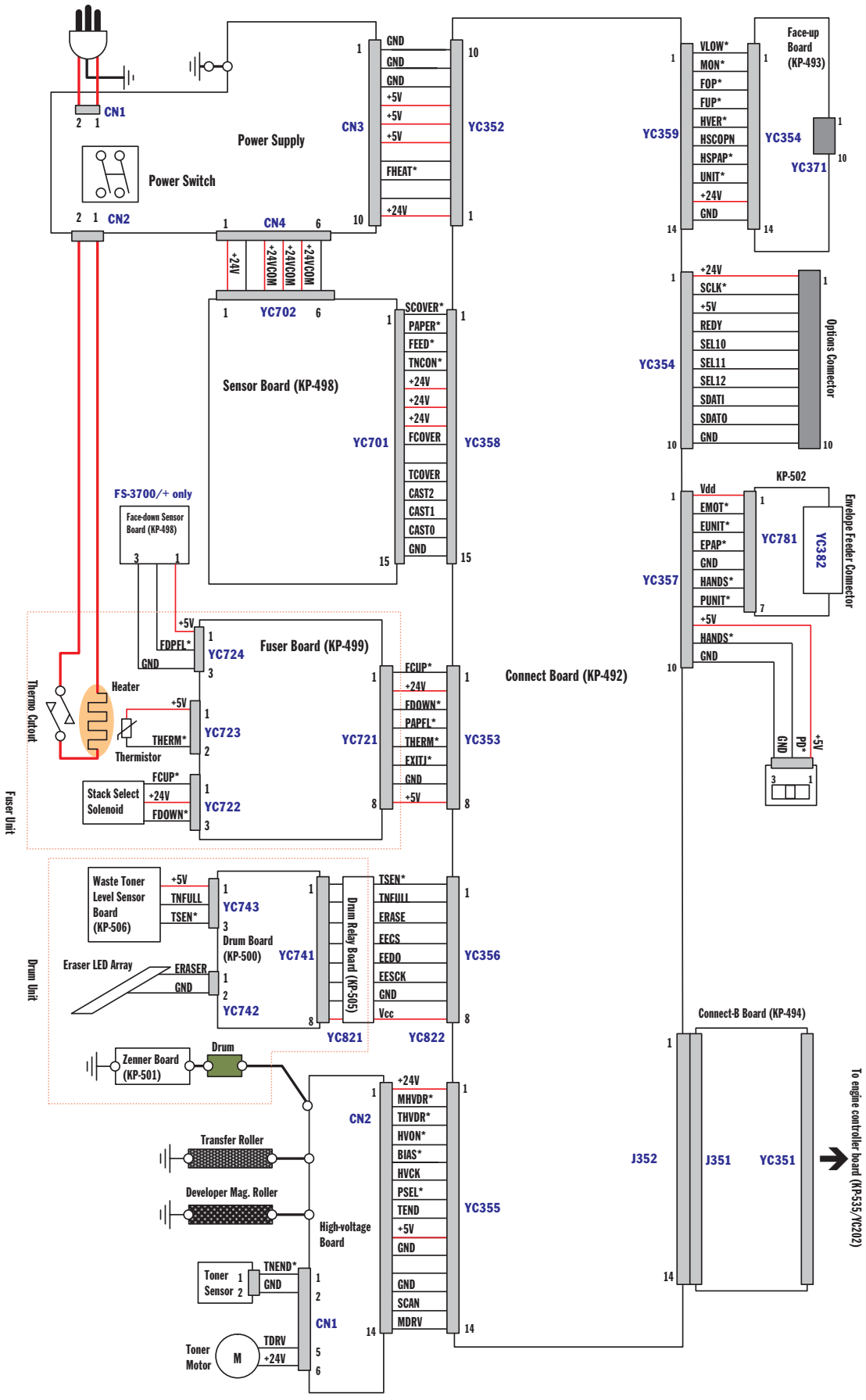
Fuser board/KP-499



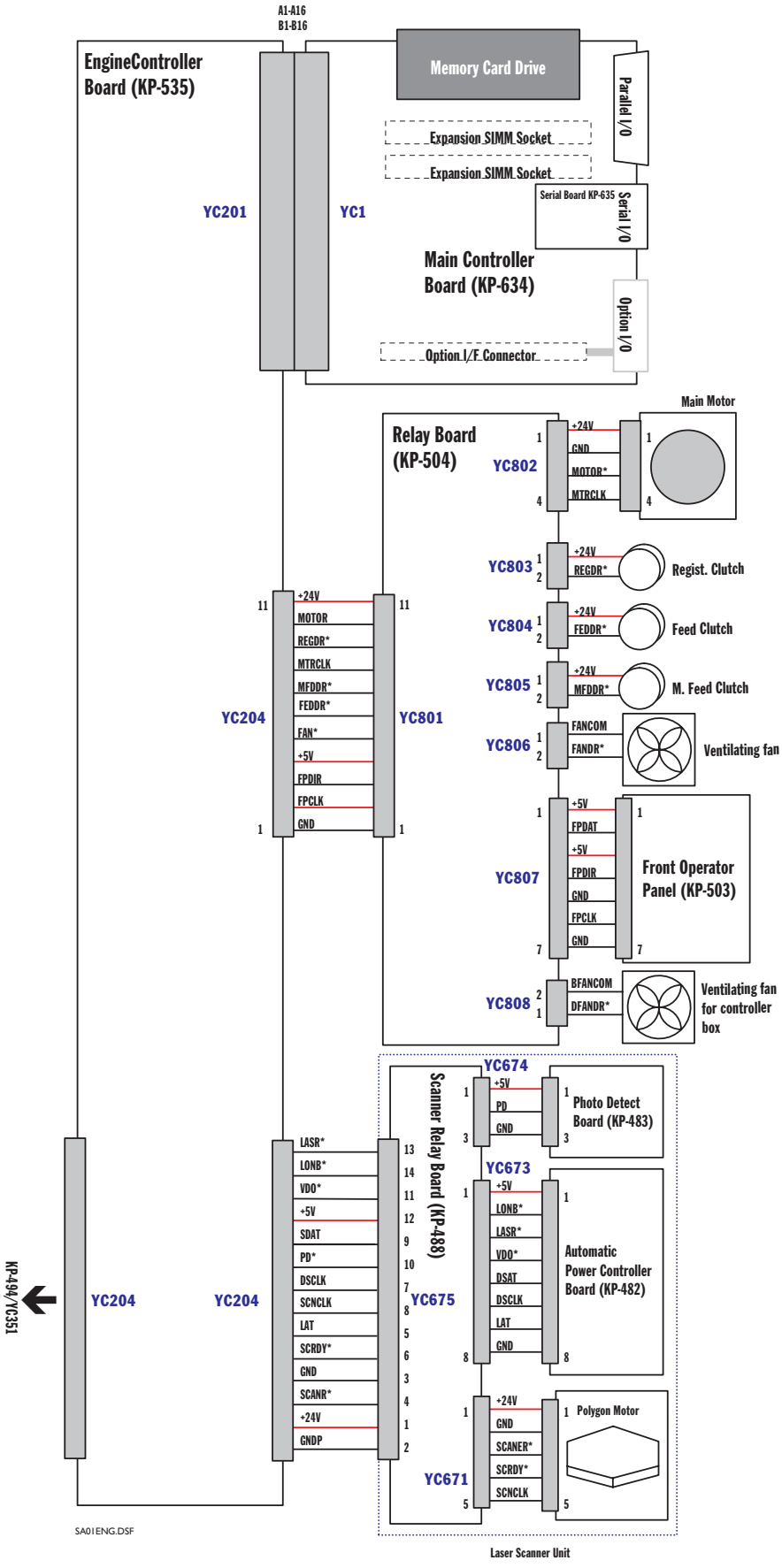
Drum connector/YC-741 (KP-500 board)



General wiring diagram ❶



General wiring diagram ❷



Diagnostic

The printer automatically executes its self-diagnostic test when it is powered up (displaying *Self-test*). The sequence and the items to be diagnosed are explained below.

When the printer locates the error with a specific item, it calls for operator's attention by showing the appropriate message on the operator panel display.

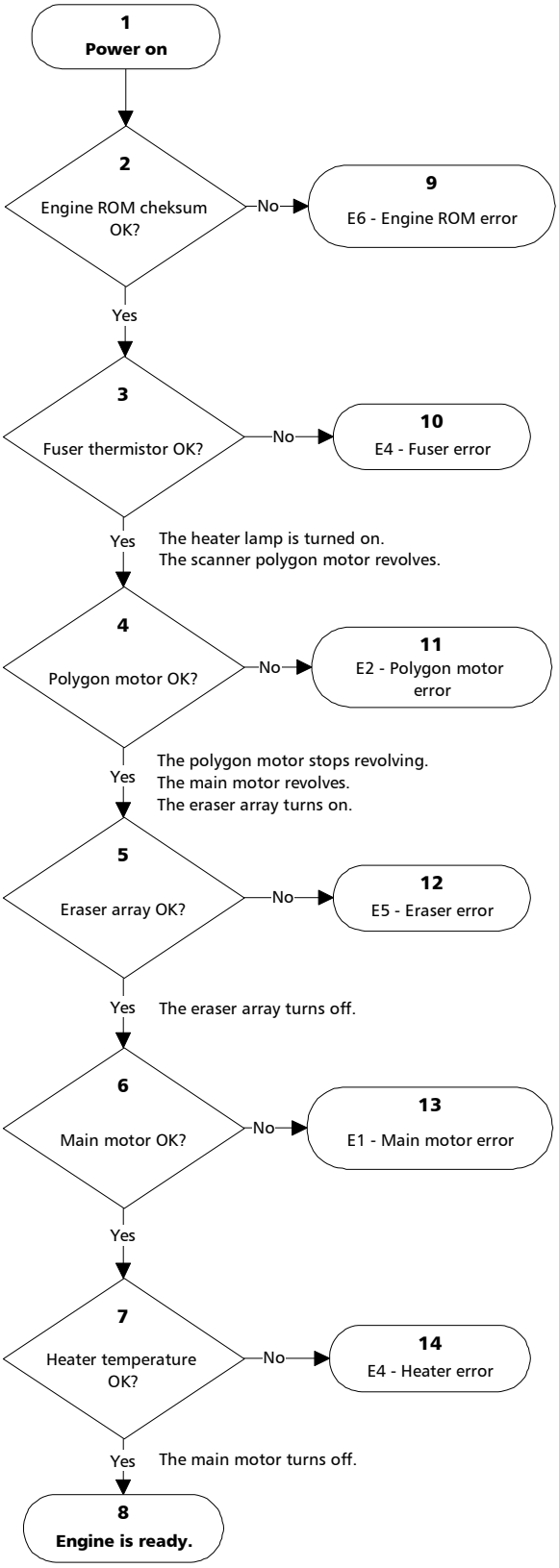
The diagnostic test is done on the following systems simultaneously:

- Engine system (E errors)
- Controller system (F errors)

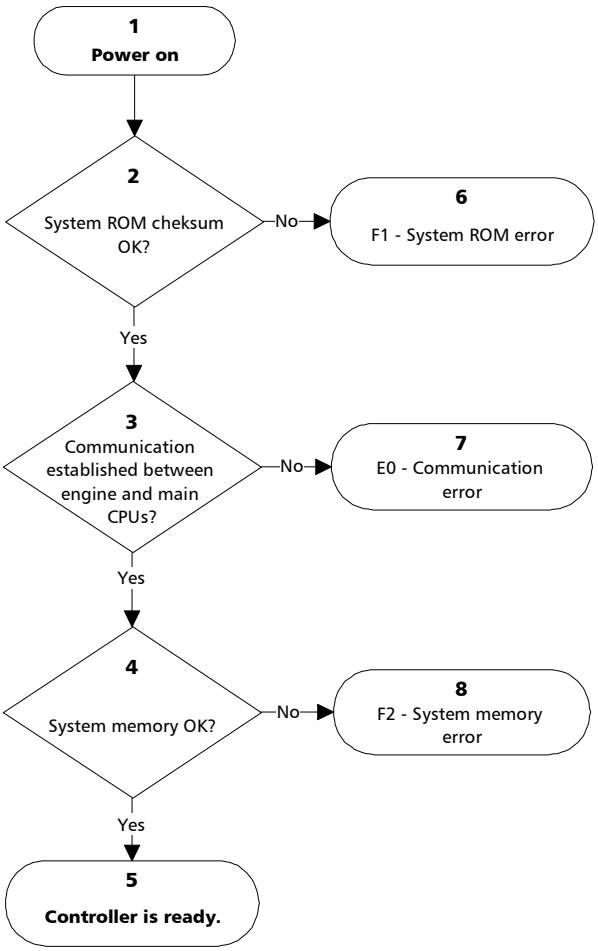
Flowcharts on the following pages show the order and the items diagnosed in each system.

Note. Diagnostic test is cancelled if one of the user-accessible covers is opened during the test.

Engine diagnostics flow



Logic controller diagnostics flow



For details on how to react to the results of diagnostics, refer to section **Service errors** on page 6-19.

General error handling

Priority

Each error message has a priority over the others. Thus, if two or more error messages are given simultaneously, the error message having the highest priority is shown. The priority is as follows (from the highest to the lowest):

✲=Short audio alarm/✺=Long audio alarm

Error message	Category	Remarks
Call service person …	Service error	See *Diagnostics* section.
Call service person F0	Service error	See *Diagnostics* section.
I/F occupied	-	
Top cover open	User-recoverable error	If not user-recoverable, see *False errors - "Top Cover Open"*, page 6-33.
Paper feed unit open	User-recoverable error	If not user-recoverable, see *False errors - "Paper Feed Unit Open"*, page 6-32.
Side cover open	User-recoverable error	If not user-recoverable, see *False errors - "Side cover Open"*, page 6-34.
Paper handler cover open	User-recoverable error	When a HS-20 is installed.
Option stacker cover open	User-recoverable error	When a HS-3E is installed.
Opt. Feeder 1 (2) rear cover open	User-recoverable error	When a PF-20 is installed.
Opt. Stacker unit rear cover open	User-recoverable error	When a SO-6/ST-20 is installed.
Duplex unit rear cover open	User-recoverable error	When a DU-20 is installed.
Replace Toner/Clean printer✲	User-recoverable error	
Missing Waste-toner bottle	User-recoverable error	If not user-recoverable, see *False errors - "Missing Waste-toner bottle"*, page 6-35.
Replace Waste-toner bottle✲	User-recoverable error	
Clean printer … Press CONTINUE✲	User-recoverable error	
Paper jam✲	User-recoverable error	
Remove Opt. Stacker paper✲	User-recoverable error	
Option Stacker paper full✲	User-recoverable error	HS-3E
Face-down tray paper fill✲	User-recoverable error	FS-3700/+ only

Error message	Category	Remarks
Paper path error✲	User-recoverable error	
MEMORY CARD err Insert again	User-recoverable error	
Insert the same MEMORY CARD	User-recoverable error	
Print Cancel?	-	
Memory overflow … Press CONTINUE✲	User-recoverable error	
Print overrun … Press CONTINUE✲	User-recoverable error	
KPDL error … Press CONTINUE✲	User-recoverable error	
MEMORYCARD err … Press CONTINUE✲	User-recoverable error	
Opt. ROM error … Press CONTINUE✲	User-recoverable error	
Set paper/Press CONTINUE✲	User-recoverable error	
Load paper✲	User-recoverable error	
Add paper✺	User-recoverable error	
Self test	-	
Sleeping	-	
Please wait	-	
PJL OPMSG/STMSG	-	
Processing	-	
Waiting	-	
FormFeed TimeOut	-	
Option interface Error	User-recoverable error	
Toner low TK-20/Clean printer	User-recoverable error	
Warning/Low memory	-	
Battery error/MEMORY CARD	User-recoverable error	
Format error/MEMORY CARD	User-recoverable error	
Warning battery/MEMORY CARD	User-recoverable error	
Ready	—	

User-recoverable errors

User-recoverable errors do not normally require a service call unless the suggested remedy does not solve them. The instructions below indicate how to respond to problems indicated by the operator panel symbolic indicators and by the panel display.

Indicator		Corrective action
	*Flashing*	The printer has run low on toner. The toner should be replaced as soon as possible.
	Lit	Install a new toner kit. See chapter 1.
	*Fast flashing*	There is a paper jam. There is a possibility that paper may be jammed at the point indicated by flashing, open and remove any jammed paper. See Section
	Slow flashing	The paper has run out in the paper cassette or multi-purpose tray. Please insert paper. See Section
	Lit	This indicates either the current paper feeder or the paper output point.
ATTENTION	*Flashing*	The printer has insufficient memory available or the printer is warming up (Pleasewait). Confirm the message indicated on the message display. See Section
	Lit	Note the maintenance message on the message display and consult Table

Message	Corrective action
`Top cover Open`	Open the top cover, then close tightly.
Side cover Open	Open the side cover, then close tightly.
Paper feed unit Open	Open the paper feed unit, then close tightly.
Face-down tray paper full	The face-down tray has become full (approx. 250 pages). Remove all printed pages from the face-down tray. When the printer senses that the face-down tray is empty again, it will continues printing into the face-down tray. (Model FS-3700/+ only)

Message	Corrective action
Add paper	Add paper to the paper cassette or multi-purpose tray.
Set paper/Press CONTINUE	Add a sheet of paper to the multi-purpose tray (*manual mode*), and press the CONTINUE key.
Load paper *papersize*	The paper size does not match. The size of the paper in the cassette is different to the size specified by the application software or by PRESCRIBE II. Either put paper of the specified size into the cassette. See Section 1.4.If the CONTINUE key is pressed, printing will be resumed. However, if more than one sheet is to be printed, the same message will again be displayed from the second sheet onward. It is also possible to abandon printing by pressing the CANCEL key.
Paper jam	Open the top cover or the paper feed unit and correct the paper jam (or paper mis-feeding in the cassette). See Section …
Warning low memory	The printer's internal memory is running low due to the number of fonts and macros downloaded. Print a status page to see how much user memory is left, and try deleting unnecessary fonts and macros. See the PRESCRIBE II DELF and DELM commands explanation in the programming manual (CD-ROM).
Toner low TK-20/Clean printer	Replace the toner container using a new toner kit. See Section …
Replace Toner/Clean printer	Replace the toner container using a new toner kit. The printer does not operate when this message is displayed. See section …
Clean printer..Press CONTINUE	Please clean the inside of the printer. See Section ...This message will be displayed when replacing the toner container after the message ReplaceTonerCleanprinter has been displayed. After cleaning the inside of the printer, press the CONTINUE key and the printer will be ready for printing.
ReplaceWaste- toner bottle	Replace the old waste toner bottle with the new one which is included in the TK-20/TK-20H toner kit. The message will also be shown if the waste toner bottle has become full. The waste toner bottle should be replaced when the message display eventually shows TonerlowTK-20Cleanprinter. See Section …
Missing Waste-toner bottle	Install the waste toner bottle. See Section ... The printer does not operate when this message is displayed.
Memory overflow..Press CONTINUE	The total amount of data received by the printer exceeds the printer's internal memory. Try adding more memory (expansion RAM). Press the CONTINUE key to resume printing. You can abandon printing by the CANCEL key.
Print overrun..Press	The data transferred to the printer was too complex to print on a

Message	Corrective action
CONTINUE	page. Press the CONTINUE key to resume printing. (The page may break in some pages.)You can abandon printing by the CANCEL key.Note: After this message has been displayed, Page protect mode will be On. To maintain optimum use of memory during printing, display >Pageprotect from the control panel, and re-select Auto.See the printer's user's manual.
MEMORY CARD err/Insertagain	The memory card is accidentally removed from the printer's memory card slot during reading. If you continue reading the memory card, insert the same memory card into the slot again. The printer again reads it from the beginning of the data.Note: We recommend that you follow the reading procedure from the beginning to ensure correct reading of the memory card.
Insert the same MEMORY CARD	You have inserted the wrong memory card when the Insertagain message was displayed. Remove the wrong memory card from the printer's memory card slot and insert the correct memory card. The printer again reads it from the beginning of the data.
Format error MEMORY CARD	This message appears when the printer is in the ready state and the memory card is not formatted, and therefore cannot be read or written. Follow the procedure on Section ... to format the card.
Warning battery MEMORY CARD	This message appears when the printer is in the ready state and the battery in the memory card is low. You can still enter the memory card mode, but the battery should be changed as soon as possible.
MEMORY CARD err/ ##..Press CONTINUE	This message appears when an error occurs during access to the memory card using the PRESCRIBE II ICCD command or from the printer's control panel (codes 09 and 11 only). The error is indicated by one of the numbers ## listed under the Memory card errors which follows.
>Read fonts Failed	The amount of memory available for the fonts header parts of font is too small to load more fonts. Try deleting unnecessary fonts and macros.
I/F occupied	This message is displayed when you attempt to use the printer's control panel to change the environmental settings on the interface from which data are presently being received.
Processing PAR FIT A4	FIT (image FITting) flashes to indicate that a loss of raster data occurred when the data was compressed to be fitted within the currently available memory. Flashing FIT extinguishes automatically when the job times out; the printer receives the next data from the host computer; or if you press any key on the printer's control panel. Try adding more memory in the printer to prevent this error.

Message	Corrective action
Processing PAR 600 A4 ↓ Processing PAR 300 A4	Change of the resolution indicator from 600 to 300 (flashing) means that the job in 600-dpi resolution was not able to run within the currently available memory. The resolution reverts to 600 dpi automatically when the job times out; the printer receives the next data from the host computer; or if you press any key on the printer's control panel. Try adding more memory in the printer to prevent this error.

Memory card errors

Error code	Applicable card type	Meaning
01	SRAM	Card size error (An attempt was made to write data of greater than 16 MB in size.). Reduce the size of the data to be written from the host computer to 16 MB or less; or, a file name could not be found in the memory card.
02	SRAM	No memory card inserted. Insert a proper memory card.
03	SRAM/flush	Non PCMCIA card. Replace the card with a PCMCIA card.
04	SRAM	Not RAM card. Use a SRAM-type card if you want to write data to an memory card.
05	SRAM	Memory card battery error. Replace the memory card's internal battery with a new one.
06	SRAM	Memory card protect error. Release the write protection on the memory card when you write data to the memory card.
07	SRAM	Non-Kyocera format. Reformat the memory card using MODE SELECT (See the printer's user's manual).
08	SRAM	Partition name error. Follow instructions given attempt in Chapter 2 to properly name the destination.
09	SRAM	Memory card data full error (An attempt was made to write data exceeding the capacity of the memory card). Abandon the writing operation on the host computer first. Press CONTINUE key; when the message turns to Waiting, press FORM FEED key (Ready).
10	-	*Reserved*
11	SRAM	Data name full (An attempt was made to write more than 127 destination data names). Press CONTINUE key (Ready).
12	-	*Reserved*

Error code	Applicable card type	Meaning
13	Flush	Erase logic error with flash memory card. Try replacing the memory card.
14	-	*Reserved*
15	Flash	Non PCMCIA flush card. Replace the card with a PCMCIA flush card.
16	-	*Reserved*
17	Flush	Unable to write to the flash memory card due to insufficient printer memory. Either delete unnecessary macros or fonts stored in the printer, or extend the printer's available memory.
18	Flush	Writing error. Try replacing the memory card.
19	-	*Reserved*

For details on memory card availability, see section *Printer specifications* in chapter 1.

Service errors

The printer does not operate when a message beginning with E, F, or C is displayed. The total numer of pages printed is also indicated. The message is categorized as follows:

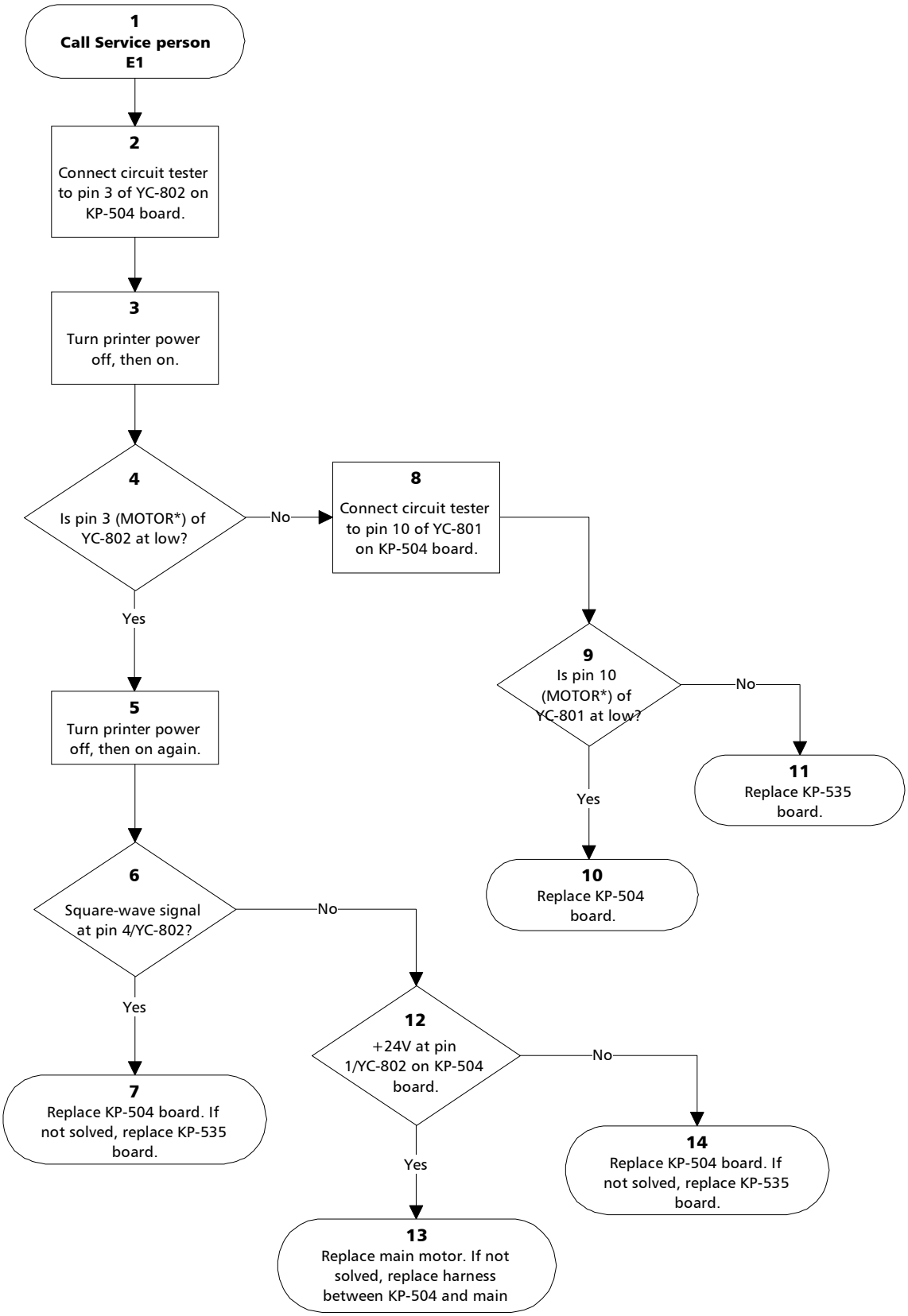
Message	Corrective action
Call service person E*n:123456*	Mechanical error (*n*=0, 1, 2, ...). Follow the appropriate instructions provided in this section.
Call service person F*n:123456*	Controller error (*n*=0, 1, 2, ...). Follow the appropriate instructions provided in this section.
Call service person C*n: 123456*	Option equipment error (*n*=0, 1, 2, …). This message pertains to either the sorter or duplexer. *C1* through *C3* are relevant to the duplexer; *C4* through *C6* to the sorter. See the service manual appropriate to the option used with the printer.
Call service person D*n: 123456*	Engine firmware download error (*n*=0, 1, 2, …). See section *Updating the engine firmware* in chapter 3.

E0 - Communication error

Meaning	Suggested causes	Corrective action
Communication between the engine controller and the main controller is failed.	• Controller gate array defect • Connector failure between the engine and the main controller • Overrun in the engine system, deactivating the progam flash ROM	Verify connector connections. Replace the engine board and/or the main controller board.

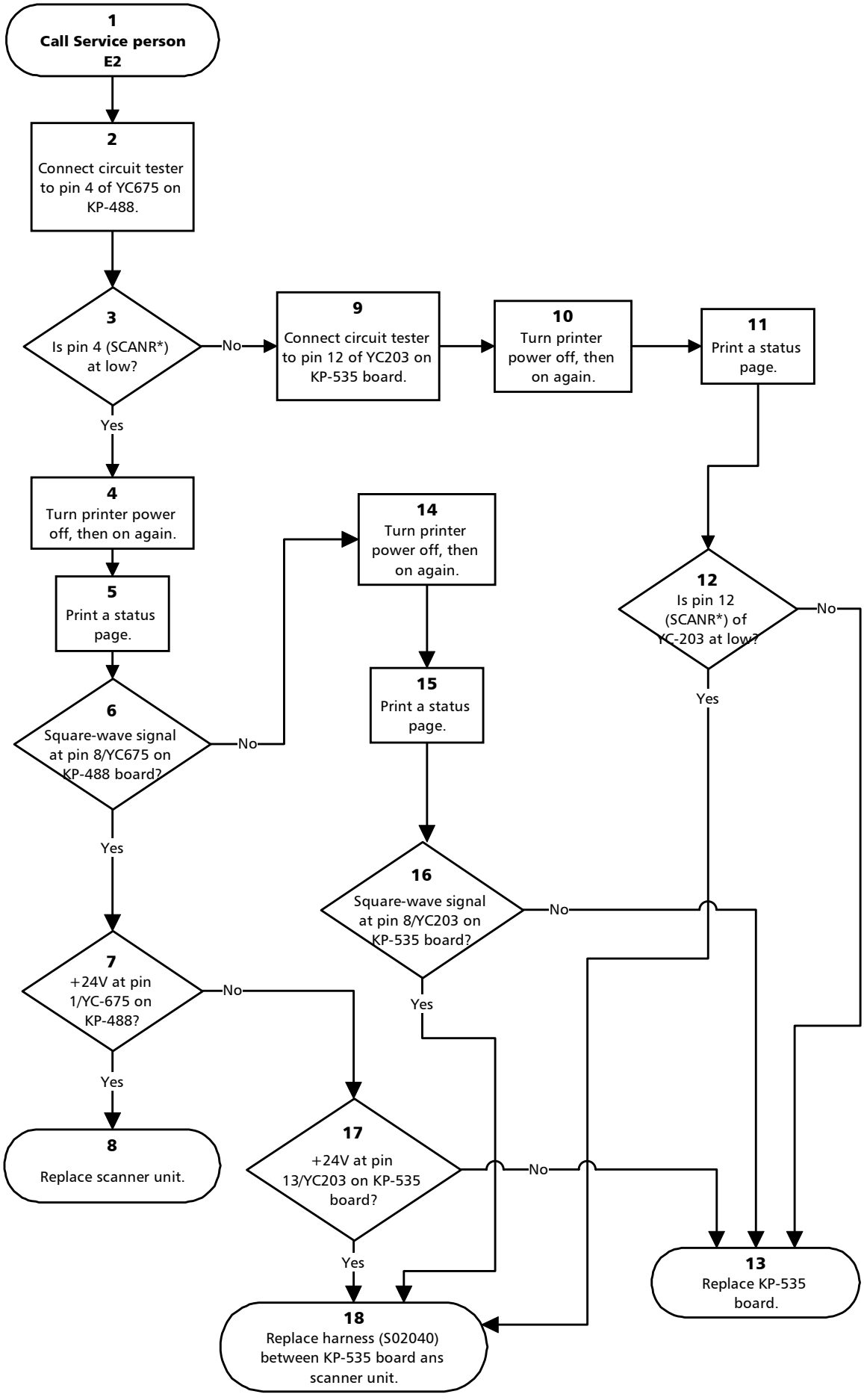
E1 - Main motor error

Meaning	Suggested causes	Corrective action
The main motor is overtorqued.	• Overcurrent in the main motor circuitry due to an excessive torque • Loose connector • Defective gate array on the engine board • No response from the main motor due to the defective motor driver (transistor)	Follow the flow chart on the next page.


1
Call Service person
E1
2
Connect circuit tester to pin 3 of YC-802 on KP-504 board.
3
Turn printer power off, then on.
4
Is pin 3 (MOTOR*) of YC-802 at low?
No
8
Connect circuit tester to pin 10 of YC-801 on KP-504 board.
Yes
5
Turn printer power off, then on again.
9
Is pin 10 (MOTOR*) of YC-801 at low?
No
11
Replace KP-535 board.
Yes
10
Replace KP-504 board.
6
Square-wave signal at pin 4/YC-802?
No
Yes
12
+24V at pin 1/YC-802 on KP-504 board.
No
7
Replace KP-504 board. If not solved, replace KP-535 board.
Yes
14
Replace KP-504 board. If not solved, replace KP-535 board.
13
Replace main motor. If not solved, replace harness between KP-504 and main

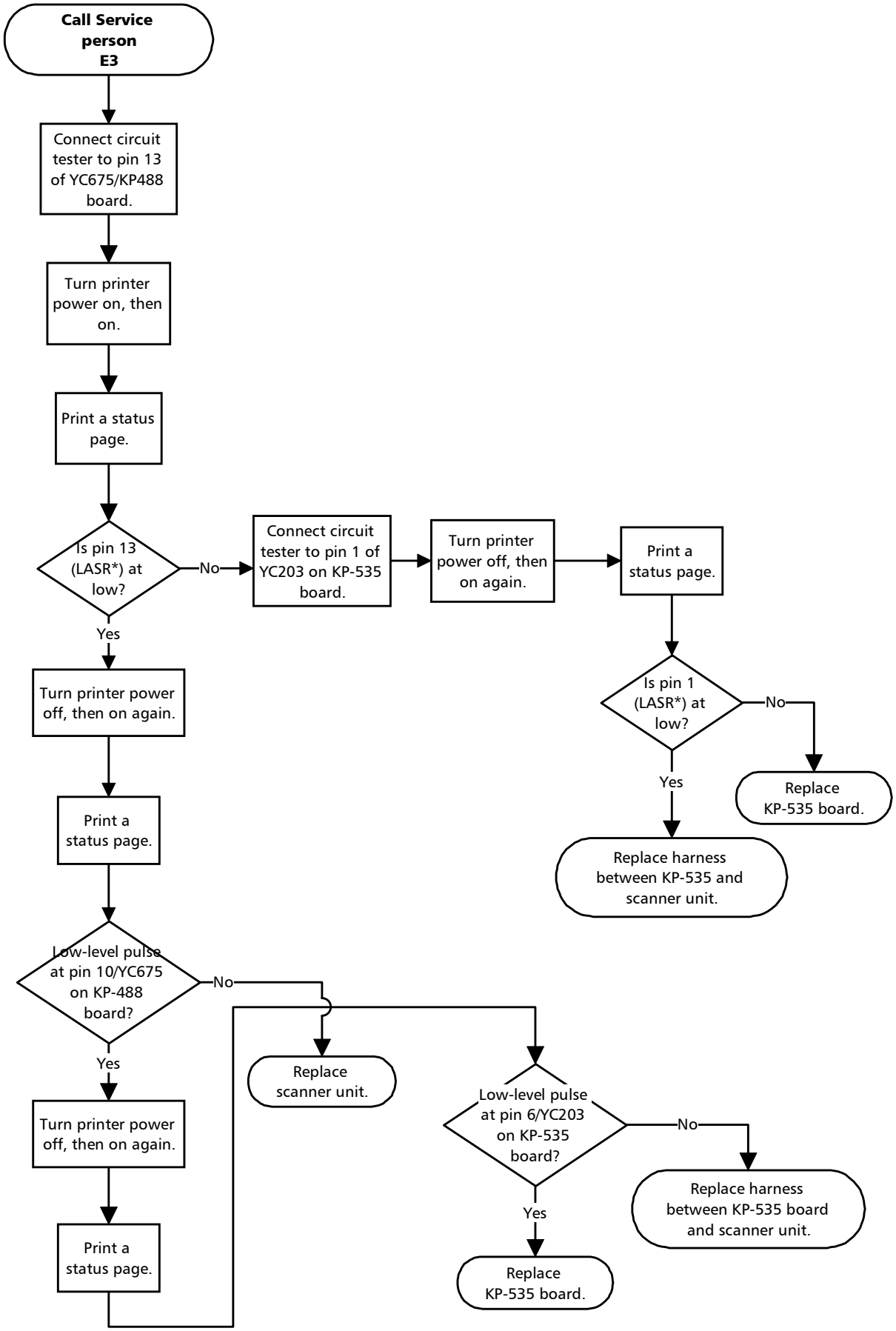
E2 - Laser scanner motor error

Meaning	Suggested causes	Corrective action
The polygon motor does not deliver a synchronous output (*L*) within the predetermined period of time.	• Timeout in the predetermined period of lead time which the scanner motor speed has to be reached at start up (SCRDY*) • Connector insertion error • Defective gate array on the engine board • Time out dur to the defective scanner motor driver (transistor)	Follow the flow chart on the next page.


1
Call Service person
E2
2
Connect circuit tester to pin 4 of YC675 on KP-488.
3
Is pin 4 (SCANR*) at low?
No
Yes
9
Connect circuit tester to pin 12 of YC203 on KP-535 board.
10
Turn printer power off, then on again.
11
Print a status page.
4
Turn printer power off, then on again.
5
Print a status page.
6
Square-wave signal at pin 8/YC675 on KP-488 board?
No
Yes
14
Turn printer power off, then on again.
15
Print a status page.
12
Is pin 12 (SCANR*) of YC-203 at low?
No
Yes
16
Square-wave signal at pin 8/YC203 on KP-535 board?
No
Yes
7
+24V at pin 1/YC-675 on KP-488?
No
Yes
8
Replace scanner unit.
17
+24V at pin 13/YC203 on KP-535 board?
No
Yes
13
Replace KP-535 board.
18
Replace harness (S02040) between KP-535 board ans scanner unit.

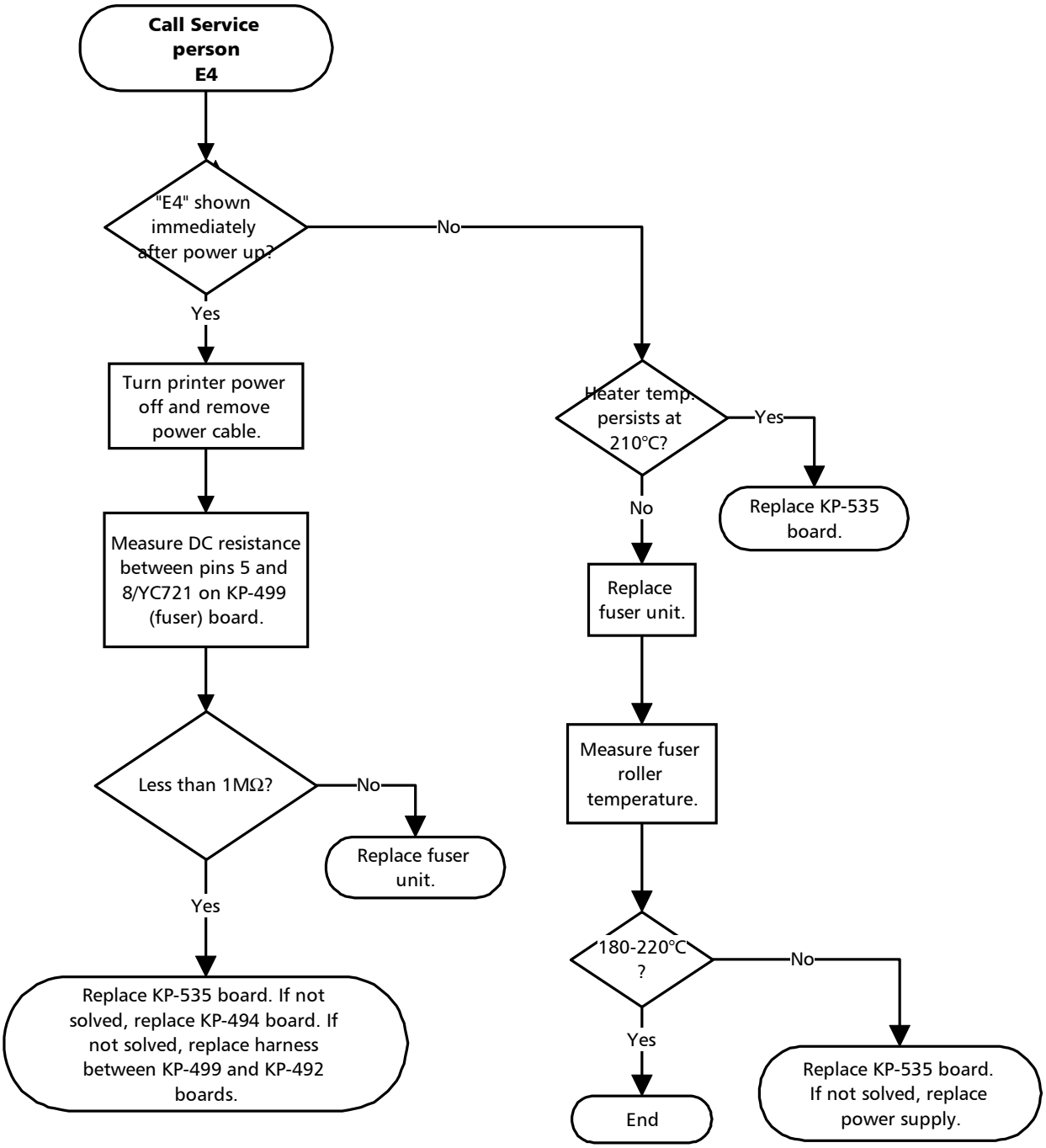
E3 - Laser beam detection error

Meaning	Suggested causes	Corrective action
Beam detection is failed. The photo detector board does not deliver a synchronous output (*L*).	• No beam hit due to the laser diode defect (PD*) • Improper connector insertion • Soiled/defective beam detector (pin-photo diode) sensor • Defective safety lock • Unoperative gate array input port	Follow the flow chart on the next page.


Call Service person E3
Connect circuit tester to pin 13 of YC675/KP488 board.
Turn printer power on, then on.
Print a status page.
Is pin 13 (LASR*) at low?
No
Connect circuit tester to pin 1 of YC203 on KP-535 board.
Turn printer power off, then on again.
Print a status page.
Is pin 1 (LASR*) at low?
No
Replace KP-535 board.
Yes
Replace harness between KP-535 and scanner unit.
Yes
Turn printer power off, then on again.
Print a status page.
Low-level pulse at pin 10/YC675 on KP-488 board?
No
Replace scanner unit.
Yes
Turn printer power off, then on again.
Print a status page.
Low-level pulse at pin 6/YC203 on KP-535 board?
No
Replace harness between KP-535 board and scanner unit.
Yes
Replace KP-535 board.

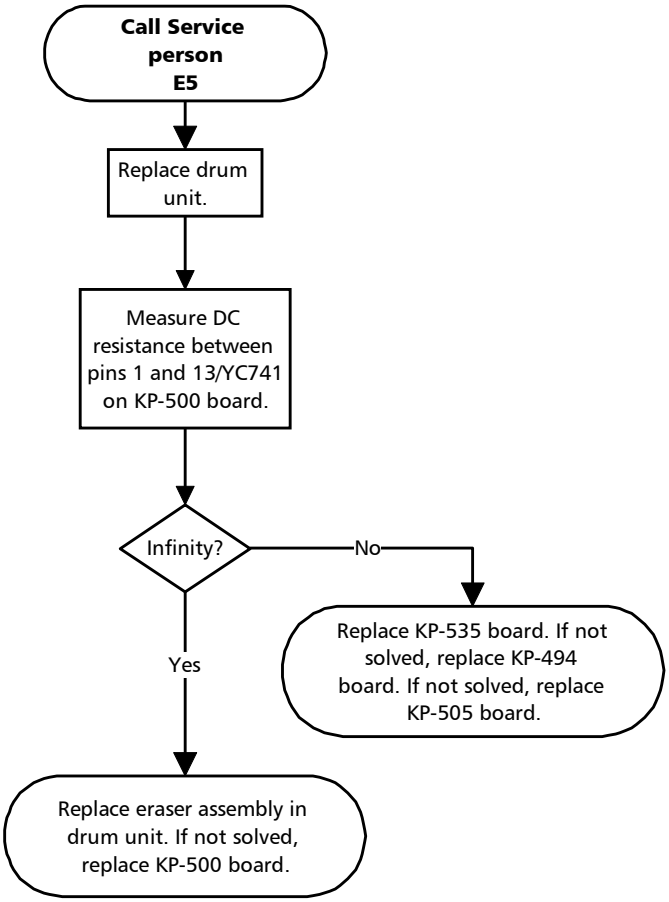
E4 - Fuser heater error

Meaning	Suggested causes	Corrective action
The fuser heater is not intact due to disconnection or the circuit failure.	• Blown-out thermistor • Improper connector insertion • Blown-out halogen heater • Blown-out thermostat • Comparator defect on the engine board • Defective engine CPU (input port) • Defective gate array (input/output port operation)	Follow the flow chart on the next page.


Call Service person E4
"E4" shown immediately after power up?
No
Yes
Turn printer power off and remove power cable.
Measure DC resistance between pins 5 and 8/YC721 on KP-499 (fuser) board.
Less than 1MΩ?
No
Replace fuser unit.
Yes
Replace KP-535 board. If not solved, replace KP-494 board. If not solved, replace harness between KP-499 and KP-492 boards.
Heater temp. persists at 210°C?
Yes
Replace KP-535 board.
No
Replace fuser unit.
Measure fuser roller temperature.
180-220°C ?
No
Yes
End
Replace KP-535 board. If not solved, replace power supply.

E5 - Eraser error

Meaning	Suggested causes	Corrective action
The eraser is blown out or the power supply does not reach to the eraser.	• Blown-out LED chip(s) • Connector insertion error • Defective gate array (input/output port)	Follow the flow chart on the next page.

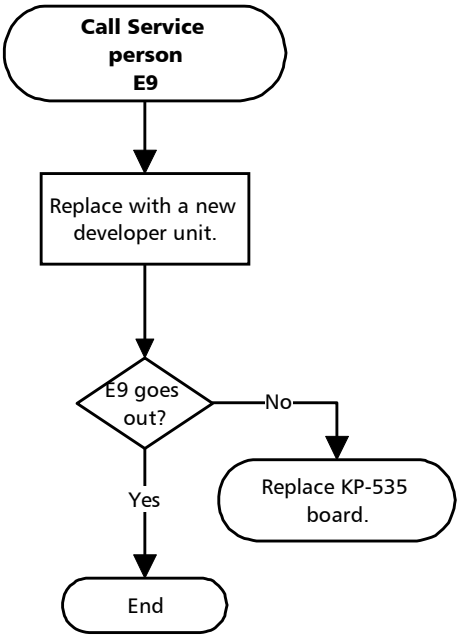

Call Service person E5
Replace drum unit.
Measure DC resistance between pins 1 and 13/YC741 on KP-500 board.
Infinity?
No
Yes
Replace KP-535 board. If not solved, replace KP-494 board. If not solved, replace KP-505 board.
Replace eraser assembly in drum unit. If not solved, replace KP-500 board.

E6 - Flash ROM error

Meaning	Suggested causes	Corrective action
Checksum is erroneous with the flash ROM.	• Data readout error on the flash ROM	Replace the engine board.

E9 - Toner motor error

Meaning	Suggested causes	Corrective action
The toner motor is overtorqued.	• Overcurrent in the toner motor circuitry due to an excessive torque • Loose connector • Defective gate array on the engine board • Defective toner motor overcurrent detector	Follow the flow chart on the next page.


Call Service person E9
Replace with a new developer unit.
E9 goes out?
No
Yes
Replace KP-535 board.
End

F0 - Front control panel error

Meaning	Suggested causes	Corrective action
Communication is failed between the front panel and the main controller.	-	Replace the main controller board. To remove the main controller board, see page 2-9.

F1 - System ROM error

Meaning	Suggested causes	Corrective action
Checksum is failed with EPROMs on the main controller board.	-	Replace the main controller board. To remove the main controller board, see page 2-9.

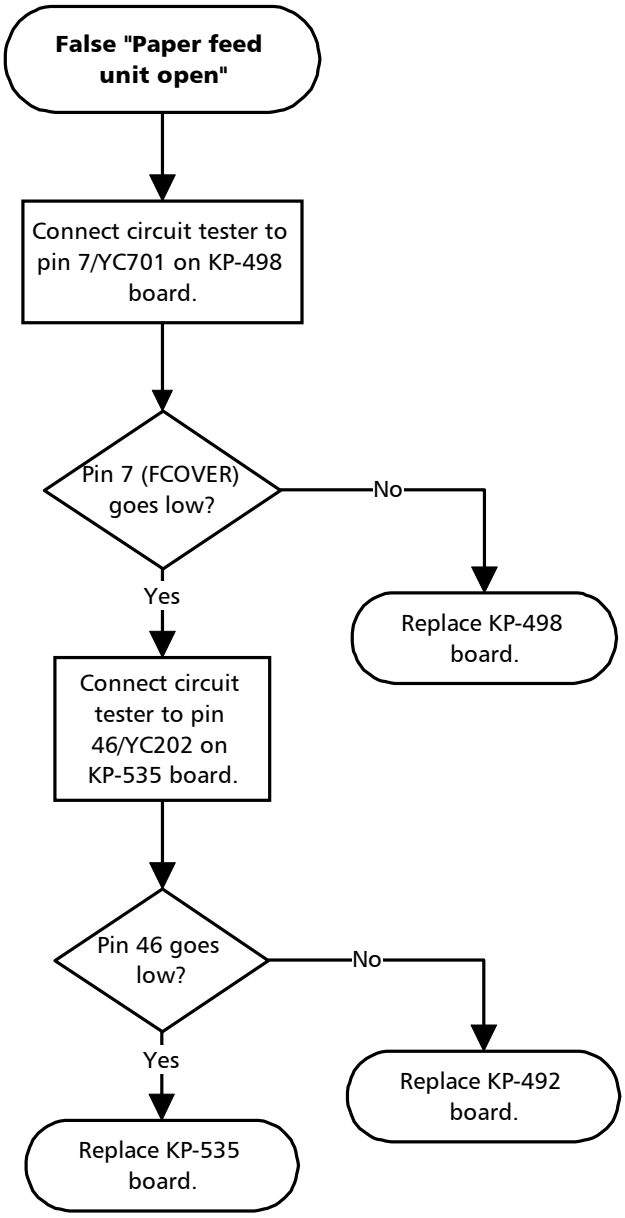
F2 - Main memory error

Meaning	Suggested causes	Corrective action
Checksum is failed with the RAM on the main controller board.	-	Replace the main controller board. To remove the main controller board, see page 2-9.

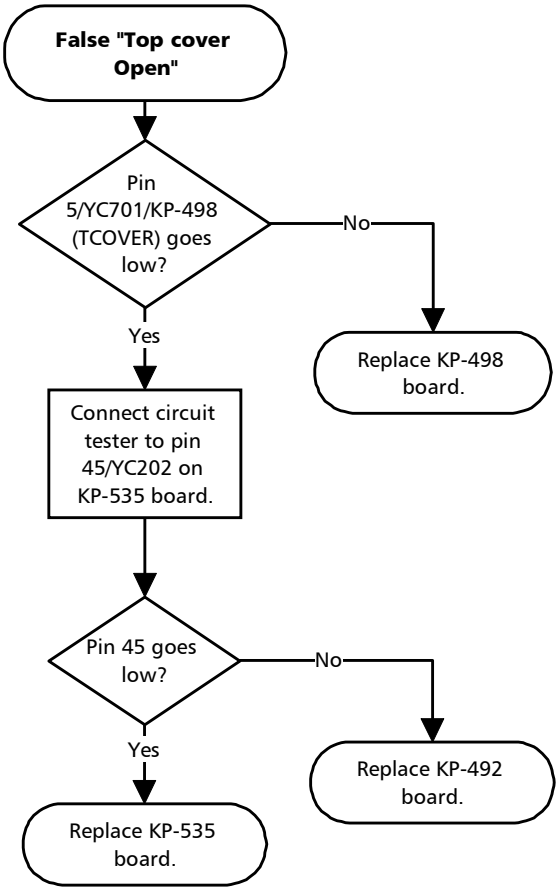
F3 - General failure

Meaning	Suggested causes	Corrective action
Miscellaneous failure with the main controller, other than F0, F1, and F3, above.	-	Turn printer power off, then on again. If not solved, replace the main controller board. To remove the main controller board, see page 2-9.

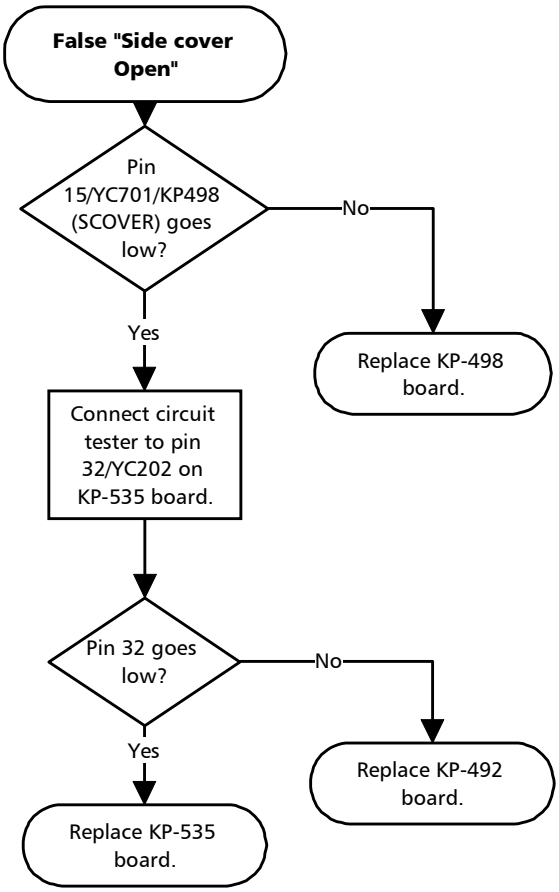
False errors - “Paper Feed Unit Open”



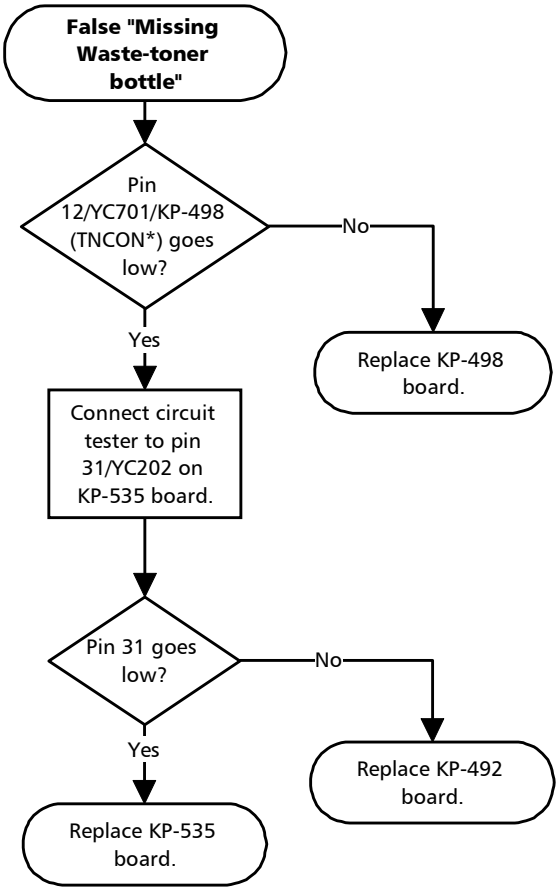
False errors - “Top Cover Open”



False errors - “Side cover Open”



False errors - “Missing Waste-toner bottle”



Print quality problems

Print quality problems range from uneven tone to completely blank output. The troubleshooting procedure for each type of problem is given below.

Completely blank printout

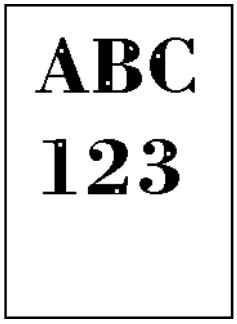
Check the developer unit.	• Check that the developer unit is inserted correctly • Check that the developer 's connector is connected properly. • Check that toner is adhered around the developing roller. If no toner appears to be on the roller, try feeding toner into the developer using the manner described in chapter 3 (See page 3-13).
Check main charging potential.	• Check the main charging output on the HV board. This requires removal of the left side cover and the test equipment: For information, contact Kyocera. Replace the HV board if high voltage potential is not available on the board.
Check the laser scanner.	• The scanner components within the scanner may be disordered. Note that the laser scanner is concealed to protect the components which are susceptible to dust. It should not be disassembled execept within a dust-free chamber. Replace the scanner unit if necessary.

All-black printout

Check the main charger unit installation.	• Open the printer side cover and check that the main charger unit is correctly seated. To do this, take out the main charger unit from the printer; then reinstall it carefully.
Check the grid plate (the mesh metal bottom part of the	• The grid plate must be flat and fit horizontally in place. Replace the main

charger unit).	charger unit if necessary.
Check the drum bias.	• Make sure the bias from the HV board is correctly arrived at the drum unit.
Check high voltage potential at the HV board.	• Check the higi-voltage output on the HV board. This requires removal of the left side cover and the test equipment: For information, contact Kyocera. Replace the HV board if high voltage potential is not available on the board.

Dropouts



Note the spacing of the defects. Use the *Repetitive defect gauge* on page6-43.	• If the defects occur at regular intervals of 63 mm, the problem may be a dirty transfer roller. Clean or replace the tranfer roller. • If the defects occur at regular intervals of 94 mm, the problem may be a damaged drum unit or fuser roller. Replace the drum unit or fuser unit accordingly.
Try changing the transfer bias potential (*Normal* or *Thick*).	• Use the **MODE SELECT** key on the printer's control panel. For details, refer to the user manual accompanying the printer.
Check paper for property.	• Paper with rugged surface or dump tends to cause this type of failure.
Check the paper chute installation.	• The paper chute (the metallic fixture provided between the transfer roller and the fuser unit for antistatic purpose) must not be fit loose. Press the paper chute down firmly if

	necessary.
Check the transfer roller installation.	• The transfer roller must be supported by the axle holder at the both ends. Clean the axle holder to remove oil and debris. Replace the transfer roller if necessary.
Check the tranfer bias potential.	• Check the transfer bias output on the HV board. This requires removal of the left side cover and the test equipment: For information, contact Kyocera. Replace the HV board if high voltage potential is not available on the board.

Black dots

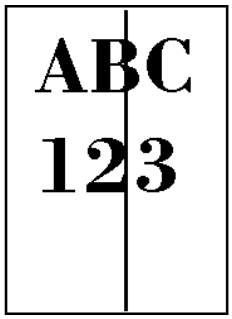
Note the spacing of the defects. Use the *Repetitive defect gauge* on page6-43.	• If the defects occur at regular intervals of 94 mm, the problem may be a damaged drum unit or fuser roller. Replace the drum unit or fuser unit accordingly. • If the defects occur at random intervals, the toner may be leaking from the drum unit. Replace the drum unit. • If the defects occur at regular intervals of 38 mm, the problem may be a toner lump on the developing roller. Remove the lump using a soft brush. Note that the developing roller surface is fragile: Contact Kyocera for type of the brush to use.

Horizontal streaks

Check drum ground.	• The drum axle and its counter part—drum grounding tab in the printer must be in a good contact. If necessary, apply a small amount of electro-conductive grease onto the tab. See Kyocera for which type of grease to use.
Check main charger contacts.	• Take out the main charger unit; check the

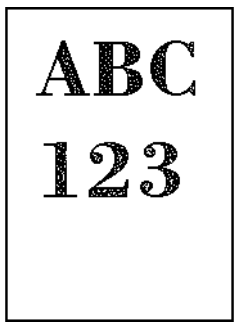
	electric terminals to see if they are clean.
The drum unit may be defective.	• Replace the drum unit.

Black vertical streaks



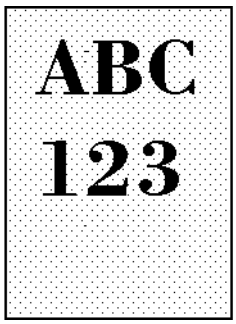
Contaminated main charger wire.	• Clean the main charger wire by pulling the green colored cleaning knob in and out several times.
Check the drum surface for a streak of toner laying lengthwise.	• A streak of toner remaining on drum after printing means that the cleaning blade in the drum unit is not working properly. Replace the cleaning blade; or replace the drum unit.
Defective developer unit.	• Replace the developer unit.

Unsharp printing



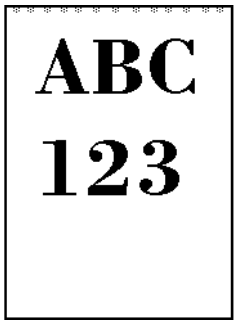
Check contamination on the main charger wire and the grid.	• Clean the main charger wire by pulling the green color main charger wire cleaner know in and out several times.
Check paper for property.	• Paper with rugged surface or dump tends to cause this type of failure.
Check the paper chute installation.	• The paper chute (the metallic fixture provided between the transfer roller and the fuser unit for antistatic purpose) must not be fit loose. Press the paper chute down firmly if necessary.
Try changing the transfer bias potential (Normal or *Thick).*	• Use the **MODE SELECT** key on the printer's control panel. For details, refer to the user manual accompanying the printer.
Check the transfer roller installation.	• The transfer roller must be supported by the axle holder at the both ends. Clean the axle holder to remove oil and debris. Replace the transfer roller if necessary.
Check the tranfer bias potential.	• Check contamination on the main charger wire and the grid.
Check *EcoPrint* setting.	• The EcoPrint mode can provides faint, unsharp printing because it acts to conserve toner for draft printing purpose. For normal printing, turn the EcoPrint mode off by using the **MODE SELECT** key on the printer's control panel.
Refresh drum.	• Try cleaning the drum surface using the printer's built-in cleaning system specifically provided for this purpose. For details, refer to page6-45.

Grey background



Check contamination on the main charger wire and the grid.	• Clean the main charger wire by pulling the green color main charger wire cleaner know in and out several times.
Check the grid plate (the mesh metal bottom part of the charger unit).	• The grid plate must be flat and fit horizontally in place. Replace the main charger unit if necessary.
Check the print density setting.	• The print density may be set too high. Try adjusting the print density using the **MODE SELECT** key. For details refer to the printer's user manual.
Check the surface potential of the drum.	• The drum potential should be approximately 240V for FS-1700/+ and 230V for FS-3700/+. These values may vary depending on production lots and the measurement is possible only by using the jig and tool specifically designed for this purpose: See Kyocera for details. The drum unit will have to be replaced if it will bear the values far out of the allowable range.
The developer unit may be defective.	• If a developer unit which is known to work normally is available for check, replace the developer currently used in the printer with it. If the symptom disappears, replace the developer unit with a new one.

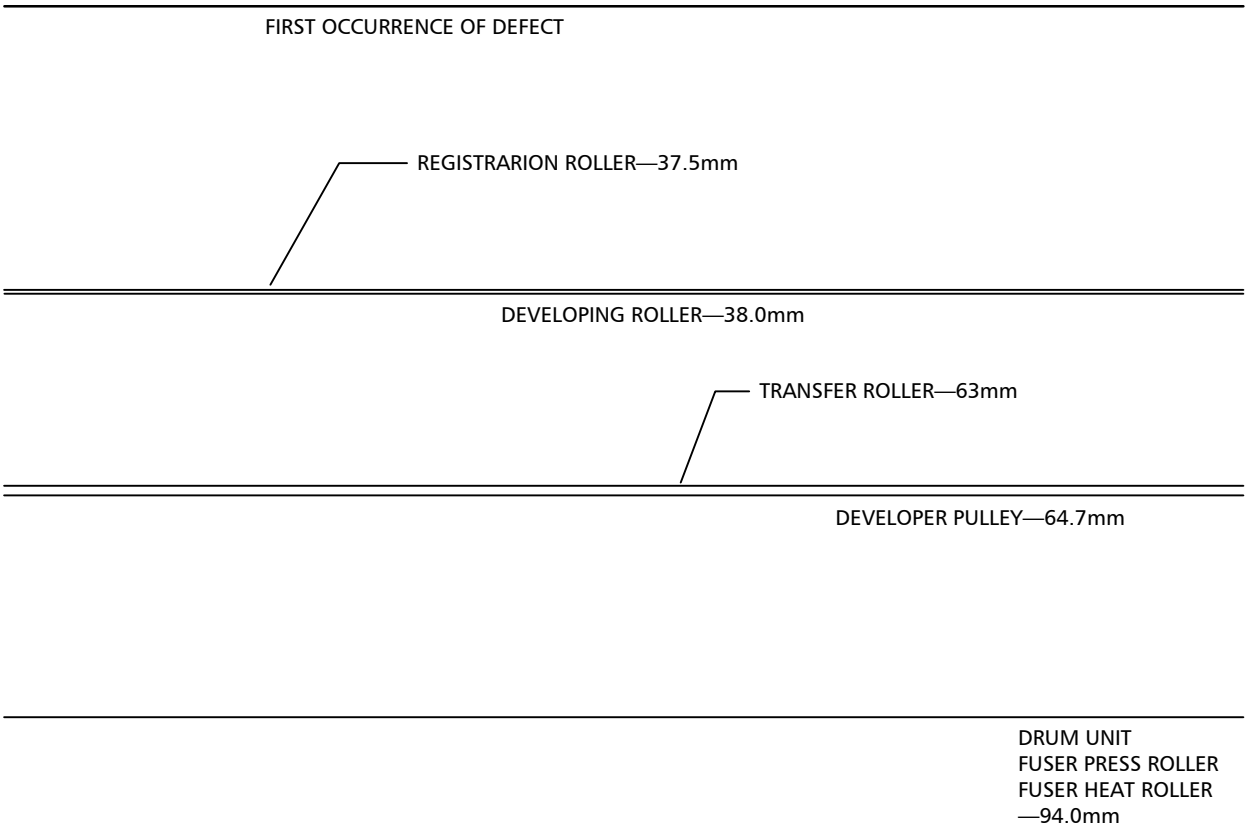
Dirt on the top edge or back of the paper



Check toner contamination in various parts.	• Dirty edges and back of the paper can be caused by toner accummulated on such parts as the paper chute, paper transportation paths, the bottom of the developer unit, and the fuser inlet. Clean these areas and parts to remove toner.
Check the transfer roller.	• If the transfer roller is contaminated with toner, clean the transfer roller using a vacuum cleaner; or by continuously printing a low-density page until the symptom has faded away.

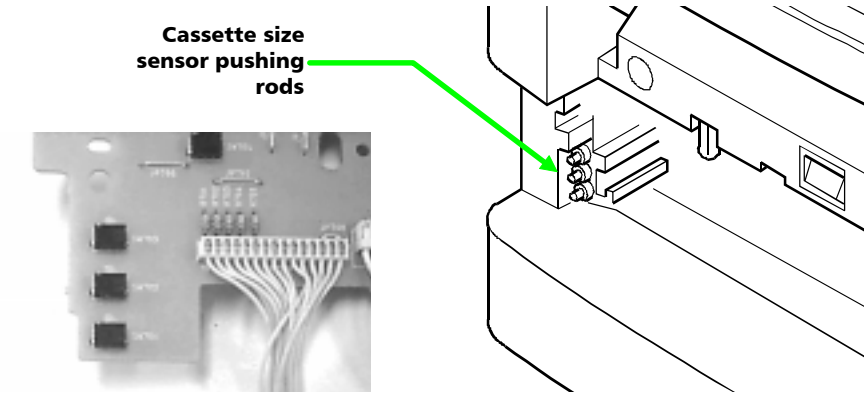
REPETITIVE DEFECTS GAUGE

Use the following measurements for checking repetitive occurrences on the printed page. See the above section for details.



CHECKING CASSETTE SIZE SENSORS

The printer tells the size of paper (cassette) to be fed by means of three sensors on the KP-498 board. These sensors (switches) are activated by the pushing pegs on paper cassettes in different paper sizes. If the sensors are not correctly activated in a correct matrix of activation, paper jam or printing defects like above may occur.



Paper size	SW701	SW702	SW703
B5	On	Off	Off
A5	Off	On	Off
A4	On	On	Off
Letter	Off	Off	On
Legal	On	Off	On
Cassette not present	On	On	On

Drum cleaning

This mode is meant to provide a *manual* means of drum cleaning in additioin to the regular cleaning procedure made automatically in a photographics cycle. In this mode, the drum turns for the period of approximately three minutes with no main charging dispersed over the drum. Since the cleaning blade in the drum continuously attempt to scrape soils and paper dust on its surface, the drum can be brought in a clean state.

To clean the drum using this feature, peform the following, top to bottom:

press	**MODE**	then,
press	✚ repeatedly until:	`Others>`
press	▸	then,
press	✚ repeatedly until:	`>Service>`
press	▸, the display should show:	`>>Developer`
press	✚, the display should show:	`>>Drum`
press	**ENTER**, the display should show:	`?`
press	**ENTER**	

The drum then starts turning and stops after approx. 3 minutes. The printer reverts to Ready.

Chapter Five C O N T E N T S

General Instructions

This chapter provides procedures for removal and replacement of field replacement components. For other components not shown in this chapter, the diagrams in the *Parts Catalog* attached with this manual will help locate the component.

For replacement of a component, use the reverse of the removal procedures explained in this chapter.

Before proceeding, make sure printer power is switched off and the power cord is unplugged from the printer. See **Warning** below.

Warning - To avoid injury to human bodies, make sure that AC power is removed and the power cord is unplugged from both the power line and the printer.

Screws/hardware

Screws and hardware used in the printer are listed in the beginning section of the *Parts catalog*. Symbol numbers also given in the list for these screws are referred to in the disassembling instructions in the following pages.

Caution - To secure a self-tapping screws, align it with the thread carefully. First turn it counterclockwise, then slowly clockwise. Do not over-tighten. In case the selftapped thread is damaged, the affected part must be replaced with a new part.

Disassembly road map

The diagram on page 5-4 is intended to give an idea on what order to be followed to reach the component. For example, in order to remove the drum unit, the toner container, developer unit, and the paper feed unit must be removed beforehand.

Note. In most cases, the toner container and the developer unit must be removed in the beginning.

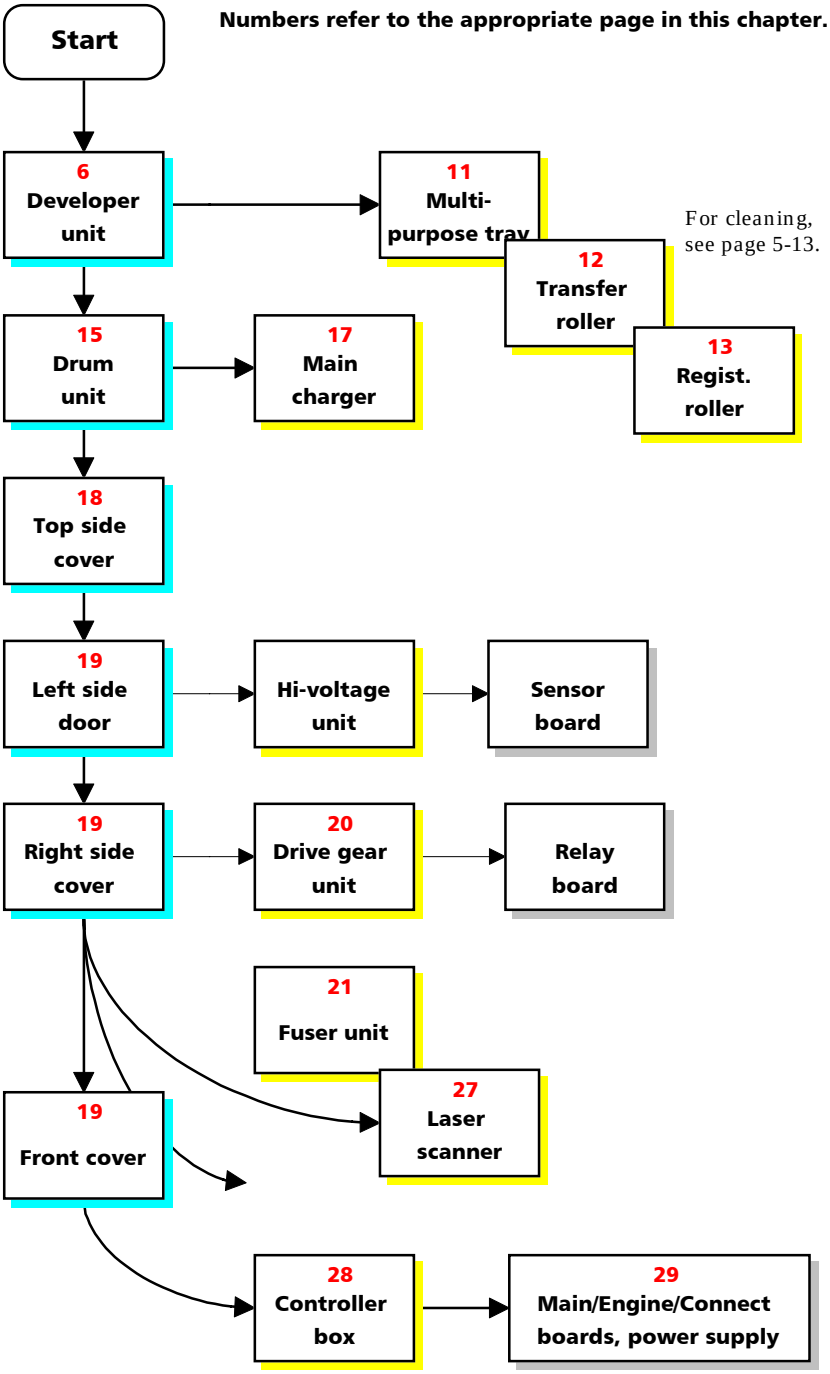
Use the reverse of removal procedures when replacing the component back in the printer. Observe whatever note provided to give critical handlings.

Warning - Before proceeding, unplug the power cord from the printer and the power supply.

Warning - Never attempt to operate the printer with a component removed.

Caution - The printer uses electrostatic-sensitive parts inside (on boards, laser scanner, etc.). Provide an antistatic (discharging) device, such as a wrist strap, that can effectively discharge your body before touching boards, laser scanner, etc.

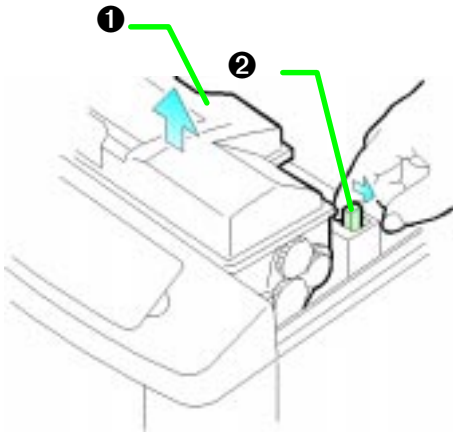
DISASSEMBLY ROAD MAP



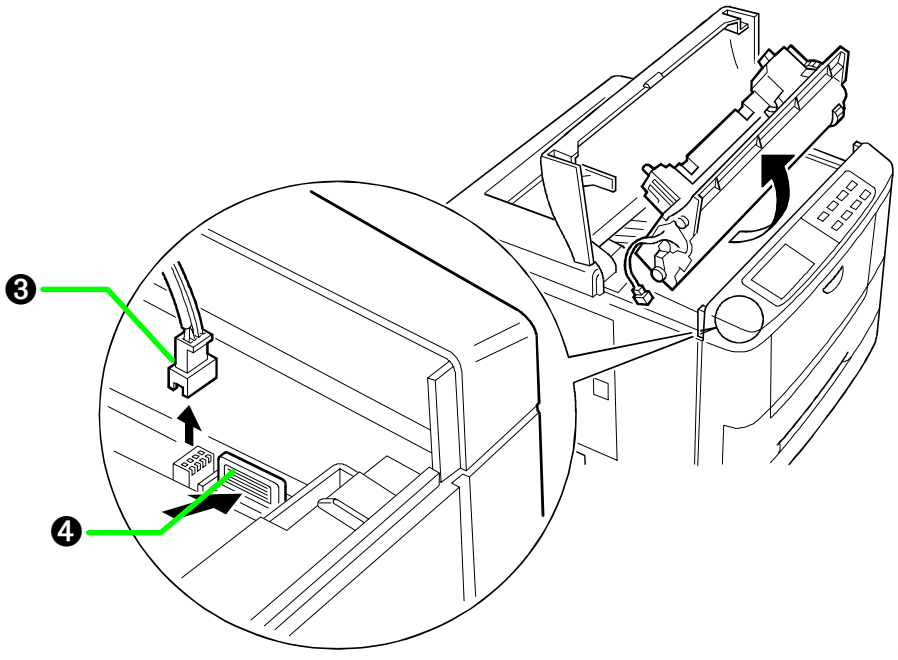
Disassembly

Removing the developer unit

Open the top cover. The toner container ❶ must be removed first: Pull the toner container release lever ❷ as below. Pull the toner container slowly up. To avoid toner adhering from spilling, keep it as level as possible.



After removing the toner container, remove the developer's connector ❸ from the printer. Then, while pressing the developer release lever ❹ towards the front of the printer, remove the developer unit.

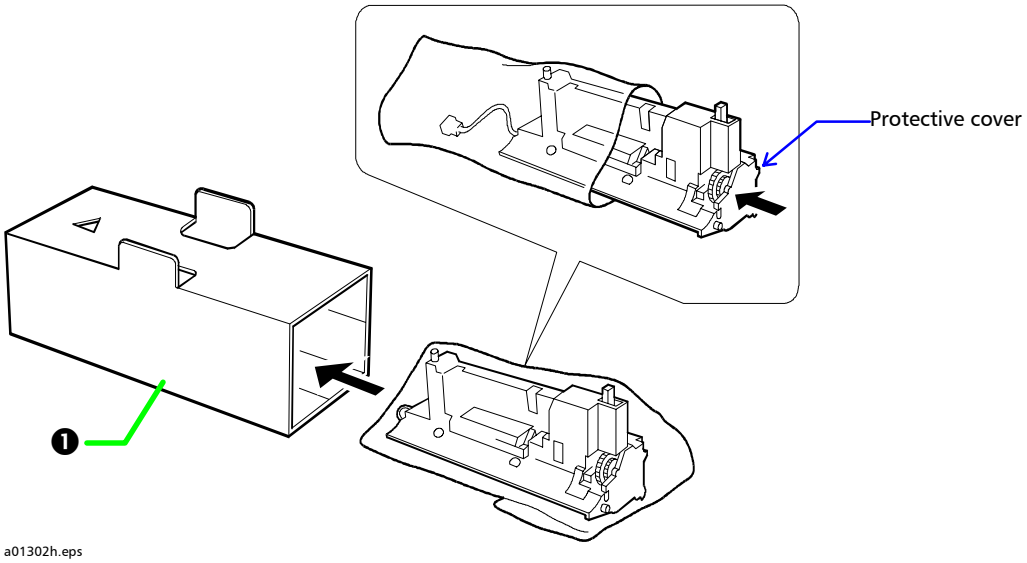


Note. After removing the developer, seal it in the protective bag and place it on a flat surface. Do not place the developer in a dusty area. If you ship the developer, pack it in the shipping container specifically supplied with the printer. See **Shipping the developer unit** on page 5-8. Also do not touch the developing roller of the developer. Do not place floppy disks near the developer.

Shipping the developer unit

If the developer unit is shipped (the developer must be shipped separately if the printer is shipped), it must be fit in the shipping container ❶ supplied originally with the printer.

First, flap the magnet roller protective cover down. Put the developer unit in the plastic bag supplied with the shipping container. Put the developer unit into the shipping container.



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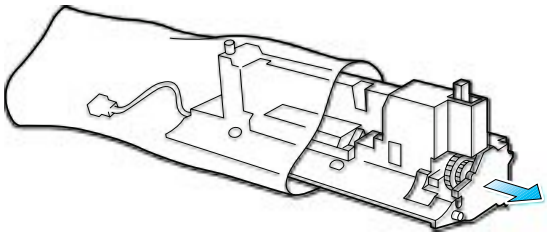
Installing a new developer

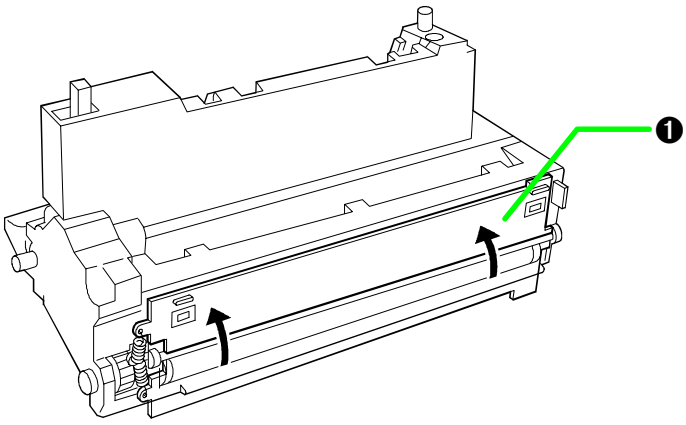
Use the following developer kit for replacement. This kit is commonly used with all models.

Kit	FS-1700/+	FS-3700/+
Developer unit	DV-20	DV-20

Produce the developer unit from the protective bag.



Flap the magnet roller protective cover ❶ up.



Install the developer using the reverse manner of removing the developer explained above. Connect the developer connector.

Removing the paper feed unit

The paper feed unit can be removed from the printer without using tools. First**, be sure to remove the paper cassette entirely out**. Otherwise, the paper feed unit will not come out.

To remove the paper feed unit, first remove the paper cassette out. While holding and pushing the locking tabs ❶ at both sides of the paper feed unit, draw the paper feed unit all the way out.

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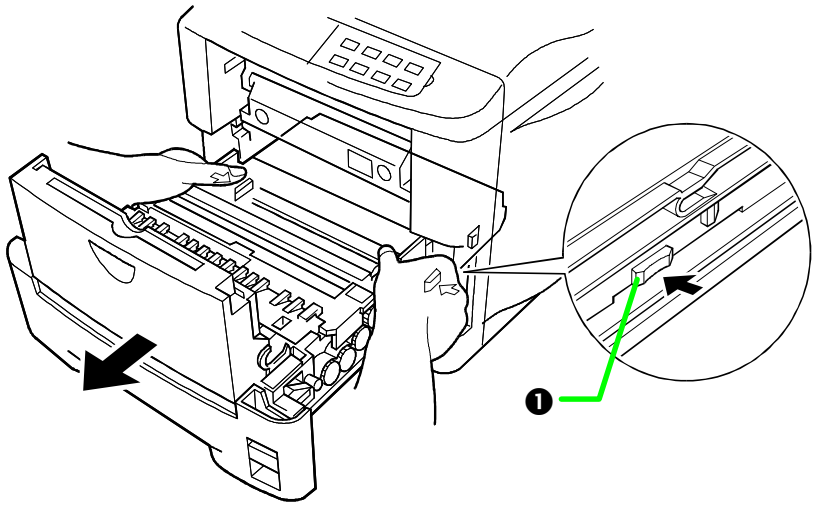
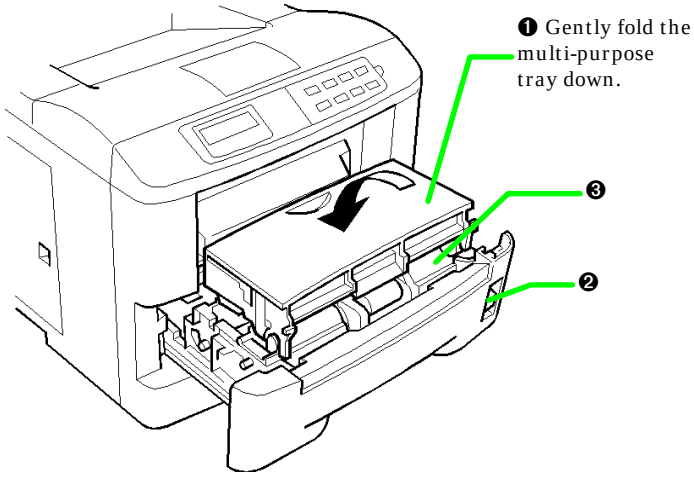
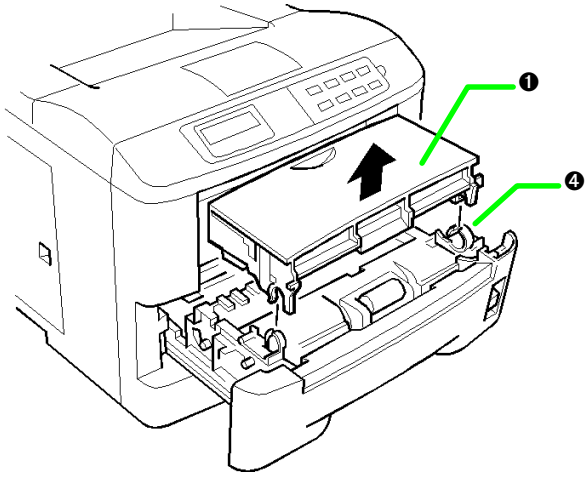


Removing the multi-purpose tray

To remove the multi-purpose tray ❶, pull the paper feed unit release lever ❷ up and draw the paper feed unit ❸ out. Then proceed as follows:



Holding the tray by both ends, pull it up until catches ❹ are released.



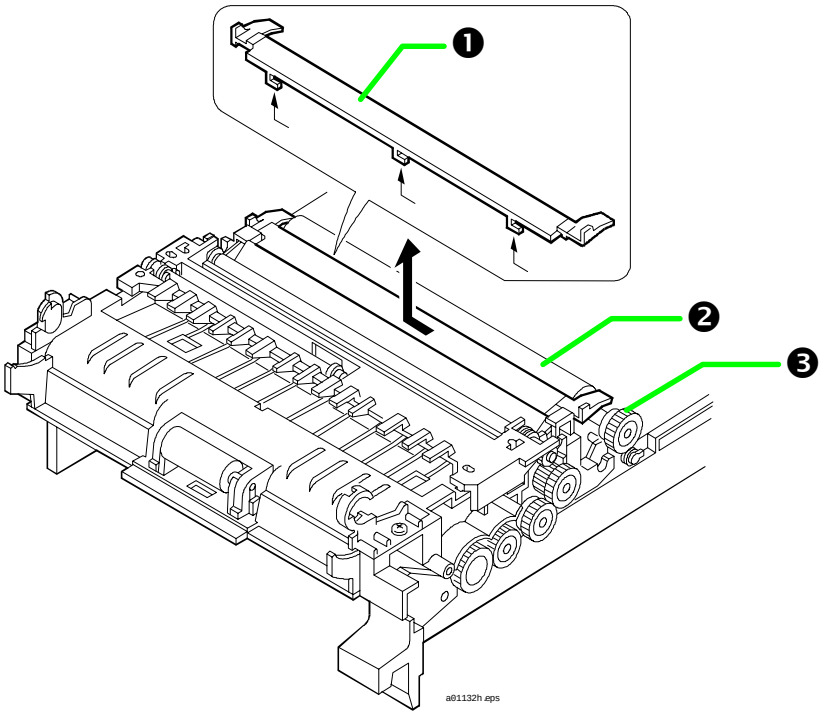
Removing the transfer roller

Before removing the transfer roller, remove the paper feed unit out of the printer.

Caution - Do not touch the transfer roller (sponge) surface. Oil and dust (particles of paper, etc.) on the transfer roller can significantly deteriorate the print quality (white spots, etc.).

Remove the transfer roller cover ❶. Facing front the paper feed unit, move it to left. Using a small flat blade screw, pull the left end of the cover.

The transfer roller ❷ is held in place by two axle holders that hold the roller axle at both ends. Hold and pull the gear ❸ at the right end of the roller up, then remove the left end.



CLEANING THE TRANSFER ROLLER

To clean the transfer roller, hold it by its gear so that the roller hangs down horizontally. Use a vacuum cleaner, moving nozzle along the roller, **but do not let the nozzle directly touch on the roller**. Thoroughly clean the entire surface of the roller.

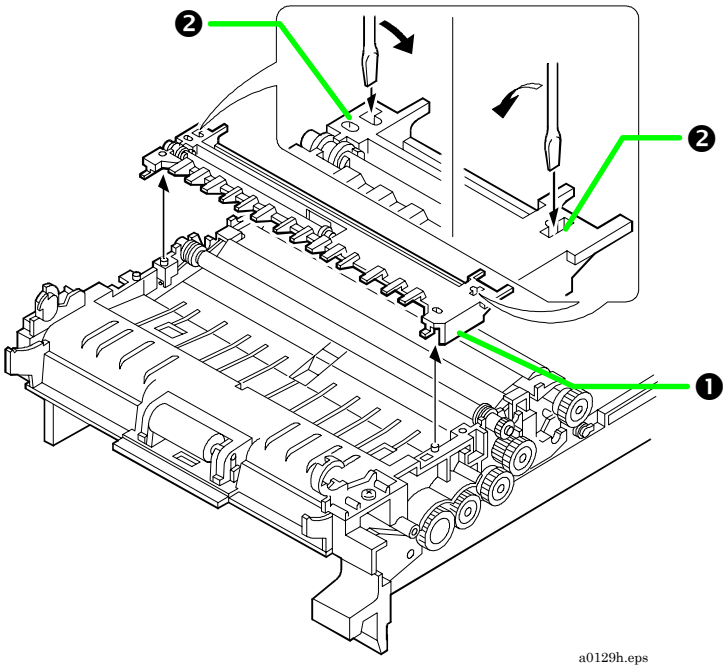
REPLACING THE TRANSFER ROLLER

Carefully clean the left side (facing the front of the paper feed unit) axle end before replacing the transfer roller. This end of the axle is directly applied with the high voltage transfer bias.

Removing the registration rollers

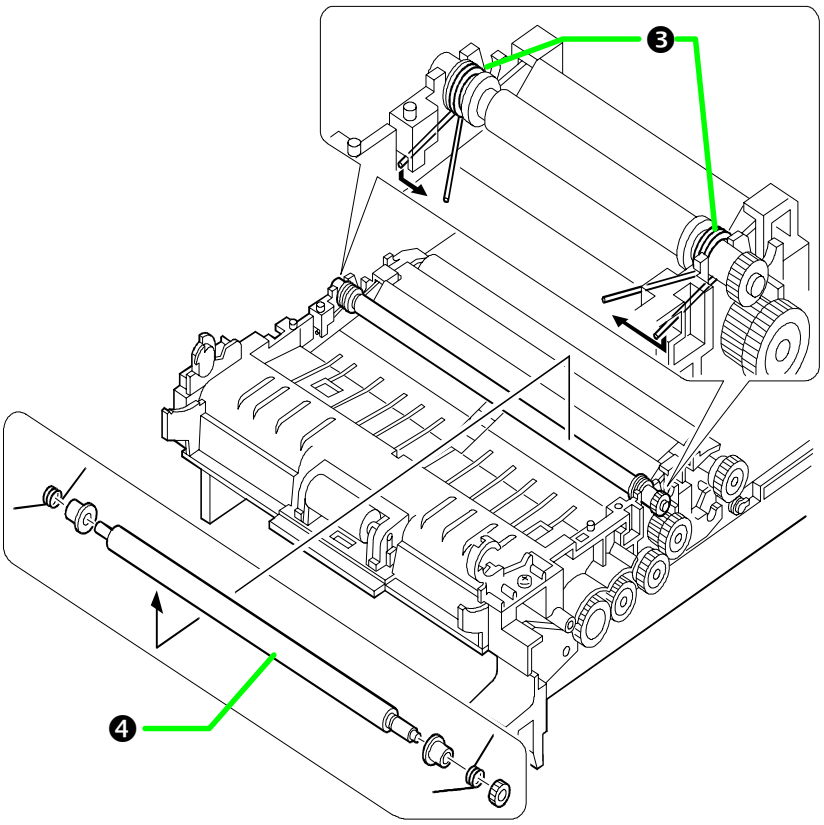
Before removing the registration rollers, remove the paper feed unit out of the printer. See **Removing the paper feed unit** on page 5-10.

Remove the registration rollers cover ❶. The cover is locked by two catches that lock it onto the paper feed unit. These catches can be accessed through the holes ❷ on the cover. Insert a screw driver as shown below and release the locks.



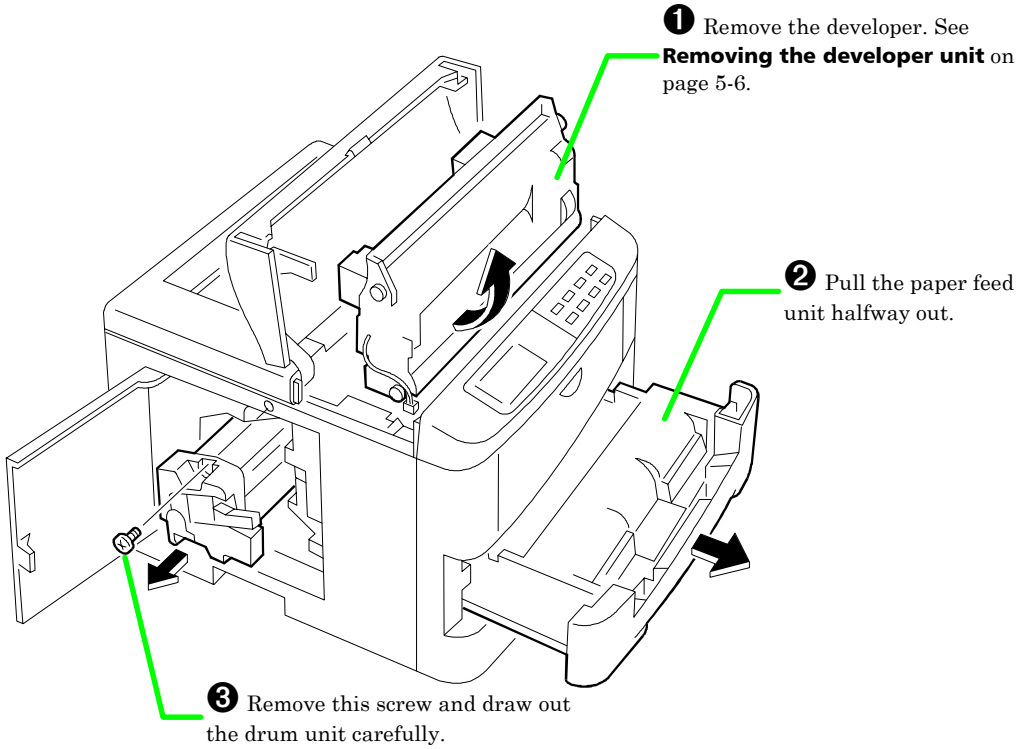
Remove the coil springs ❸ that are used to secure and press the top (metal) registration roller ❹ towards the bottom (rubber) registration roller underneath.

Protect your eyes with goggles.



Removing the drum unit

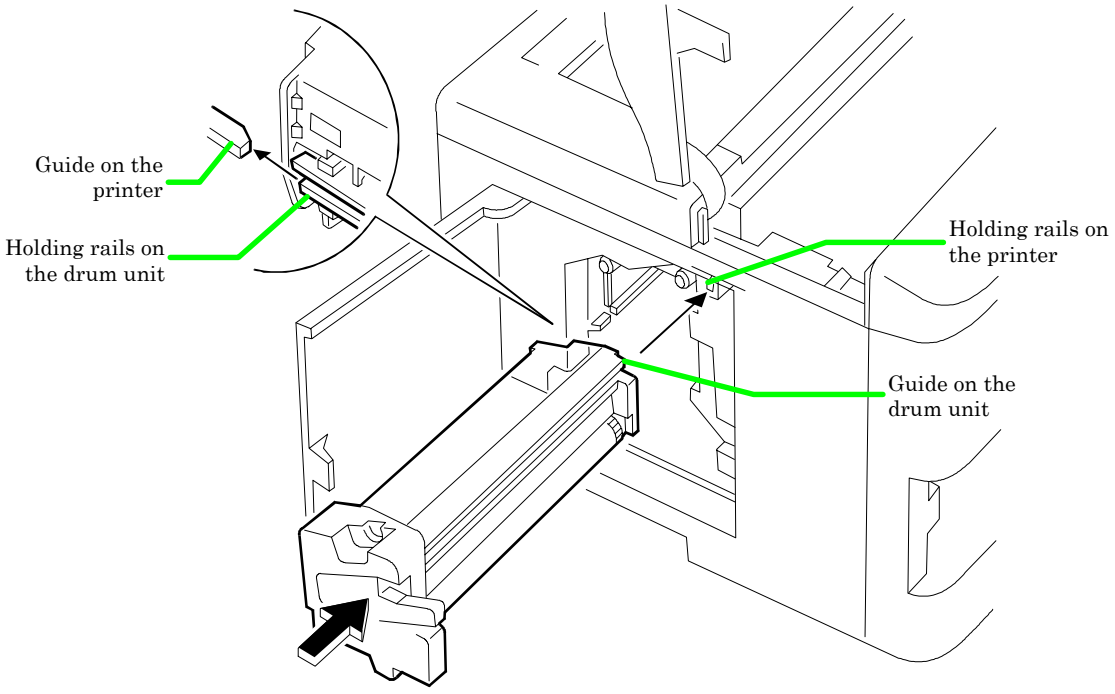
Caution - Before removing the drum unit ❸, be sure to remove the developer unit ❶ and draw out the paper feed unit ❷ half way. Do not attempt to forcibly pull out the drum without first having done all of these procedures.



Caution - Store the drum unit in a clear, clean place, not exposed to a strong light source. Seal it in a protective bag. Avoid bump the drum surface onto hard objects.

Replacing the drum unit

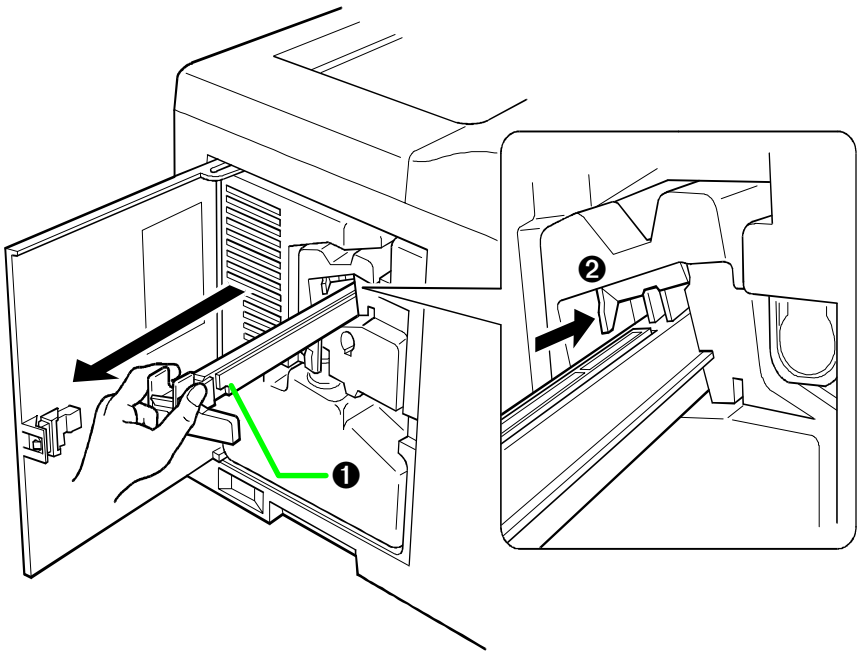
To replace the drum unit into the printer, be sure to align the guides and rails on the drum unit with each other. Do not force to slide the drum unit in unless they are properly aligned with each other.



Main charger unit

Pull the main charger ❶ until it stops. While pushing the (white) locking peg ❷ inwards the printer, pull the main charger unit all the way out.

The main charger unit is technically explained in chapter 4, *Operation*.



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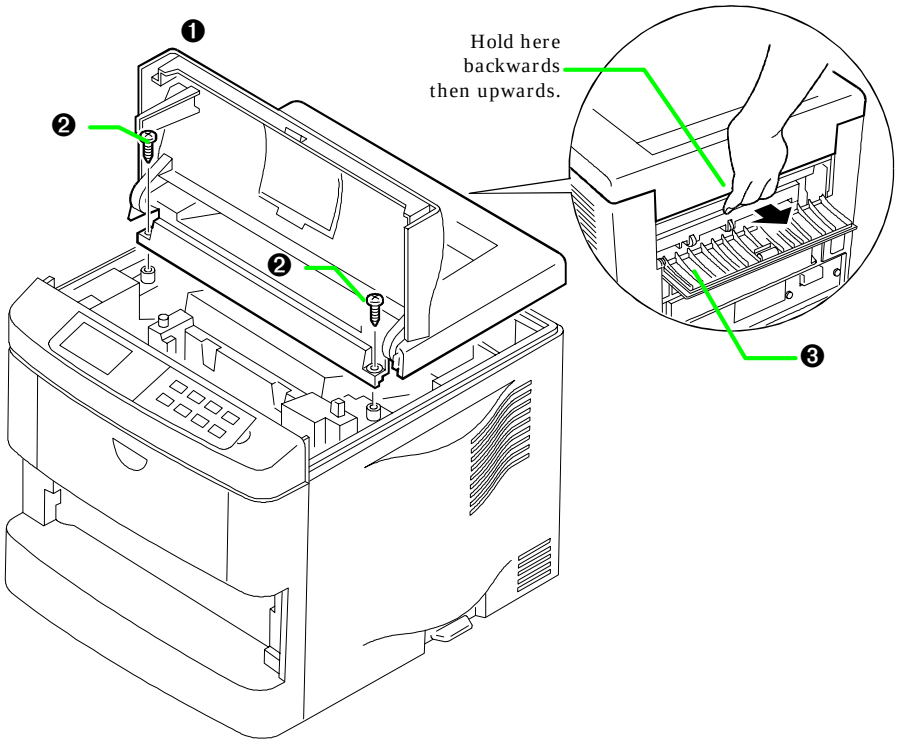
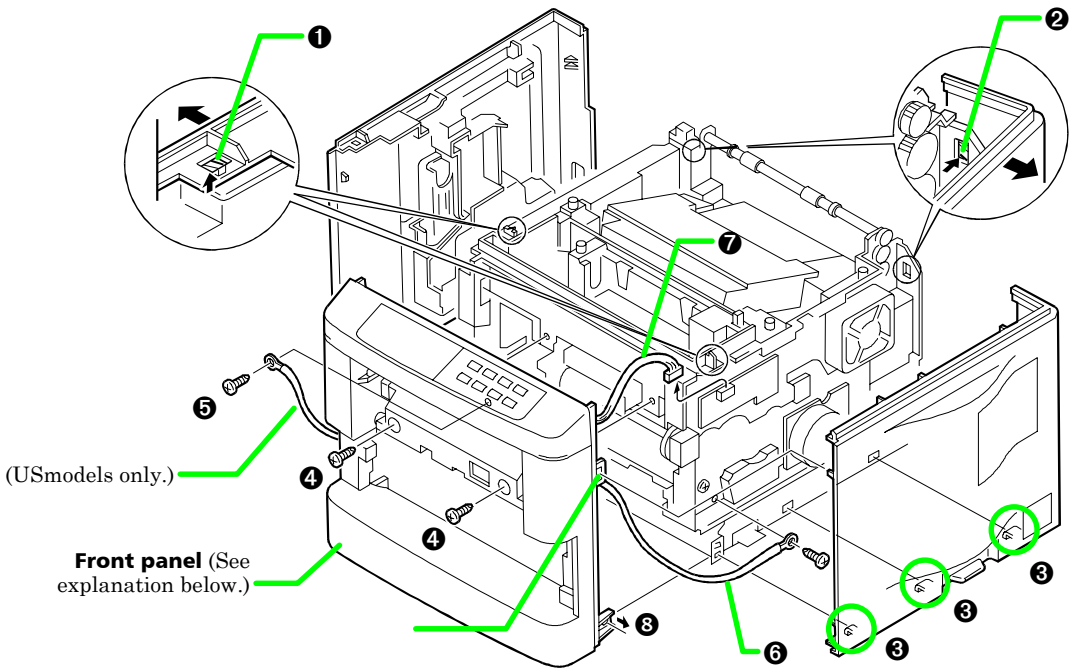
Top side cover

Open the toner container access door ❶. Remove two screws ❷. While holding the spring-loaded back side cover ❸ to open, pull the back plane of the top cover away from the printer, then pull it upwards to remove.



Removing covers

The left and right side covers are snapped onto the chassis by catches and holes. No screws are used. To remove the left and right side covers, release those catches and holes at the front ❶ and the rear ❷ from each other, by inserting a small flat blade screw driver between the cover and the chassis. Then, free the catches at the bottom ❸ by lowering the top side of the cover downwards.

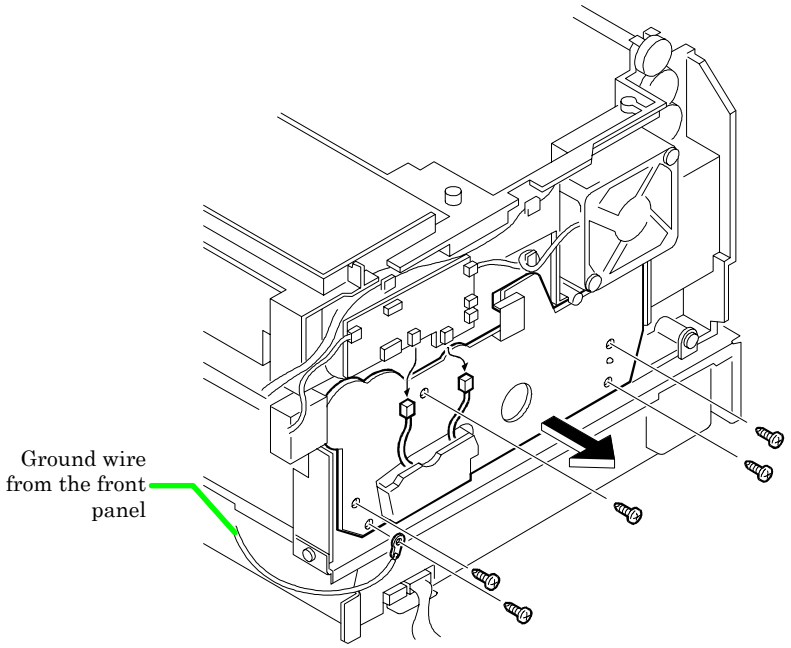


Removing the front panel

See the picture above. Remove two screws ❹ that secure the front panel to the chassis. Remove the ground wire from the chassis front ❺. Remove the other ground wire ❻. Unplug the connector ❼. Release catches ❽ in four parts. Remove the front panel.

Removing the drive gears assembly

The right side cover must be removed first. Remove five screws. Detach two connectors. Then remove the drive assembly from the printer.

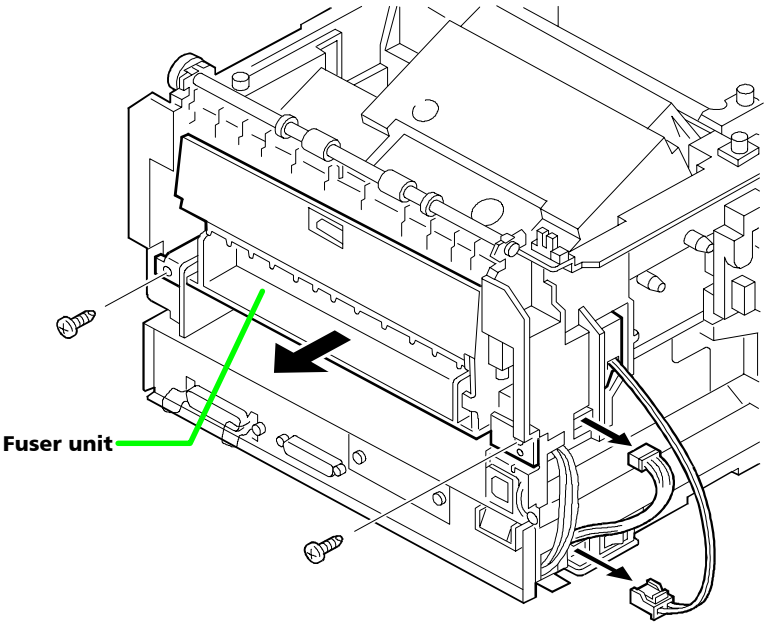


Removing the fuser unit

Before removing the fuser unit, remove the covers first (Refer to **Removing covers,** page 5-19.

Warning - The fuser is hot after the printer was running. Wait until it cools down.

Disconnect plugs first. To remove the fuser unit remove two screws at the back.



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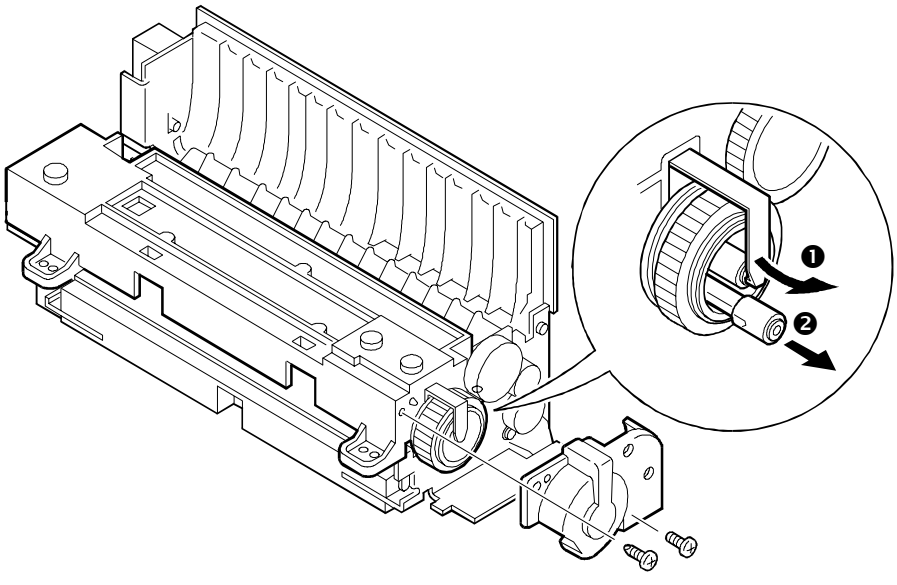
Removing the heater lamp

Warning - The heater is extremely hot immediately after the printer was running. Allow substantial period of time until it cools down. Also, the heater is fragile: Handle it with great care.

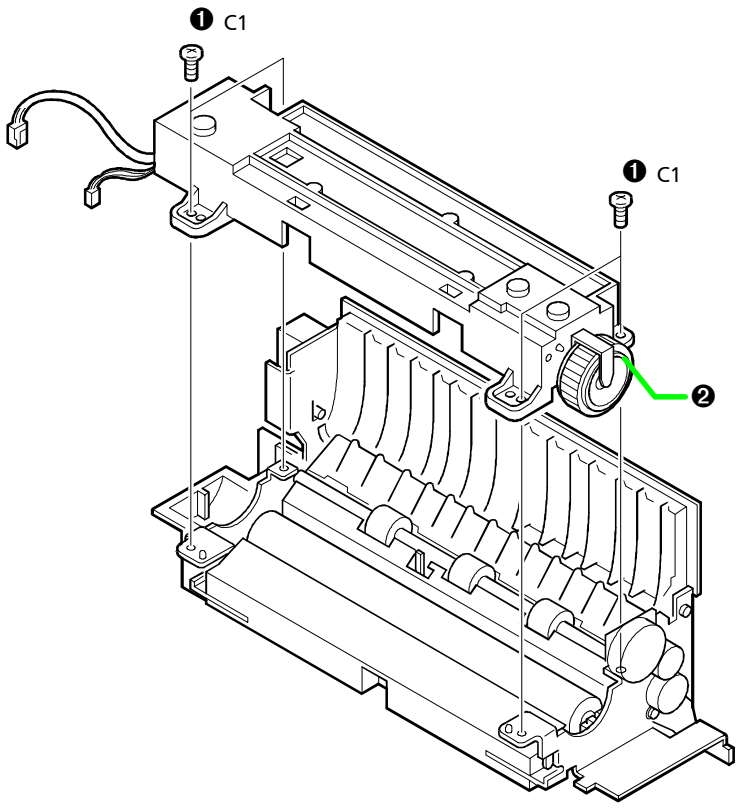
To remove the heater lamp, remove two screws on the cover at the right side of the fuser unit. Remove the cover. Slightly pulling the terminal outward ❶, so that it bends to free the heater head ❷, draw the heater lamp out.

Note. Do not directly touch on the heater lamp. Finger prints on the heater's outer surface can prevent proper fusing of toner on paper. A01126dm.eps



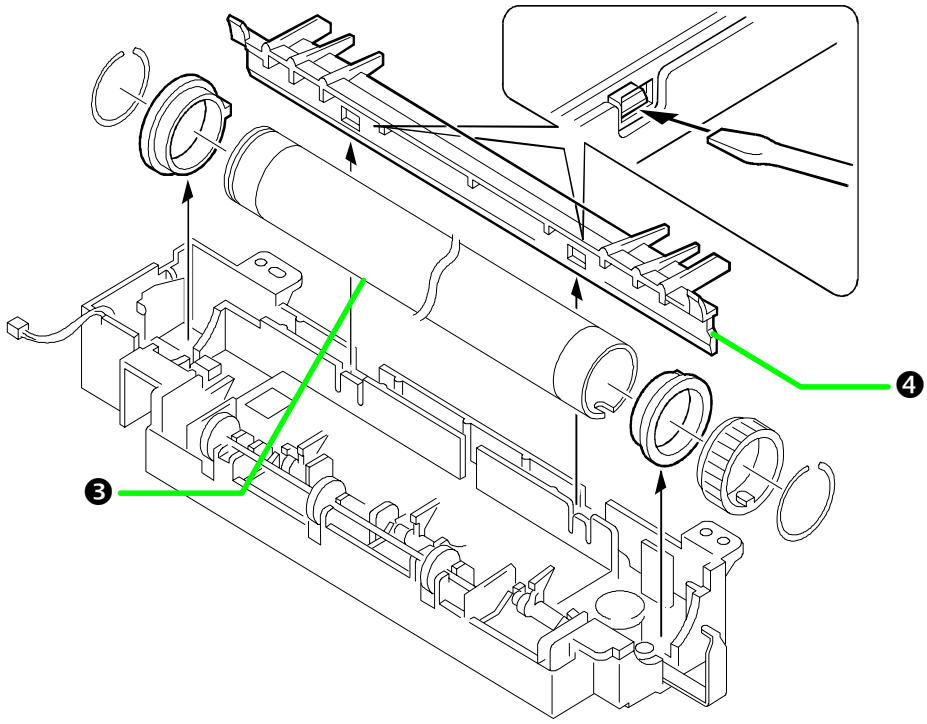
Replacing the fuser rollers

Remove four screws ❶ on the top case. Use care not to let the top (heat) roller ❷ fall when lifting the top case.



To gain access to the heat (metal) roller ❸, the roller retaining plate ❹ must be removed. To remove the retaining plate, use a small flat blade screwdriver inserting it into the gaps as shown in the figure below.

Caution - Special care should be taken not to let the screwdriver go too far into the hole. Such an action can irrevocably damage the roller surface.



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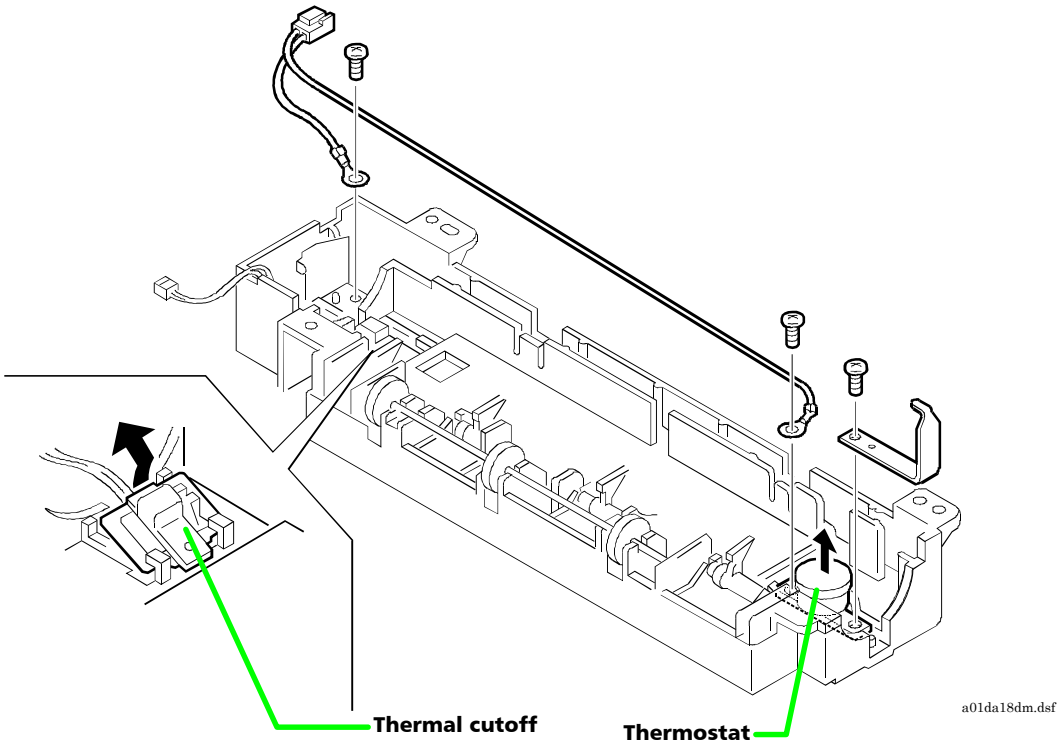
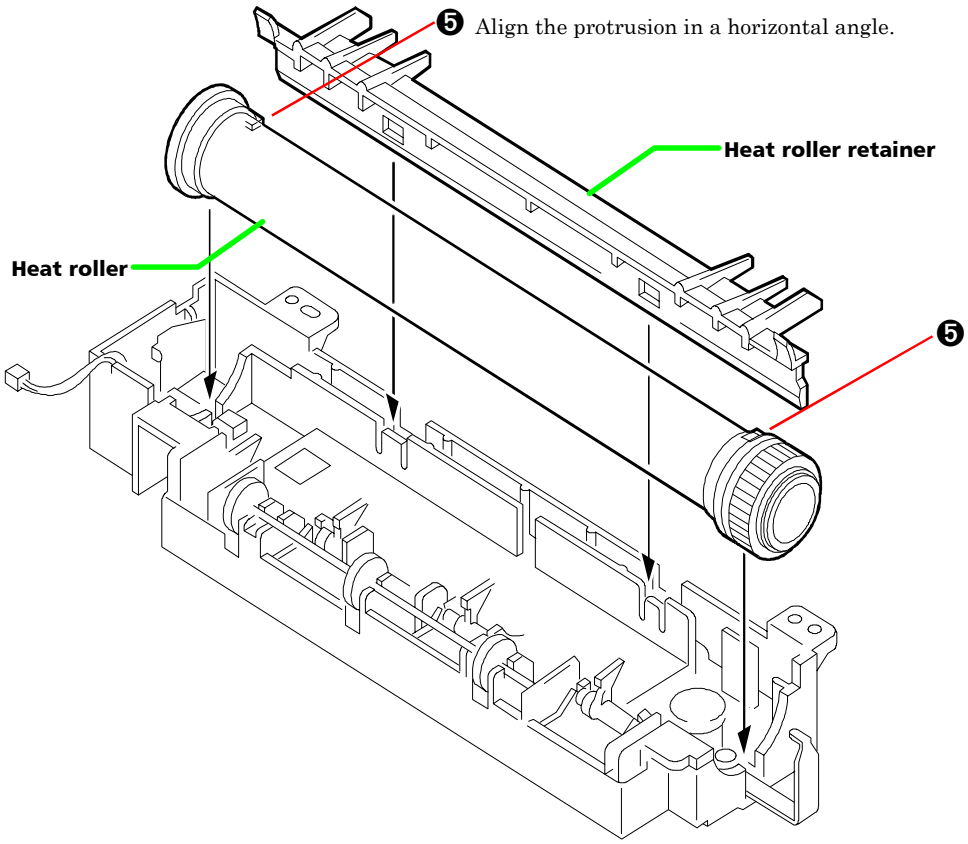
Removing the themostat and thermal cutoff



Replacing the heat roller

To replace the heat roller, align the protrusions ❺ on both collars so that they face the paper input side (the drum unit side) [horizontally].

Then insert the heat roller retainer ❹ back in place.

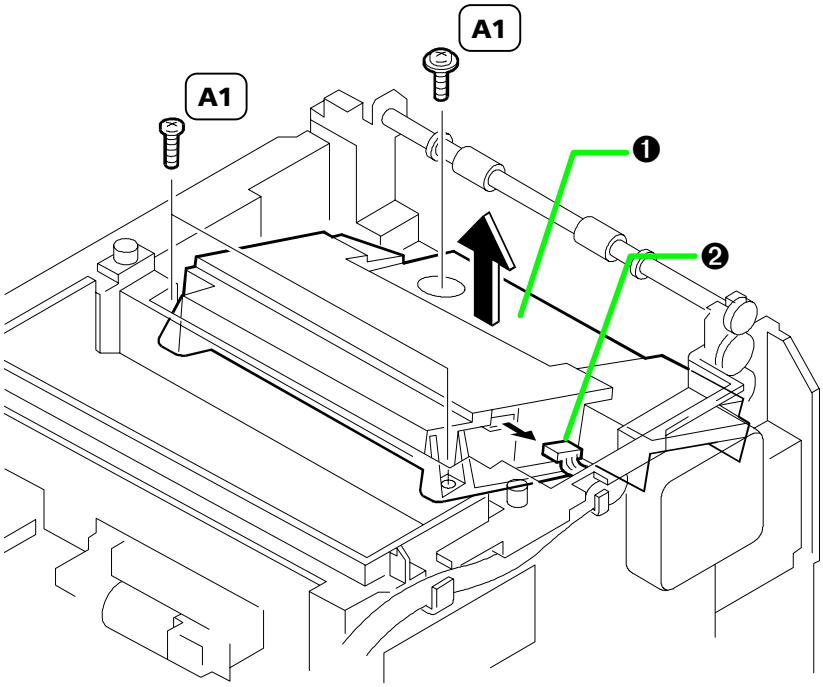


Removing the laser scanner

To remove the laser scanner, the top cover must be removed first. For details on removing the top cover, refer to **Removing covers** on page 5-19.

Warning - The laser scanner contains electrostatic-sensitive parts inside (laser diode, etc.). Before touching the laser scanner, provide an antistatic (discharging) device, such as a wrist strap, that can effectively discharge your body.

To remove the laser scanner ❶, remove a connector ❷. Remove three screws. **After removing the scanner, handle it carefully.**

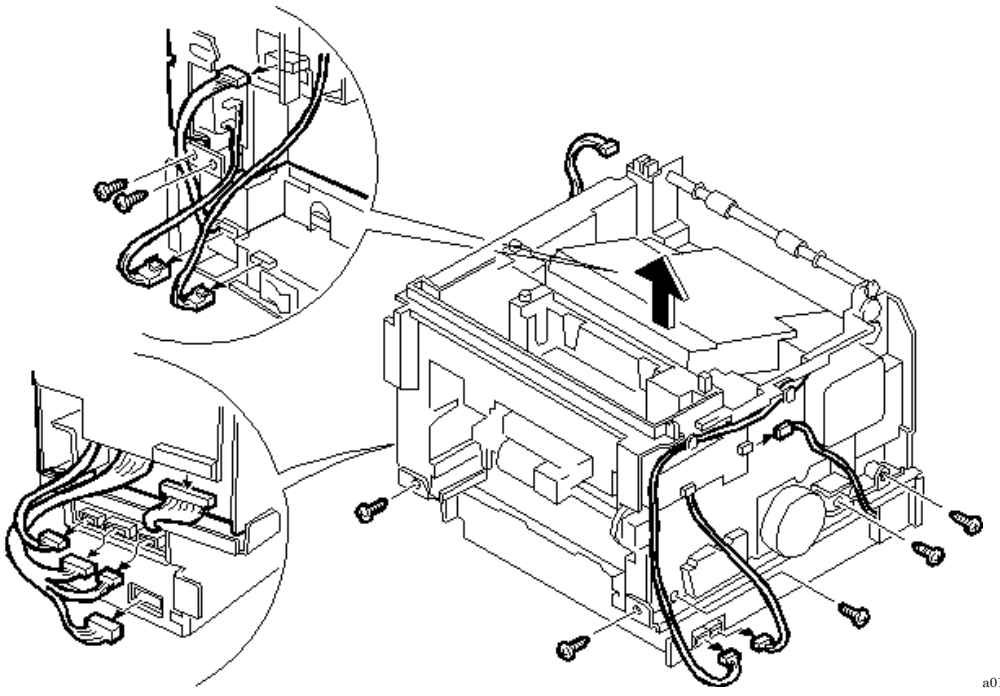


Removing the controller box

Before removing the controller box, the following parts must be removed in the order indicated. (For details on removing these parts, refer to the page enclosed by brackets.)

- Developer (Page 5-6)
- Drum unit (Page 5-16)
- Top side cover (Page 5-19)
- Left side cover (Page 5-19)
- Right side cover (Page 5-19)
- Front panel (Page 5-19)

Remove the connectors, then remove the screws as shown in the diagram below.



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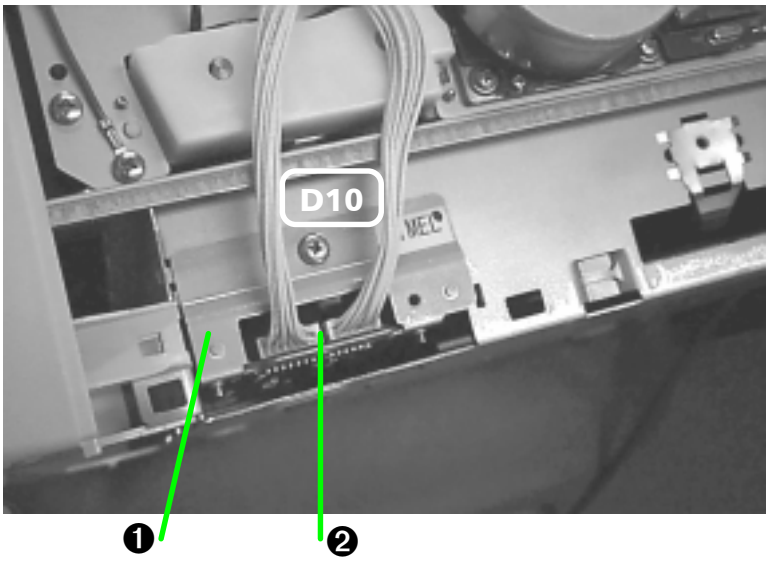
Removing the engine board

In prior to removing the engine board, remove the following parts (For details on removing these parts, refer to the page enclosed by brackets.):

- Top cover (Page 5-5-18)
- Right side cover (Page 5-5-19)
- Memory card [if inserted in the slot]
- Main controller board [Remove three screws securing the board to the rear panel.]

To remove the engine board ❶, remove two connectors ❷; then remove a screw **D10**. Draw out the engine board slowly along the rails.



Use the reverse procedure to replace the engine board back in the printer.

Chapter Four O P E R A T I O N O V E R V I E W

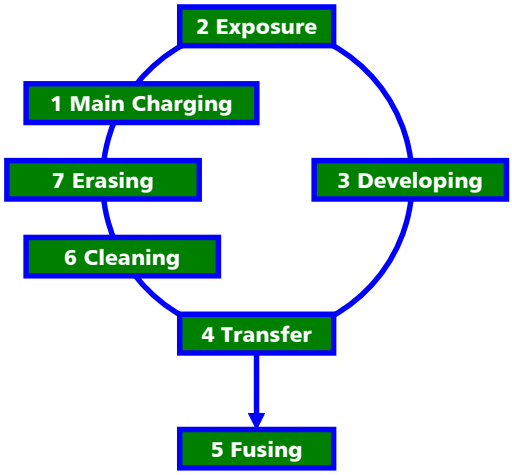
Electrophotographics system

Electrophotography is the technology used in laser printing which transfers data representing texts or graphics objects into a visible image which is developed on the photosensitive drum, finally fusing on paper, using light beam generated by a laser diode.

The key features for the electrophotography system used in the printer are:

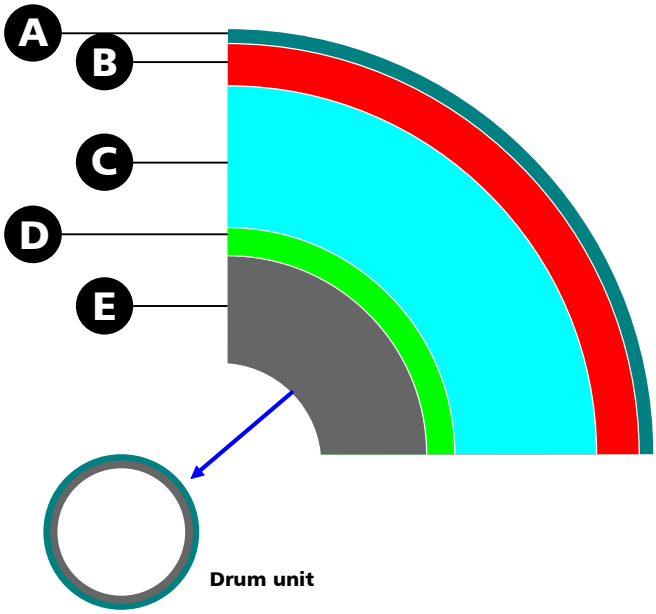
- ❒ 600 dpi resolution
- ❒ Newly developed amorphous silicon drum with no heating device
- ❒ Diode laser scanning
- ❒ Mono component toner

The electrophotography system of the printer performs a cyclic action made of seven steps as shown below.



Amorphous-silicon drum

The printer uses the long lasting amorphous silicon drum. The drum surface is a composite of five substances coated in five layers as shown below.



A Secondary protection layer

B Primary protection layer (1µm)

C Photoconductor α-Si

D Carrier block (1-3µm)

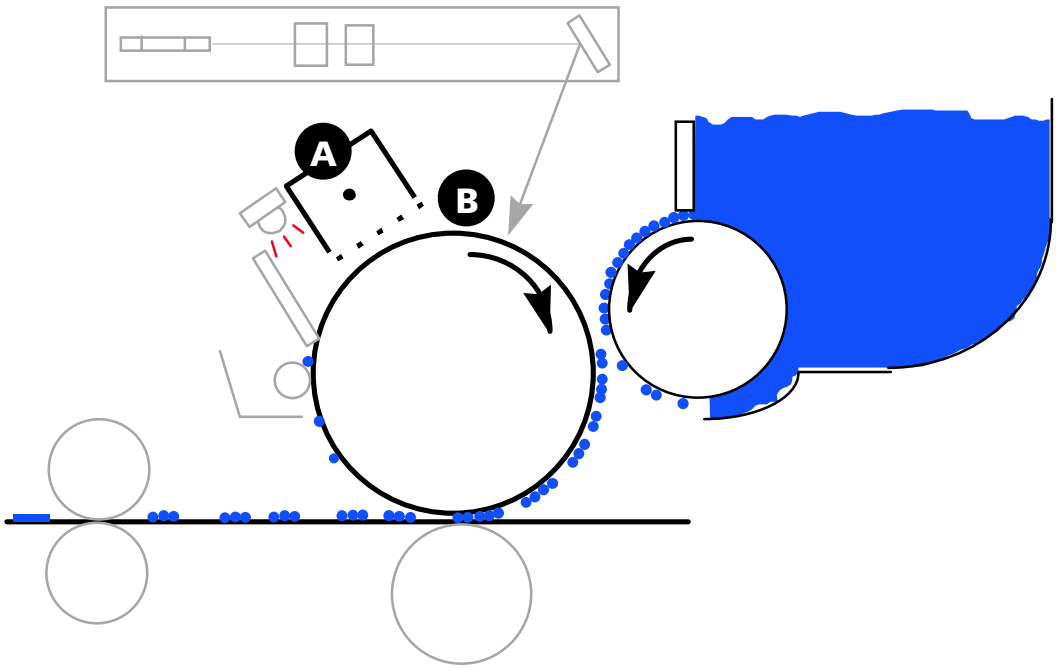
E Aluminum base

The primary and secondary layers are for protecting the amorphous silicon layer underneath. The amorphous silicon layer is of photoconductive, meaning it can be electronically conductive when exposed to a (laser) light source to effectively ground electrons charged on its outer surface to the ground. This layer is approximately 15µm thick for the FS-1700 and FS-3700; and approximately 9µm for the Plus Series.

The carrier block layer lies between the amorphous silicon layer and the aluminum base cylinder and prevents the backward electron flow, from the base cylinder to the drum's outer surface, which might give adverse effect (usually "ghost") on the print quality.

Charging the drum

Figure below is a simplified diagram of the electrophotographics components. Charging the drum is done by the main charger wire (in the main charger unit) marked **A** in the diagram.

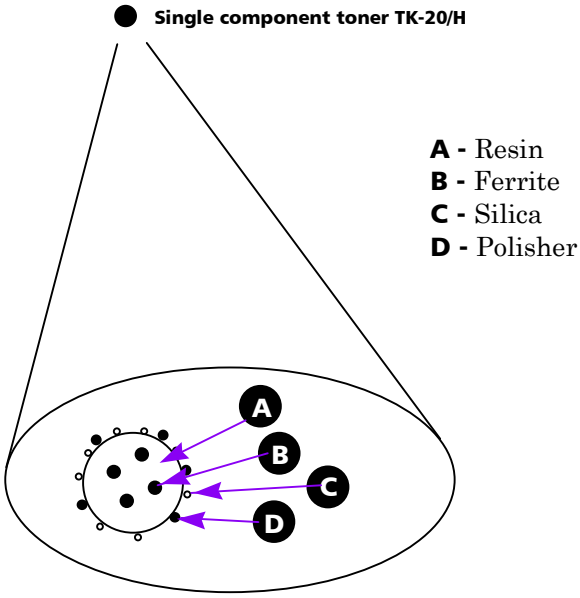


As the drum (**B**) rotates in a “clean (neutral)” state, its photoconductive layer is given a uniform, positive (+) electrical charge dispersed by the main charger wire (**A**).

Due to high-voltage scorotron charging, the charging wire can get contaminated by oxidization and therefore must be cleaned periodically from time to time using the method explained in section **Main charger unit** on page 3-7. Cleaning the charging wire prevents print quality problems such as black streaks caused by the oxide accumulated around the charging wire.

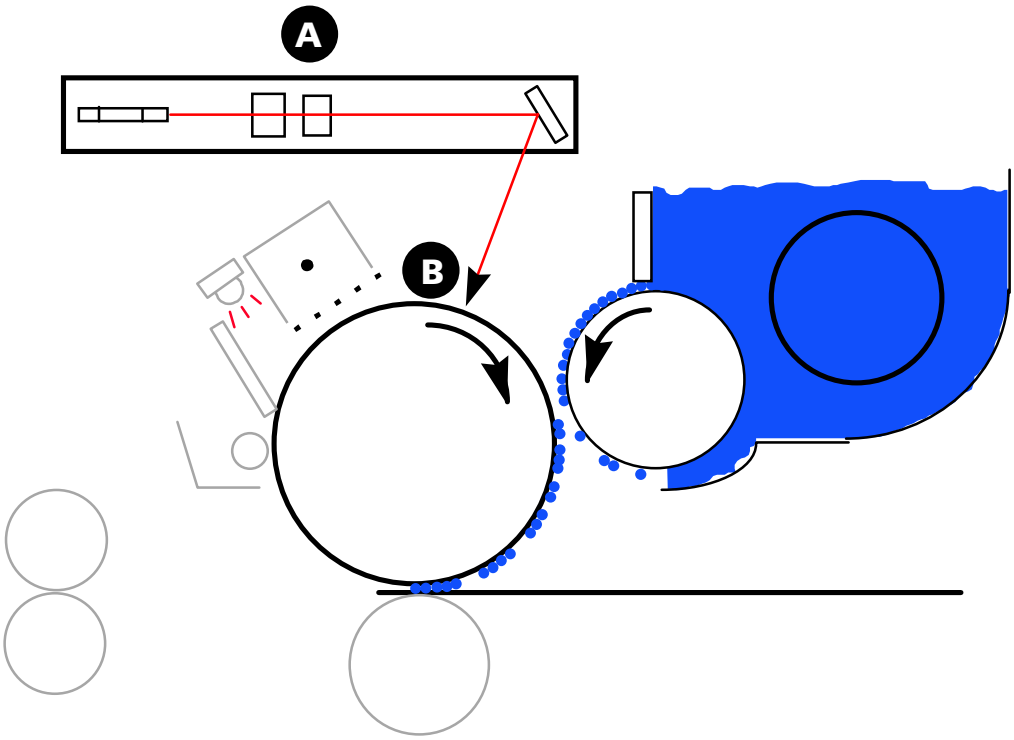
Toner

The toner is fed from the toner pack TK-20/H. The toner is comprised of the following substances as depicted below.

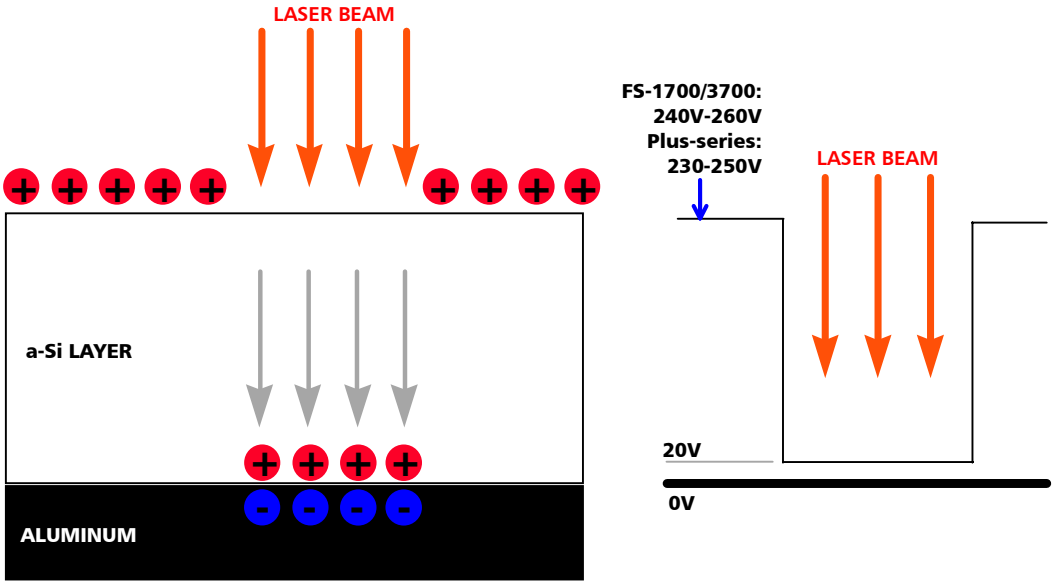


Exposure

The charged surface of the drum (“B”) is then scanned by the laser beam from the scanner unit (“A”).

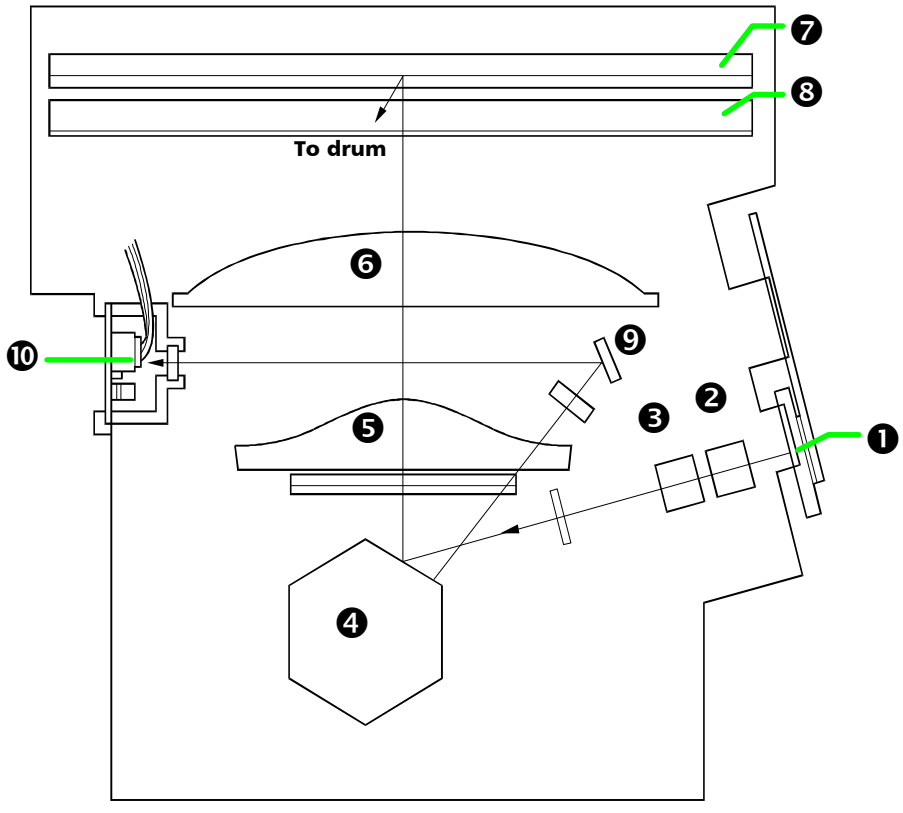


The laser beam is switched on for a black dot and off for a white (blank) dot according to the print data. Whenever it is illuminated by the laser beam, the electrical resistance of the photoconductor is reduced, the potential on the photoconductor is also lowered to 20V, effectively driving the charge through the a-Si layer down to the aluminum base.



Scanner unit

The 600 dpi scanner unit includes the diode laser that produces the 670 nm wavelength laser beam. This wavelength is specifically designed to match the photoconductive response of amorphous silicon.



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The illustration shows the laser scanner for model FS-3700/+.

❶ **Laser diode -** emits diffused, visible laser.

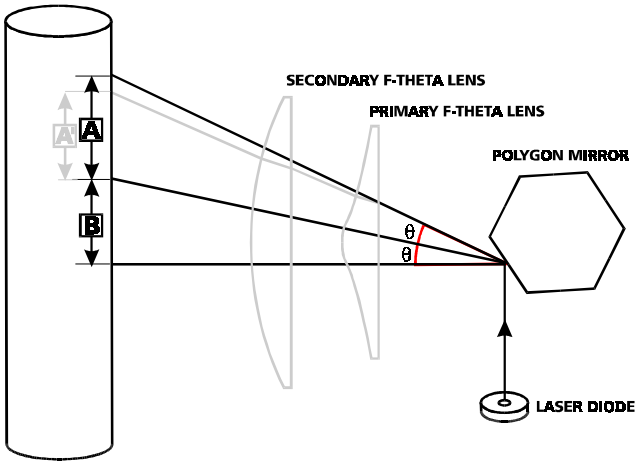
❷ **Collimeter lens -** aligns the laser beam to the cylindrical lens.

❸ **Cylindrical lens -** compensates the slant angle at which the laser beam hits a polygon mirror segment.

❹ **Polygon mirror (motor) -** has six mirror segments around its octagonal circumference; each mirror corresponding to one scanned line width on the drum when laser beam scans on it.

❺ **Primary f-theta lens -** See below.

❻ **Secondary f-theta lens -** The primary (above) and secondary f-theta lenses equalize focusing distortion on the drum edges. The effective length of line ("A," "B" below) the laser beam draws on the drum becomes longer as the laser beam hits closer to the drum edges. In the figure below, distances represented by "A" and "B" are not the same (A>B) until the f-theta lenses are provided between the polygon mirror and the drum (A'=B).



❼ **Diversion mirror -** diverts the laser beam vertically onto the drum. Note the diffused laser beam finally pin-points on the drum.

❽ **Protective glass -** prevents dust, debris, etc., from entering the scanner assembly.

❾ **Sensor mirror -** bends the very first shot of a laser scan towards the beam detection sensor (See next.).

❿ **Beam detector sensor -** when shone by the sensor mirror above, this photosensor generates a trigger signal for the engine controller to start activating the paper feeding system.

Scanning laser

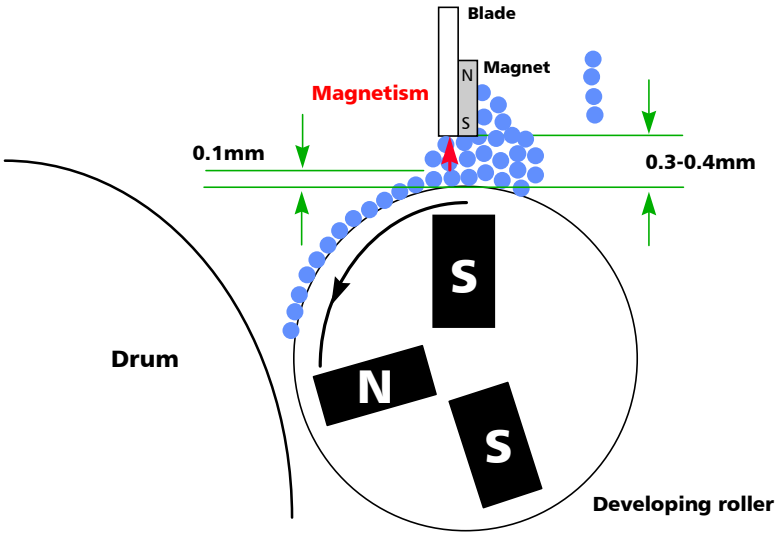
The laser beam hits one of six polygonal mirrors. As the mirror revolves (at the revolution of 17,000 rpm for model FS-1700/+; 27,000 rpm for model FS-3700/+), the laser beam reflects off of it and reaches the charged drum surface in a lengthwise manner.

A pair of (plastic) lenses provides focusing the horizontally sweeping laser beam onto the drum. As the drum rotates, the laser beam sweeps the entire length of the drum so that the drum's entire circumference is exposed to the laser beam. The revolution of the polygon mirror motor and the drum itself is timing-controlled so that each successive sweeping of the laser beam produces a $^1/_{600}$ inch offset. The printer's controller system continuously turns the laser beam on and off to put a dot at every $^1/_{600}$ inch distance horizontally. The diameter of a dot is typically 70 μm.

Synchronizing the output data with one scanning line is achieved by the photo sensor provided next to the first mirror. At the beginning of each laser sweeping, the beam hits the photo sensor which in turn sends a command to the logic controller for synchronization.

Development

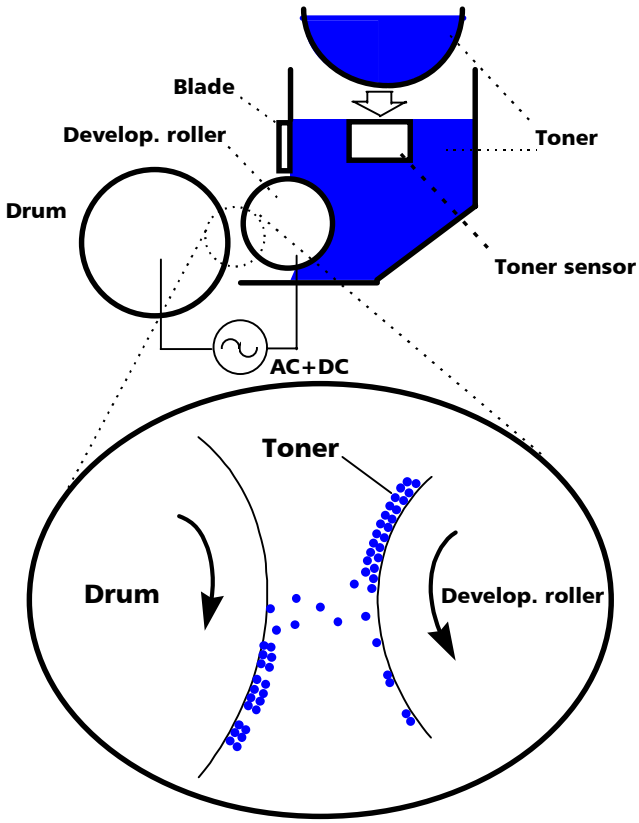
The latent image constituted on the drum is *developed* into a visible image. The developing roller contains a 3-pole (S-N-S) magnet core and an aluminum cylinder rotating around the magnet core. Toner attracts to the developing roller since it is powdery ink made of black resin bound to iron particles. A magnetized blade positioned approximately 0.3 mm above the developing roller constitutes a smooth layer of toner in accordance with the roller revolution.

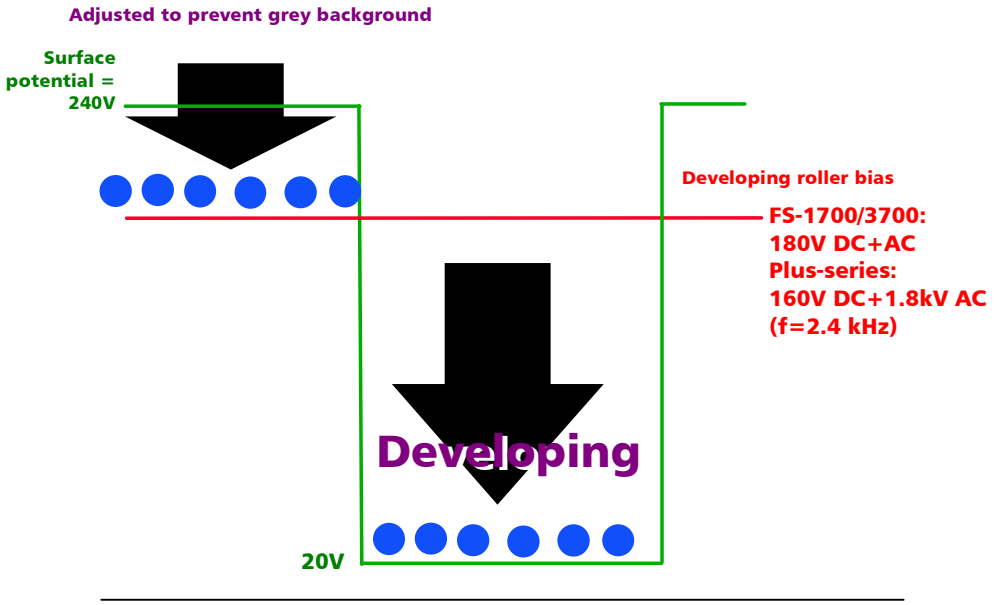


Developing roller bias

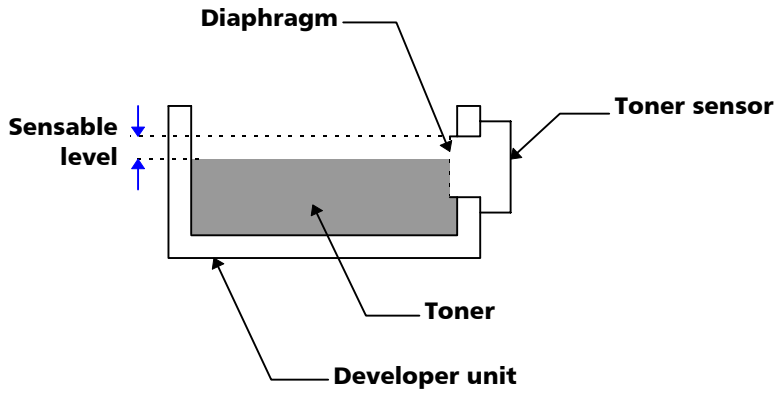
The developing roller is connected to a AC-weighted, positive DC power source. Toner on the developing roller is given a positive charge. The positively charged toner is then attracted to the areas of the drum which was exposed to the laser light. (The gap between the drum and the developing roller is approximately 0.3 mm.) The non-exposed areas of the drum repel the positively-charged toner as these areas maintain the positive charge.

The developing roller is also biased with an ac potential to apply compensation to the toner's attraction and repelling actions for more contrast in the development.





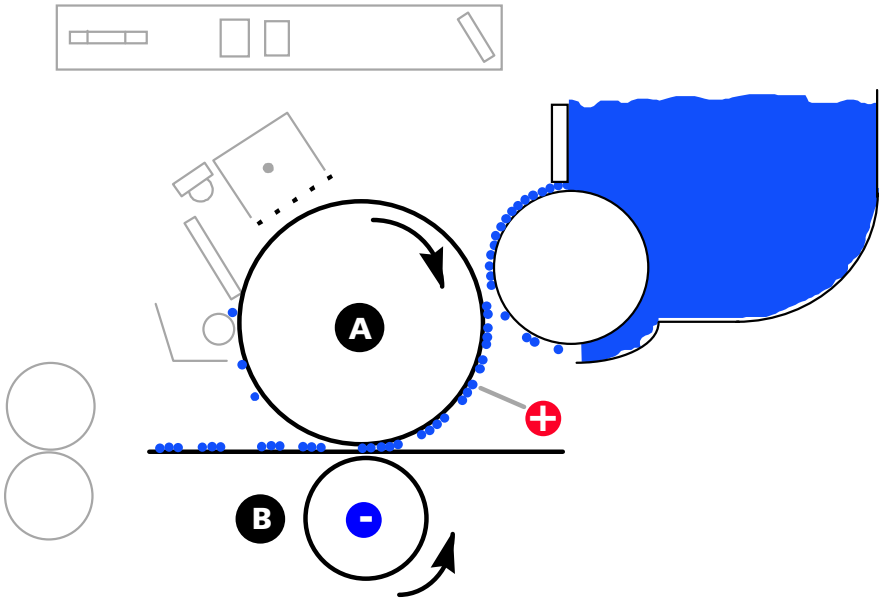
A toner replenishment sensor is provided within the developer. As the toner supply from the toner container dwindles and the toner level lowers in the reservoir, the sensor translates it through its diaphragm, urging the toner motor to feed more toner.



Transfer

The image developed by toner on the drum ("A" below) is transferred onto the paper using the electric charge attraction given by the toner itself and the transfer roller ("B" below). The transfer roller is negatively biased so that the positively charged toner is attracted onto the paper while it is pinched by the drum and the transfer roller.

The paper is automatically peeled off the drum because of the small diameter of the drum. To prevent thin paper wrapping around the drum, the static discharger brush is provided to reduce the attraction of the negatively charged paper to the positively charged drum.

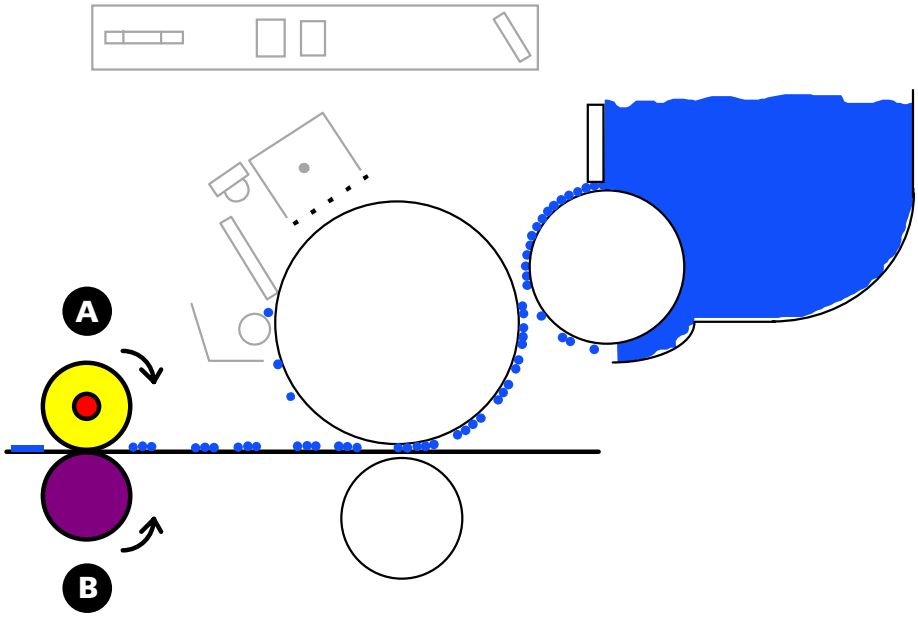


The nominal transfer bias is set to approximately -1.80 kV (limit) with the current of 65±2μA. Since thicker paper (91 to 200 g/m²) such as postcards, OHP, envelopes, etc., tend to require more bias potential for the satisfactory transferring process, the transfer bias is user-switchable to -2.45 kV (limit) by using the printer's operator panel. Double-sided printing using a DU-20 duplexer automatically increases the transfer bias to the above value.

Fusing

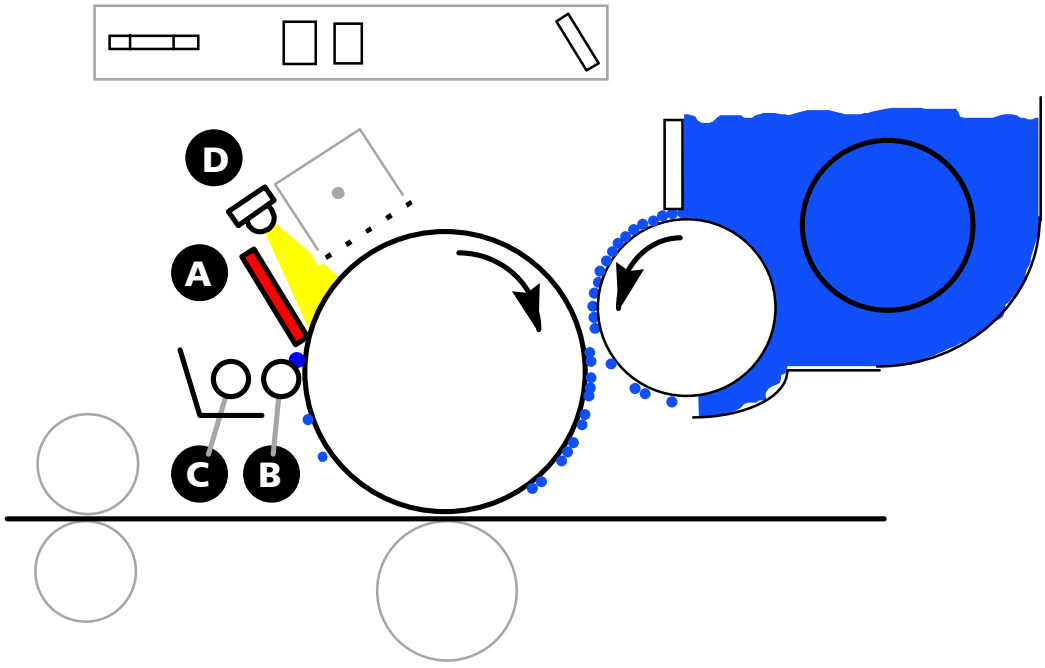
The toner on the paper is permanently fused onto the paper as it passes between the florin-finished heat roller ("A" below) and the pressure roller ("B" below) in the fuser unit. The toner is molten and pressed into the paper. The heat roller has a halogen lamp, turning frequently on and off to maintain a preheat temperature at approximately 175°C.

The heat roller temperature is constantly monitored by the engine control circuit using a thermistor. For safety against overheating, the fuser system is protected by a triac which automatically opens power to the halogen lamp. If the temperature exceeds 350°C, it activates the thermo-cut device to interrupt open power to the halogen lamp.



Drum cleaning and erasing static charge

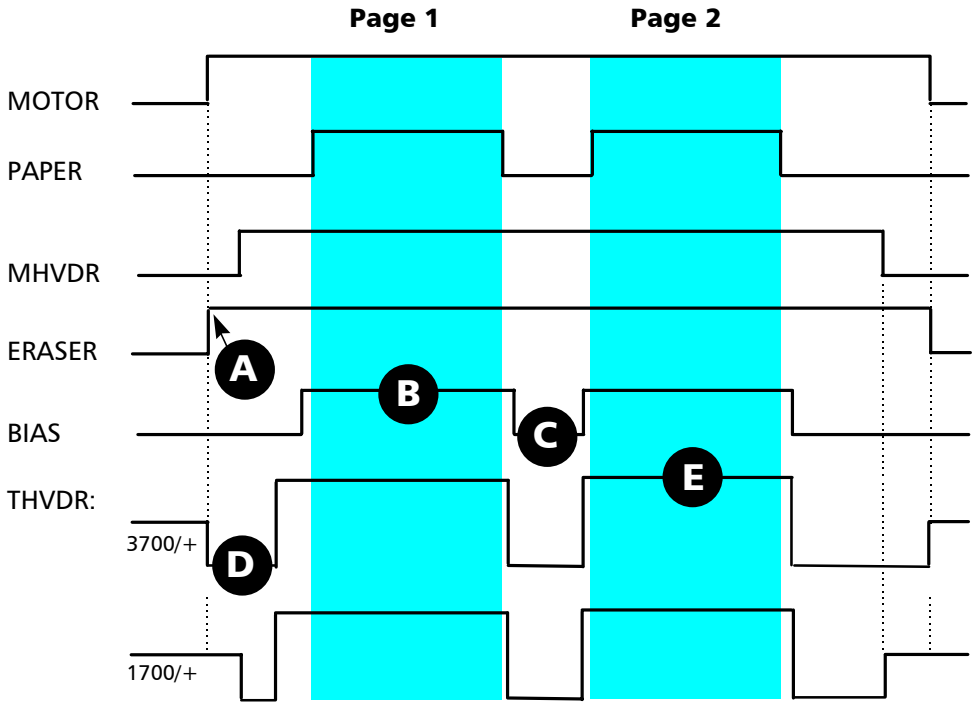
The drum needs to be physically cleaned of toner remaining on its surface in the previous rotation. The cleaning blade (**A** below) is constantly pressed against the drum and scrapes the residual toner on the drum off to the refresher roller (**B** below). The refresher roller drives the toner to the spiral (fins) roller (**C** below) at one end of which the waste toner bottle is connected to collect the waste toner.



After the drum is physically cleaned, it then must be cleaned to an electrically neutral state. This is necessary to erase any residual positive charges, ready to accept the next uniform charge. The residual charge is canceled by exposing the drum to the light emitted from the eraser LED (**D** above) in the similar manner as described in page 4-6. This lowers the electrical conductivity of the drum surface making the residual charge on the drum surface escape to the ground.

Typical photo process timing chart

The following chart shows the signals used for photo processing. These signals activate the corresponding device in the following timing sequences. A simple description for these signals follow.



MHVDR (Main High Voltage DRive) - drives main charger with high voltage bias. This signal is kept on during the job is processed.

ERASER - turns on the eraser (LED array) as soon as the motor begins revolving (**A** above).

BIAS - turns on the developer bias (on the magnet roller). The duration of this signal is dependent on the current paper size (**B**) and turns off between pages (**C**).

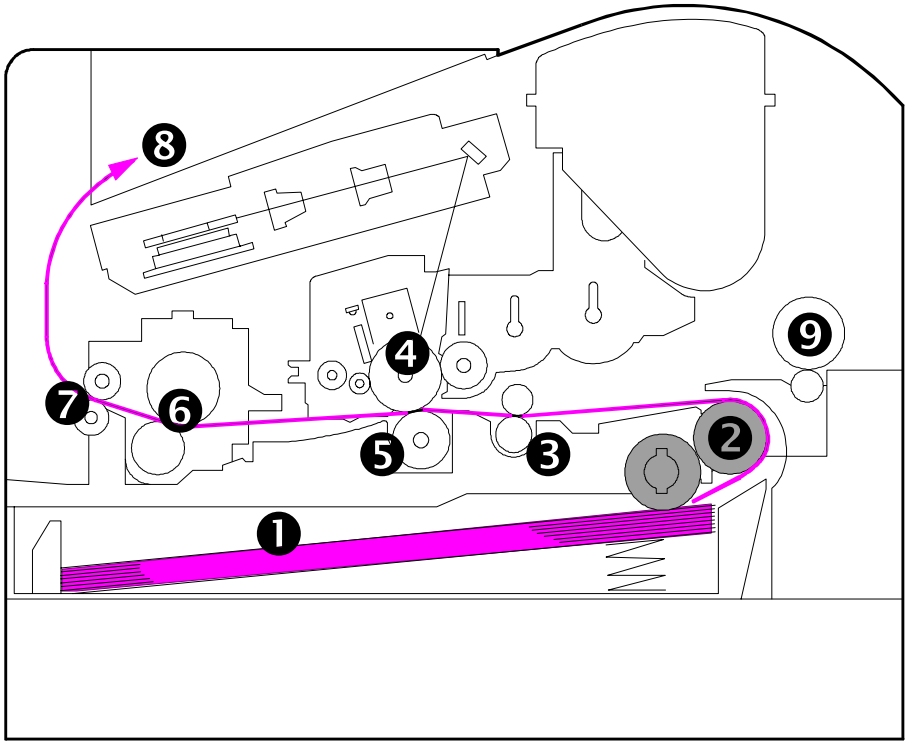
THVDR (Transfer High Voltage Drive) - turns on the transfer bias. Note that the transfer bias is reverse (+300V) at the beginning of a print job (**D**)until the paper is actually fed onto the transfer roller. This prevents contamination on the back side of paper by

effectively repelling the toner during the paper is not present between the drum and the transfer roller. The transfer bias is kept on during a print job (**E**).

Paper feeding system

The paper feeding system picks up paper from the paper cassette or the manual feeding tray and at a precise timing feeds it to the electrophotography system for developing image on the paper. It finally delivers the printed page to either the face-down or face-up tray.

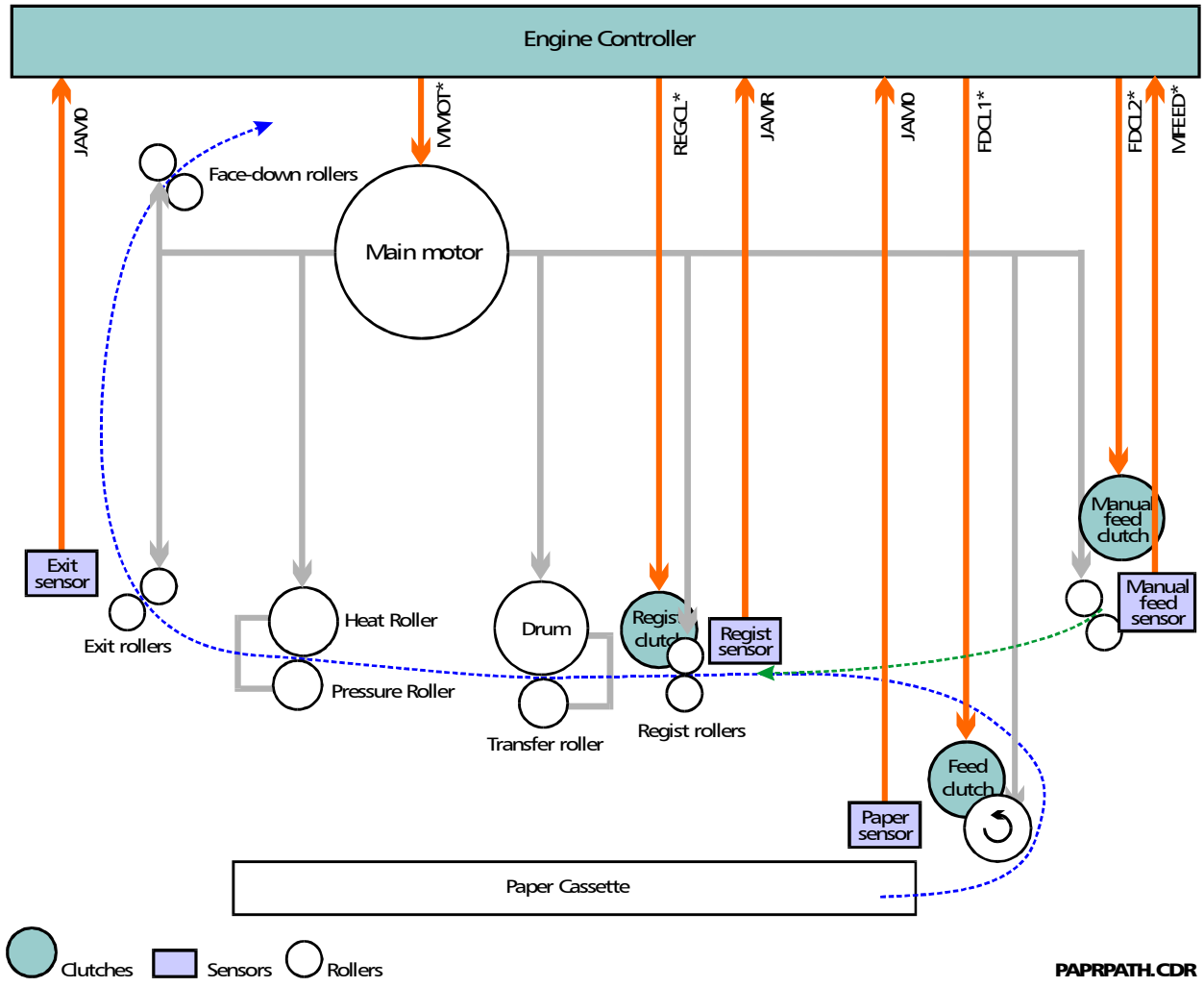
The figure below shows the paper feeding path within the printer.



A01123.eps

❶Paper (cassette). ❷Paper feed roller+clutch+sensor. ❸Registration rollers+clutch+sensor. ❹Drum. ❺Transfer roller. ❻Fuser rollers. ❼Exit rollers+sensor.❽Face-down output tray+sensor (FS-3700/+ only). ❾Manual feed roller+clutch+sensor.

Following on the next page is another diagram showing locations of sensors, roller, and solenoids arranged along with this paper path.



Paper feed components/signals

Cassette feeding

The main logic controller sends the PRINT* signal to the engine controller after finishing data processing. The engine controller CPU then starts the main motor (MMOT), polygon motor, registration rollers, and the fuser heater. The engine controller then issues the FDCL1 signal to connect the main motor power to the paper feed tires. The tires feed the top sheet in the paper stack in the cassette towards the registration rollers until the paper reaches the registration jam sensor (JAMR). As the engine controller sends VSREQ to the main logic controller, the main logic controller subsequently issues VSYNC to activate the registration rollers, thus starting to feed paper towards the drum.

The paper is advanced to the drum, to the fuser unit, triggering the exit sensor (JAM0), and finally delivered either to the face-down tray or the face-up tray as switched by the output stack selector tab.

Manual/multi purpose tray feeding

The printer recognizes the existence of paper on the manual feed or multi purpose tray when the manual feed sensor is pushed up (HANDS).

In manual paper feed mode, the paper placed on the manual feeding tray or multi purpose tray is drawn in when the manual feed clutch is energized by the FDCL2 signal to drive the manual feed roller.

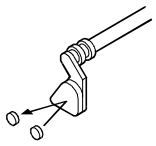
The subsequent print process is identical to the above section.

Paper jam sensing

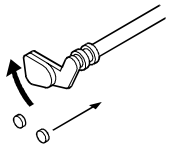
The registration sensor and the exit (fuser) sensor keep track of the paper sent through the printer's paper path by watching the time of period during which either sensor is kept activated.

Registration sensor - A photo reflector sensor is used. While the paper is not present (❶), the reflector (shiny mirror surface) at the end of the actuator is in the position that can reflect the light to shine the receptor. As the top edge of the paper reaches the registration sensor, the reflector is pushed up and the light is interrupted(❷), triggering the sensor.

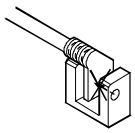
❶

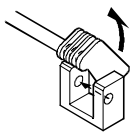


❷



Exit sensor - This is a photo penetration sensor, combined with an actuator arm extending to the fuser board. The actuator is in the way back at the fuser outlet. The reflector at one end of the actuator is normally seated in-between the photo transmitter and sensor (❶). It is dressed away out of them when the paper in the fuser sensor pushed up the actuator (❷), allowing the light to hit the receptor and turning the sensor circuit on.

❶ 

❷ 

On detecting a paper jam, the engine controller stops printing action and shows the “Paper jam” message. After removing paper jam, the printer resumes printing when either the toner access door or the feed assembly is once opened and closed. If paper jammed past the exit sensor, the printer will not attempt to print the same page.

Paper coming from the paper cassette should pass the registration sensor in a predetermined period of time that begins with the feed clutch turned on (FDCL1).

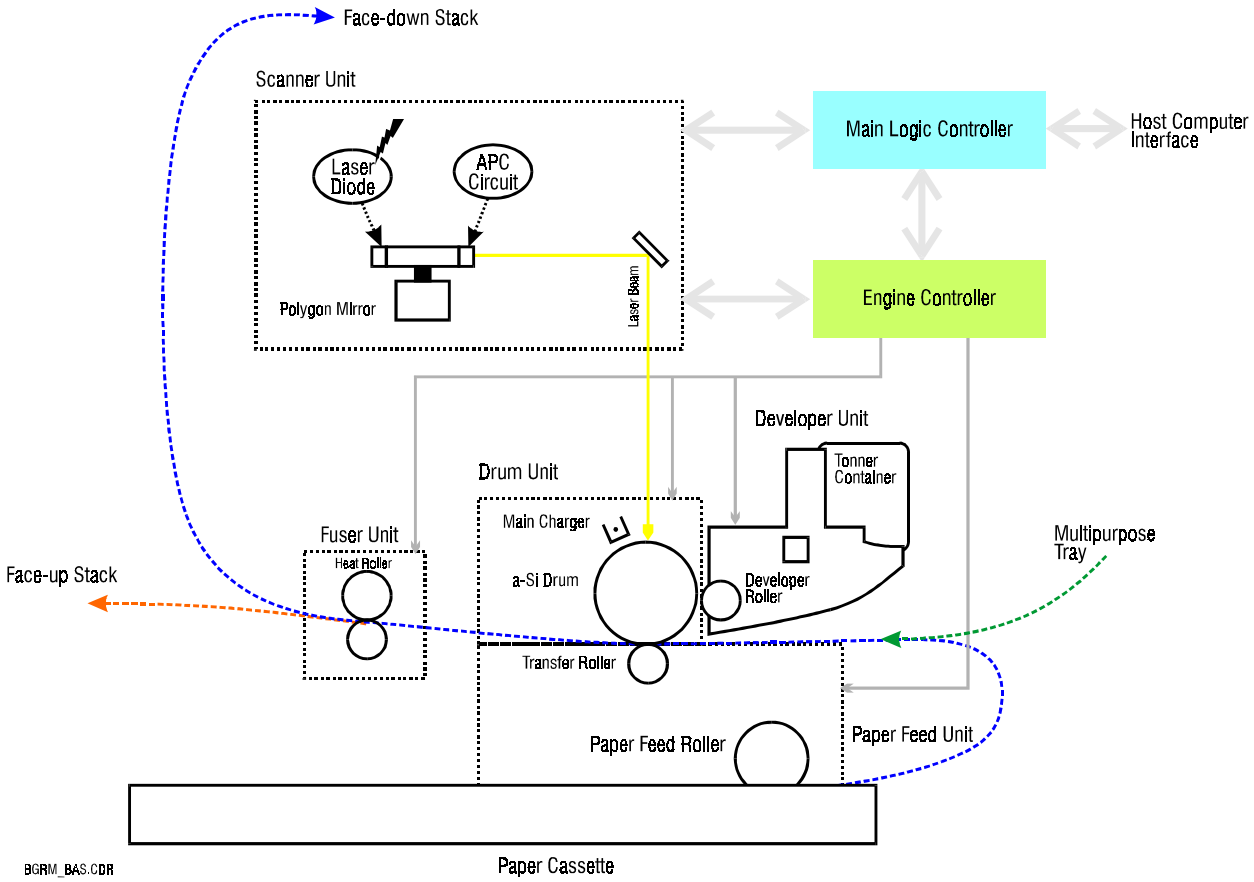
Basic engine functions

This section presents a general functional overview of the engine system of the printer. It was intended to provide a comprehensive knowledge on basic functions that the engine system performs during printing. The following printer functions are covered:

- ❒ Engine controller system
- ❒ Main logic controller system
- ❒ Paper feed system
- ❒ Power system

Basic sequence of operation

The following figure is a simplified block diagram of the printer engine system.



BASIC ENGINE SYSTEM DIAGRAM

Engine controller system

The engine controller provides control over all print engine activities. It drives laser, coordinates the electrophotography process with print data from the main logic controller. The engine system also manages information collected back from sensors, etc., so that a message is given in case of need for user attention.

The engine controller is responsible for the following systems, explained step by step in the following pages:

Flash memory

The engine controller uses a flash memory to store environmental parameters that does not require a battery backup. The flash memory is driven by +5 V power and designed to stand reading and writing for nominally 100,000 times.

High-voltage generator

The engine controller produces clocks (HVCLK1 and HVCLK2) and apply programmed divisor to generate high-voltage outputs for main charging. The clock oscillation can be toggled on and off by the engine controller CPU.

Laser scanner control

In order to activate the laser scanner, the engine controller does the following tasks:

- ❒ Forced laser activation timing
- ❒ Laser diode current limit
- ❒ Laser power control output
- ❒ Beam detection photo-sensor output
- ❒ Polygon motor activation
- ❒ Polygon motor readiness detection
- ❒ Polygon motor output frequency control (multi-step)

Polygon motor control

The output frequency signal to the polygon motor is generated by the engine gate array as it divides the engine system clock (16.9344 MHz).

The polygon motor has the following specifications (depending on model):

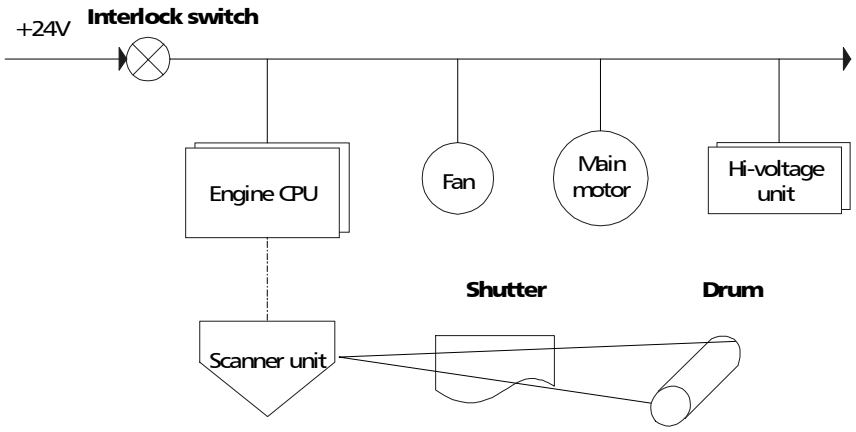
Model	Speed (rpm)	Input (Hz)	SCSEL signal
FS-1700/+	17008	1,696.15	0
FS-3700/+	27166	2,713.85	1

As the laser beam reaches the beam detector sensor, the sensor board generates the horizontal synchro signal (PD*). This signal makes the engine gate array consequently turn the video output signal (VDO*) and the APC signal (LONB*) high which respectively activate the laser light and the APC controller.

The engine CPV attempts to detect the horizontal synchronization signal so that the laser diode is normally triggered. If the horizontal synchronization output is not found after the laser driving current control (LENB*) is set low, the engine CPV recognizes it as the failure on the APC board and gives the E3 error.

Safety interlock

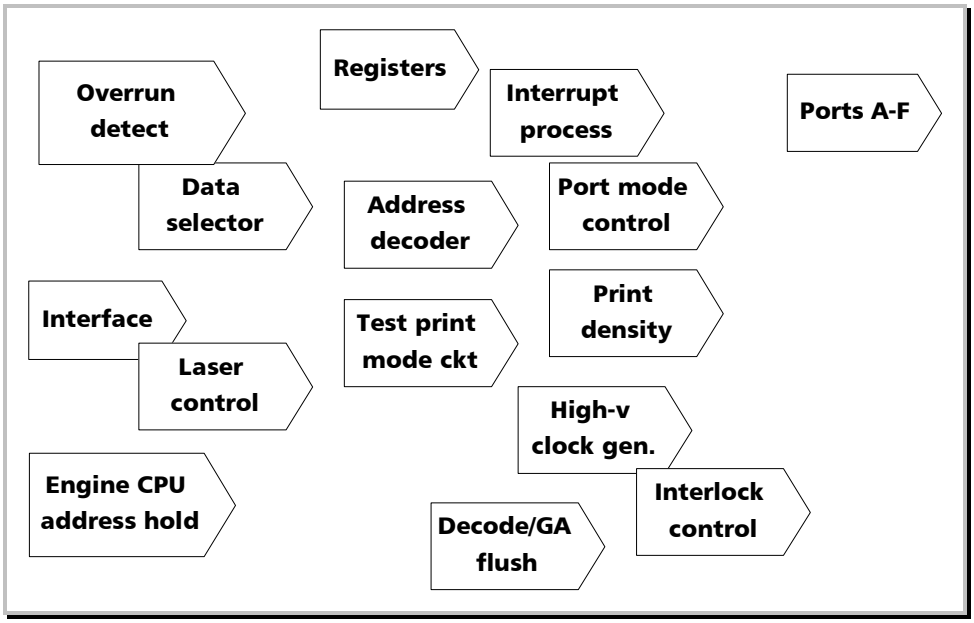
For safety purpose, micro switches are provided to sense that either the top (toner access) or side (drum access) cover is open. These switches, when the applicable cover is open, open and disconnect the DC power to the laser scanner as follows.



The engine gate array

The engine gate array is a supplementary device to the Engine CPU. The gate array is a 100-pin QFP type that has the internal blocks as figured below.

GATE ARRAY INTERNAL BLOCKS



Pin assignment

Pin assignment for the engine gate array is table on the following pages. The device in **Remarks** column means those which the signal is forwarded to.

ENGINE GATE ARRAY PINS

Pin No.	Ckt signal	GA signal	In/out	Description	Logic	Remarks
1	THVDR*	THVDR	OUT	Transfer charger control output, L: On	Neg.	HV board
2	REVB*	REVBN	OUT	Reverse bias control output, L: Rev. bias	Neg.	HV board
3	VDD	VDD		Power terminal (+5V)		
4	VSS	VSS		Power terminal (Ground)		
5	MHVDR*	MHVDR	OUT	Main charger control output, L: On	Neg.	HV board
6	BIAS*	BIAS	OUT	Bias control output, L: On	Neg.	HV board
7	ERASE*	ERASEN	OUT	Eraser control output, L: On	Neg.	Eraser
8	FDWSD*	PC3	OUT	Face-down solenoid	Neg.	FD solenoid
9	FOP	PC2	OUT	HS-20 gate diverter	Pos.	HS-20
10	JAMO*	PA1	IN	Fuser sensor input, H: No paper	Neg.	Fuser
11	EPAP*	PA0	IN	Envelope feeder paper sensing, H: Paper	Neg.	Env. feeder
12	EUNIT*	PB5	IN	Envelope feeder installation, L: Installed	Neg.	Env. feeder
13	EMOTR*	PD4	OUT	Envelope feeder motor control output, L: On	Neg.	Env. feeder
14	JAMR	PA2	IN	Registration sensor input, L: No paper	-	-
15	VSS	VSS		Power terminal (Ground)		
16	PAPER	PA4	IN	Cassette paper detection, L: Empty		
17	MFEED*	PA3	IN	Manual feed slot paper detection, L: Paper	Neg.	
18	BTBSEN*	PB1	IN	Waste toner reservoir detection, L: Installed	Neg.	
19	UNIT*	PB4	IN	HS-20 installation input, L: Installed	Neg.	HS-20
20	HSPAP*	PB3	IN	HS-20 paper sensing, L: Paper passing	Neg.	HS-20
21	COPN	PB2	IN	HS-20 status input, L: Open		HS-20
22	FUP	PC5	OUT	HS-20 gate diverter output, H: Face-up stack	Pos.	HS-20
23	FUPSD*	PC4	OUT	Face-up solenoid control	Neg.	Solenoid
24	MON*	PD1	OUT	HS-20 motor control output, L: On	Neg.	HS-20
25	VOLW*	PD0	OUT	HS-20 motor revolution output, L: On	Neg.	HS-20
26	TEST1	TEST1	IN	G/A test input 1, H: Test mode		Jumper
27	TEST0	TESTN	IN	G/A test mode, L: Test mode		Fixed high

Pin No.	Ckt signal	GA signal	In/out	Description	Logic	Remarks
28	VDD	VDD		Power terminal (+5 V)		
29	VSS	VSS		Power terminal (Ground)		
30	TESTCLK	TSTCLK	IN	G/A test clock		Fixed low
31	ILOCK	PB0	IN	Interlock input	Pos.	
32	ERRDY	PA5	IN	Eraser blow-out det., L: Blown		Eraser
33	THSBY	PD5	OUT	Fuser heater control, L: Print; H: Idle		Fuser
34	FCS*	GACE	OUT	Flash ROM chip select	Neg.	Flash ROM
35	FDCL2*	PC1	OUT	M-feed roller clutch control, L: On	Neg.	Clutch
36	FDCL1*	PC0	OUT	Paper pickup roller clutch control, L: On	Neg.	Clutch
37	REGCL	PD7	OUT	Regist. roller clutch, L: Off	Pos.	Clutch
38	SCCLK	SCCLK	OUT	Polygon motor clock	Pos.	Scanner
39	PDIN	PDIN	IN	Beam detect	Neg.	Scanner
40	VSS	VSS		Power terminal (Ground)		
41	LATCH	LATCH	OUT	Laser, LED density data latch	Pos.	Scanner
42	DSCLK	DSCLK	OUT	Laser, LED density data transfer clock	Pos.	Scanner
43	SDATA	SDATA	OUT	Laser, LED density data	Pos.	Scanner
44	VDO	VDOOUT	OUT	Video data	Neg.	Scanner
45	LENB	PC7	OUT	Laser diode drive control	Pos.	Scanner
46	LONB	LONB	OUT	APC control, L: Sampling	Neg.	Scanner
47	SCAN*	PC6	OUT	Polygon motor control, L: On	Neg.	Scanner
48	SCRDY*	PA7	IN	Polygon motor ready, L: Ready	Neg.	Scanner
49	MMOT*	PD3	OUT	Main motor control, L: On	Neg.	Main motor
50	FAN	PF0	OUT	Polygon motor ready, H: On	Pos.	Fan
51	X1	CKO0	OUT	Clock (Engine CPU)		
52	X2	CKO1	OUT	Clock (Engine CPU)		
53	VDD	VDD		Power terminal (+5 V)		
54	VSS	VSS		Power terminal (Ground terminal)		
55	CLCK*	CLCKN	IN	G/A test clock clear, L: Clearing		Fixed high
56	XTO	XTO	IN	Oscillator (16.9344 [MHz])		
57	XTI	XTI	IN	Oscillator (16.9344 [MHz])		
58	INTO	INTO	OUT	Interrupt	Pos.	
59	RES*	RSTN	IN	Power on reset	Neg.	
60	ASTB	ASTB	IN	Engine CPU ASTB		

Pin No.	Ckt signal	GA signal	In/out	Description	Logic	Remarks
61	WR*	WRN	IN	Engine CPU WR*	Neg.	
62	RD*	RDN	IN	Engine CPURD*	Neg.	
63	A16	A16	IN	Engine CPU address		
64	A15	EA15	IN	Engine CPU address		
65	VSS	VSS		Power terminal (Ground)		
66	A14	EA14	IN	Engine CPU address		
67	A13	EA13	IN	Engine CPU address		
68	A12	EA12	IN	Engine CPU address		
69	AD7	AD7	IN/OUT	Engine CPU address/data bus		
70	AD6	AD6	IN/OUT	Engine CPU address/data bus		
71	AD5	AD5	IN/OUT	Engine CPU address/data bus		
72	AD4	AD4	IN/OUT	Engine CPU address/data bus		
73	AD3	AD3	IN/OUT	Engine CPU address/data bus		
74	AD2	AD2	IN/OUT	Engine CPU address/data bus		
75	AD1	AD1	IN/OUT	Engine CPU address/data bus		
76	AD0	AD0	IN/OUT	Engine CPU address/data bus		
77	EA7	EA7	OUT	Engine CPU address		ROM address
78	VDD	VDD		Power terminal (+5 V)		
79	VSS	VSS		Power terminal (Ground)		
80	EA6	EA6	OUT	Engine CPU address		ROM address
81	EA5	EA5	OUT	Engine CPU address		ROM address
82	EA4	EA4	OUT	Engine CPU address		ROM address
83	EA3	EA3	OUT	Engine CPU address		ROM address
84	EA2	EA2	OUT	Engine CPU address		ROM address
85	EA1	EA1	OUT	Engine CPU address		ROM address
86	EA0	EA0	OUT	Engine CPU address		ROM address
87	RCSEN*	PD2	IN	Waste toner reservoir fullness	Neg.	
88	HEATT	PD6	OUT	Fuser heater control, H: On		Fuser
89	VDOIN	VDOIN	IN	Video data	Neg.	Scanner
90	VSS	VSS		Power terminal (Ground)		
91	PDOUT	PDOUT	OUT	Beam detect sensing	Neg.	Main log. board
92	S/C	SC	IN/OUT	Main I/F status command		Main I/F
93	SCLK	SCLK	IN	Main I/F status command clock		Main I/F

Pin No.	Ckt signal	GA signal	In/out	Description	Logic	Remarks
94	CBSY*	CBSYN	IN	Main commands in transmission	Neg.	Main I/F
95	SBSY*	SBSYN	OUT	Engine status in transmission	Neg.	Main I/F
96	CINH*	CINHN	OUT	Engine busy	Neg.	Main I/F
97	HVCLK1	HVCK1	OUT	HV unit clock 1		HV board
98	HVCLK2	HVCK2	OUT	HV unit clock 2		HV board
99	T/CSN	PA6	IN	Remaining toner sensing , H: Empty		HV board
100	HVOL	HVOL	OUT	Transfer bias (Thick/normal paper)		HV board

Power supply

The power supply contains the AC and DC power and distribution circuitry on the board. The high voltage generator is not included on this board but on the separate high-voltage board. The power supply circuit is diagrammed on the next page.

AC INPUT AND RECTIFIER: Either 120V or 230V AC power arriving at CN1 is fed to the AC line filter circuit (L1, L3, C1, C2, etc.) and rectified by diode array BD1 to DC power. Transistor Q1 performs switching of the DC power output for downverting it to the 24V and 5V AC voltage by means of transformer T1.

24V DC POWER LINE: The 24V AC at the secondary output of T1 is rectified by D1 and C12/C13 and delivered to connectors CN3 and CN4 for distribution. The 24V DC power is referred to as *VDD* or *VDDCOM* and is used by the following components in the engine system:

- ❒ Face-up/down stack solenoids
- ❒ Clutches (registration, feed, manual-feed)
- ❒ Fans
- ❒ High-voltage generator (board)
- ❒ Main motor and laser polygon motor
- ❒ Clutches, motors, solenoids within the option units

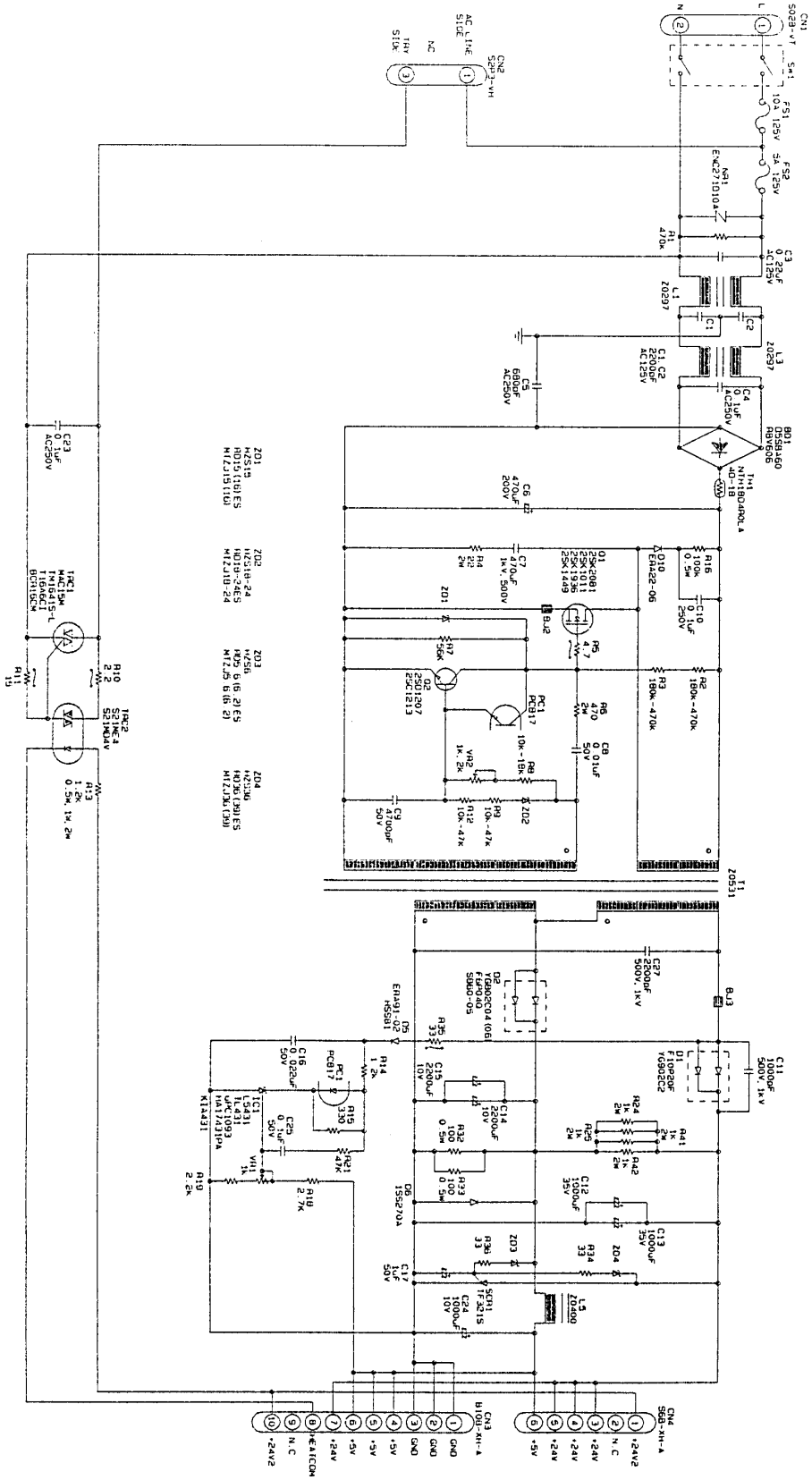
The 24V DC power is forcibly interrupted for safety whenever the printer top cover or the drum unit access door is opened. For details, see the **Safety interlock** section, page 4-4-31.

5V DC POWER LINE: The 5V AC at the secondary output of T1 is rectified by D2 and C14/15, etc., like as for the 24V DC power line. It also delivered to CN3 and CN4. The 5V DC power is referred to as *VCC* and is comprehensively used by the main controller, sensors, engine controller, etc.

POWER PROTECTION CIRCUIT: A fraction of the 5V DC output is wired to the diode segment of PC1, protection controller. In case of short-circuiting in the 5V DC load side , the diode triggers the transistor segment of PC1, activating Q2 and effectively shutting off the switching regulator (Q1) output.

FUSER HEATER POWER CONTROL: On the AC primary side, the fuser heater and thermocut device are wired in series across CN2. The heater is switched on and off as being controlled by TRIAC TRC1. TRC1 turns on the heater when HEATCOM (pin 8) at CN3 is energized by command from the engine controller.

POWER SUPPLY CIRCUIT (US/CANADA VERSION)



Logic controller system

The logic controller system does the following:

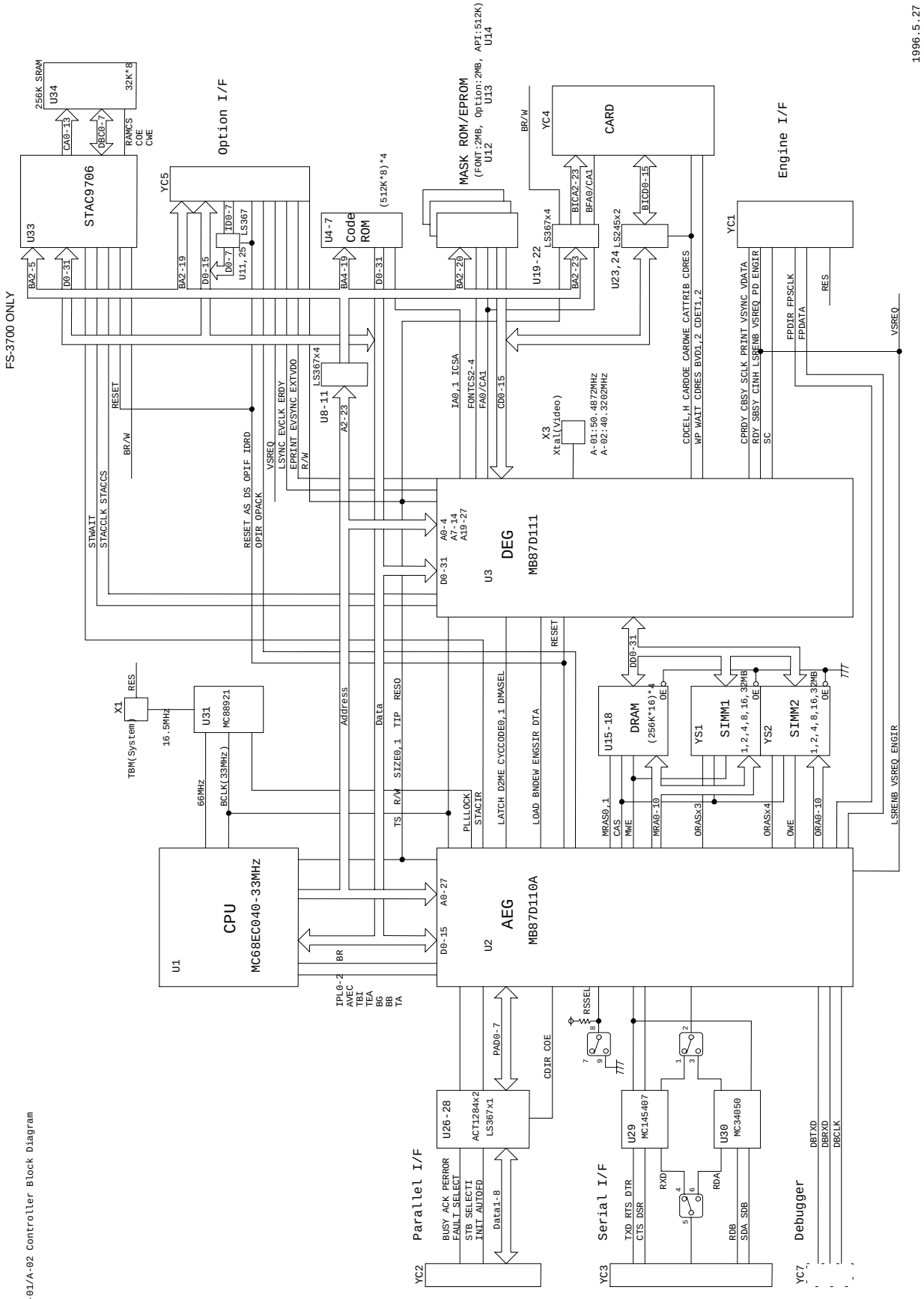
- ❒ Communicates with the host computer to receive data at one of the printer's interface
- ❒ Analyzes and translates the print data to be the dot data in the raster memory
- ❒ Communicates with the engine system to discern radiness for printing
- ❒ Stores fonts and macro information

The main logic controller has specifications as shown in the following section. A simplified diagram is illustrated on page 4-41.

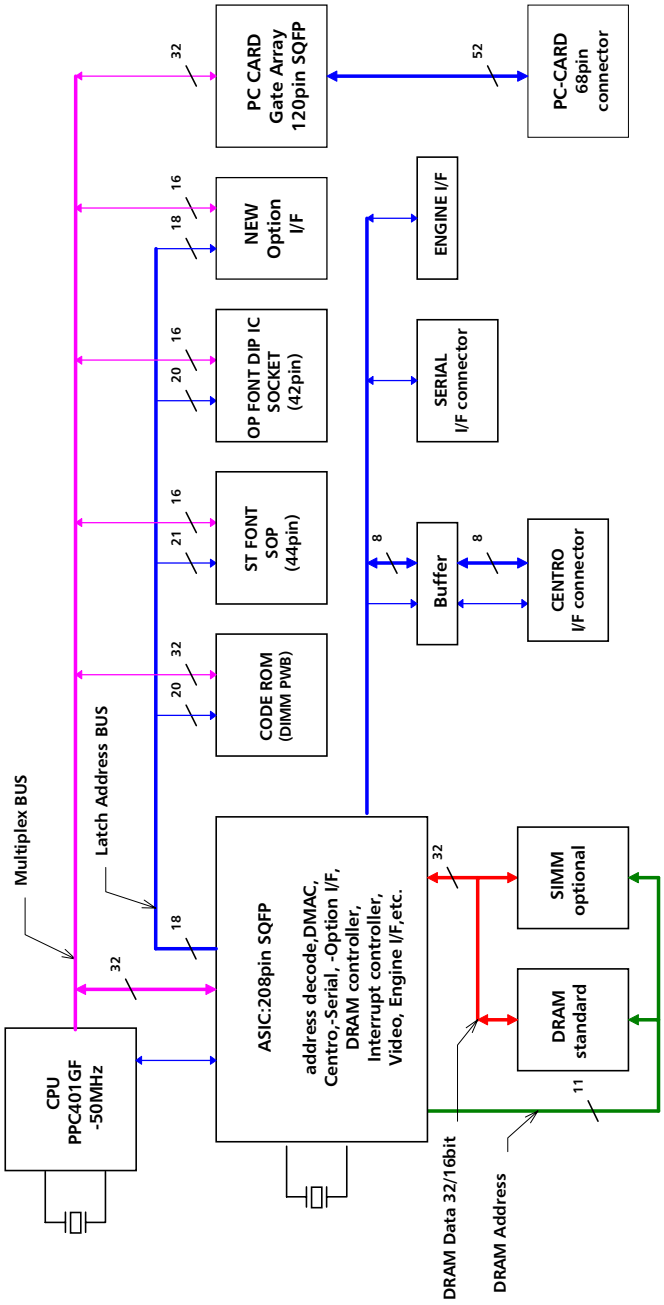
Logic controller specifications

Item		Specification			
		FS-1700	FS-1700+	FS-3700	FS-3700+
CPU		MC68EC040-33	PowerPC603-66	MC68EC040-33	PowerPC603e-100
System ROM size		2 MB (512 kB × 4)	4MB (2MB × 2)	2 MB (512 kB × 4)	4MB (2MB × 2)
RAM size	Standard	2 MB (512 kB × 4)	4MB (2MB × 2)	2 MB (512 kB × 4)	4MB (2MB × 2)
	Maximum	66 MB (Two PC SIMM slots)	68 MB (Two PC SIMM slots)	66 MB (Two PC SIMM slots)	68 MB (Two PC SIMM slots)
Fonts	Resident	2 MB (2 MB × 1)	4 MB (4 MB × 1)	2 MB (2 MB × 1)	4 MB (4 MB × 1)
	Custom	2 MB [PK-1/2/4]	—	2 MB [PK-1/2/4]	—
Application program interface		512 kB (512kB×1)	←	←	←
PC card		1 slot, JEIDA4.2/PCMCIA 2.1	←	←	←
Interface	Parallel	High-speed bi-directional [IEEE 1284]	←	←	←
	Serial	RS-232C/422A (Jumper setting)	←	←	←
	Option	See Interface.	←	←	←
Engine communication		Serial interface	←	←	←
Front panel communication		Serial interface	←	←	←
Other features	Smoothing	KIR2 (Vector compensation method)	←	←	←
	Toner saver	EcoPrint [On/Off]	←	←	←
	Enlarge/reduction	Main scan/sub scan	←	←	←
	Video clock	50.4872 MHz	25.2436 MHz	40.3202 MHz	←

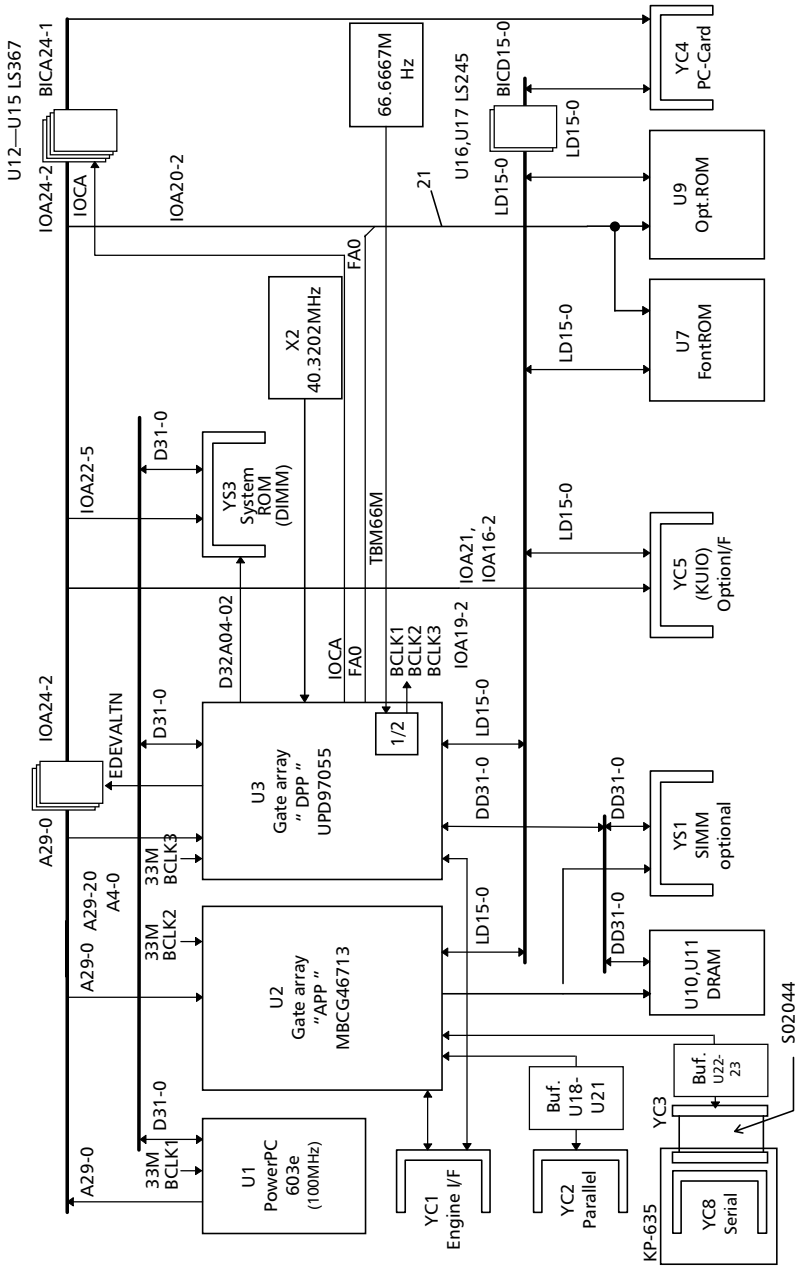
CONTROLLER BLOCK DIAGRAMS: FS-1700/3700



FS-1700+/FS-3700+



FS-1500+/FS-3700+



Printing data processing

The printer communicates with the host computer for receiving the print data at one of the printer's interfaces and temporarily store them in the interface buffer. The main logic controller analyzes the data for translating them into the dot data according to the original print image. The resultant dot data are depicted in the raster memory (DRAM's).

While data processing is in course, on the other hand, the main logic controller CPU talks to the engine CPU via the engine interface, to discern the readiness of the printer's engine for printing.

If the engine is ready to start printing, the main conttroller issues print signal towards the engine controller which request the paper feed. In synchronization with the procerssion of the paper within the printer, U2 and U3 release video data in the raster memory. Thus the video data are transfered to the laser scanner together with the horizontal synchronization signal and the video clock.

On reception of the video data, the laser diode turns on and off to constitutes the print image over the drum. The image on the drum, referred to as the static latent image, is applied with toner, transferred onto the paper, and finally fused permanently on the paper by means of heat and pressure.

API ROM socket

Socket U14 (for the FS-1700/3700) or U9 (for the Plus Series) which is empty at the shipment accepts an API (Application Program Interface) ROM. The API ROM should be a JEDEC-conforming EPROM, having the following features:

Socket No.	U14/U9
Pins	40
Size	4 Mbits
Composition	256 k by 16 bits
Access speed	>120 ns

The number of clocks should be 19. Data are read in a 32-bit mode expanded using hardware.

The following table shows the pin-to-signal assignments for the ROM to be used.

API ROM socket pin assignment

Pin No.	Terminal description	Signal name	Pin No.	Terminal description	Signal name
1	AVpp	VCC (fixed)	**21**	A0	FA0/CA1
2	CE*	GND (fixed)	**22**	A1	BA2
3	D15	CD15	**23**	A2	BA3
4	D14	CD14	**24**	A3	BA4
5	D13	CD13	**25**	A4	BA5
6	D12	CD12	**26**	A5	BA6
7	D11	CD11	**27**	A6	BA7
8	D10	CD10	**28**	A7	BA8
9	D9	CD9	**29**	A8	BA9
10	D8	CD8	**30**	GND	GND
11	GND	GND	**31**	A9	BA10
12	D7	CD7	**32**	A10	BA11
13	D6	CD6	**33**	A11	BA12
14	D5	CD5	**34**	A12	BA13
15	D4	CD4	**35**	A13	BA14
16	D3	CD3	**36**	A14	BA15
17	D2	CD2	**37**	A15	BA16
18	D1	CD1	**38**	A16	BA17
19	D0	CD0	**39**	A17	BA18
20	OE*	FONTCS4*	**40**	VCC	VCC

The asterisked (*) descriptions mean negative logic.

System ROM

FOR MODEL FS-1700/3700 (U4 to U7)

The system ROMs, also referred to as code ROM, contain informaton for controlling the controller CPU. These are served by the controller CPU MC68EC040 (33 MHz) which is a 18-pin CQFP.

The system ROM chips incorporate the following features:

Number of ROMs	4
Socket Nos.	U4 to U7
Pins	32, DIP
Size	4 Mbits
Composition	512 k by 8 bits
Access speed	>120 ns

FOR PLUS-SERIES (YS3)

A DIMM is used for the same purpose as above for the FS-1700+ and FS-3700+. This detachable DIMM is served by the controller CPU PowerPC603-66 for the FS-1700+; by PowerPC603e-100 for the FS-3700+.

The DIMM incorporate the following features:

Number used	1
Socket No.	YS3 (U1, U2)
Pins	72, DIMM
Size	4 Mbits
Composition	1MB by 16 bits
Access speed	>120 ns

RAM

The RAM temporarily holds print data and font information transferred from the host buffers. The size of the RAM is expandable using comprehensive PC SIMMs. The standard RAM size is 2 MB for both FS-1700 and FS-3700 (66 MB maximum); and 4

MB for both Plus Series models (68 MB maximum).

	FS-1700/3700	Plus Series
Number of RAMs	4	2
Socket Nos.	U15 to U18	U10 and U11
Pins	40, SOJ	42, SOJ
Size	2 MB	4 MB
Composition	512 kB (256 k by 16 bits) by 4	2 M!B (1MB by 16 bits) by 2
Access speed	80 ns	80 ns

The expansion SIMM should incorporate the following features:

Number of SIMM sockets	2
Socket Nos.	YS1/YS2
Pins	72
Size	4/8/16/32 MB
Access speed	<80 ns

Memory card slot interface

The controller accepts a SRAM (or certain flash) type memory card that comforms to the PCMCIA (version 2.1) standards. The address and data busses for the card are bufferred by using U19 to U22 and U23/24 (for models FS-1700/FS-3700); and using U12 to U15 and U16/U17 (for Plus Series).

Option interface

FOR MODEL FS-1700/3700

The printer has an open socket for installing an optional interface card such as a serial interface card or an Ethernet network interface card. The interface has a video interface that can receive video data of either 300 dpi or 600 dpi. The transmission of video data must be in accordance with the video data transfer clock (EVCLK) that the DEG date array issues to accept the optional video interface. The video data transferred in synchoronization with the clock are temporarily stored in the line buffer (SRAM, contained in the DEG gate array), then passed to the engine controller.

The option interface has the following features:

Card connector	80 pins (See table below), AMP 176372-3 or equivalent
Applicable interface card	Kyocera IB-3

FOR PLUS-SERIES MODELS

The Plus-series models have two slot-in type slots for the option interface cards. The interface allows the DMA access.

Option interface pin assignment

Pin assignment of the option interface connector is tabled on the following page.Option interface pin assignment

Pin No.	Terminal	Signal	Pin No.	Terminal	Signal
1	+5V	VCC	16	A16	BA17
2	+5V	VCC	17	A15	BA16
3	+5V	VCC	18	A14	BA15
4	+5V	VCC	19	A13	BA14
5	+5V	VCC	2O	A12	BA13
6	+5V	VCC	21	A11	BA12
7	+12V	NC (Not used)	22	A10	BA11
8	+12V	NC (Not used)	23	A9	BA10
9	-12V	NC (Not used)	24	A8	BA9
10	-12V	NC (Not used)	25	A7	BA8
11	NC	NC (Reserved)	26	A6	BA7
12	NC	NC (Reserved)	27	A5	BA6
13	NC	NC (Reserved)	28	A4	BA5
14	A18	BA19	29	A3	BA4
15	A17	BA18	30	A2	BA3

Option interface pin assignment - Continued

Pin No.	Terminal	Signal	Pin No.	Terminal	Signal
31	A1	BA2	56	D10	D10
32	NC	NC (Reserved)	57	D9	D9
33	NC	NC (Reserved)	58	D8	D8
34	OPIF*	OPIF*	59	D7	D7
35	OPRDY*	(D7)	60	D6	D6
36	ID6	(D6)	61	D5	D5
37	ID5	(D5)	62	D4	D4
38	ID4	(D4)	63	D3	D3
39	ID3	(D3)	64	D2	D2
40	ID2	(D2)	65	D1	D1
41	ID1	(D1)	66	D0	D0
42	ID0	(D0)	67	VDO%	EXTVDO
43	NC	NC (Reserved)	68	LSYNC*	LSYNC*
44	NC	NC (Reserved)	69	VCLK	EVCLK
45	AS*	AS*	70	PRINT*%	EPRINT*
46	DS*	DS*	71	VSREQ*	VSREQ*
47	OPDAC*	OPACK*	72	VSYNC*%	EVSYNC*
48	RW	R/W	73	RDY*%	ERDY*
49	OPIR*	OPIR*	74	NC	NC (Reserved)
50	RESET*	RESET*	75	GND	GND
51	D15	D15	76	GND	GND
52	D14	D14	77	GND	GND
53	D13	D13	78	GND	GND
54	D12	D12	79	GND	GND
55	D11	D11	80	GND	GND

Parallel interface

The printers have a port for the parappel interface that is compatible with the gate array µPD65650-268-3BA used with the current line-up of the Plus series printers. The parallel interface supports the protocols defined by the IEEE 1284 standards. To gain conformity to these standards, the printer supports the ECP and nibble modes.

Details on the signals on the parallel interface are described in the appropriate appendix in this manual.

Serial interface

The printer incorporates a port for the serial interface. The serial interface controller is included within the gate array and supports both the RS-232C and RS-422A protocols. Since the RS-232C support is designed to be compatible with SNMP (Simple Network Management Protocol), CTS and DSR signals are included. Switching to either mode is toggled by changing a jumper wire arrangement on the controller board. A 25-pin D-sub connector is used for the serial port. The RS-422A's extra signal lines are assigned to some of the vacant RS-232C terminals. (See *Appendix A* for the interface later in this manual for details.)

The serial interface has the following features:

Connector type	25-pin, D-sub
Baud rates/sec.	300/600/1200/2400/4800/9600/19200/38400/57600/115200
Protocol	RS-232C/RS-422A (switchable)

The serial interface connector also incorporates the debugging signal outputs as explained below.

Debugging outputs

Connector YC7 (for models FS-1700/FS-3700) or YC6 (for Plus-series models) provides the following signals for debugging

Pin No.	Signal	Direction of flow	Definition
2	DBTXD	Printer to host	Transmission data
3	DBRXD	Host to printer	Reception data
4	DBCLK	Host to printer	Transfer clock

Engine interface

The interface to the engine system is based on the serial interface, not the parallel interface that was used with the previous line-up of the Ecosys printers. The serial-to-parallel conversion is executed on a hardware basis.

The engine board is detachable from the printer at its interface connector. The engine interface connector has the following pin assisngments:

Engine interface connector assignment

Pin No.	Terminal	Signal	Pin No.	Terminal	Signal
A1	GND	GND	B1	GND	GND
A2	VCC	VCC	B2	VCC	VCC
A3	VCC	VCC	B3	VCC	VCC
A4	RPORT	EGIR*	B4	D/CZ	NC (Reserved)
A5	VSREQZ	VSREQ*	B5	SBSYZ	SBSY*
A6	CBSYZ	CBSY*	B6	SCLK	SCLK
A7	S/CZ	SC	B7	CPRDY	CPRDY
A8	RDYZ	RDY*	B8	CINHZ	CINH*
A9	RXD	NC (Reserved)	B9	VCC	VCC
A10	TXD	NC (Reserved)	B10	FRM/BYZ	NC (Reserved)
A11	FPDATA	FPDAT	B11	VSYNCZ	VSYNC*
A12	PRINTZ	PRINT*	B12	PDZ	PDOUT*
A13	RESETZ	RST*	B13	FPSCLK	FPCK
A14	LEN	OUTPE*	B14	VDO	VIDEO
A15	GND	GND	B15	FPDRC	FPDR
A16	GND	GND	B16	GND	GND

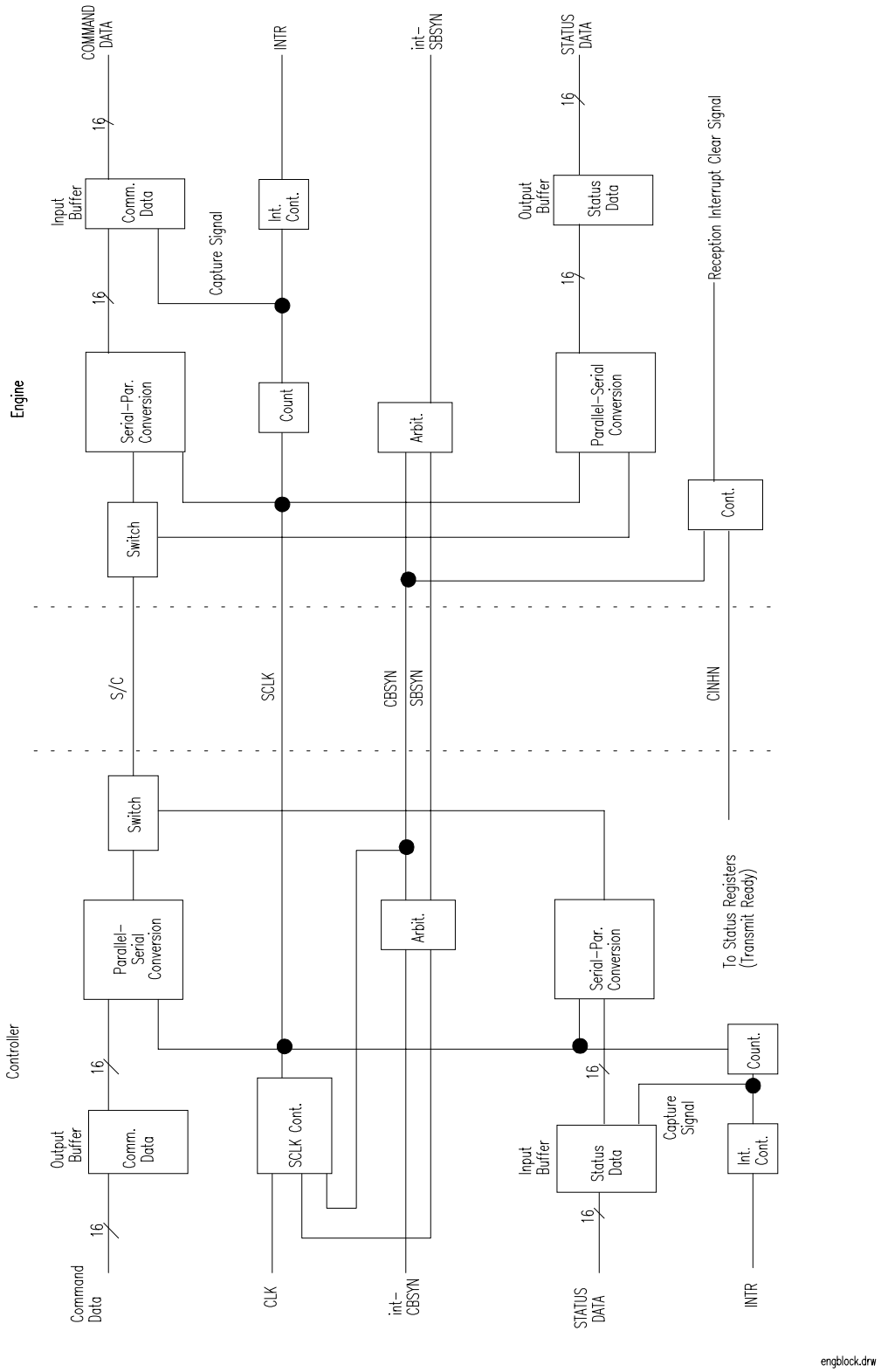
* Means negative logic.

Signals used for the engine interface

The following signals are used for the engine interface communication. Figure on next page shows a simplified function diagram of the engine interface and the signals.

Signal	Meaning	Active	Definition
SBSYN	Status-BuSY-sigNal	Low	Determines which direction for the engine system to transfer the status data. If SBSYN is true, the controller is unable to transfer the command data towards the engine system. The controller can read in the status data transferred from the engine system by forwading SCLK to the engine.
CBSYN	Command-BuSY-sigNal	Low	Determines which direction for the controller system to transfer the command data. If CBSYN is true, the controller can transfer the command data towards the engine system by forwading SCLK to the engine system
S/C	Status-data/Command-data	-	This is a bi-directional serial datum containing the status data and command data as well as attributive information. The transfer data commences with LSB, then to MSB.
SCLK	Serial CLocK	-	The width of the clock pulse is approx. 1µsec (960 ns). SCLK is the clock delivered by the controller and used to synchronize the status data and command data with each other.
CINHN	Command IN-Hibit sigNal	Low	This signal inhibits the signal transmission. If CINHN is low, the controller is not allowed to ready the transmission data. This inhibit is cancelled when the engine controller reads in the reception data.

Engine interface signals



Chapter Three C O N T E N T S

Life expectancy of modules

The table below shows the nominal life expectancy for modules. Detailed part information for each module (except toner containers) can be found in chapter 7, *Parts Catalog*.

Module	Nominal life	Model			
	(pages)	FS-1700	FS-1700+	FS-3700	FS-3700+
Toner container	10,000	TK-20	←	←	←
Toner container	20,000	TK-20H	←	←	←
Drum unit	300,000	DK-20	DK-22	DK-21	←
Developer unit	300,000	DV-20	←	←	←
Fuser unit	300,000	FK-20	←	FK-21	←
Refurbishment kit[1]	300,000	MK-20	MK-22	MK-21	←

[1] Includes DK, DV, FK kits, and a feed-transfer unit.

Toner containers

The toner container is the only consumable that the printer requests replacement during normal operation (user-replaceable). The following toner containers are available for use with models FS-1700/+ and FS-3700/+.

Model	Life in pages*	No. of waste toner bottles included
TK-20	10,000	One
TK-20H	20,000	Two

* Based on letter or A4 size paper; average print density of 5%.

Toner container replacement

The printer gives two steps of user attention as explained below. The first one is the warning that the toner is almost run out. This is the earliest chance for the user to replace the toner container and clean various parts inside the printer (See section **Cleaning the printer** on page 3-7):

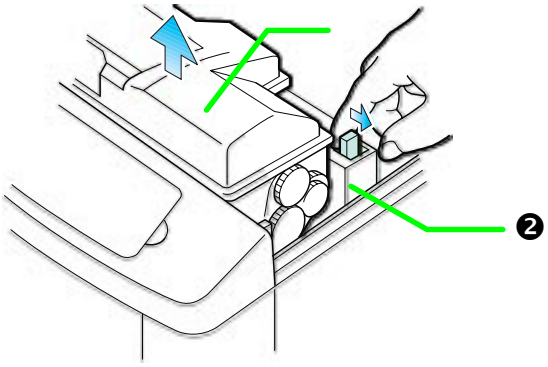
```
Toner low TK-20 Clean printer
```

If the user continues to use the printer, the printer will print approximately 50 pages (A4 or Letter size paper, 5% average toner density), eventually the toner supply being exhausted at which point the printer will stop printing and the following message will be displayed:

```
Replace Toner Clean printer
```

This instructs to install a new toner kit to bring the printer back in normal operation. Cleaning various parts inside must be also done in this occasion (See section **Cleaning the printer** on page 3-7).

To replace the toner container ❶, pull the toner container release lever ❷ to right as shown.



Then, refer to section **Installing toner** on page 2-4 to install the new toner container. After installing the new toner container, several parts in the printer must be cleaned as instructed in section **Cleaning the printer** on page 3-7.

If the toner container has been replaced when the message

```
Replace Toner Clean printer
```

was displayed, the message

```
Clean printer.. press CONTINUE
```

will be displayed after replacement. After cleaning the inside of the printer following the procedure shown below, press the **CONTINUE** key; the message will disappear and the printer will be ready for printing.

The printer can get ready for printing approximately 15 seconds after replacing the toner container.

Waste toner bottle

Locate the new waste toner bottle in the toner kit, and install in the printer according to section **Installing the new waste toner bottle** on page 2-6.

Note that the printer has a sensor to monitor the presence of the waste toner bottle. The printer does not operate without a bottle installed.

For the reference, the waste toner bottle can hold up to 100g of waste toner. The nominal amount of waste toner derived after 10,000 pages have been printed is 20 to 30g (Letter or A4 size paper; average toner density of 5%).

Toner saver mode (*EcoPrint*)

The *EcoPrint* enables to reduce the amount of toner consumed on the page so as to save printing costs by drastically extending the toner container life. EcoPrint mode is factory-set to off and turned on by the printer's front control panel (also accessible through the application software with the assistance of the printer driver). See details in the **Mode Select Menu** roadmap in chapter 2.

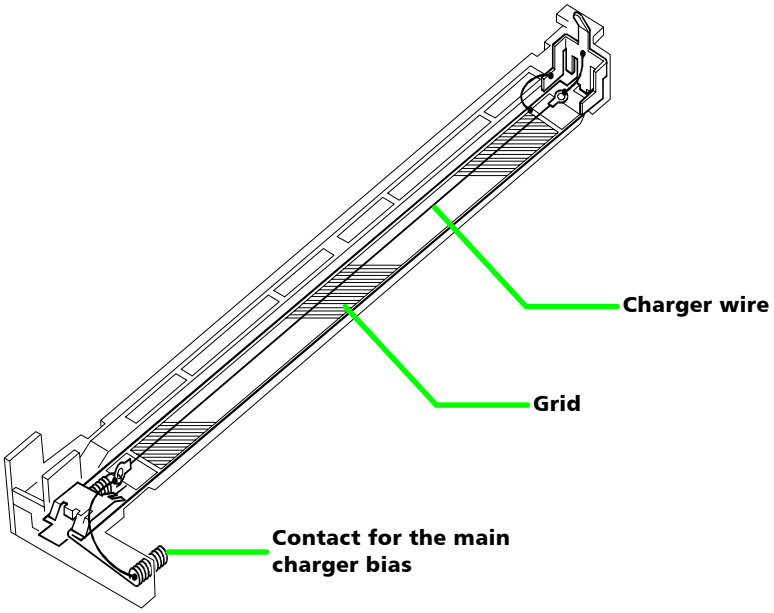
The *EcoPrint* setting has no effect on the print speed.

Cleaning the printer

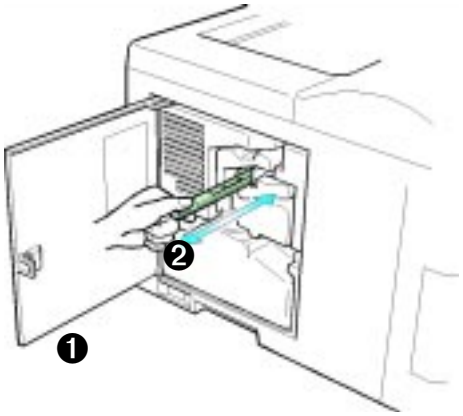
To avoid print quality problems, the following printer parts must be cleaned with every toner container replacement.

Main charger unit

The main charger unit should be cleaned in its two parts - the wire and grid (See the picture below.) - whenever the toner container is changed. Cleaning of the main charger can be done without needing any tools thanks to its self-cleaning system.

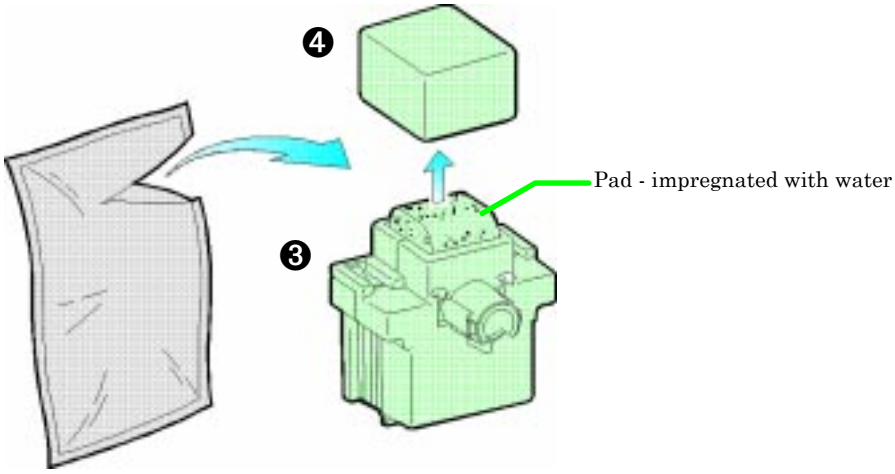


To clean the main charger, first open the drum access door ❶. Pull the cleaning knob (green) ❷ slowly in and out a few times. This pulls a cleaning pad inside the drum unit along the wire.



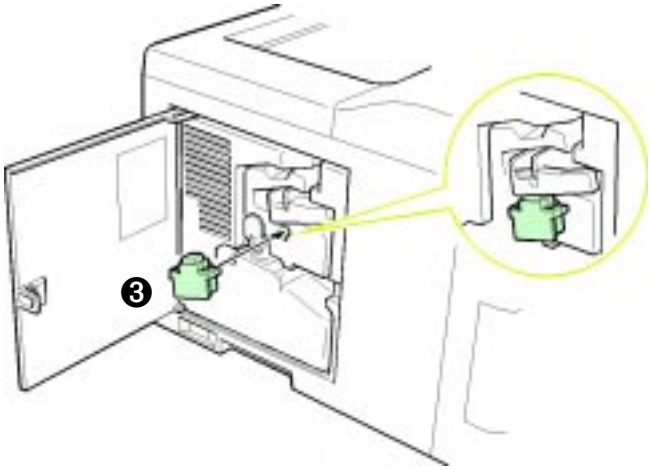
Then, clean the grid using the grid cleaner supplied with the toner kit.

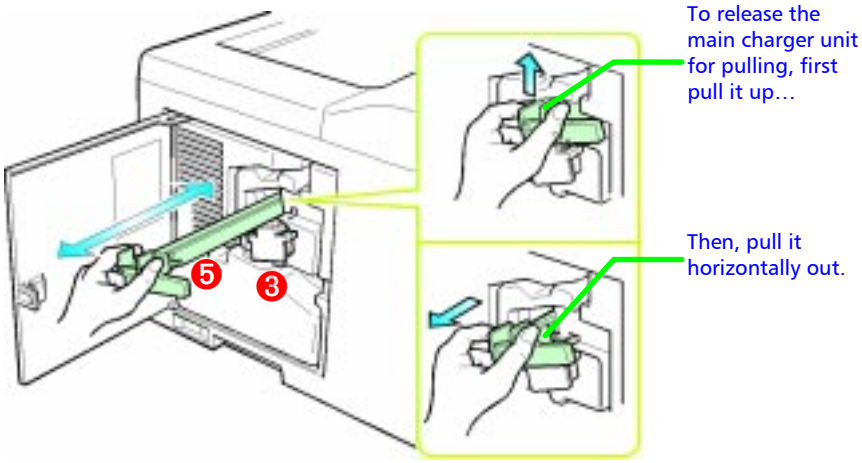
Take the grid cleaner ❸ from protective bag in the new toner kit, and remove the cap ❹.



The grid cleaner pad is impregnated with water. Perform the following cleaning procedure before the pad dries.

Attach the grid cleaner ❸ to the printer with the pad uppermost, as shown in the diagram below.



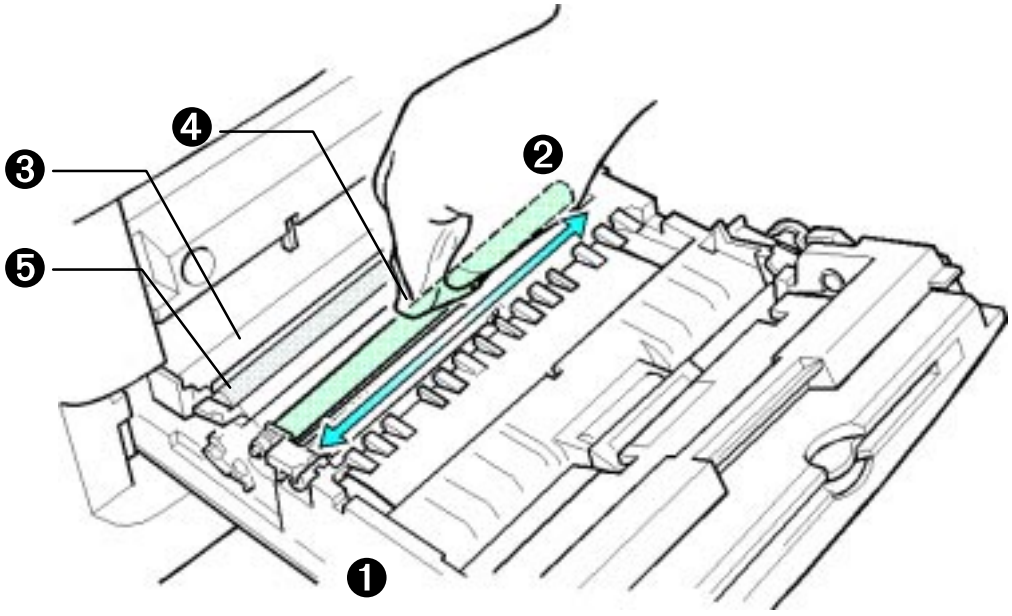

To release the main charger unit for pulling, first pull it up…
Then, pull it horizontally out.
5
3

Paper Feed Unit

To avoid print quality problems due to paper dust and debris, clean the paper feed unit ❶ in the following manner.

Pull the paper feed unit release lever up and draw the paper feed unit all the way out until it stops. Wipe the paper dust on the registration roller ❷ and the paper ramp ❸ using the wiper cloth ❹ included in the toner kit.

Do not touch the transfer roller ❺ (black sponge roller) when wiping the paper ramp.



Replacing the developer

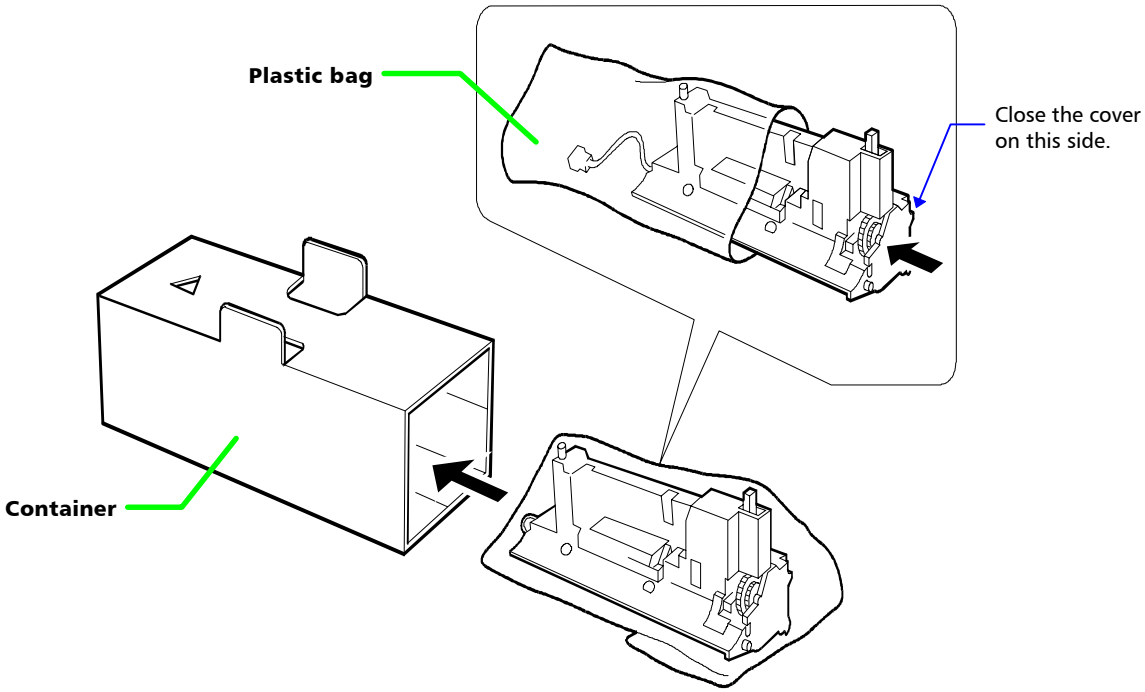
In case that the developer unit is to be removed from the printer for shipment or replacing to a new one, it should be handled following the instructions below.

Also, a new developer unit, after installing, needs a special treatment that repletes the developer with toner for printing. This can be done by using the front control panel (See section **Feeding toner into the new developer** on page 3-13).

Shipping the developer unit

The printer is supplied with a developer container package that should be retained for future shipment of the developer.

To pack the developer in the container package, first flap down the magnet roller protective cover, then refer to the diagram below:



Feeding toner into the new developer

The new developer unit is shipped from the factory with no toner contained. The developer can be automatically repleted with toner when a toner container is installed onto it and the printer is turned on. However, because the toner reservoir in the developer has a large capacity, it requires a lengthy period of time until a substantial amount of toner has been fed to get the printer ready. (A new developer needs approximately 200g for triggering the sensor inside.)

A great many seconds of time for this is greatly deducted by using the service menu in the printer's mode select routine as accessed by its front control panel. Follow these steps to use this feature, top to bottom (For details on using the front control panel keys, refer to section *Mode Select Menu* diagram on page 2-17.

Key to press:	Display to show:
MODE	
✚ (repeatedly)	`Others>`
▸	
✚ (repeatedly)	`>Service>`
▸	`>>Developer`
ENTER	`>>Developer?`
ENTER	The printer enters the service mode and the developer unit and the toner feeder motor are continually activated.

Turn printer power off, then on.

When printer power is turned on again, the printer continually engages in this mode for a period of approximately 4 minutes for model FS-1700/+; and approximately 5 minutes for model FS-3700/+, after which the printer reverts to the ready state.

Updating the engine firmware

The printer accepts update of the engine firmware as well as the localized front panel message data through the parallel interface. Updating using these data is implemented by directly rewriting the flush memory in the printer's engine board. The printer must be in the *supervisor* mode (See page 3-15) to update the engine firmware.

Note. This applies the engine firmware only. The controller firmware is updated by replacing DIMM.

Kyocera supplies three types of data for updating the engine firmware depending on the purpose of update. These are:

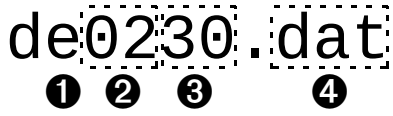
- ❒ Engine firmware data
- ❒ Front panel initialization data (required to reprogram the panel message)
- ❒ Front panel message data

These data may be stored in a memory card for field use. To store (write) data in a memory card, and reread them into the printer through the slot, refer to the printer's *User's Manual*.

Note. Each single data must be written on a memory card. Do not write more than one data on a memory card.

Engine/front panel data format

The data is identified using the following naming syntax:



	Identifies...
❶	*de:* Engine firmware data *dm*: Front panel message data
❷	*01*: FS-1700 *02*: FS-3700 *24*: FS-1700+ *25*: FS-3700+
❸	Version of data
❹	*dat*: Engine firmware data *dan*: Panel message data for Danish *swe*: Panel message data for Swedish *ita*: Panel message data for Italian *spa*: Panel message data for Spanish

Downloading data from the parallel interface

To download data from the parallel interface:

Perform, from top to bottom:	Then the display shows:
Turn printer power on. Make sure the printer is *Ready*.	`Ready`
At the DOS prompt, execute the following command: `!R! BOOT "SPR";` **Note**—Do not add an EXIT; command in the above.	
The display should indicate `Supervisor Mode`.	`Supervisor mode`
DOS COPY the data to download from the host computer.	`Downloading`
Check the display reverts to *Ready*.	`Ready`
Turn power off, then on again. Check the display shows Ready. If not, refer to *Downloading errors* section that follows.	

Confirm the status page shows the new engine version (See *Appendix B*, page B-4). If the message display indicates *Call service person Dn (*n=*0, 1, …)*, refer to section on Downloading data from a memory card page 3-17.

Downloading data from a memory card

To download data written in a memory card to the printer:

Perform, from top to bottom:	Then the display to show:
Insert the memory card in the printer's memory card slot (at the right side).	
Turn printer power on. The printer automatically reads data in the memory card, indicating *Downloading* on the message panel.	`Downloading`
When the data is successfully read, the message display indicates *Supervisor mode*.	`Supervisor mode`
Turn printer power off.	
Remove the memory card from the printer.	

Turn printer power on again. Check the display shows Ready. If not, refer to Downloading errors section that follows.	Ready

Confirm the status page shows the new engine version (See *Appendix B*, page B-4). If the message display indicates *Call service person Dn (*n=*0, 1, …)*, refer to section Downloading errors below.

Downloading errors

The following messages are indicated on the message display when an error occurred during downloading data.

Error message	Meaning	Corrective action
Call service person D0—Checksum error	Checksum error occurred during downloading. The engine ROM is empty.	Turn printer power off once, then on again. Try downloading again.
Call service person D1—Machine compatibility error	The data to be downloaded is not compatible with the printer.	Obtain correct data for the printer model.
Call service person D2—Version compatibility error	The version of the data does not match the current engine version.	Obtain the correct version of data.
Call service person D3—Data error	The data to be downloaded is corrupted.	Obtain the correct data.

Adjusting the transfer bias for thick paper

Printing on paper with extra thickness of 91 to 200 g/m², such as postcards, OHP, envelopes, etc., tend to result in faint printing because of insufficient penetration of transfer bias developer at the transfer roller. For the satisfactory transferring process on different paper thickness, the transfer bias is user-switchable from -1.8 kV to -2.45 kV (limit), or vice versa, by using the printer's operator panel.

To increase the transfer bias for a type of thick paper, perform the following steps, top to bottom:

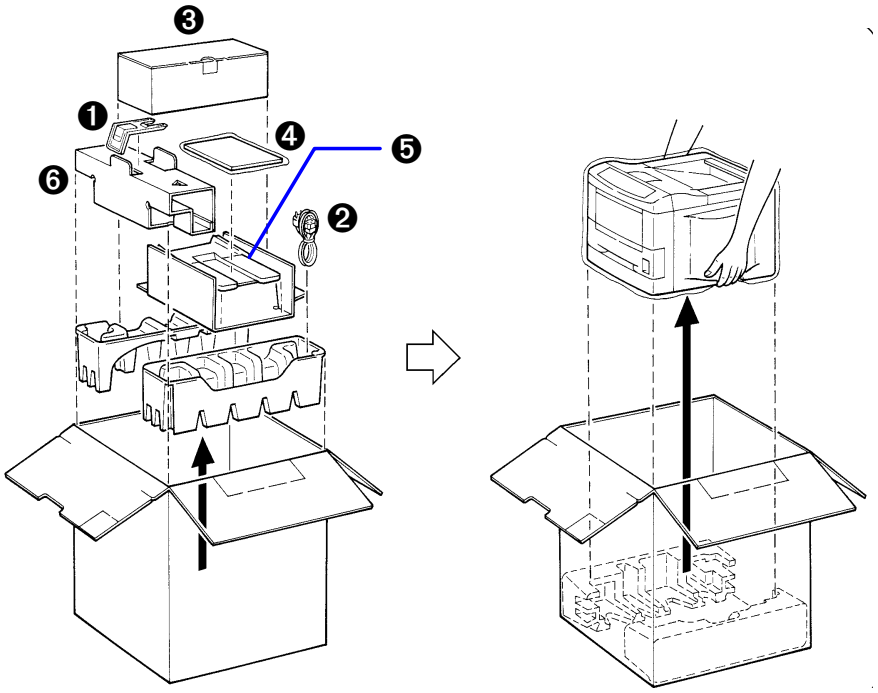
Key to press:	Display to show:
MODE	
✚ (repeatedly)	`Paper type` `Normal`
ENTER	`Paper type` `Normal ?`
✚	`Paper type` `Thick ?`
ENTER	The transfer bias is raised for thick paper.

Double-sided printing using a DU-20 duplexer automatically introduces the higher setting of the transfer bias.

Chapter Two C O N T E N T S

Unpacking

While unpacking the printer, check that the listed parts are all present.

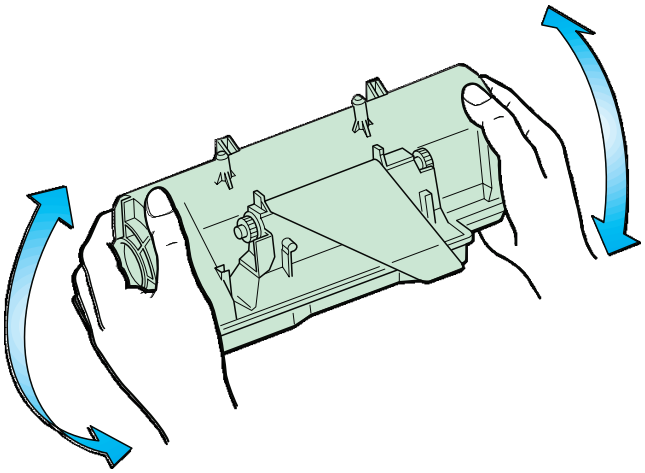


❶ Paper stopper for ❺, 1
❷ Power cable, 1
❸ Toner kit - TK-20, 1
❹ Document including CD ROM, 1
❺ Face-up stack tray, 1
❻ Container for developer, 1

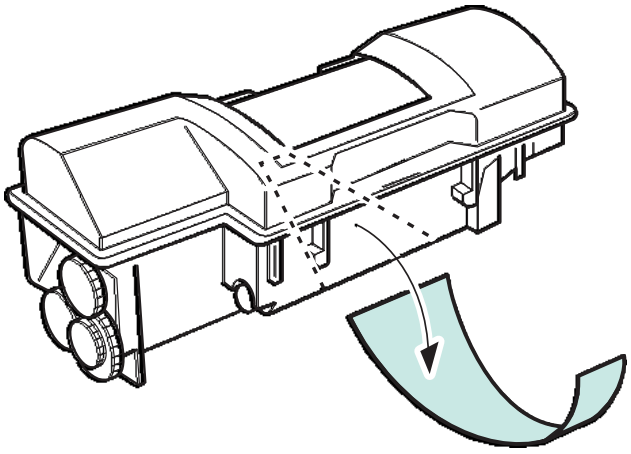
Note—The face-up stack tray and paper stopper are not included for the FS-1700+.

Installing toner

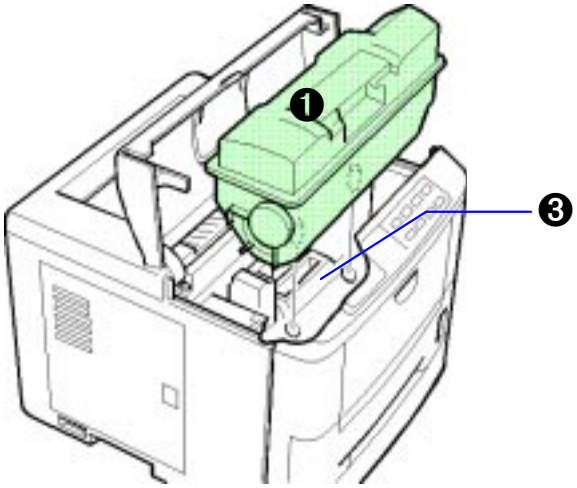
Take the toner container from the toner kit (TK-20) supplied with the printer. Give it a good shake (5 to 6 times).



Peel off the seal ❷ on the bottom of the toner container by carefully pulling off.



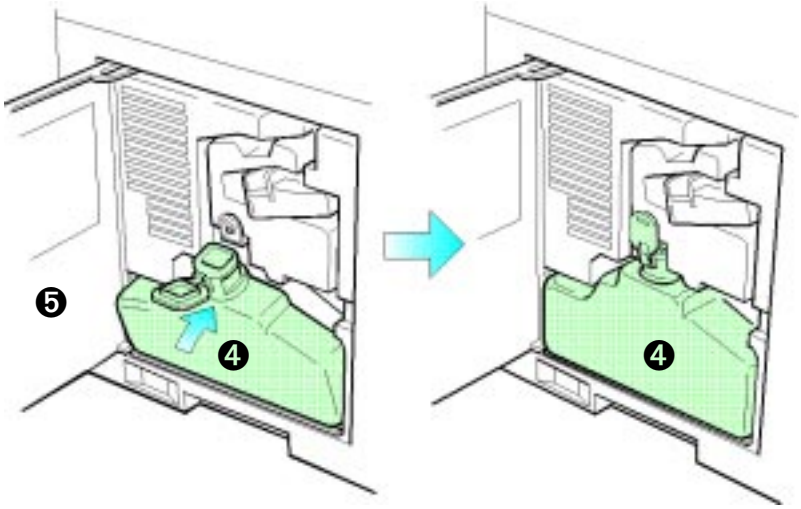
Insert the toner container in the printer as below. **Align the two locating pins at the bottom of the container with the mating holes in the printer (the developer unit ❸).**



Caution - To avoid trouble (toner spilling, etc.), the toner container must be correctly seated and locked in the printer. To do this, press the far side of the container ❶ at the PUSH HERE marks until a click is heard.

Installing the waste toner bottle

The waste toner bottle ❹ is also supplied. It must be installed inside the drum access door ❺ in the left side of the printer. Open the drum access door and install it as shown.



Developer initialization

The printer is shipped from the factory with no toner supplied in its developer unit. When the printer is first switched on after the toner container is installed in the manner above, there will be a delay of several minutes before the printer gets ready to print a job.

This delay is necessary for the printer to fill the developer reservoir with a sufficient amount of toner to continuously support a print job.

The period of time for this delay varies depending on model: approximately 4 minutes for model FS-1700/+ (12-ppm); and approximately 5 minutes for model FS-3700/+ (18-ppm).

Since the automatic implementation of the developer initialization is done only once at first switching power on, if a new developer is installed in the printer, the developer must be initialized manually using the service mode on the front panel. Refer to the section **Feeding toner into the new developer** on page 3-12.

Expanding memory

Expanded printer memory enables to print more complex pages, download more fonts, and define more macros.

It begins by explaining how to remove the main circuit board from the printer, and explains how to install a SIMM (single in-line memory module) on the main circuit board. The minimum memory requirements for the printer with various options installed are listed in the table below. Refer to this table for obtaining a rough approximation on how much memory is required for a particular need.

Minimum memory requirements

Printing environment	Resolution			
	300 dpi		600 dpi	
	1700/ 3700	1700+/ 3700+	1700/ 3700	1700+/ 3700+
HP emulation	2MB	4MB	2MB	4MB
HP+duplex	2MB	4MB	3MB	4MB
HP+KPDL	2MB	4MB	3MB	4MB
HP+KPDL+duplex	3MB	4MB	5MB	4MB
HP+KPDL+resource protection	n/a	n/a	10MB	10MB
HP+KPDL+resource protection+duplex	n/a	n/a	14MB	14MB

SIMM to be used

Memory size in MB	4, 8, 16, 32
Number of pins	72
Access speed	80 ns or faster
Parity	With/without
Bus width	32 bits

Notes on handling the main circuit board and SIMMs

Protect the electronics by taking these precautions:

- ❒ Before touching the main circuit board, touch a water pipe or other large metal object to discharge yourself of static electricity. While doing the work, it is recommended that you wear an antistatic wrist strap.
- ❒ Touch the main circuit board and SIMM only by the edges.
- ❒ Follow the instructions the SIMM manufacturer provides.

Removing the main circuit board

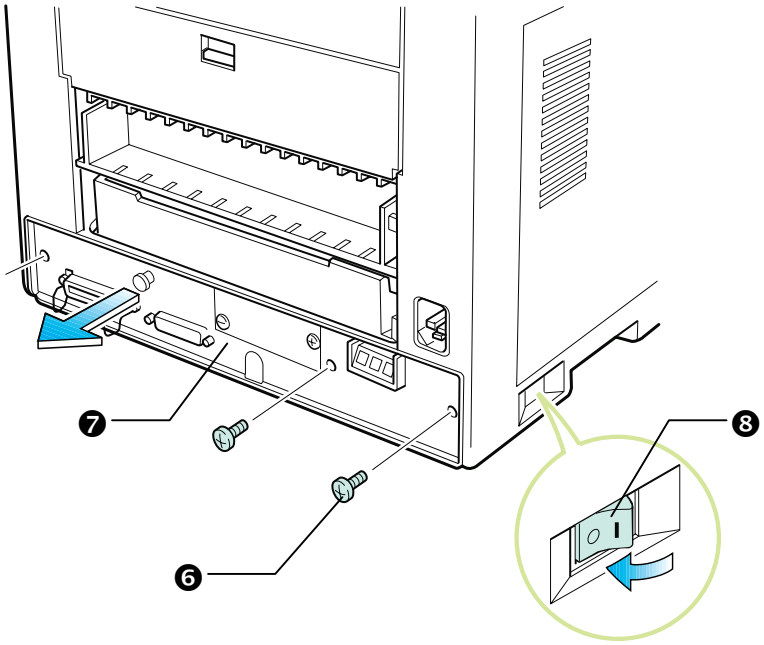
The main circuit board of the printer is equipped with two sockets for memory expansion. Expansion memory is available in the form of a SIMM.

Turn the printer's power off. Unplug the printer's power cable and disconnect the printer from the computer or the network.

Remove the PC card that may be inserted in the PC card slot at the left side of the printer.

Turn the power switch ❻ off. Remove the main circuit board ❼ by removing the three (plated) screws ❽ from the rear cover.

The diagram below examples model FS-1700 and FS-3700.

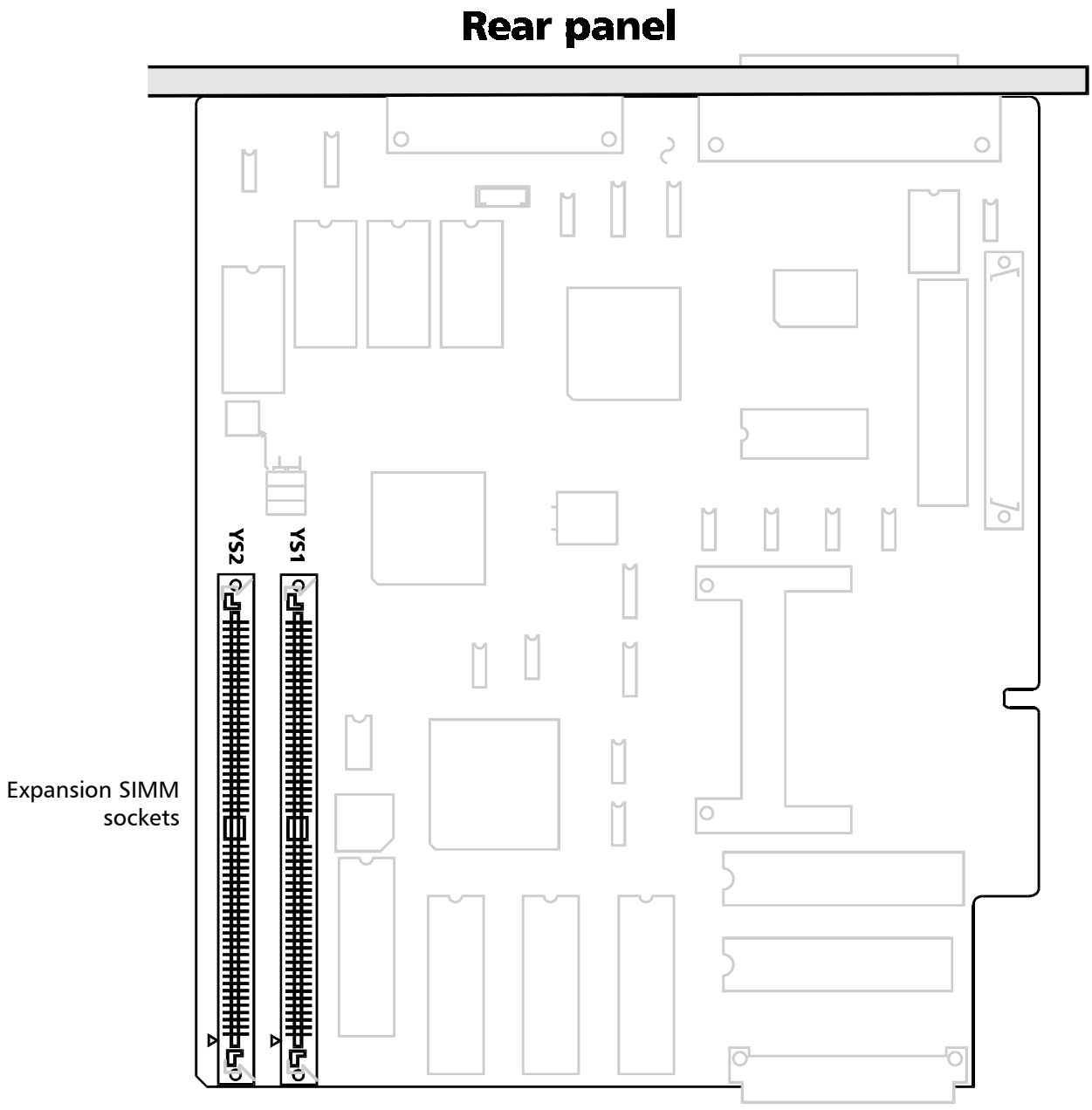


Pull the main circuit board all the way out of the printer.

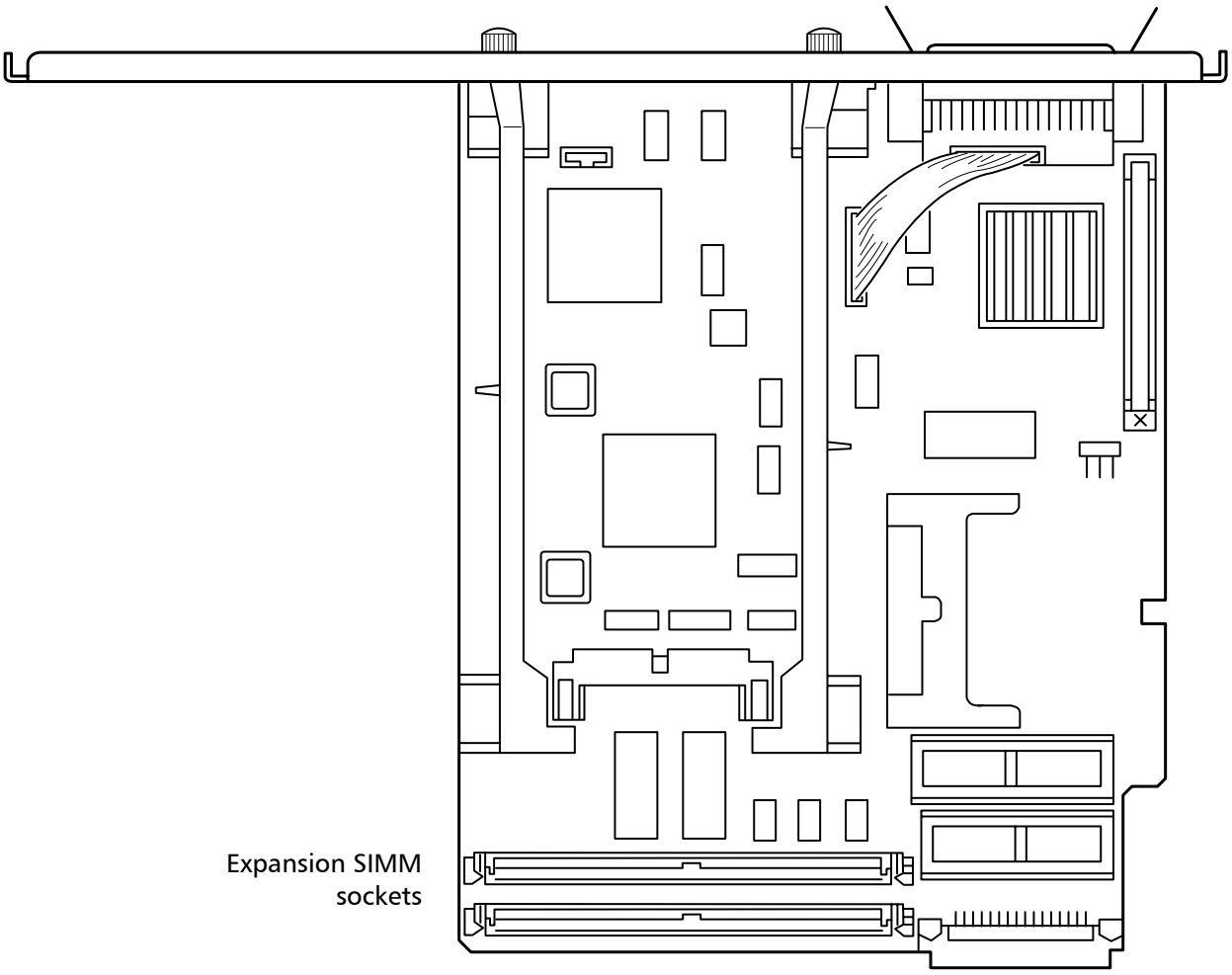
Caution - Before pulling the board out, clean an area on the table, etc., at the back of the printer's rear panel. Foreign objects, accidentally sticking to the back of the main board, can cause serious damage to the printer.

Refer to the **Error! Reference source not found.** diagram on page **Error! Bookmark not defined.**. Locate the sockets for memory expansion on the main board. These sockets have 72 pins and are symbolized as *YS1* and *YS2*.

FS-1700/FS-3700

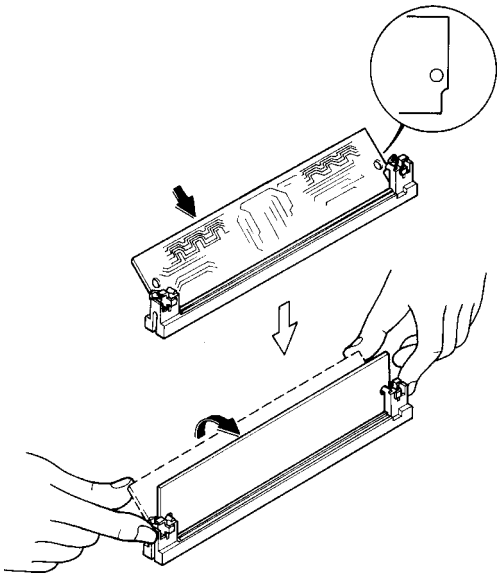


FS-1700+/FS3700+

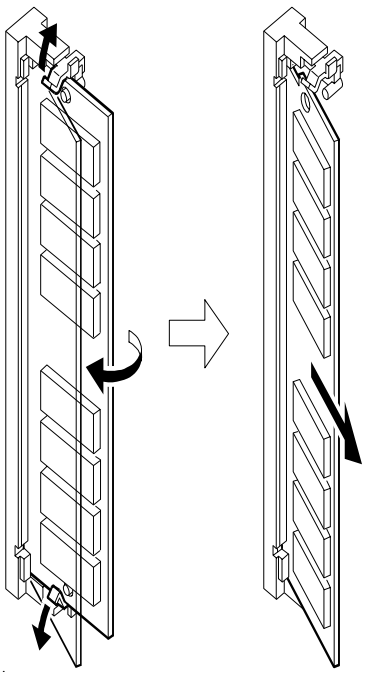


Installing SIMMs

Insert the SIMM ❶ into the socket ❷ as shown. Carefully push the board upright until it snaps into place. Make sure that the catches at the ends of the socket fit into the holes ❸ at the ends of the SIMM board.



FS-1700/FS-3700



FS-1700+/FS-3700+

Testing the expansion memory

After installing SIMMs in the printer, test the printer to see if the installation has been successful. To test the expansion memory, turn printer power on and print a status page.

If the installation has been successful, the *Total memory (Memory Allocation)* of the status page will show the expanded memory size corresponding to the amount of memory added.

Installing KPDL (models FS-1700 and FS-3700 only)

The KPDL (Kyocera Printer Description Language) is an upgrade for adding Kyocera's implementation of the PostScript page description language to models.

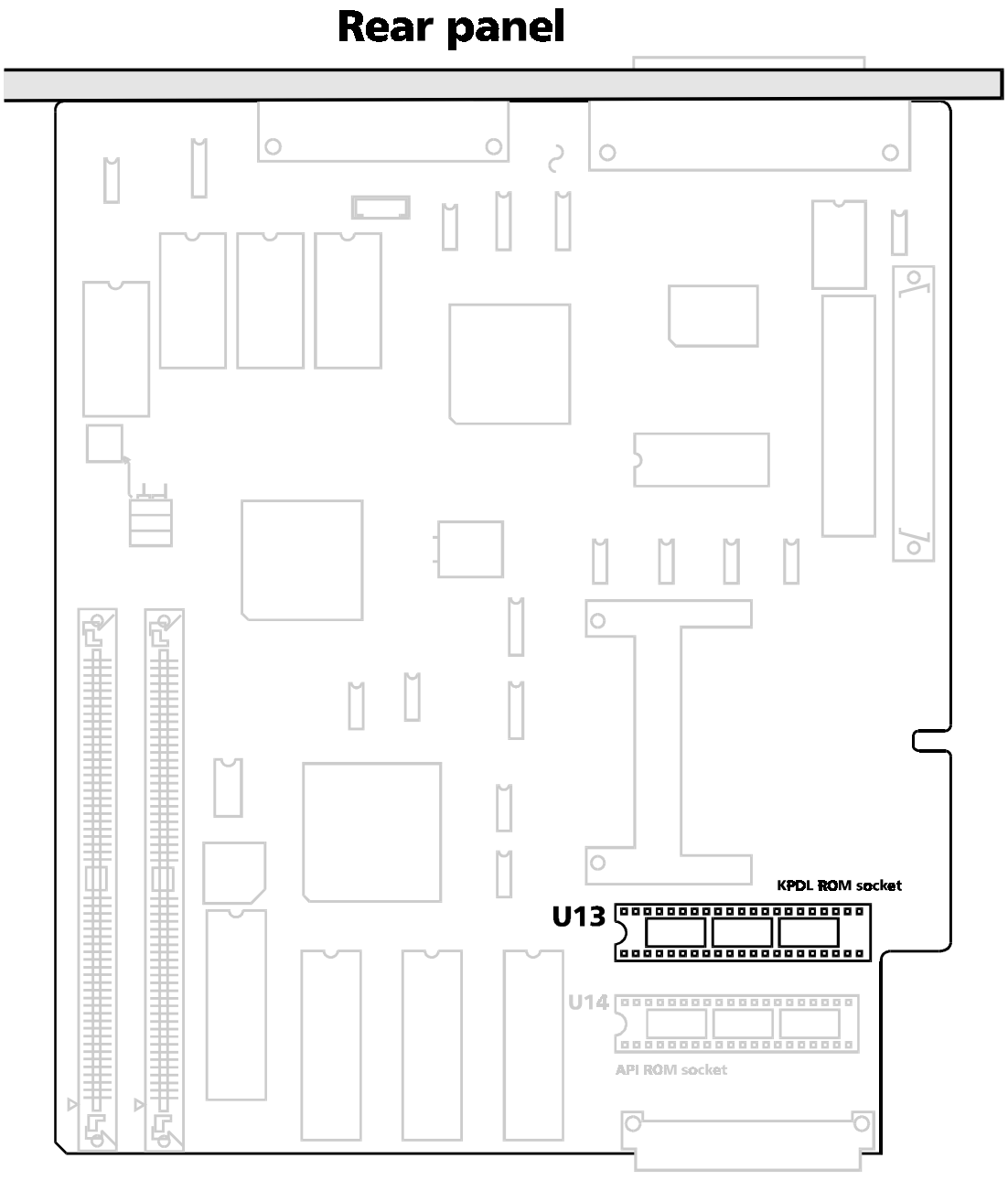
The KPDL is already installed for the Plus Series as a standard.

Upgrade is done by inserting a KPDL ROM (PK-4) into an empty socket on the printer's main circuit board. For details, refer to the KPDL *Upgrade Kit Installation Manual* supplied with the PK-1/2/4.

Removing the main circuit board

Refer to the instructions for removing the main circuit board under section *Expanding memory*, page 2-7, and remove the main circuit board.

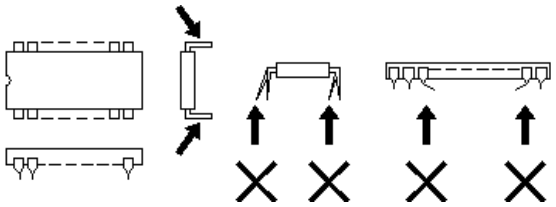
Locate the socket for inserting the KPDL ROM. Refer to the **KPDL ROM SOCKET** diagram on page 2-15. This socket is marked as *U13*, adjacent to another (shorter) empty socket (U14).



KPDL ROM SOCKET

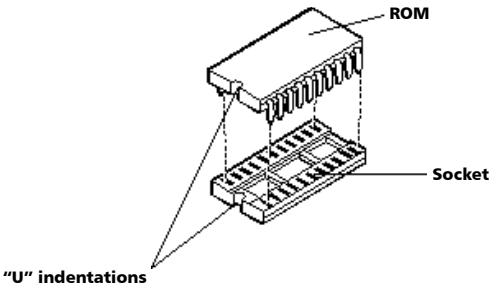
Installing the ROM

Before installing the KPDL ROM, carefully straighten the pins as follows.



Make sure that none of the pins are bent.

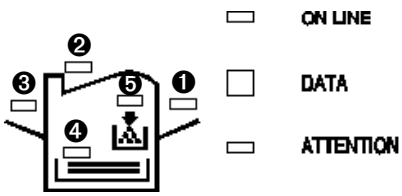
To insert the ROM into its socket, position the ROM in the socket as shown. Make sure that the U-shaped indentation at the end of the ROM is oriented in the same direction as the U-shaped indentation at the end of the socket. Align all pins of the ROM properly with their socket holes.



Using the Control Panel

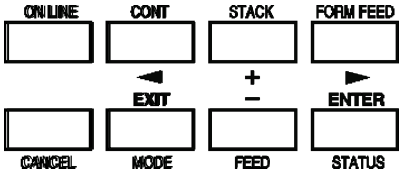
The printer's control panel have LED indicators and a quartz message display to provide a quick access to the printer's conditions.

Indicators



Indicator	Status	Function
ONLINE/Green	Flashing	A memory error (See chapter 6) has occurred.
	Steady	The printer is on-line and ready prints received data.
	Off	The printer is off-line. The printer stores but not print received data.
DATA/Green	Flashing	The printer is receiving data at its interface.
	Steady	Indicates either that data is being processed, or that data is being written to the memory card.
ATTENTION/Red	Flashing	A service call is required. Read the message on the message display. (Also, see chapter 6.)
	Steady	The printer needs attention for a problem that can be cleared by the user.
Manual feed indicator/❶		Lights when paper is fed from the multi-purpose feed tray, bulk (front loading) feeder, or the option envelope feeder if installed. If this flashes, paper jam is suggested in a particular location, refer to chapter 6.
Face-down stack indicator/❷		Lights when printed pages are delivered to the face-down output tray. If this flashes, paper jam is suggested in a particular location, refer to chapter 6.
Face-up stack indicator/❸		Lights when printed pages are delivered to the face-up output tray, or to the option stacker if installed. If this flashes, paper jam is suggested in a particular location, refer to chapter 6.
Cassette feed indicator/❹		Flashing: indicates the possibility that paper may be jammed at this point, open and remove any jammed paper. Lit: indicates when paper is fed from the paper feed cassette.
Toner indicator/❺		Flashes when the toner supply is low to request replenishing.

Front panel keys



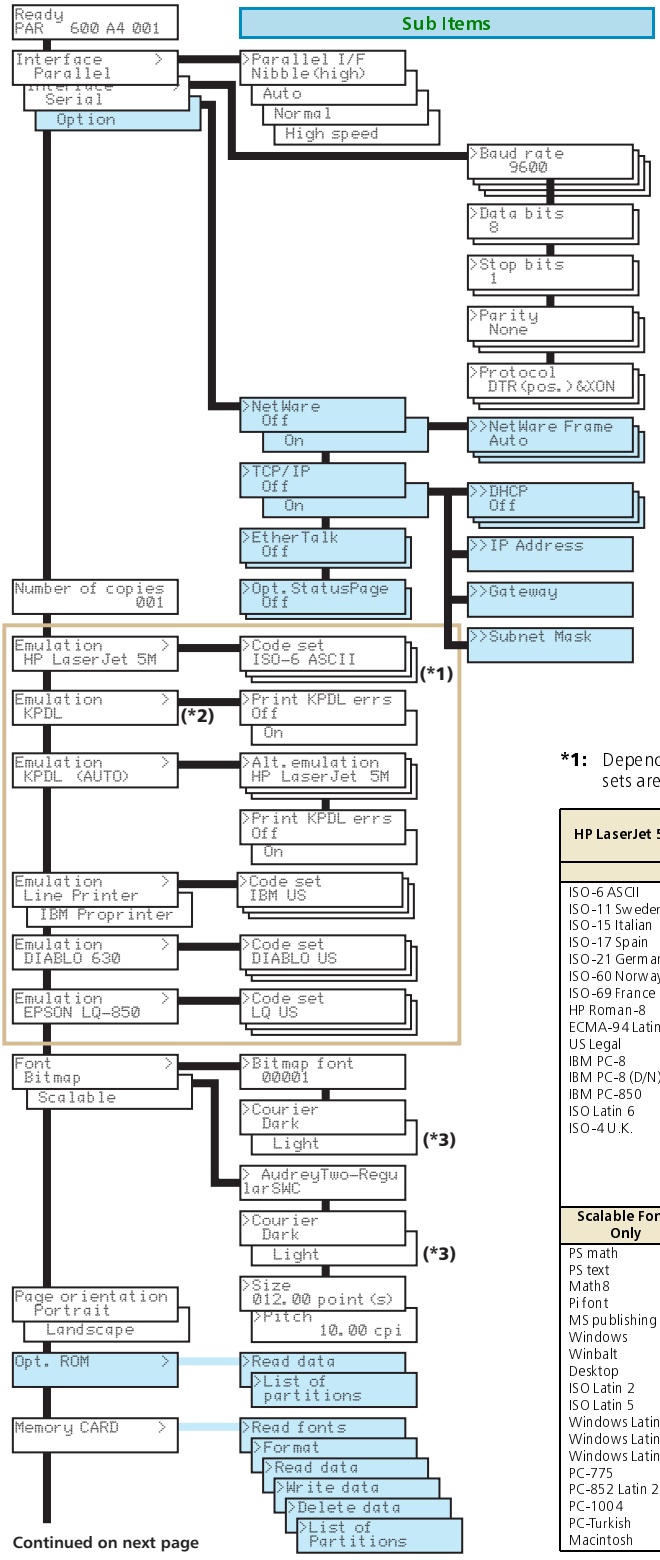
Key	Function
ONLINE	Switches the printer on-line and off-line.
CONTINUE	Depending on the message being indicated, there are cases where operation will continue after pressing this key. If such a message is displayed, operation will be resumed after pressing this key.
STACK	Selects whether printed pages are delivered to the face-down, face-up tray, or optional sorter/stacker (if installed).
FORM FEED	Prints and feeds out one page.
CANCEL	Abandons a printing job, resets numeric values, or cancels a setting procedure.
MODE/EXIT	Enters/exits the mode selection menu. See **Mode selection menu** below.
FEED	Selects the cassette feed or multi purpose tray feed.
STATUS/ENTER	Prints a page of information on the printer's current status. (The printer must be on-line.).

Mode selection menu

The **MODE** key on the control panel allows to set or change the printer environment such as the number of copies to make, emulation, etc., and to print a font list, manipulating a memory card, etc.

During operating in the mode selection, several front panel keys serve exclusively for its secondary function as labeled beside them (**EXIT**, **+**, **-**, **ENTER**, ◀, ▶). The diagram on the next page gives a full load map to the full options and the sequence of mode selection as well as usage of these secondary keys.

Mode Select Menu



Continued on next page

This diagram gives quick reference to the full menu options and the sequence of selection. Vertical movement between delections in the diagram is achieved by the + and - keys; and horizontal movement by the ◄ and ► keys.

1. Press the **MODE** key.
2. Press the + or - key repeatedly until the message display indicates the desired item.
3. Press the **ENTER** key to start changing the setting.
4. Press the + or - key until the desired setting is selected.
5. Press the **ENTER** key again.

   If you want to abandon the setting, press the **CANCEL** key instead of the **ENTER** key.
6. Press the **EXIT** key to finalize the setting procedure. The message display returns to Ready.

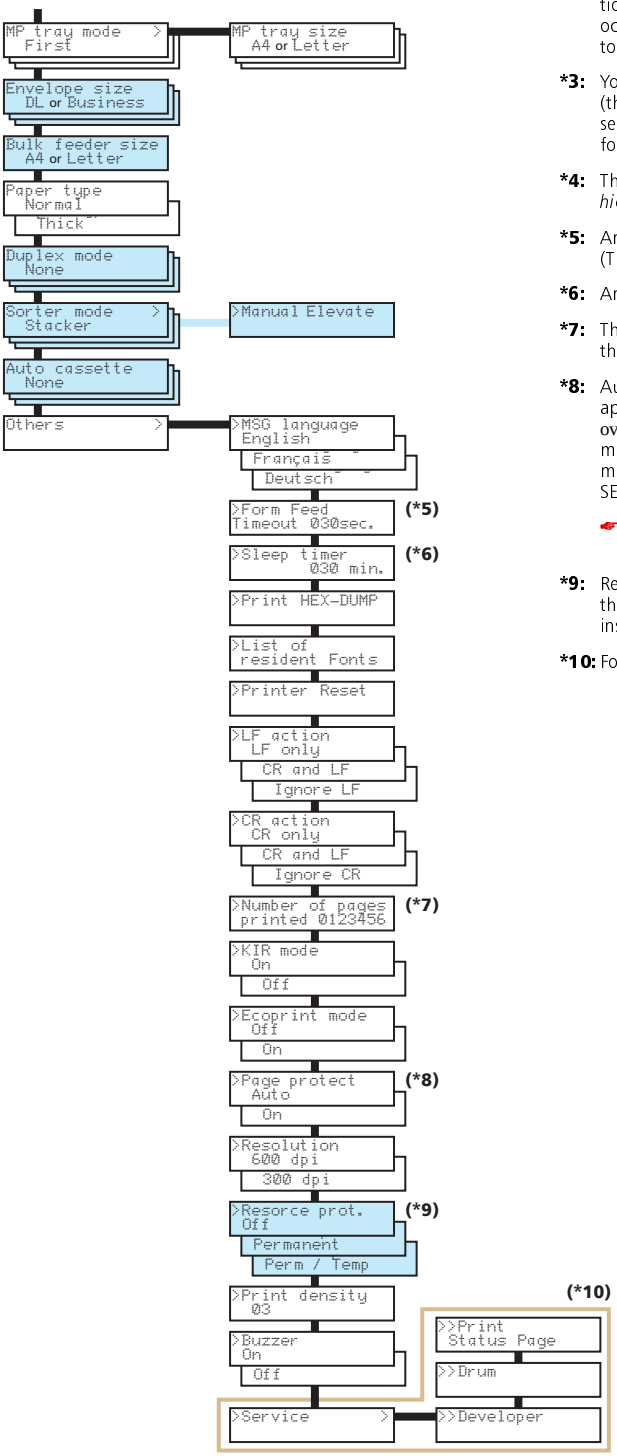
Hints

- For all setteing procedures, finalize the change by pressing **ENTER**.
- You can use the illuminated ◄ (**CONTINUE**) and ► (**FORM FEED**)

***1:** Depending on the emulation selected, the following set > code sets are available.

HP LaserJet 5M	IBM Proprinter X24E or Line Printer	DIABLO 630	EPSON LQ-850
Bitmap and Scalable Fonts			
ISO-6 ASCII ISO-11 Sweden ISO-15 Italian ISO-17 Spain ISO-21 Germany ISO-60 Norway ISO-69 France HP Roman-8 ECMA-94 Latin 1 US Legal IBM PC-8 IBM PC-8 (D/N) IBM PC-850 ISO Latin 6 ISO-4 U.K.	IBM US IBM D/N IBM PC-850 IBM PC-860 IBM PC-863 IBM PC-865 US Legal	DIABLO US DIABLO France DIABLO Germany DIABLO U.K. DIABLO Denmark DIABLO Sweden DIABLO Italy DIABLO Spain DIABLO Japan US Legal	LQ US LQ France LQ Germany LQ U.K. LQ Denmark LQ Sweden LQ Italy LQ Spain LQ Japan LQ Norway LQ Denmark 2 LQ Spain 2 Latin America IBM US IBM D/N IBM PC-850 IBM PC-860 IBM PC-863 IBM PC-865
Scalable Fonts Only			
PS math PS text Math8 Pifont MS publishing Windows Winbalt Desktop ISO Latin 2 ISO Latin 5 Windows Latin 1 Windows Latin 2 Windows Latin 5 PC-775 PC-852 Latin 2 PC-1004 PC-Turkish Macintosh			

Continued from previous page



***2:** The printer can be set to print error data during KPDL emulation. If this is set to **On**, error data will be printed if trouble occurs during printing. This is set to **Off** before leaving the factory.

***3:** You can select either of two Courier fonts, Dark (bold) or Light (thin), as the default font. The original selection is Dark. The selection made applies to both bit map fonts and scalable fonts; the two cannot be set independently.

***4:** The **>Size** menu is not available for the *Courier* and *LetterGothic* fonts. Use the **>Pitch** menu to scale these fixed fonts.

***5:** Any value from 0 to 495 [seconds] in 5-second increments. (The printer does not time out with the value set to 0.)

***6:** Any value from 0 to 120 [minutes] in 5-minute increments.

***7:** This is the total number of pages printed by the printer up to the present time.

***8:** Auto is the default setting, and this selection does not usually appear in the MODE SELECT menu. In the event of a **Print overrun Press CONTINUE** error due to insufficient printer memory, the printer automatically switches to page protect mode **On**. In such a case this selection will appear in the MODE SELECT menu.

☛ **In order to maintain efficient use of printer memory, the setting should normally be set to Auto.**

***9:** Resouce protection is available only when the printer has more than 10 MB (14 MB if the duplexer is on) of additionally installed main memory.

***10:** For service purpose only.

Service mode

Within `Others` option, the `Service` mode can be accessed by authorized service personnel. This mode provides two special treatments for service purpose: *cleaning on the drum surface* and *accelerating initial toner replenishment for a new developer*.

The service mode is available only when the printer is ready. While in service mode, the printer accepts print data but does not print it.

For details, see *chapter 3*, page 3-13.

Chapter One C O N T E N T S

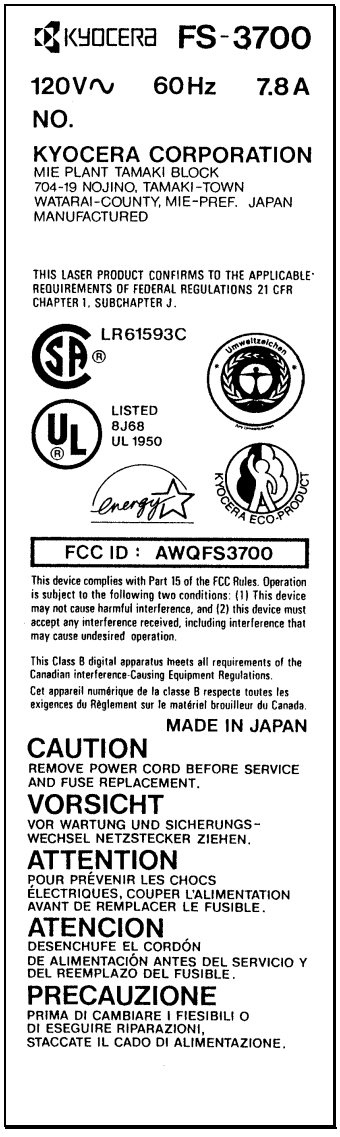
Printer identification labeling

The printer bears its model and serial numbers at its back. The following diagrams example labels for model FS-3700.

The label also contains other safety precautions.

Europe/Asia version

US/Canada version



Printer Specifications

ENGINE

Specification	FS-1700/+	FS-3700/+
Print method	Electrophotography laser scan	←
Print speed (A4 or letter, when printing multiple copies of the same page)	12 pages/minute	18 pages/minute
Resolution (dpi)	600 horizontal/600 vertical	←
Smoothing	KIR 2 (2400 horizontal/600 vertical)	←
First print (A4 or letter), depends on input data	15 seconds or less	12 seconds or less
Warm-up time at 23°C or 68°F	50 seconds or less	40 seconds or less
Maximum duty cycle	25,000 pages/month	50,000 pages/month
Laser diode	Visible laser	←
Main charger	Scorotron wire	←
Transferring	Biased roller	←
Separation	Charging	←
Drum cleaning	Blade	←
Drum discharging	LED array	←
Fuser	Heat and pressure	←
Paper	Plain paper (See *Appendix B*)	←
Capacity of paper feed tray	250 sheets	←
Capacity of output trays	250 sheets	←

CONTROLLER

Specification	FS-1700	FS-1700+	FS-3700	FS-3700+
CPU	68EC040/33	PowerPC603-66	68EC040/33	PowerPC603-100
System ROM size	2MB (512 kB×4)	4MB (16Mb×2)	2MB (512 kB×4)	4MB (16Mb×2)
Resident font ROM size	2 MB (2 MB × 1)	4MB (32Mb×1)	2 MB (2 MB × 1)	4MB (32Mb×1)
Option fonts ROM	16Mbits (PK-4)	—	16Mbits (PK-4)	—
Main RAM	2MB (512 kB×4)	4MB (2MB×2)	2MB (512 kB×4)	4MB (2MB×2)
Additional RAM (SIMM)	64MB maximum	←	←	←
Memory card	SRAM or flush, JEIDA 4.2/PCMCIA 2.1 See *Recommended flash cards* in this chapter.			
Host interface	Parallel/serial/option			
Page description language	Prescribe II			
Standard emulation modes	HP LaserJet 4, IBM Proprinter X24E, Diablo 630, Epson LQ-850	HP LaserJet 5M, IBM Proprinter X24E, Diablo 630, Epson LQ-850, line printer	HP LaserJet 4, IBM Proprinter X24E, Diablo 630, Epson LQ-850	HP LaserJet 5M, HP LaserJet 5Si, IBM Proprinter X24E, Diablo 630, Epson LQ-850, line printer

WEIGHT AND DIMENSIONS

Specification	FS-1700/+	FS-3700/+
Width	37.3 cm (14.7”)	←
Height	31 cm (12.2”)	←
Depth	38.3 cm (15.1”)	←
Weight (Main unit)	14 kg (30 lb.)	←

POWER REQUIRMENTS

Specification		FS-1700/+	FS-3700	FS-3700+
Voltage requirements	US/Canada	120V AC ±10%, 60Hz ±2%		
	Europe/Asia	220-240V AC±10%, 50 or 60Hz ±2%		
Watts	Maximum	667 W	898W	←
	Printing	311 W	404 W	←
	Standby	105 W	120 W	←
	Sleeping	19 W	20 W	21W
Maximum current	US/Canada	5.8 A	—	—
	Europe	3.0 A	—	—

ENVIRONMENTAL REQUIREMENTS

Specification	FS-1700/+	FS-3700/+
Operating temperature and humidity	10°C to 32.5°C (50°F to 90.5°F), 20 to 80% RH	←
Maximum altitude	2,000 m (6,500 feet)	←
Noise emission	50 dB maximum/39 dB at standby	53 dB maximum/39 dB at standby

Recommended flash cards

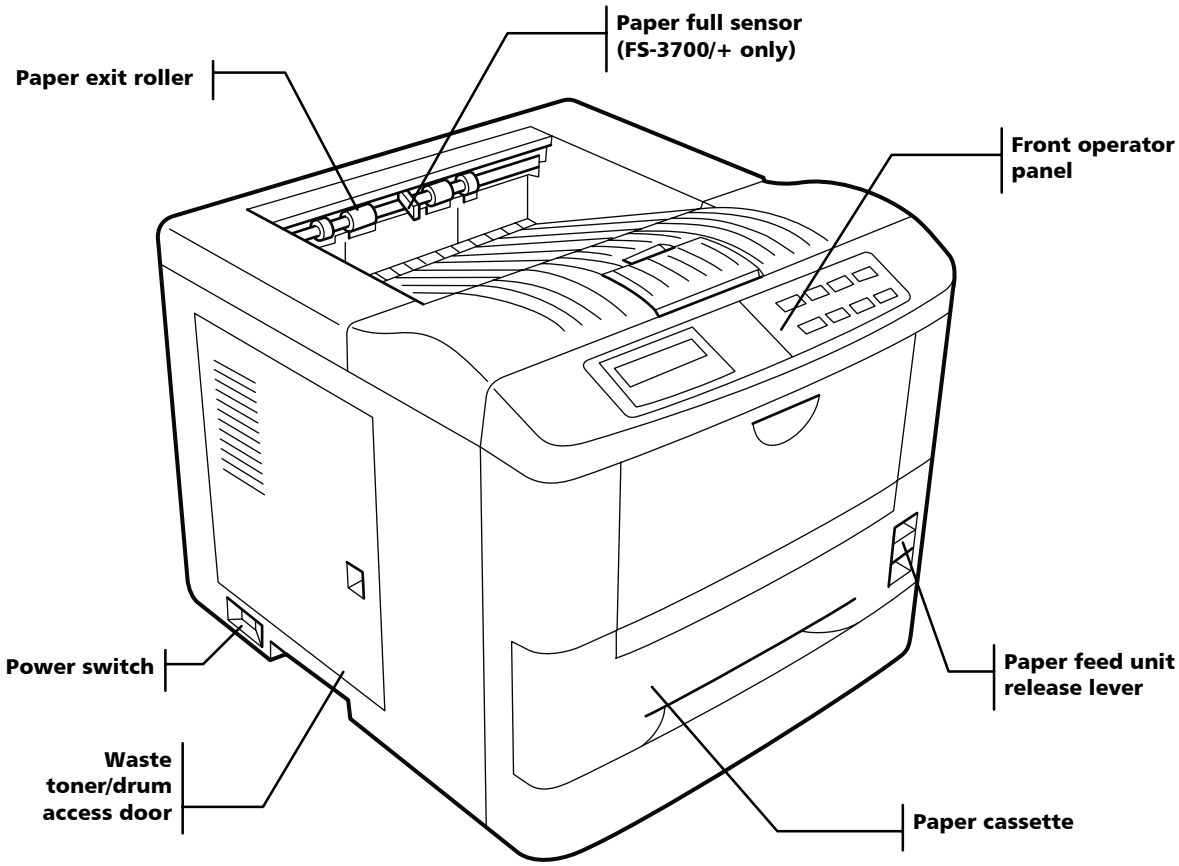
Both FS-1700 and FS-3700 Series printers provide support for a JEIDA/PCMCIA category of memory card in both SRAM and flush types. The normal series supports memory size of up to 16 MB; and the Plus Series supports up to 32 MB.

Following is a list of makes and models of flush cards recommended for use with the printers. Note that the flush card to be used should be operable on 5V DC.

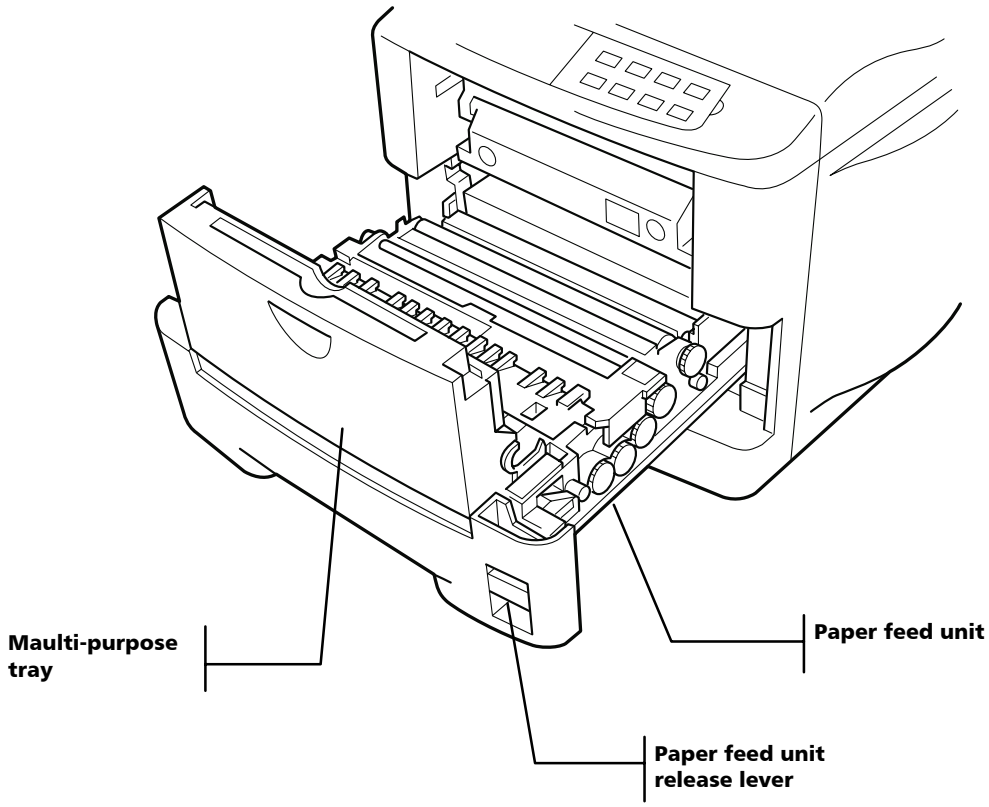
	Model	Capacity
AMD	AmC001CFLKA	1 MB
	AmC002CFLKA	2 MB
	AmC004CFLKA	4 MB
	AmC004DFLKA	4 MB
	AmC008DFLKA	8 MB
	AmC010CFLKA	10 MB
Fujitsu	MB98A81063	1 MB
	MB98A81183	2 MB
	MB98A81273	4 MB
	MB98A81373	8 MB
	MB98A81473	16 MB
Panasonic	BN-02MHF4C (CC)	2 MB
	BN-04MHF4C (CC)	4 MB
Intel	Series 2+/iMC004FLSP	4 MB
Centennial	FL01M-20-11114-03	1 MB
	FL02M-20-11114-03	2 MB

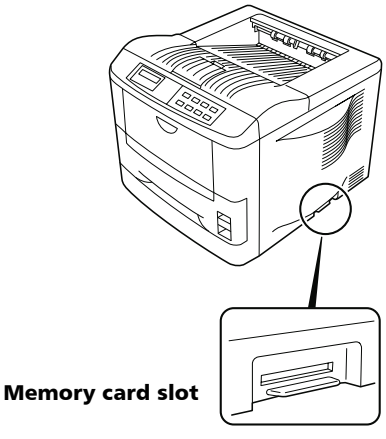
Front and internal views

Front view

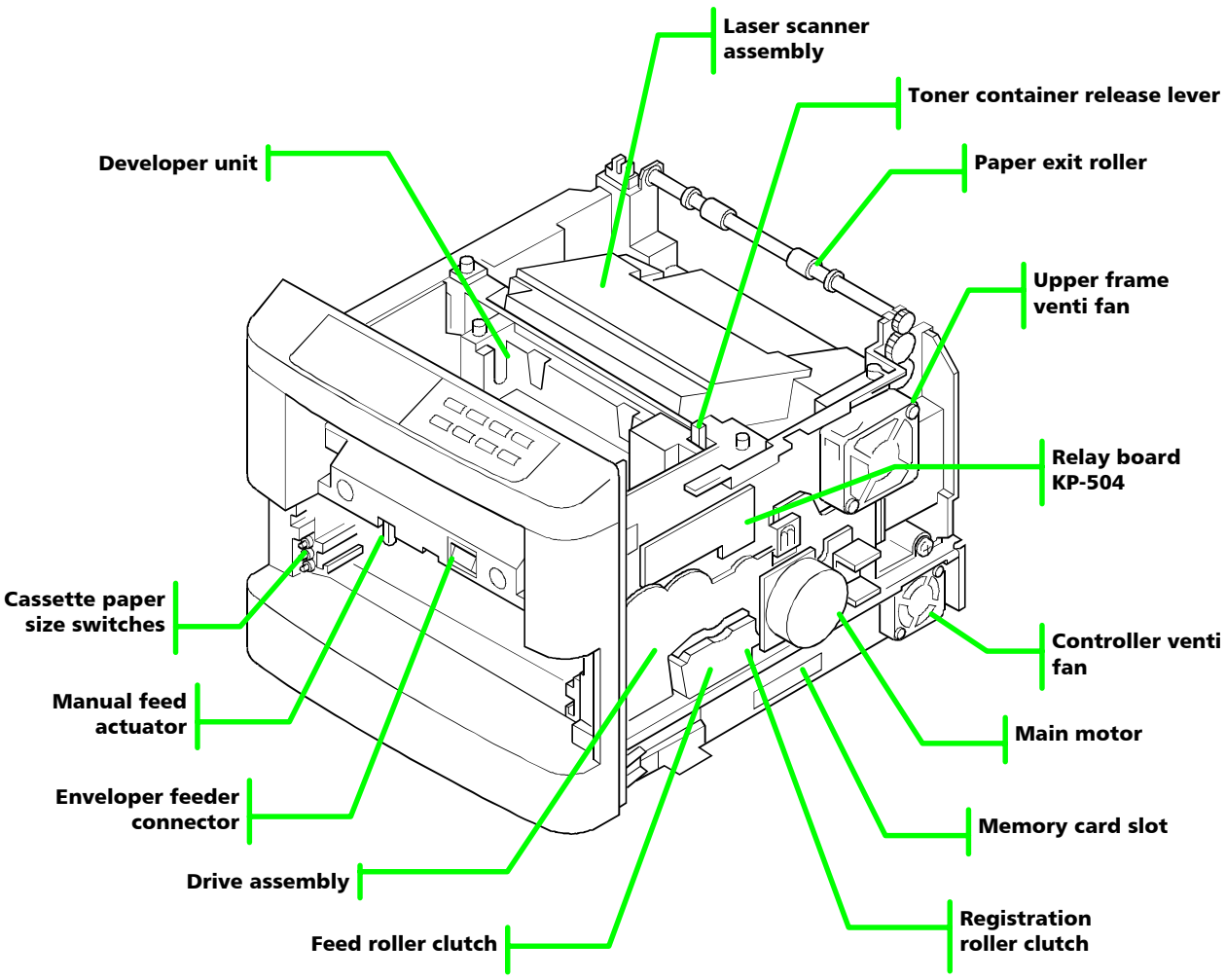


Paper feed unit

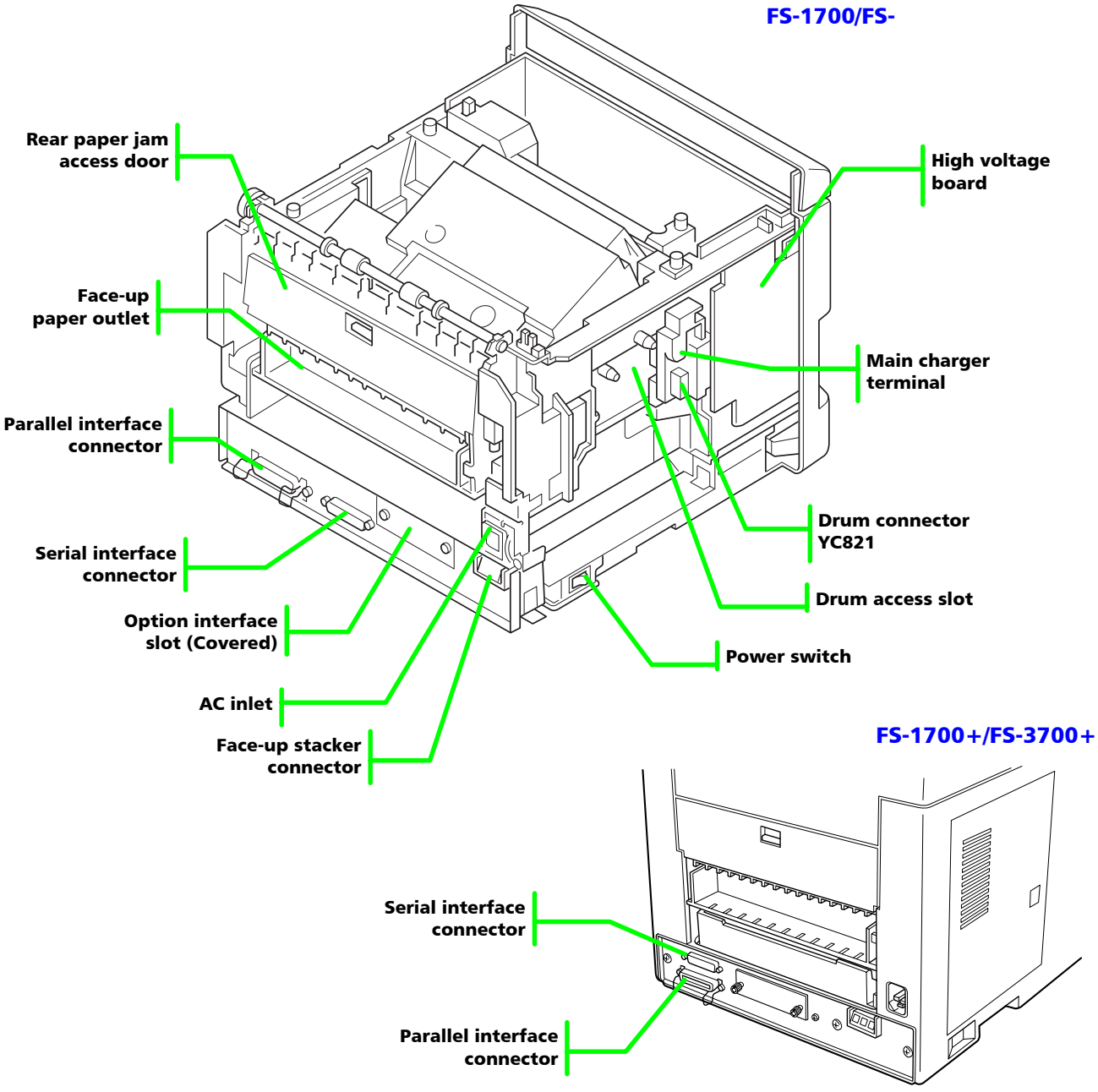




Internal assemblies ❶



Internal assemblies ❷



Safety information

Laser safety

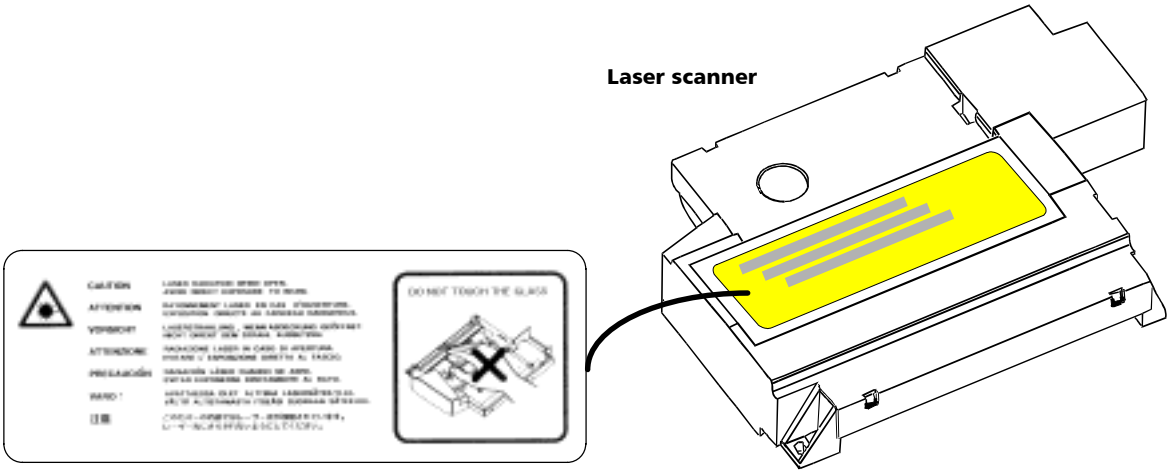
This printer is certified as a Class 1 laser product under the U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to Radiation Control for Health and Safety Act of 1968. This means that the printer does not produce hazardous laser radiation. Since radiation emitted inside the printer is completely confined within protective housings and external covers, the laser beam cannot escape from the printer during any phase of user operation.

Laser notice

The printer is certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter for Class I (1) laser products, and elsewhere is certified as a Class I laser product conforming to the requirements of IEC 825.

Class I laser products are not considered to be hazardous. The printer contains internally a Class IIIb (3b) laser that is nominally a 5 milliwatt laser operating in the wavelength region of 670 nanometers. The laser system and printer are designed so there is never any human access to laser radiation above a Class I level during normal operation, user maintenance, or prescribed service condition.

Laser product labels are located on top of the laser scanner:



Warning - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

CDRH regulations

The Center of Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured after August 1, 1976. Compliance is mandatory for products marketed in the United States. A label indicating compliance with the CDRH regulations must be attached to laser products marketed in the United States.

Ozone concentration

Laser printers generate ozone gas (O_3) which may concentrate in the place of installation and cause an unpleasant smell. To minimize the concentration of ozone gas, we recommend that the laser printer not be installed in a confined area lacking ventilation.

FCC notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Change or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.

Interference cable to the computer shall be used with shielded circular cable.

Any modification without prior permission may cause harmful interface. If any modification/change is introduced to this equipment without prior permission, Kyocera, as the manufacturer, cannot guarantee compliance with FCC rules.

To use equipment which does not comply with FCC rules is prohibited. The printer may be optionally installed with the following units:

CONFORMING TO CLASS A LIMITS:

- HS-3E Bulk Paper Stacker
- PF-7 Bulk Paper Feeder

CONFORMING TO CLASS B LIMITS:

- EF-1 Envelope Feeder
- DU-20 Duplexer
- HS-20 Paper Handler/Stacker
- PF-20 Paper Feeder
- PF-20mini Paper Feeder
- SO-6 Sorter/Stacker
- ST-20 Bulk Paper Stacker
- IB-3 AppleTalk Interface Board
- PK-series KPDL Upgrade Kit

Important note on the interface connectors

Be sure to turn off printer power before connecting or disconnecting an interface cable to the printer. For protection against static discharge which may be applied to the printer's internal electronics through the interface connector(s), keep any interface connector which is not in use capped using the protective cap supplied.

Warning - This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, etc.) certified to comply with the Class B limits may be attached to this equipment. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Canadian Department of Communications compliance statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité aux normes du ministère des Communications du Canada

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

ISO 7779

Maschinenlärminformationsverordnung 3. GSGV, 18.01.1991: Der höchste Schalldruckpegel beträgt 70 dB(A) oder weniger gemäß ISO 7779.

Environmental requirements

Environmental conditions

The **ENVIRONMENTAL REQUIREMENTS** section on page 1-6 should be observed to ensure the optimum operation of the printer. The use of the printer in a location which does not satisfy the requirements may result in troubles and risk shortening its service life.

The printer will work best if it is installed in a location that is:

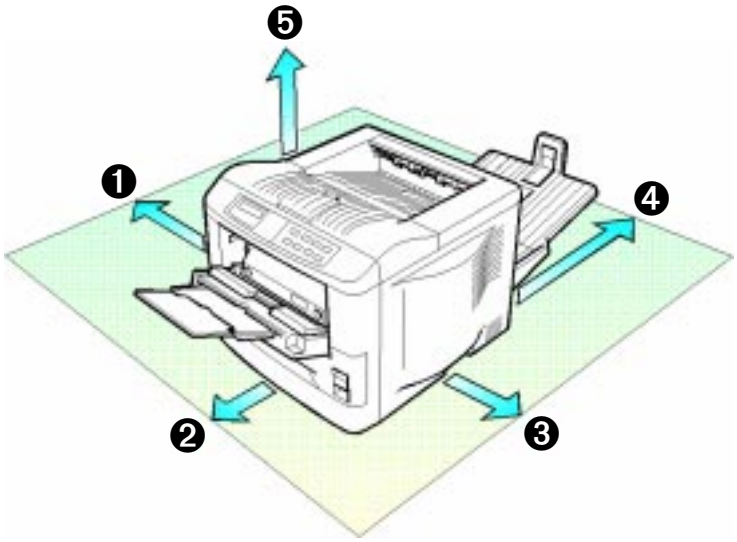
- ❒ Level and well supported (Place the printer on a sturdy table or desk.)
- ❒ Not exposed to sunlight or other bright light (not next to an uncurtained window). Do not place the printer on an unstable cart, stand, or table.
- ❒ Near an AC wall outlet, preferably one that can be used for the printer alone (See section

POWER REQUIRMENTS on page 1-5). (The outlet should have a ground slot, or an adaptor should be used. If you use an extension cord, the total length of the power cord plus extension cord should be 17 feet or 5 meters or less.

- ❒ Well ventilated, not too hot or cold, and not too damp or dry (See section **ENVIRONMENTAL REQUIREMENTS** on page 1-6). If you install the printer where the temperature or humidity is outside the requirements in section Environmental requirements in chapter 1, the best print quality may not be expected and there will be an increased chance of paper jams.
- ❒ Provide a sufficient clearances around the printer to ensure ventilation and ease of access. See section **Clearance** on page 1-19.)

Clearance

Allow the necesary minimum clearance on all sides of the printer (below). A total space of 92 by 138 cm (36 by 54”) is needed.



Clearance	Dimensions
Left ❶	30 cm (12”)
Front ❷	60 cm (24”)
Right ❸	25 cm (10”)
Back ❹	40 cm (16”) or 20 cm (8”) if the face-up tray is not installed.
Above ❺	30 cm (12”)

Places to avoid

Avoid installing the printer in locations exposed to:

- Direct drafts of hot or cold air.
- Direct drafts of outside air. (Avoid locations next to outside doors.)
- Sudden temperature or humidity changes.
- Any source of high heat, such as a radiator or stove.
- Excessive dust. Dust and smoke may cause contamination on the laser scanner window, causing print quality problem.
- Vibration.
- Ammonia fumes or other harmful fumes. (In case of humigating the room or saturate it with insecticide, remove the printer first.)
- Avoid greenhouse-like rooms. (Because of sunlight and humidity.)
- Avoid enclosed spaces that block ventilation.
- Avoid sites more than 6500 feet or 2000 meters above sea level.

Note on power

- Use only the power source voltage conforming to the printer's rated power voltage (See the

POWER REQUIRMENTS on page 1-5). Do not use other power sources.

- Disconnect the printer from the power source before attempting removal or replacement of an electrical component or a printed-circuit board.
- The printer should not be connected to a power source until the instruction is given to do so when performing tests described in this manual.
- In connecting the printer power, exercise an extreme care in handling the power supply or any other electric parts which may give an electric shock.
- Before performing maintenance or repair, power from both the power source and the associated peripheral devices (computer, sorter, etc.) should be disconnected, unless otherwise specified.
- To avoid possible electrical shock, extreme caution must be exercised in handling the power cord and any other electrical part.

Warning! /Wornung!

As the disconnect device is not incorporated in the printer's AC primary circuit, an easily accessible socket outlet must be provided near the equipment.

If the printer is used with the optional Sorter (SO-6) or Stacker (ST-20), in order to avoid short-circuiting, it should be ensured that these devices are plugged securely into their respective power outlets.

Da kein Trennschalter in den Wechselstrom-Primärkreis des Druckers eingebaut ist, muß eine leicht zugängliche Steckdose in der Nähe des Gerätes vorhanden sein.

Wenn der Drucker mit dem gesonderten Sorter (SO-6) oder Stapler (ST-20) verwendet wird, muß darauf geachtet werden, daß diese Geräte einwandfrei an separate Steckdosen angeschlossen sind, um Kurzschluß zu vermeiden.

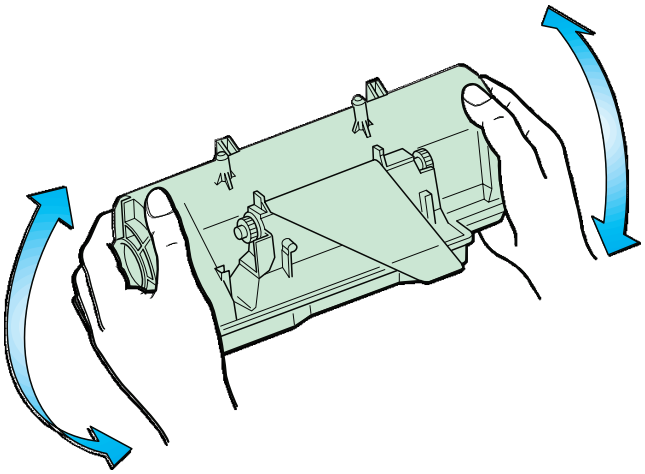
About the toner

The printer should use Kyocera TK-20 Toner Kit. To ensure the high print quality and long service life, the following handling precautions should apply.

Caution - As the Ecosys printers are designed to ensure the optimum print quality when used with the Kyocera's proprietary toner, Kyocera do not recommend to use any refilled toner containers that may be available commercially. This is because Kyocera have no means for control over how such refilled toner could affect the print quality and the reliability of the printer.

Toner container handling

To loosen and mix the toner inside, with the label side down, thoroughly shake the toner container (in the direction of the arrow) ten times or more.



Do not attempt to disassemble or refill the toner container.

Toner storage

The toner contained in the container is susceptible to temperature and humidity. To ensure the high print quality, store the toner container in a place that satisfy the following environmental conditions:

Temperature	-20°C to 40°C (-4°F to 104°F)
Humidity	15 to 90% RH

Note. If the toner container is removed from the printer's developer unit, put it in a protective bag and keep it in a dark place.

Caution - If the printer is shipped for return, etc., do not ship it with the toner container installed. Otherwise, toner may leak and contamination may result in the printer.

FS-1700/FS-3700 Series Combined Service Manual

Notice

The information in this manual is subject to change without notification. Additional pages may be inserted in future editions. The user is asked to excuse any technical inaccuracies or typographical errors in the present edition.

No responsibility is assumed if accidents occur while the user is following the instructions in this manual. No responsibility is assumed for defects in the printer's firmware.

The contents of this manual are protected by copyright. No part of this manual may be reproduced or copied by any means without the permission of the copyright holder. The printer's firmware (contents of its read-only memory) is similarly protected by copyright.

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PowerPC is a trademark of International Business Machines Corporation.

EnergyStar is a U.S. registered mark.

Models FS-1700 and FS-3700 printers use PeerlessPrint5 to provide the HP LaserJet IV compatible PCL5e language emulation. PeerlessPrint5 is a trademark of the Peerless Group, Redondo Beach, CA 90278, U.S.A.

Models FS-1700+ and FS-3700+ printers use PeerlessPrintXL to provide the HP LaserJet compatible PCL6 language emulation. PeerlessPrintXL is a trademark of The Peerless Group. These two models was developed using Tornade Real Time Operating System and Tools from Wind River Systems.

Warning:

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, etc.) certified to comply with the Class B limits may be attached to this equipment. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Check that the cable is wired correctly. If an IBM communication adapter cable type 1502067 is used, it will have to be resoldered the wiring at the printer end of the cable. The procedure is as follows.

Conventions

Throughout this manual, the following conventions are used:

Color is available when viewed online to emphasize important items.

CAPITAL letters are used to name printer parts and assemblies.

Italic letters refer related chapters or sections or documentations.

Bold letters are also used for emphasis wherever italics may cause a confuse.

This symbol followed by **Warning** denotes that the following paragraph(s) includes precautions which, if ignored, could result in personal injury, and/or irrevocable damage to the printer.

When followed by **Caution** this symbol denotes that the following paragraph(s) include the precautions which, if ignored, could result in damage to the printer.

About the chapters ...

Unless otherwise specified, the contents of this manual apply to all printer models of Ecosys FS-1700, FS-1700+, FS-3700, and FS-3700+.

The manual is comprised of the following chapters:

Chapter	Contents
One - Product information	Includes printer specifications, product appearances, safety information, etc.
Two - Installation and operation	Provides how to install and operate the printer.
Three - Maintenance	Instructs maintenance to be conducted periodically on the printer.
Four - Operation overview	Explains basic functions of the printer methcnism including engine and logic controller systems.
Five - Disassembly	Instructs removal of parts for replacing them.
Six - Troubleshooting	Provides countermesure to follow for troubleshooting.
Appendix	**Contents**
A - Printer interface	Information regarding the printer's parallel and serial interfaces.
B - Status page	Explains detail of the service information on the status page.
C - Paper specifications	Explains how to choose the right paper.
Separate	**Contents**
Parts catalog	Information of parts for ordering.

The manual will be supplemented with chapters or appendixes accordingly.

REVISION HISTORY

Version	Date	Replaced pages	Remarks
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1.00	25-April-97	4-12	
1.01	18-Sep-97	3-3	
1.02	1-Nov-97	6-43	
1.10	1-June-98		Inclusion of Plus ser.

This document was created using Microsoft® Word 95. To obtain its intended view of the document, the following fonts must be installed in addition to those already installed under Windows 95 by default: Century Schoolbook (regular/italic/bold), Humanist 777 (regular/italic), and Humanist 777 Black (black).

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