



# HP LaserJet Pro M14-M17 and LaserJet Pro MFP M28-M31

Troubleshooting Manual

## Copyright and License

© Copyright 2018 HP Development Company, L.P.

Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

The information contained herein is subject to change without notice.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.


Edition 1, 04/2018


## Trademark Credits


Microsoft®, Windows®, Windows® XP, and Windows Vista® are U.S. registered trademarks of Microsoft Corporation.

## Conventions used in this guide


---


 **TIP:** Helpful hints or shortcuts.

 **NOTE:** Information that explains a concept or how to complete a task.

 **Reinstallation tip:** Reinstallation helpful hints, shortcuts, or considerations.

 **IMPORTANT:** Information that help the user to avoid potential printer error conditions.

 **CAUTION:** Procedures that the user must follow to avoid losing data or damaging the printer.

 **WARNING!** Procedures that the user must follow to avoid personal injury, catastrophic loss of data, or extensive damage to the printer.

---





## For additional service and support information

HP service personnel, go to one of the following Web-based Interactive Search Engines (WISE) sites:

### AMS

- <https://support.hp.com/wise/home/ams-en>
- <https://support.hp.com/wise/home/ams-es>
- <https://support.hp.com/wise/home/ams-pt>

### APJ

- <https://support.hp.com/wise/home/apj-en>
- <https://support.hp.com/wise/home/apj-ja>
- <https://support.hp.com/wise/home/apj-ko>
- <https://support.hp.com/wise/home/apj-zh-Hans>
- <https://support.hp.com/wise/home/apj-zh-Hant>

### EMEA

- <https://support.hp.com/wise/home/emea-en>

Channel partners, go to HP Channel Services Network (CSN) at [www.hp.com/partners/csn](http://www.hp.com/partners/csn).

At these locations, find information on the following topics:

- Install and configure
- Printer specifications
- Up-to-date control panel message (CPMD) troubleshooting
- Solutions for printer issues and emerging issues
- Remove and replace part instructions and videos
- Service advisories
- Warranty and regulatory information

Channel partners, access training materials in the HP University and Partner Learning Center at <https://content.ext.hp.com/sites/LMS/HPU.page>.

To access HP PartSurfer information from any mobile device, go to <http://partsurfermobile.hp.com/> or scan the Quick Response (QR) code below.





---

# Table of contents

1 Theory of operation .....	1
Basic operation .....	2
Sequence of operation .....	3
Formatter-control system .....	4
Sleep delay .....	4
Auto-On / Auto-Off mode .....	5
Printer job language (PJM) .....	5
Printer management language (PML) .....	5
Control panel .....	5
Wireless (wireless models) .....	5
Low end data model (LEDM) .....	5
Advanced control language (ACL) overview .....	5
Near field communication (NFC) (wireless models) .....	6
CPU .....	6
Input/output .....	6
USB .....	6
Memory .....	6
Firmware .....	6
Nonvolatile random access memory (NVRAM) .....	6
Random access memory (RAM) .....	6
HP Memory enhancement technology (MEt) .....	7
Engine-control system .....	8
DC controller .....	9
Motors .....	9
Solenoids .....	10
Switches .....	10
Sensors .....	11
Low-voltage power supply .....	12
Low-voltage power supply voltages description .....	12
Overcurrent/overvoltage protection .....	12
Sleep mode operation .....	12
Low-voltage power supply unit failure detection .....	12

High-voltage power supply .....	13
Fuser control .....	13
Introduction .....	13
Fuser circuits .....	15
Fuser heater protection .....	16
Engine laser scanner system .....	17
Laser failure detection .....	17
Pickup, feed, and delivery system .....	19
Introduction .....	19
Photo sensors and switches .....	20
Motors, clutches, and solenoids .....	21
Jam detection/prevention .....	22
Scanning and image capture system (MFP M28-M31) .....	25
<b>2 Solve problems .....</b>	<b>27</b>
Solve problems checklist .....	28
Print a configuration report .....	29
Check the event log using the HP Embedded Web Server or HP Tool Box .....	29
Troubleshooting process .....	31
Determine the problem source .....	31
Troubleshooting flowchart .....	31
Power subsystem .....	33
Power-on checks .....	33
Power-on troubleshooting overview .....	33
Tools for troubleshooting .....	38
Individual component diagnostics .....	38
Tools for troubleshooting: Engine diagnostics .....	38
Engine test .....	38
Half self-test functional check .....	39
Drum rotation functional check .....	39
Diagrams .....	40
Diagrams: Block diagrams .....	41
Sensors and switches .....	41
Motor .....	42
Image-formation system .....	43
Diagrams: Printed circuit assembly (PCA) connector locations .....	44
Diagrams: Formatter connections .....	44
Diagrams: Engine controller unit (ECU) connections .....	46
Diagrams: External plug and port locations .....	47
Diagrams: Locations of major components .....	48
External panels, doors, and covers .....	48

Main assemblies .....	49
Main parts .....	49
PCA .....	50
Diagrams: Timing chart .....	51
Diagrams: Circuit diagrams .....	52
Advanced configuration with HP Embedded Web Server (EWS) and HP Device Toolbox (Windows) .....	53
Control panel (layout and interpreting light patterns) .....	55
Control panel (M14-M17) .....	55
Base model (M14-M17) .....	55
Wireless models (M14-M17) .....	56
Interpret control-panel light patterns (M14-M17) .....	57
Control panel (MFP M28-M31) .....	58
Base model (MFP M28-M31) .....	58
Wireless models (MFP M28-M31) .....	59
Interpret control-panel light patterns (MFP M28-M31) .....	60
Improve print quality .....	64
Introduction .....	64
Update the printer firmware .....	64
Print from a different software program .....	64
Check the paper-type setting for the print job .....	65
Check the paper type setting on the printer .....	65
Check the paper type setting (Windows) .....	65
Check the paper type setting (OS X) .....	65
Check toner-cartridge status .....	65
Print a cleaning page .....	66
Visually inspect the toner cartridge .....	67
Check paper and the printing environment .....	67
Step one: Use paper that meets HP specifications .....	67
Step two: Check the environment .....	67
Try a different print driver .....	68
Adjust Print Density .....	68
Print quality troubleshooting guide .....	71
Resolving print quality problems .....	71
Introduction .....	71
Troubleshoot print quality problems .....	72
Printer-specific image defects .....	79
Repetitive image defects .....	79
Use a ruler to measure between repetitive defects .....	79
Printer-specific print quality troubleshooting guide .....	83
Light print .....	84

Dark print .....	84
Blank page .....	86
All black .....	87
White spots .....	88
Dirt on the back of the page .....	89
Vertical lines .....	90
Vertical white lines .....	91
Horizontal lines .....	92
Horizontal white lines .....	93
Dropouts .....	94
Loose toner .....	95
Toner smear .....	96
Misformed or misplaced image .....	97
Wrinkles or creases .....	98
Dirt on the front of the page .....	99
Vertical density variation .....	100
Repetitive image defects .....	101
Improve copy and scan image quality (MFP M28-M31) .....	102
Introduction .....	102
Check the scanner glass for dirt and smudges .....	102
Check the paper settings .....	102
Optimize for text or pictures .....	104
Edge-to-edge copying .....	104
Clean the printer .....	105
Print a cleaning page .....	105
Clean the scanner glass and platen (MFP M28-M31) .....	105
Clean the pickup rollers .....	106
Solve paper-handling problems .....	107
Printer does not pick up paper or misfeeds .....	107
Introduction .....	107
The product does not pick up paper .....	107
The product picks up multiple sheets of paper .....	107
Prevent paper jams .....	107
Clear paper jams .....	108
Introduction .....	108
Paper path jam sensor locations .....	108
Experiencing frequent or recurring paper jams? .....	109
Paper jam locations .....	111
Clear jams from the input tray .....	111
Clear jams from inside the product .....	113
Clear jams from the output areas .....	114

Solve performance problems .....	116
Solve connectivity problems .....	117
Solve USB connection problems .....	117
Solve wireless network problems .....	117
Introduction .....	117
Wireless connectivity checklist .....	117
The printer does not print after the wireless configuration completes .....	118
The printer does not print, and the computer has a third-party firewall installed .....	119
The wireless connection does not work after moving the wireless router or printer .....	119
Cannot connect more computers to the wireless printer .....	119
The wireless printer loses communication when connected to a VPN .....	119
The network does not appear in the wireless networks list .....	119
The wireless network is not functioning .....	119
Perform a wireless network diagnostic test .....	120
Reduce interference on a wireless network .....	121
Service mode functions .....	122
Secondary service menu .....	122
Printer resets .....	124
Restore the factory-set defaults .....	124
NVRAM initialization .....	124
Super NVRAM initialization .....	124
Firmware upgrades .....	125
Update the firmware using the Firmware Update Utility .....	125
<b>Appendix A Certificates of volatility .....</b>	<b>127</b>
Certificate of volatility (M14-M17) .....	128
Certificate of volatility (MFP M28-M31) .....	132
<b>Index .....</b>	<b>137</b>





---

# List of tables

Table 1-1	Sequence of operation .....	3
Table 1-2	Motors .....	9
Table 1-3	Solenoids .....	10
Table 1-4	Switches .....	10
Table 1-5	Sensors .....	11
Table 1-6	Converted DC voltages .....	12
Table 1-7	Fuser control functions .....	14
Table 1-8	Fuser components .....	15
Table 1-9	Laser failure detection .....	17
Table 1-10	Photo sensors and switches .....	20
Table 1-11	Motors and solenoids .....	21
Table 1-12	Functions for pickup, feed and delivery system .....	21
Table 1-13	Jam detection .....	23
Table 2-1	Troubleshooting flowchart .....	32
Table 2-2	Sensors and switches .....	41
Table 2-3	Motor .....	42
Table 2-4	Formatter connections (M14-M17 models) .....	44
Table 2-5	Formatter connections (MFP M28-M31 models) .....	45
Table 2-6	Engine controller unit (ECU) connections .....	46
Table 2-7	External plug and port locations (M14-M17) .....	47
Table 2-8	External plug and port locations (MFP M28-M31) .....	47
Table 2-9	External panels, doors, and covers (M14-M17) .....	48
Table 2-10	External panels, doors, and covers (MFP M28-M31) .....	48
Table 2-11	Main assemblies .....	49
Table 2-12	Main parts .....	49
Table 2-13	PCA .....	50
Table 2-14	Status-light legend .....	57
Table 2-15	Control-panel light patterns .....	57
Table 2-16	Status-light legend .....	60
Table 2-17	Control-panel light patterns .....	60
Table 2-18	Supported operating systems and print drivers .....	68
Table 2-19	Image defects table quick reference .....	72

Table 2-20	Light print .....	73
Table 2-21	Gray background or dark print .....	74
Table 2-22	Blank page — No print .....	74
Table 2-23	Black page .....	75
Table 2-24	Banding defects .....	75
Table 2-25	Streak defects .....	76
Table 2-26	Fixing/fuser defects .....	77
Table 2-27	Image placement defects .....	77
Table 2-28	Output defects .....	78
Table 2-30	Solve performance problems .....	116
Table 2-31	Secondary service menu .....	123

---

# List of figures

Figure 1-4	High-voltage power supply circuits .....	13
Figure 1-5	Fuser components .....	14
Figure 1-6	Fuser control .....	15
Figure 1-8	Pickup, feed, and delivery system .....	19
Figure 1-9	Photo sensors and switches .....	20
Figure 1-10	Motors, solenoids, and clutches .....	21
Figure 1-11	Paper path and (jam) sensor locations .....	23
Figure 1-12	Scanning and image capture system outline .....	25
Figure 2-1	Engine test page .....	34
Figure 2-2	Engine test page .....	35
Figure 2-3	Engine test page .....	37
Figure 2-4	Engine test page .....	38
Figure 2-5	Sensors and switches .....	41
Figure 2-6	Motor .....	42
Figure 2-7	Image-formation system .....	43
Figure 2-8	Formatter connections (M14-M17 models) .....	44
Figure 2-9	Formatter connections (MFP M28-M31 models) .....	45
Figure 2-10	Engine controller unit (ECU) connections .....	46
Figure 2-11	External plug and port locations (M14-M17) .....	47
Figure 2-12	External plug and port locations (MFP M28-M31) .....	47
Figure 2-13	External panels, doors, and covers (M14-M17) .....	48
Figure 2-14	External panels, doors, and covers (MFP M28-M31) .....	48
Figure 2-15	Main assemblies .....	49
Figure 2-16	Main parts .....	49
Figure 2-17	PCA .....	50
Figure 2-18	General timing chart .....	51
Figure 2-19	General circuit diagram .....	52
Figure 2-20	Examples of repetitive defects .....	80
Figure 2-21	Place the ruler on the page .....	81
Figure 2-22	Locate the next repetitive defect .....	81
Figure 2-23	Determine the defective assembly .....	82
Figure 2-41	Paper path and (jam) sensor locations .....	109

Figure 2-42	Paper jam locations (M153-M154)	111
Figure A-1	CoV HP LaserJet Pro M15a (1 of 2)	128
Figure A-2	CoV HP LaserJet Pro M15a (2 of 2)	129
Figure A-3	CoV HP LaserJet Pro M15w (1 of 2)	130
Figure A-4	CoV HP LaserJet Pro M15w (2 of 2)	131
Figure A-5	CoV HP LaserJet Pro MFP M28a (1 of 2)	132
Figure A-6	CoV HP LaserJet Pro MFP M28a (2 of 2)	133
Figure A-7	CoV HP LaserJet Pro MFP M28w (1 of 2)	134
Figure A-8	CoV HP LaserJet Pro MFP M28w (2 of 2)	135

---

# 1 Theory of operation

- [Basic operation](#)
- [Formatter-control system](#)
- [Engine-control system](#)
- [Engine laser scanner system](#)
- [Pickup, feed, and delivery system](#)
- [Scanning and image capture system \(MFP M28-M31\)](#)

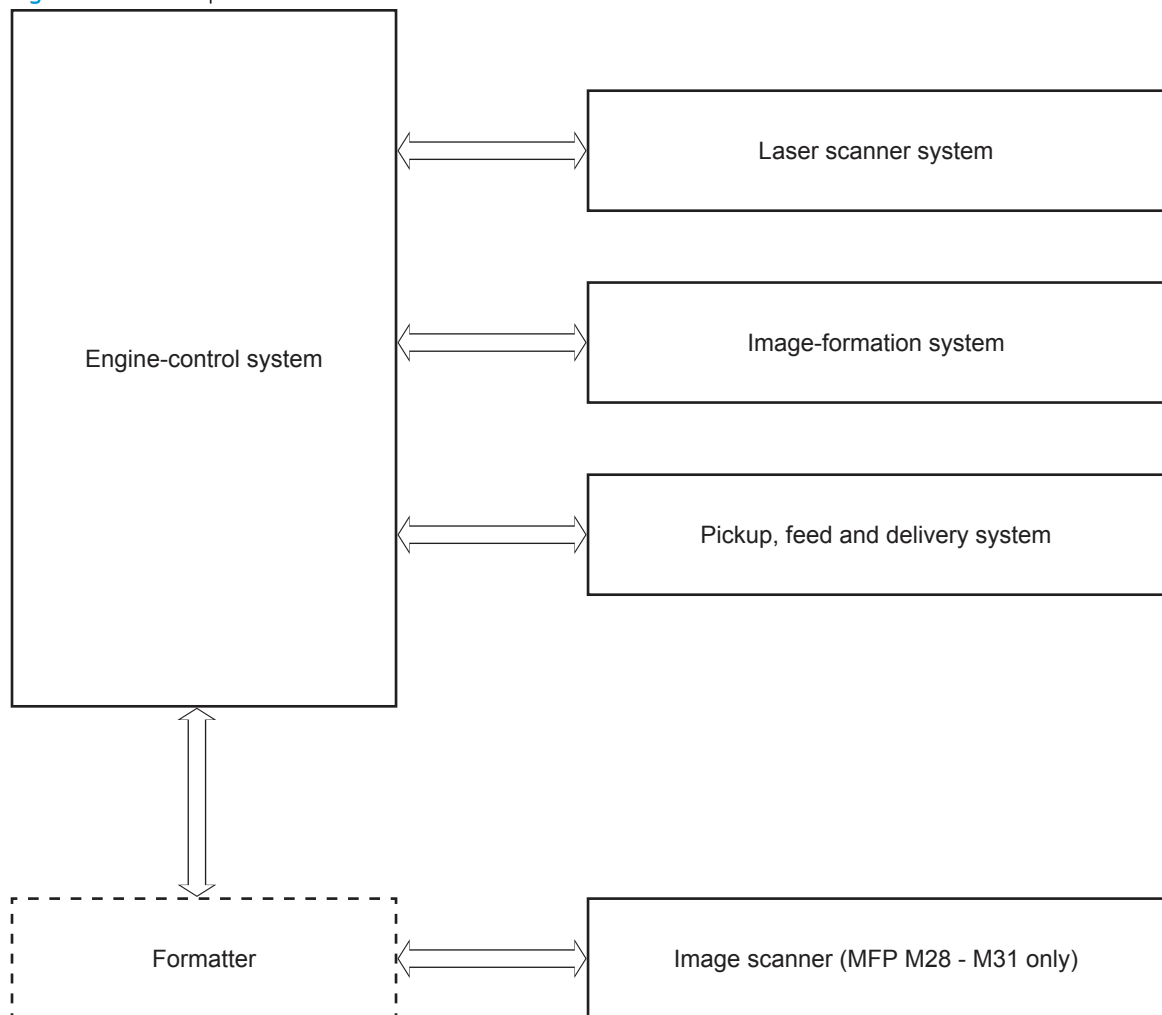
## Basic operation

The printer routes all high-level processes through the formatter, which stores font information, processes the print image, and communicates with the host computer.

The basic printer operation comprises the following systems:

- Engine control system
- Laser scanner system
- Image-formation system
- Pickup, feed, and delivery system
- Integrated scanner system (HP LaserJet Pro MFP M28-M31 models only)

Figure 1-1 Basic operation



## Sequence of operation

The DC controller in the engine control system controls the operational sequence of the printer. The table below shows the duration and operation for each period from when the printer power is turned on until the motor stops rotating.

**Table 1-1** Sequence of operation

Period	Duration	Description
Waiting	From the time the power is turned on, the door is closed, or when the printer exits sleep mode until the printer is ready for printing	<ul style="list-style-type: none"><li>• Heats the fuser film in the fuser</li><li>• Rotates and stops the main motor</li><li>• Clean the transfer roller</li></ul>
Standby	From the end of the waiting sequence, the last rotation until the formatter receives a print command, or until the printer is turned off	<ul style="list-style-type: none"><li>• The printer is in the Ready state</li><li>• Enter active OFF or inactive OFF if a power control mode designation command is sent</li></ul>
Initial rotation	From the time the formatter receives a print command until the paper enters the paper path	<ul style="list-style-type: none"><li>• Rotates the main motor</li><li>• Activates the high-voltage power supply</li><li>• Prepares the laser scanner unit</li><li>• Warms the fuser to the correct temperature</li></ul>
Printing	From the time the first sheet of paper enters the paper path until the last sheet has passed through the fuser	<ul style="list-style-type: none"><li>• Forms the image on the photosensitive drums</li><li>• Transfers the toner to the paper</li><li>• Fuses the toner image onto the paper</li></ul>
Last rotation	From the time the last sheet of paper exits the fuser until the motors stop rotating	<ul style="list-style-type: none"><li>• Moves the last printed sheet into the output bin</li><li>• Stops the main motor</li><li>• Stops the high-voltage power supply</li><li>• Stops the laser scanner unit</li><li>• Stops the fuser</li><li>• If the DC controller receives another print command, the printer enters the initial rotation period when the last rotation is complete.</li></ul>

# Formatter-control system

The formatter is involved in the following procedures:

- Controlling the sleep delay function
- Receiving and processing print data from the various printer inputs
- Monitoring control-panel functions and relaying printer status information (through the control panel and the bidirectional input/output)
- Developing and coordinating data placement and timing with the DC controller PCA
- Storing font information
- Communicating with the host computer through the bidirectional interface

The formatter receives a print job from the bidirectional interface and separates it into image information and instructions that control the printing process. The DC controller PCA synchronizes the image-formation system with the paper input and output systems, and then signals the formatter to send the print-image data.


## Sleep delay

When the printer is in sleep delay mode, the control-panel backlight is turned off, but the printer retains all printer settings. The default setting is a 15-minute idle time. The setting can be changed or turned off from the control panel menus.

The printer exits sleep delay mode and enters the warm-up cycle when any of the following occurs:

- A print job, valid data, or a PML or PJL command is received at the serial port.
- A control panel button is touched.
- The scanner lid is opened (MFP M28/M31 only).

---

 **TIP:** Error messages override the sleep delay message. The printer enters sleep mode at the appropriate time, but the error message continues to display.

---



## Auto-On / Auto-Off mode

Use the Auto-On / Auto-Off feature to to automatically adjust the printer power settings at predetermined times to conserve energy.

 **TIP:** Use the HP Embedded Web Server (EWS) to manage the Auto-On / Auto-Off feature.

## Printer job language (PJL)

Printer job language (PJL) is an integral part of configuration, in addition to the standard printer command language (PCL) and PostScript (PS). With standard cabling, use PJL to perform a variety of functions, such as these:

- **Dynamic I/O switching:** The printer can be configured with a host on each I/O by using dynamic I/O switching. Even when the printer is offline, it can receive data from more than one I/O simultaneously, until the I/O buffer is full.
- **Context-sensitive switching:** The printer can automatically recognize the personality (PS or PCL) of each job and configure itself in that personality.
- **Isolation of print environment settings from one print job to the next:** For example, if a print job is sent to the printer in landscape mode, the subsequent print jobs are printed in landscape mode only if they are formatted for it.

## Printer management language (PML)

The printer management language (PML) allows remote configuration and status monitoring through the I/O ports.

## Control panel

The formatter sends and receives printer status and command data to and from the control panel.

## Wireless (wireless models)

Wireless models contain a wireless card to enable 802.11b/g/n wireless communication.

## Low end data model (LEDm)

The low-end data model (LEDm) provides one consistent data representation method and defines the dynamic and capabilities tickets shared between clients and devices, as well as the access protocol, event, security, and discovery methods.

## Advanced control language (ACL) overview

The advanced control language (ACL) is a language that supports printer control and firmware downloads in printers that support both PJL/PCL and host-based printing. Each sequence of ACL commands must be preceded by a unified exit command (UEL) and an @PJL ENTER LANGUAGE=ACL command. The ACL sequence is always followed by a UEL. Any number of commands can be placed between the UELs. The only exception to these rules is the download command. If a firmware download is completed, the download command must be the last command in the sequence. It will not be followed by a UEL.

The firmware searches for the UEL sequence when parsing commands. However, while downloading binary data such as host-based code or NVRAM data, the firmware suspends UEL parsing. To handle hosts that “disappear” during binary sequences, the firmware times out all ACL command sessions. If a timeout occurs during a non-download command sequence, it is treated as the receipt of a UEL. If a timeout occurs during firmware download, the printer resets.

## Near field communication (NFC) (wireless models)

This printer supports near field communication (NFC) capabilities. NFC enables an easy, one-to-one HP wireless direct print connection using a simple device-to-device touch. Mobile device users can quickly connect to the printer and print documents and images from a mobile device, such as a smartphone or tablet, by touching the device to the NFC icon on the printer.

## CPU

The formatter incorporates an 500 MHz processor.

## Input/output

The following sections discuss the input and output features of the printer.

## USB

The printer uses a universal serial bus (USB) 2.0 connection.

## Memory

If the printer encounters a problem when managing available memory, a clearable warning displays on the control panel.

## Firmware

Memory on the formatter stores the firmware. A remote firmware upgrade process is used to overwrite and upgrade the firmware.

## Nonvolatile random access memory (NVRAM)

The printer uses nonvolatile memory (NVRAM) to store I/O and information about the print environment configuration. The contents of NVRAM are retained when the printer is turned off or disconnected.

## Random access memory (RAM)

### M14-M17

- 8MB Flash / 8MB DRAM (base bundle)
- 16MB Flash / 16MB DRAM (W bundle)

### MFP M28-M31

- 16MB Flash / 32MB DRAM (base bundle)
- 16MB Flash / 32MB DRAM (W bundle)

## HP Memory enhancement technology (MEt)

The HP Memory Enhancement technology (MEt) effectively doubles the standard memory through a variety of font- and data-compression methods.



**NOTE:** The MEt is available only when printing in printer command language (PCL) mode; it is not functional when printing in PostScript (PS) mode.

---

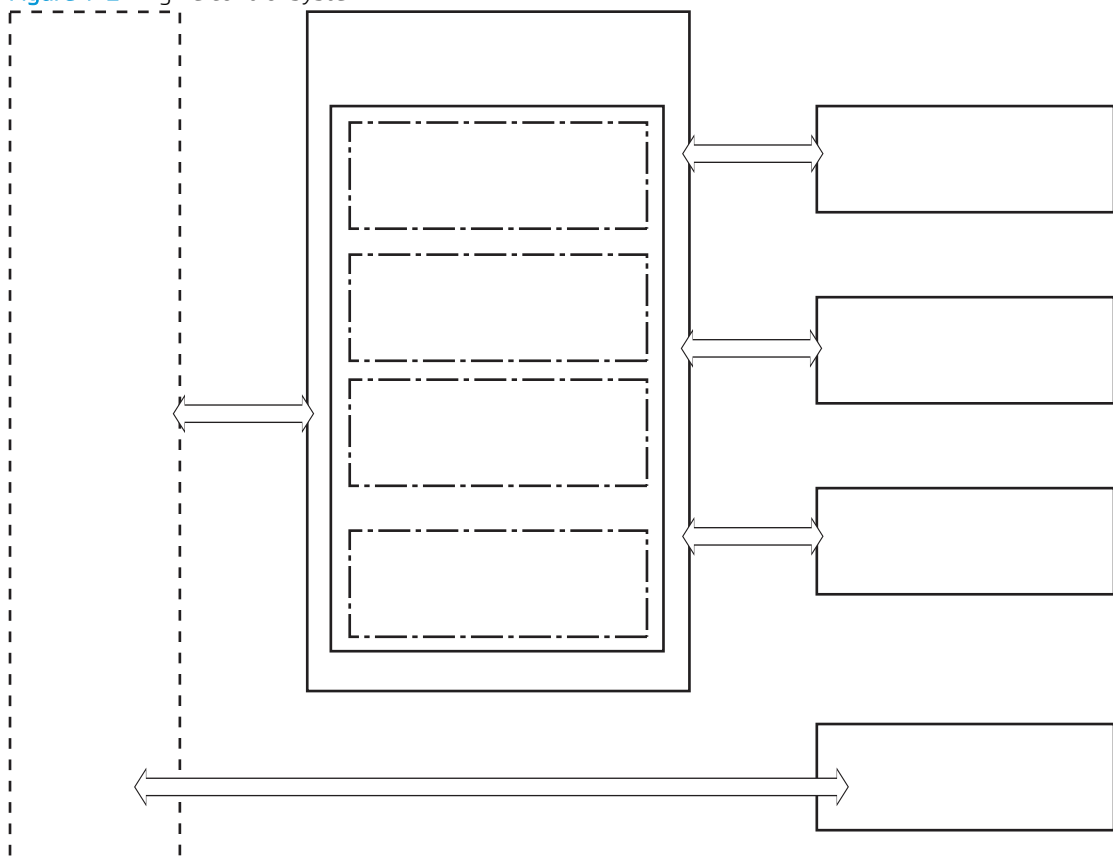
## Engine-control system

The engine-control system receives commands from the formatter and coordinates all of the other systems. The engine-control system contains the following components:

- DC controller
- High-voltage power supply
- Low-voltage power supply
- Fuser control

The formatter receives a print job from the bidirectional interface and separates it into image information and instructions that control the printing process. The DC controller PCA synchronizes the image-formation system with the paper input and output systems, and then signals the formatter to send the print-image data.

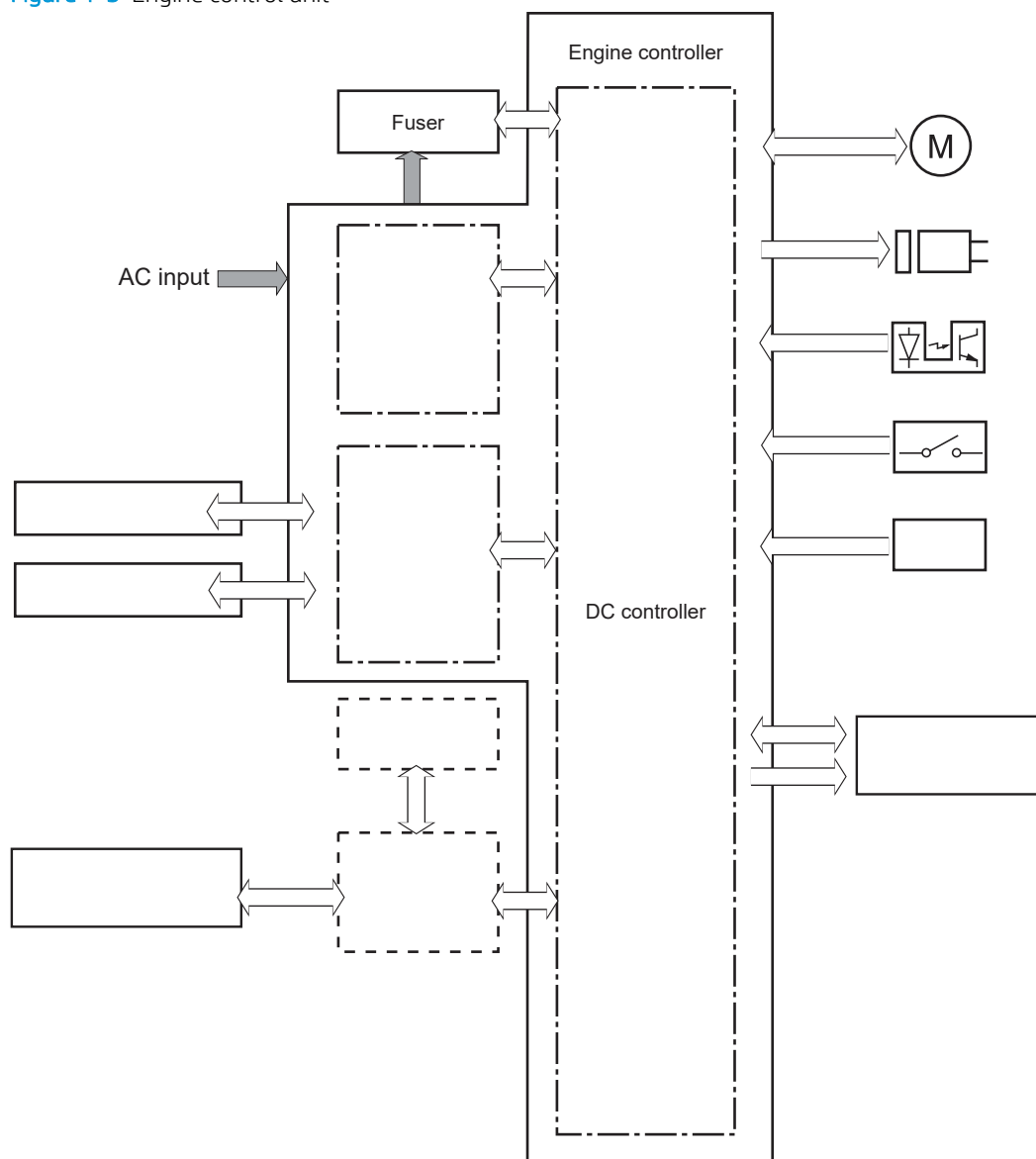
Figure 1-2 Engine control system



DC controller

The DC controller PCA controls the operation of the printer and its components. The DC controller PCA starts printer operation when the power is turned on and the power supply sends DC voltage to the DC controller PCA. After the printer enters the standby sequence, the DC controller PCA sends out various signals to operate motors, solenoids, and other electrical components based on the print command and image data that the host computer sends.

**Figure 1-3** Engine control unit



## Motors

### Table 1-2 Motors

Component name	Abbreviation	Components driven	Failure detection
Motor	M1	Main motor	No
	M2	Scanner motor	Yes

## Solenoids

The printer has one solenoid. The solenoids is used for printer operation control.

**Table 1-3 Solenoids**

Component abbreviation	Component name
SL1	Pickup solenoid

## Switches

A switches is used for printer operation control.

**Table 1-4 Switches**

Component abbreviation	Component name
SW1001	24V interlock switch

## Sensors

The printer has 7 sensors. Sensors are used for remote detection of various functions during printer operation.

**Table 1-5 Sensors**

Sensor type	Abbreviation	Component name
Photo interrupter	PS501	Registration sensor
	PS502	Fuser output sensor
	PS503	Fuser media width sensor
	PS504	Tray 1 media out sensor <sup>1</sup>
	PS505	Tray 1 media size sensor <sup>1</sup>
	PS506	Main motor rotation number sensor
(NA)		Environment sensor (measures temperature and humidity)

<sup>1</sup> Only for HP LaserJet Pro M14-M17 wireless models and HP LaserJet Pro MFP M28-M31 models.

## Low-voltage power supply

The low-voltage power supply converts AC power from the power receptacle into DC power to cover the DC loads.

### Low-voltage power supply voltages description

The low-voltage power supply converts the AC power into DC voltages, which it then subdivides, as described in the table below.



**NOTE:** **Inactive OFF:** In this state the power supply is OFF.

**Table 1-6** Converted DC voltages

Main DC voltage	Sub-voltage	Behavior
+24 V	+24 VA	Constantly supplied
	+24 VB	Stopped when cartridge door is opened. (SW1001)
	+24 VC	Stopped when cartridge door is opened. (SW1001)
	+24 VD	Stopped during active OFF or inactive OFF
+3.3 V <sup>1</sup>	+3.3 VA	Constantly supplied
	+3.3 VB	Stopped during standby Stopped during active OFF or inactive OFF
	+3.3VP0	Stopped during active OFF or inactive OFF

<sup>1</sup> +3.3V is supplied from the formatter.

### Overcurrent/overvoltage protection

The low-voltage power supply has a protective function against overcurrent and overvoltage conditions to prevent failures in the power supply circuit. If an overcurrent or overvoltage event occurs, the system automatically cuts off the output voltage.

If the DC power is not being supplied from the low-voltage power supply, the protective function might have activated. In this case, turn off the power switch, and then disconnect the power cord. Do not connect the power cord or turn the power switch on again until the root cause is found and corrected.

### Sleep mode operation

**Active OFF:** In this state the printer is in Sleep mode. The low-voltage power supply is output to the formatter and DC controller only.

### Low-voltage power supply unit failure detection

For safety the printer interrupts +24VB and +24VC power when the 24V interlock switch is turned off. This stops DC power supply to the following load:

- Developing bias

The remote switch control circuit turns the power on or off so that the AC power flows even if the power switch is turned off.



**CAUTION:** Power is present in the printer even when the power switch is turned off. Always unplug the printer power cord before disassembling the printer.

## High-voltage power supply

The high-voltage power supply applies biases to the following components:

- Primary charging roller (in the toner cartridges)

The primary charging bias negatively charges the surface of the photosensitive drum to prepare for image formation.

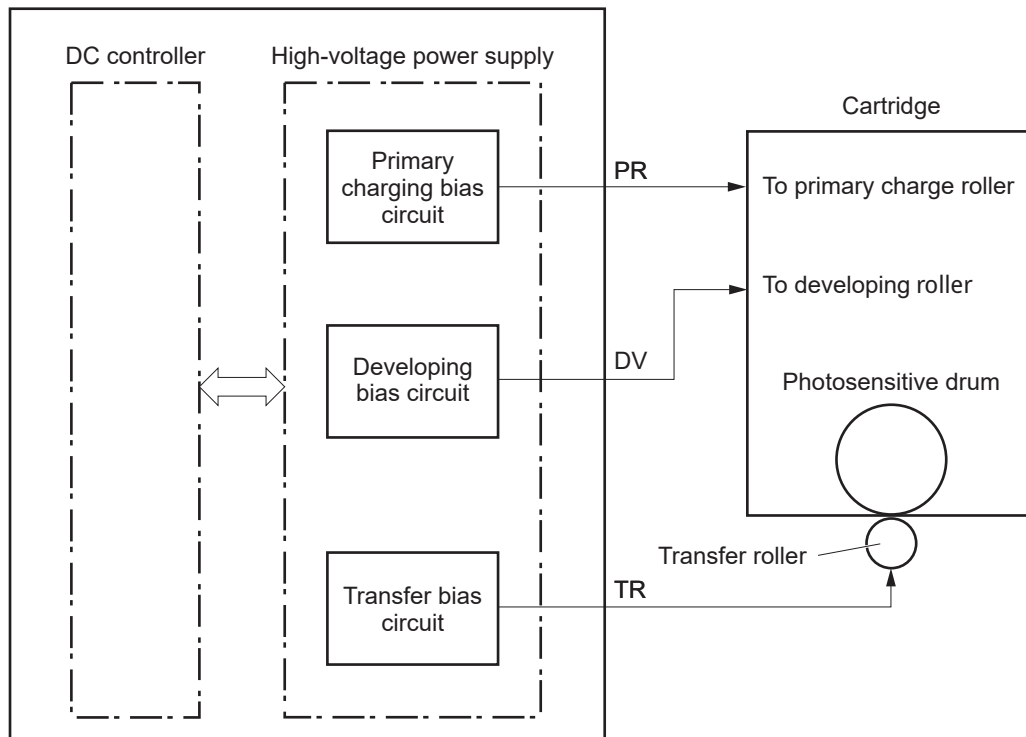
- Developing roller (in the toner cartridges)

The developing bias adheres toner to an electrostatic latent image formed on the photosensitive drum.

- Transfer roller

The transfer bias transfers the toner from the photosensitive drum onto the paper.

**Figure 1-4** High-voltage power supply circuits  
Engine controller



## Fuser control

### Introduction

The fuser heater control circuit and the safety circuit control the fuser temperature according to signals from the DC controller.

**NOTE:** The printer uses an on-demand fusing method.

Figure 1-5 Fuser components

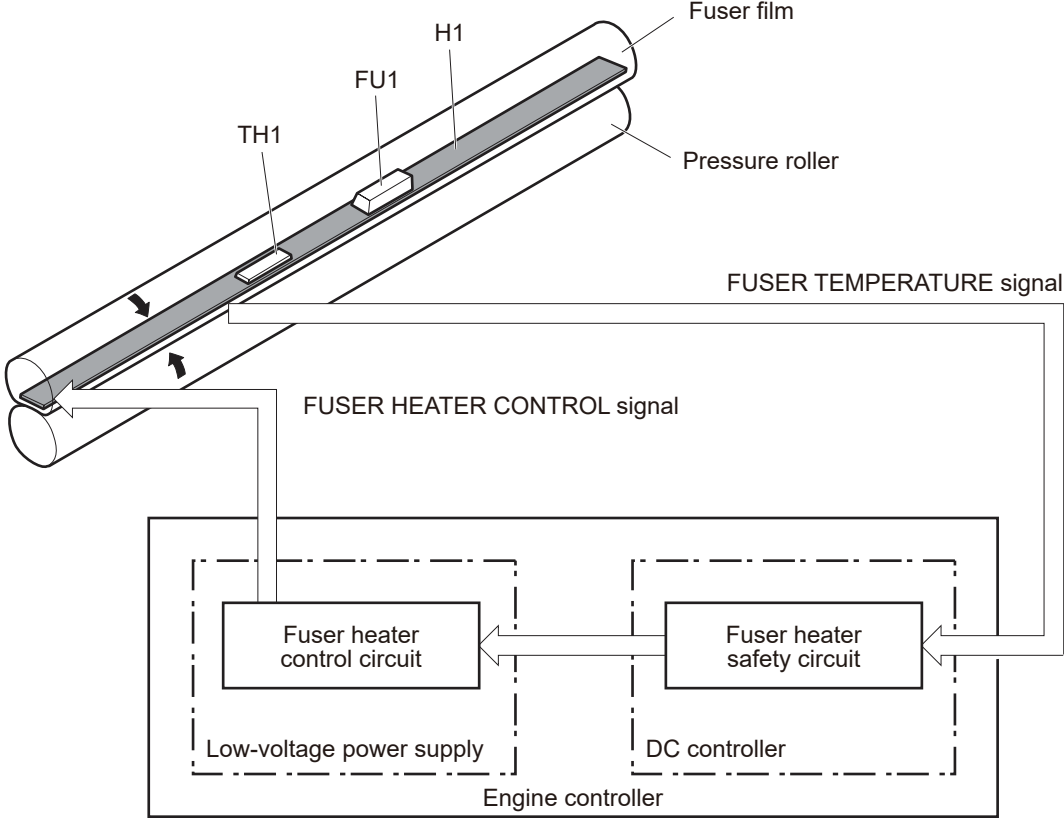


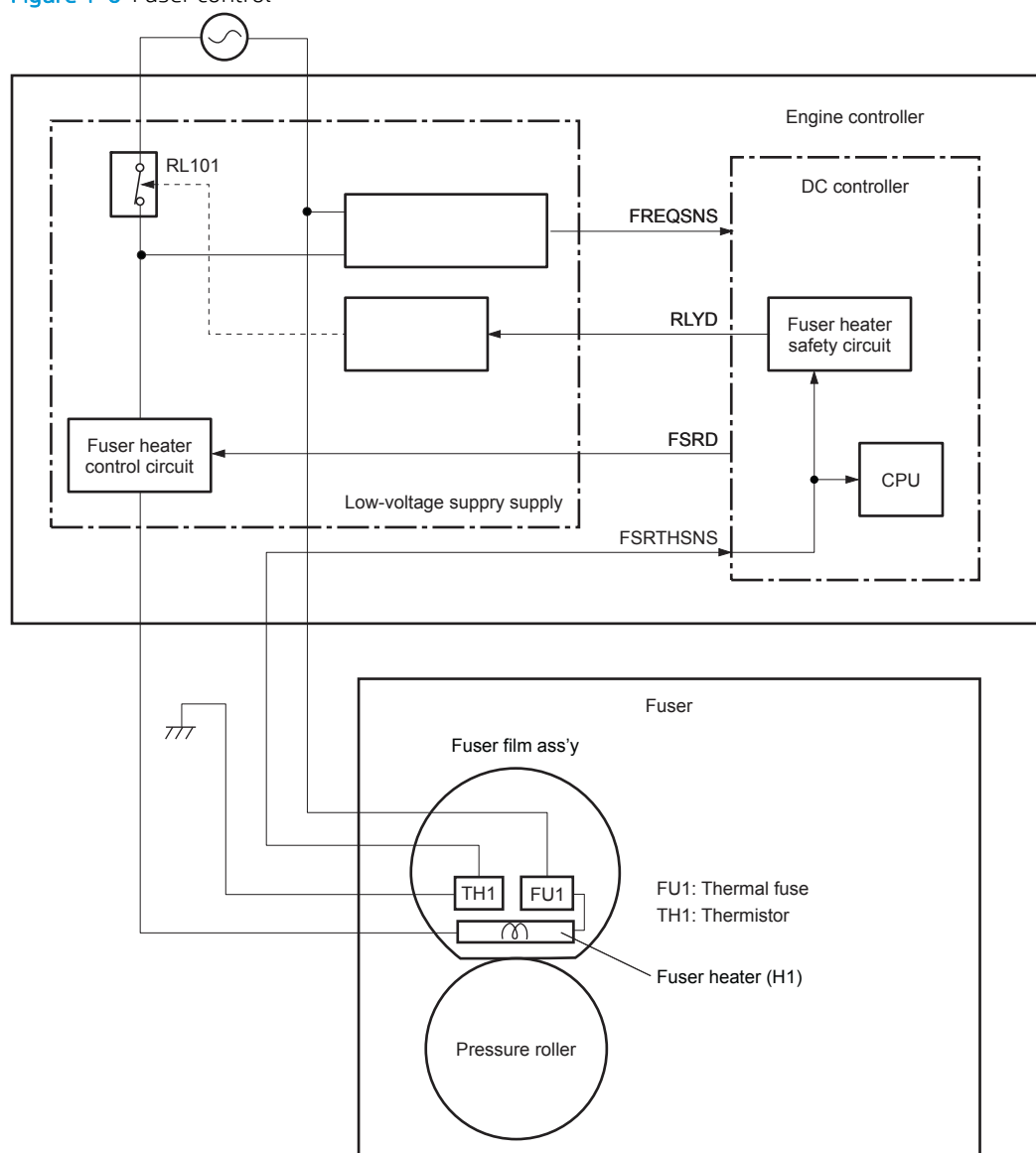
Table 1-7 Fuser control functions

Fuser detective function	Applied
Fuser temperature control	Yes
Heat up error detection	Yes
Low temperature error detection	Yes
High temperature error detection	Yes
Breaking of a heater wire detection	No
Driving circuit failure detection (frequency detection circuit failure detection)	Yes
Low-voltage power supply failure detection	No
Fuser pressure release mechanism failure detection	No
Fuser type discrepancy detection	No
Fuser type identification detection	No
Fuse presence detection	No
Fuser life detection	No
Fuser roller cleaning	Yes

## Fuser circuits

The fuser heater control circuit and the fuser heater safety circuit control the fuser temperature according to commands from the DC controller. The fuser consists of the following major components:

**Figure 1-6** Fuser control



**Table 1-8** Fuser components

Type of component	Abbreviation	Function
Fuser heater	H1	Heats the fuser film assembly
Thermistors (Contact type)	TH1	Detects the center temperature of the fuser heater
Thermal switch (Contact type)	TP1	Prevents an abnormal temperature rise in the fuser heater

## Fuser heater protection

Fuser heater protection is a feature that detects excessive temperatures in the fuser and interrupts the power supply to the fuser heater.

The following three protective components prevent the fuser heater from excessive rising temperature:

- **DC controller:** Monitors the detected temperature of the thermistor. If excessive temperature is detected, the DC controller deactivates the FUSER HEATER CONTROL signal and turns off the relay (RL101) to interrupt power supply to the fuse heater.
- **Fuser-heater safety circuit:** Monitors the detected temperature of the thermistor. If excessive temperature is detected, the fuser-heater safety circuit turns off the relay (RL101) to interrupt power supply to the fuse heater.
- **Thermal fuse:** If the temperature in the heater is abnormally high, the contact in the thermal fuse opens to interrupt power supply to the fuse heater.

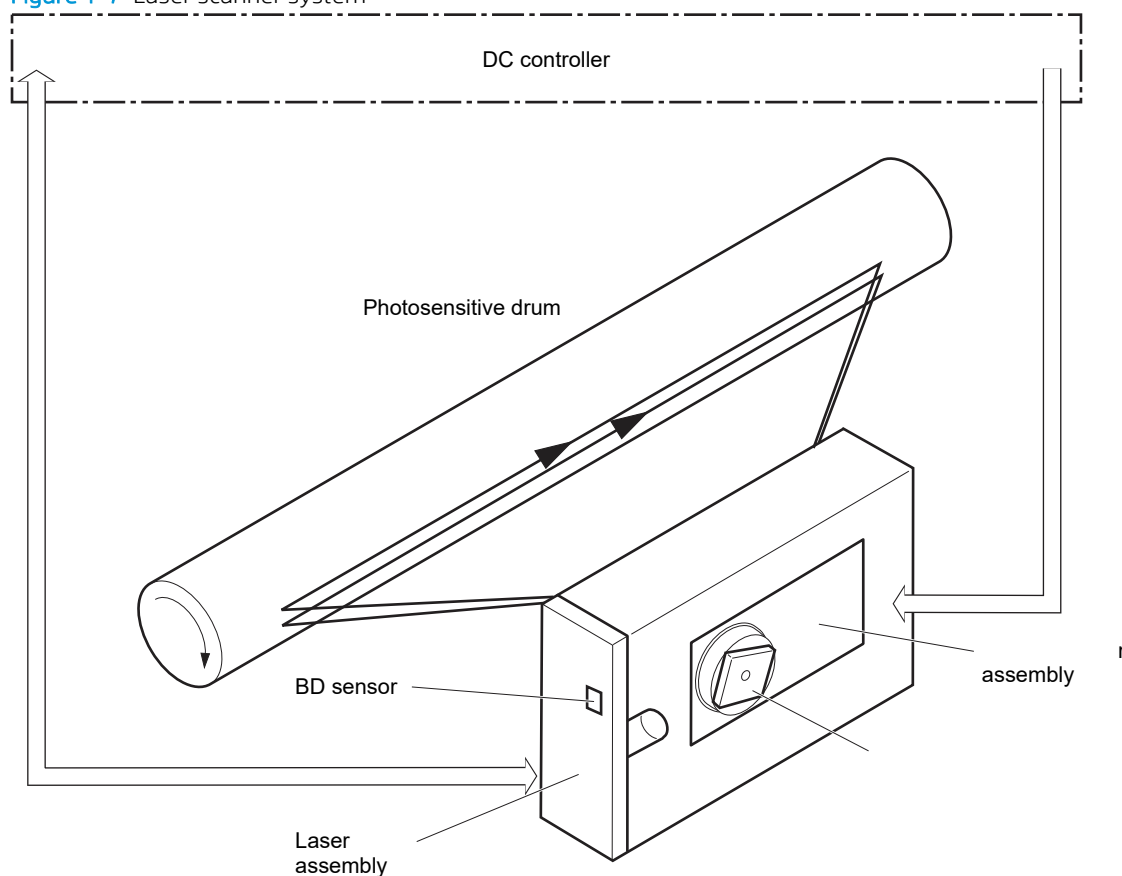
## Engine laser scanner system

The DC controller forms the latent image on the surface of the photosensitive drum by controlling components (using the VIDEO signals) of the laser scanner system.

The laser scanner system consists of the following components.

- Laser assembly
- Scanner motor assembly
- BD sensor
- Scanner mirror

**Figure 1-7** Laser scanner system



## Laser failure detection

The DC controller identifies the following laser scanner failures:

**Table 1-9** Laser failure detection

Failure detective function	Applied
BD failure detection	No
Scanner motor startup failure detection	Yes

Table 1-9 Laser failure detection (continued)

Failure detective function	Applied
Scanner motor rotation failure detection	Yes
Laser scanner failure detection	No

# Pickup, feed, and delivery system

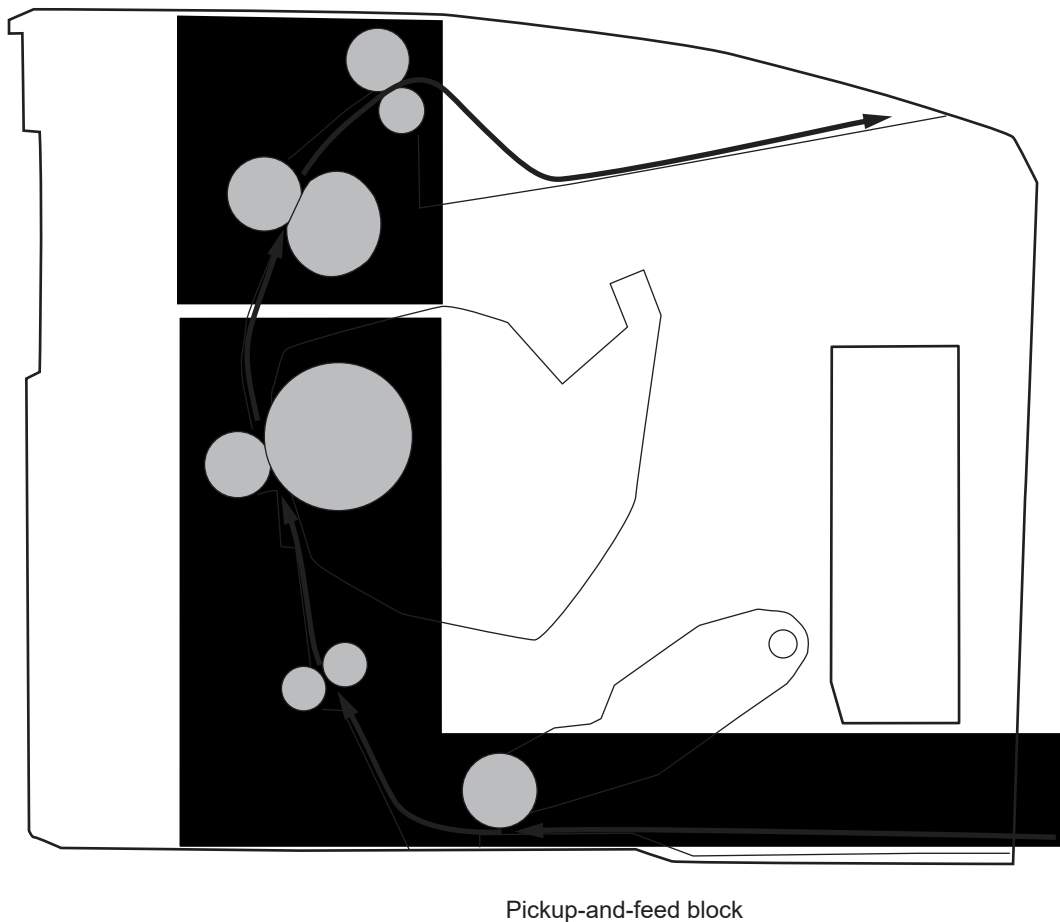
## Introduction

The DC controller controls the pickup, feed, and delivery system according to commands from the formatter. The pickup, feed, and delivery system uses a series of rollers to move the paper through the printer.

The pickup, feed, and delivery system consists of the following functional blocks. The DC controller controls each block to pick up, feed and deliver the paper.

- **Pickup-and-feed-block:** Controls the movement of the paper from each pickup source to the fuser inlet.
- **Fuser-and-delivery-block:** Controls the movement of the paper from the fuser to the delivery destination.

**Figure 1-8** Pickup, feed, and delivery system  
Fuser-and-delivery block



# Photo sensors and switches

The following figure shows the photo sensors and switches for the pickup, feed, and delivery system.

Figure 1-9 Photo sensors and switches

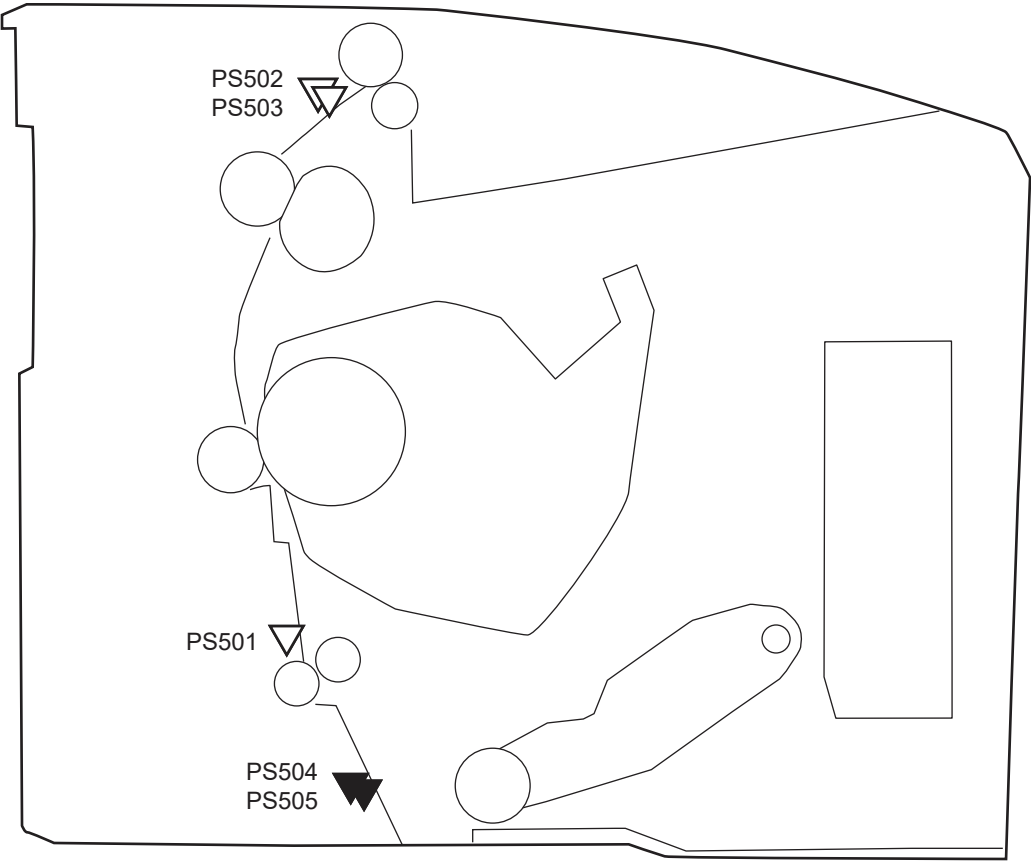


Table 1-10 Photo sensors and switches

Abbreviation	Component
PS501	Registration sensor
PS502	Fuser output sensor
PS503	Fuser media width sensor
PS504	Tray 1 media out sensor <sup>1</sup>
PS505	Tray 1 media size sensor <sup>1</sup>

<sup>1</sup> Only for HP LaserJet Pro M14-M17 wireless models and HP LaserJet Pro MFP M28-M31 models.



# Motors, clutches, and solenoids

The following figure shows the motors, clutches, and solenoids for the pickup, feed, and delivery system.

Figure 1-10 Motors, solenoids, and clutches

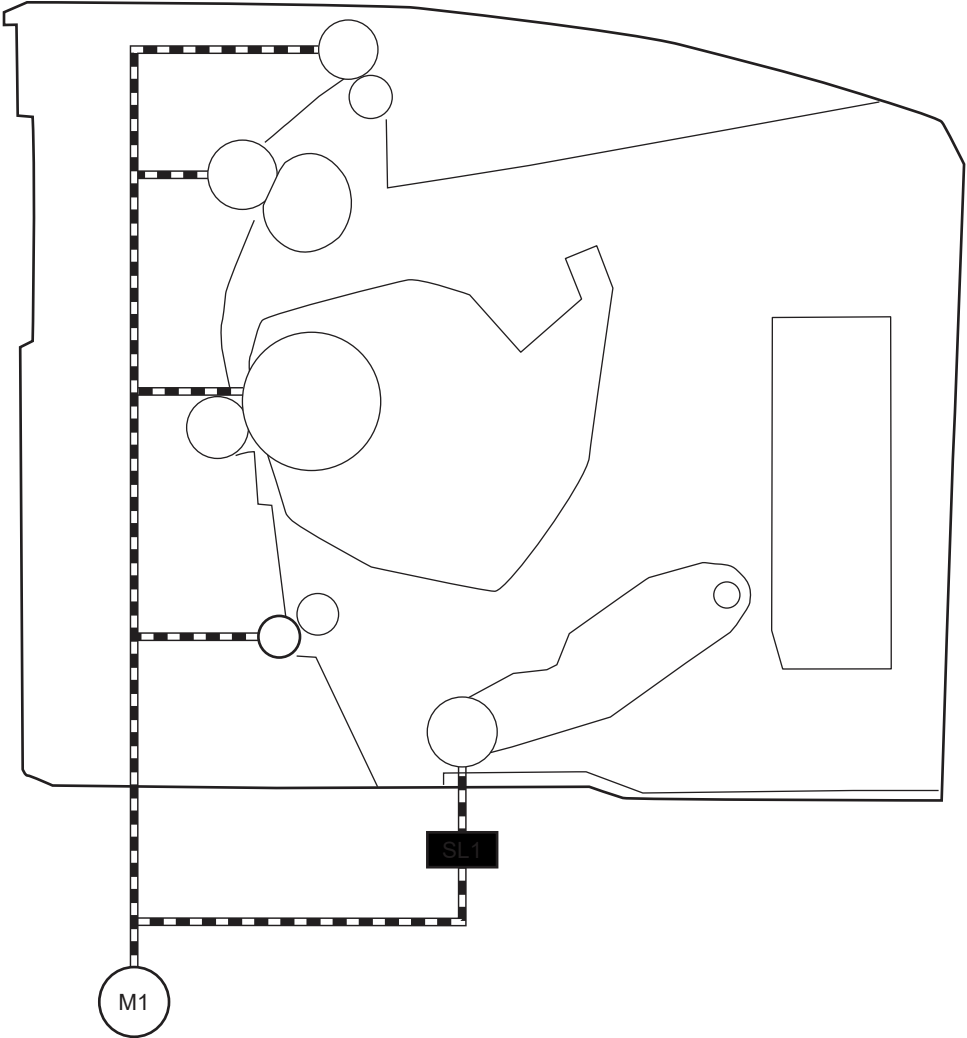


Table 1-11 Motors and solenoids

Abbreviation	Component
M1	Main motor
SL1	Pickup solenoid

Table 1-12 Functions for pickup, feed and delivery system

Function	Supported
Tray 2 media size detection	N/A
Tray 2 presence detection	N/A
Tray 2 media surface detection	N/A

**Table 1-12 Functions for pickup, feed and delivery system (continued)**

Function	Supported
Tray 2 media presence detection	N/A
Tray 2 media level detection	N/A
Tray 2 lift-up control	N/A
Tray 2 lift-down control	N/A
Tray 2 multiple-feed prevention mechanism	N/A
Tray 1 media presence detection <sup>1</sup>	Yes
Tray 1 media width detection <sup>1</sup>	Yes
Tray 1 last-media detection	N/A
Skew-feed prevention mechanism	N/A
Feed speed control	Yes
Loop control	N/A
Media detection	N/A
OHT detection	N/A
Image leading edge positioning	N/A
Media length detection	Yes
Media width detection	Yes
Pressure roller pressure release control	N/A
Output bin media-full detection	N/A
Automatic delivery	Yes
Duplex switchback control	N/A
Duplex feed control	N/A

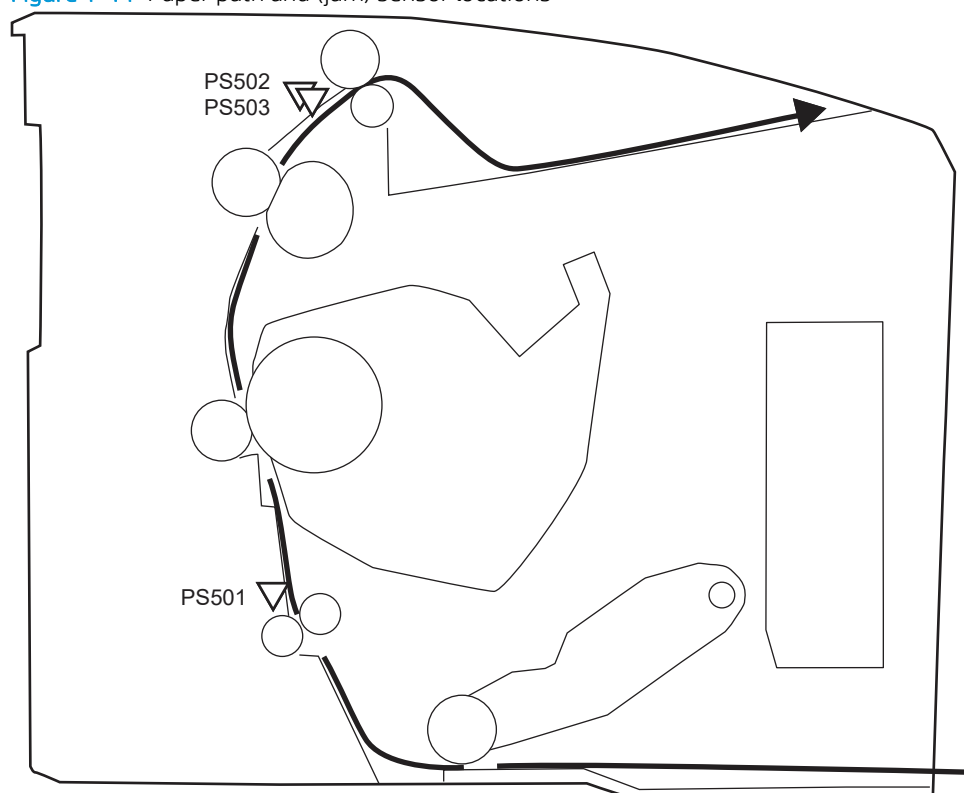
<sup>1</sup> Only for HP LaserJet Pro M14-M17 wireless models and HP LaserJet Pro MFP M28-M31 models.

## Jam detection/prevention

The printer uses the following sensors to detect the paper as it moves through the paper path and to report to the DC controller if the paper has jammed.

- Registration sensor (PS501)
- Fuser output sensor (PS502)
- Fuser media width sensor (PS503)

**Figure 1-11** Paper path and (jam) sensor locations



The printer determines that a jam has occurred if one of these sensors detects paper at an inappropriate time. The DC controller stops the print operation and notifies the formatter.

**Table 1-13** Jam detection

Jam name	Applied
No pick jam 1	Yes
No pick jam 2	No
No pick jam 3	No
No pick jam 4	No
Pick stay jam 1	Yes
Pick stay jam 2	No
Pick stay jam 3	No
Pick stay jam 4	No
Fuser delivery delay jam 1	Yes
Fuser delivery delay jam 2	No
Fuser delivery delay jam 3	No
Fuser delivery delay jam 4	No
Fuser delivery stay jam 1	Yes
Fuser delivery stay jam 2	No
Fuser delivery stay jam 3	No

**Table 1-13 Jam detection (continued)**

<b>Jam name</b>	<b>Applied</b>
Fuser delivery stay jam 4	No
Residual paper jam 1	Yes
Residual paper jam 2	Yes
Residual paper jam 3	No
Residual paper jam 4	No
Door open jam 1	Yes
Door open jam 2	No
Door open jam 3	No
Door open jam 4	No
Fuser wrap jam 1	Yes
Fuser wrap jam 2	No
Fuser wrap jam 3	No
Fuser wrap jam 4	No
Duplex switchback jam 1	No
Duplex switchback jam 2	No
Duplex switchback jam 3	No
Duplex switchback jam 4	No
Duplex re-pickup jam 1	No
Duplex re-pickup jam 2	No
Duplex re-pickup jam 3	No
Duplex re-pickup jam 4	No
Delivery delay jam 1	No
Delivery delay jam 2	No
Delivery delay jam 3	No
Delivery delay jam 4	No
Delivery stay jam 1	No
Delivery stay jam 2	No
Delivery stay jam 3	No
Delivery stay jam 4	No
Multiple feed jam 1	No
Multiple feed jam 2	No
Multiple feed jam 3	No
Multiple feed jam 4	No

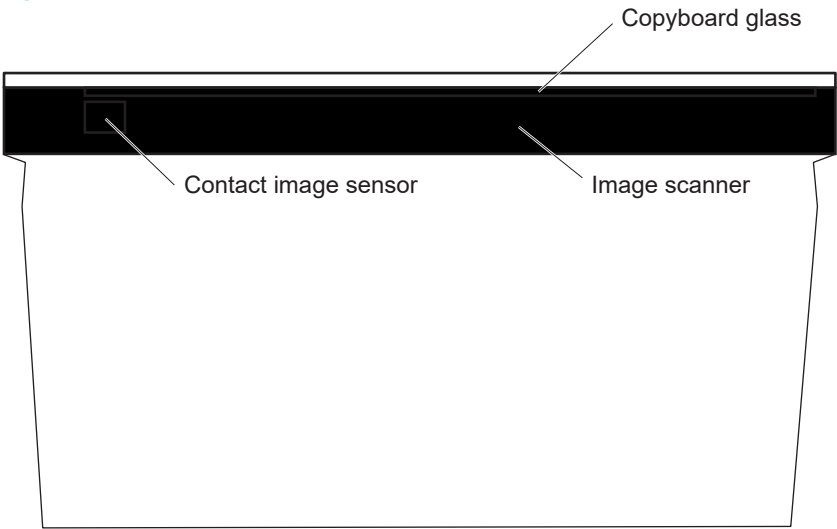
# Scanning and image capture system (MFP M28-M31)

 **NOTE:** This section is for HP LaserJet Pro MFP M28-M31 models only.

The image scanner is installed at the top of the printer, and scans a document placed on the glass using a contact image sensor (CIS).

The formatter controls the operational sequence of the image scanner.

**Figure 1-12** Scanning and image capture system outline



Component type	Abbreviation	Component name
Motor	M3	Scan motor
Sensor	CIS	Contact image sensor (scan IPM: 2.25 at 400ppi)



---

## 2 Solve problems


- [Solve problems checklist](#)
- [Troubleshooting process](#)
- [Tools for troubleshooting](#)
- [Improve print quality](#)
- [Print quality troubleshooting guide](#)
- [Improve copy and scan image quality \(MFP M28-M31\)](#)
- [Clean the printer](#)
- [Solve paper-handling problems](#)
- [Solve performance problems](#)
- [Solve connectivity problems](#)
- [Service mode functions](#)
- [Firmware upgrades](#)

## Solve problems checklist




If the printer is not correctly functioning, complete the steps (in the order given) in the following checklist. If the printer fails a checklist step, follow the corresponding troubleshooting suggestions for that step. If a checklist step resolves the problem, skip the remaining checklist items.

1. Make sure that the printer is set up correctly.
  - a. Press the power button to turn on the printer or to deactivate the Auto-Off mode.
  - b. Check the power-cable connections.
  - c. Make sure that the line voltage is correct for the printer power configuration. See the label that is on the printer for voltage requirements. If you are using a power strip and its voltage is not within specifications, plug the printer directly into the wall. If it is already plugged into the wall, try a different outlet.
2. Check the cable connections.
  - a. Check the cable connection between the printer and the computer. Make sure that the connection is secure.
  - b. Make sure that the cable itself is not faulty, by using a different cable if possible.
  - c. Check the wireless network connection (wireless models only): Make sure that the wireless button on the control panel is lit.  
  
If the printer remains unable to connect to the network, uninstall and then reinstall the printer. If the error persists, contact a network administrator.
3. Check to see if any codes appear on the control panel (MFP M28-M31 only).  
Check to see if the Attention LED on the control panel is lit or flashing.
4. Make sure that the paper you are using meets specifications.
5. Make sure that the paper is loaded correctly in the input tray.
6. Make sure that the printer software is installed correctly.
7. Verify that you have installed the printer driver for this printer, and that you are selecting this printer from the list of available printers.
8. Print a configuration report.

### Print a configuration report from the M14-M17 control panel

- a. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
- b. Release the Resume/Cancel  button.

### Print a configuration report from the MFP M28-M31 control panel

- a. Press and hold the Start Copy  button until the Ready  light begins blinking.
- b. Release the Start Copy  button.



After printing the configuration report, check the following:




- a. If the page does not print, verify that the input tray contains paper and that the paper is properly loaded.
  - b. Make sure that the toner cartridge is installed correctly.
  - c. If the page jams in the printer, clear the jam.
  - d. If the event log (on the configuration page) shows an error, clear the error condition.
  - e. If the print quality is unacceptable, complete the following steps:
    - Verify that the print settings are correct for the paper you are using.
    - Solve print-quality problems.
9. Print a small document from a different program that has printed in the past. If this solution works, then the problem is with the program you are using. If this solution does not work (the document does not print), complete these steps:
- a. Try printing the job from another computer that has the printer software installed.
  - b. Check the cable connection. Direct the printer to the correct port, or reinstall the software, selecting the connection type you are using.

## Print a configuration report


 **NOTE:** An error log is included on the configuration page.

Print a configuration report to test the printer.

### Print a configuration report from the M14-M17 control panel


1. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
2. Release the Resume/Cancel  button.

### Print a configuration report from the M28-M31 control panel

1. Press and hold the Start Copy  button until the Ready  light begins blinking.
2. Release the Start Copy  button.

## Check the event log using the HP Embedded Web Server or HP Tool Box

1. Open the HP Embedded Web Service (EWS):

 **NOTE:** HP Device Toolbox is software used to connect to the HP Embedded Web Server when the printer is connected to a computer using a USB cable. It is available only if a full installation was performed when the printer was installed on a computer. Depending on how the printer is connected, some features might not be available.

The HP Embedded Web Server is not accessible beyond the network firewall.

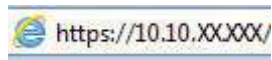
- a. Open the HP Printer Assistant.

- **Windows 10:** From the **Start** menu, select **All Apps**, select **HP**, and then select the printer name.
- **Windows 8.1:** Select the down arrow in the lower left corner of the **Start** screen, and then select the printer name.
- **Windows 8:** Right click an empty area on the **Start** screen, select **All Apps** on the app bar, and then select the printer name.
- **Windows 7, Windows Vista, and Windows XP:** From the computer desktop, select **Start**, select **All Programs**, select **HP**, select the folder for the printer, and then select the printer name.

- b. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.

#### Network connected printers

- a. Print a configuration report to determine the IP address or host name.
- b. Open a web browser, and in the address line, type the IP address or host name exactly as it displays on the printer configuration report. Press the **Enter** key on the computer keyboard. The EWS will open.




---

 **NOTE:** If the web browser displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

---

2. Select the **Home** tab, and then select the **Event Log** page.

---

 **TIP:** If needed, print the event log from the browser.

---

# Troubleshooting process

## Determine the problem source

When the printer malfunctions or encounters an unexpected situation, the printer control panel alerts the user to the situation. This section contains a pre-troubleshooting checklist to filter out many possible causes of the problem. Use the troubleshooting flowchart to help diagnose the root cause of the problem. The remainder of this chapter provides steps for correcting problems.

- Use the troubleshooting flowchart to pinpoint the root cause of hardware malfunctions. The flowchart provides guides to the sections of this chapter that contain steps to correct the malfunction.

Before beginning any troubleshooting procedure, check the following issues:

- Are supply items within their rated life?
- Does the configuration report reveal any configuration errors?
- Is the printer installed on a level surface ( $\pm 1^\circ$ )?
- Does the printer environment fall within the acceptable ranges?

### Recommended temperature and humidity

- 15°C (59°F) to 27°C (80.6°F)
- 20% to 70% (relative humidity, non condensing)

### Allowed temperature and humidity

- 15°C (59°F) to 30°C (86°F)
- 10% to 80% (relative humidity, non condensing)
- Is the printer exposed to ammonia gas (such as that produced by diazo copiers or office cleaning materials)?



**NOTE:** Ammonia gas can adversely effect some printer components (like the photosensitive drum in the toner cartridge).

- Make sure that the toner cartridge is full seated and installed correctly, and that the cartridge door fully closes.
- Was the toner cartridge opened soon after being moved from a cold to warm environment? If so, allow the cartridge to sit at room temperature for 1 to 2 hours before printing.









**NOTE:** The customer is responsible for checking supplies and for using supplies that are in good condition.

## Troubleshooting flowchart

This flowchart highlights the general processes to follow to quickly isolate and solve printer hardware problems.

Each row depicts a major troubleshooting step. Follow a “yes” answer to a question to proceed to the next major step. A “no” answer indicates that more testing is needed. Go to the appropriate section in this chapter, and follow the instructions there. After completing the instructions, go to the next major step in this troubleshooting flowchart.

**Table 2-1 Troubleshooting flowchart**

<b>1</b> <b>Power on</b>	Is the printer on and does a readable message display?		Follow the power-on troubleshooting checks.  After the control panel display is functional, see step 2.
	Yes ↓	No →	
<b>2</b> <b>Control panel</b>	Is the control panel <b>Ready LED</b> illuminated?		Determine printer errors using the LED display (MFP M28-M31 only) and <b>Attention LED</b> state.  After the errors have been corrected, go to step 3.  <b>NOTE:</b> The printer event log is also available from the following: <ul style="list-style-type: none"> <li>• Configuration Page</li> <li>• HP Embedded Web Server</li> <li>• HP Tool Box</li> </ul>
	Yes ↓	No →	
<b>3</b> <b>Event log</b>	Access the event log to see the history of errors with this printer.		Correct any error conditions found in the event log. See the Control panel (layout and interpreting light patterns) section of the service manual.  <b>NOTE:</b> Use the following to access the event log: <ul style="list-style-type: none"> <li>• Configuration Page</li> <li>• HP Embedded Web Server</li> <li>• HP Tool Box</li> </ul> <p>If paper jams inside the printer, see the Clear paper jams section of the service manual.</p> <p>After successfully evaluating the event log, see step 4.</p>
	Yes ↓	No →	
<b>4</b> <b>Information pages</b>	Print the configuration page.		<b>Print a configuration report from the M14-M17 control panel</b> <ol style="list-style-type: none"> <li>1. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.</li> <li>2. Release the Resume/Cancel  button.</li> </ol> <b>Print a configuration report from the M28-M31 control panel</b> <ol style="list-style-type: none"> <li>1. Press and hold the Start Copy  button until the Ready  light begins blinking.</li> <li>2. Release the Start Copy  button.</li> </ol> <p>Verify all printer settings.</p> <p>After evaluating the configuration report, see step 5.</p>
	Yes ↓	No →	
<b>5</b> <b>Print quality</b>	Is the print quality acceptable?		Compare print defects with the examples in the Print quality troubleshooting guide section in this manual.  After the print quality is acceptable, see step 6.
	Yes ↓	No →	

**Table 2-1 Troubleshooting flowchart (continued)**

6 Interface	Can the customer print successfully from the host computer?		Verify that the USB cable is connected correctly.
	Yes. This is the end of the troubleshooting process.	No →	<p><b>Wireless models only:</b> verify that a valid IP address is being used.</p> <p>If error messages display (or the <b>Attention LED</b> is illuminated), see the Control panel (layout and interpreting light patterns) section of the service manual..</p> <p>When the customer can print from the host computer, this is the end of the troubleshooting process.</p>

## Power subsystem

### Power-on checks

The basic printer functions should start up when the printer is connected into an electrical outlet and the power switch is pushed to the *on* position. If the printer does not start, use the information in this section to isolate and solve the problem.

**MFP M28-M31 wireless model only:** If the control panel display remains blank, random patterns display, or asterisks remain on the control panel display, perform power-on checks to find the cause of the problem.

### Operational check

If the printer does not start with the power turned on, do the following:

- The low-voltage power supply overcurrent/overvoltage protection circuit might be functioning.
  - a. Turn the printer power off, and then unplug the power cord.
  - b. Leave the power off for 5 minutes or longer.
  - c. Plug the power cord in and turn the printer power on.
- If the error persists: the fuse on the engine controller unit (ECU) might be blown or the ECU is defective. Replace the ECU.

### Power-on troubleshooting overview

When the printer power is turned on, the normal operation sounds of a motor rotating is heard and the output rollers rotate.

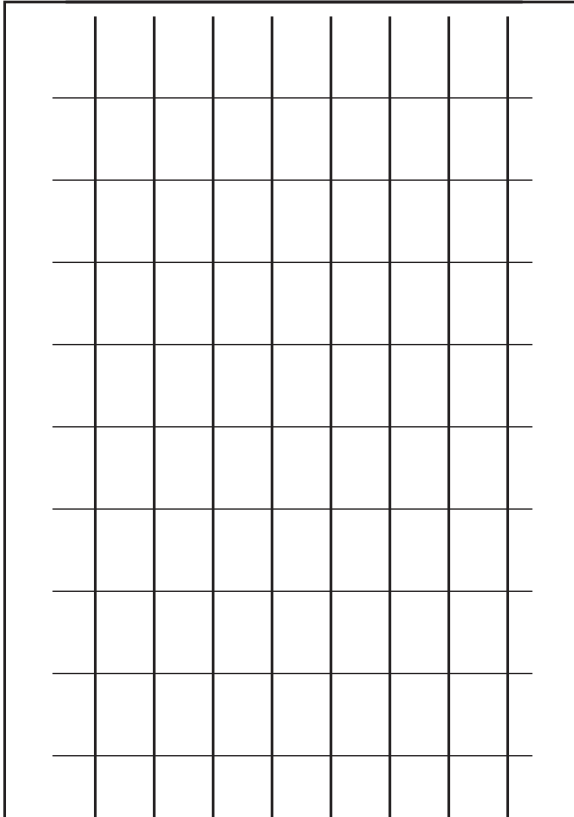
### Test pages

Printing a test page helps determine if the printer is functioning. If a printer failure occurs, print a test page to verify printer functionality.

### Engine-test page

- ▲ With the printer on and in the Ready state, open and then close the cartridge door four times within 5 seconds. The printer prints one simplex engine test page.

Figure 2-1 Engine test page



### Power-on troubleshooting overview

When the printer power is turned on, the normal operation sounds of a motor rotating is heard and the output rollers rotate.

### Troubleshooting power on problems

1. Verify that power is available to the printer. If the printer is plugged into a surge protector or uninterruptible power supply (UPS), remove it, and then plug the printer directly into a known operating wall receptacle (make sure that the wall receptacle provides the correct voltage and current for the printer).

Unplug any other devices on the same circuit that the printer is using.

2. Try another known operating wall receptacle and a different power cord.
3. Listen for startup noises (motors and output roller rotation) and illuminated lights on the control panel. If startup noises are not heard, try opening and then closing the cartridge door.

---

 **NOTE:** Operational motors and control-panel lights indicate the following:

- AC power is present at the printer.
  - The low-voltage power supply (LVPS) is providing either or both 24 Vdc and 5 Vdc voltages.
  - The DC controller microprocessor is functioning.
- 

4. If startup noises are not heard, check the following:

- a. Turn the printer off, and then replace the formatter (the engine can not turn on with the formatter removed).
- b. Turn the printer on, and then listen for startup noises. If normal startup noises are heard, go to step 5.



**NOTE:** MFP: M28-M31 wireless model only: The control panel will be blank with the formatter removed.

- c. If normal startup noises and lights are still not present, replace the engine controller assembly.



**NOTE:** If the error persists after replacing these assemblies, escalate the problem to the Global Business Unit (GBU).

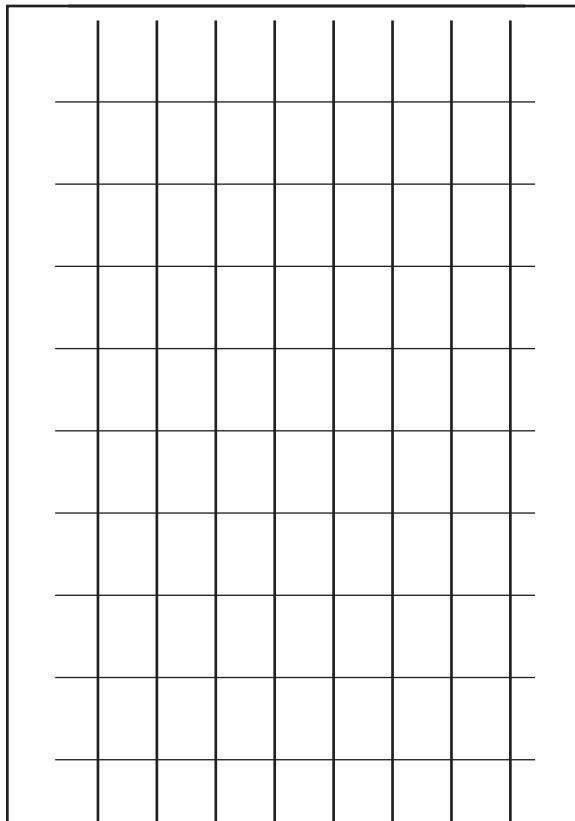
5. Try printing an engine test page.



**NOTE:** The test page can only use the cassette tray as the paper source, so make sure that paper is loaded in the cassette tray.

- ▲ With the printer on and in the Ready state, open and then close the cartridge door four times within 5 seconds. The printer prints one simplex engine test page.

**Figure 2-2** Engine test page



If the engine test page prints, the print engine is operating normally (a failed engine test print page does not necessarily indicate that the print engine or DC controller is defective).



**NOTE:** If the engine test page does not print, turn the printer off, replace the formatter, and then try the engine test again. If the page prints, the problem might be the formatter.

**MFP M28-M31 only:** A blank control panel display (or if the control-panel LED does not illuminate) can be caused by one or more of the following:

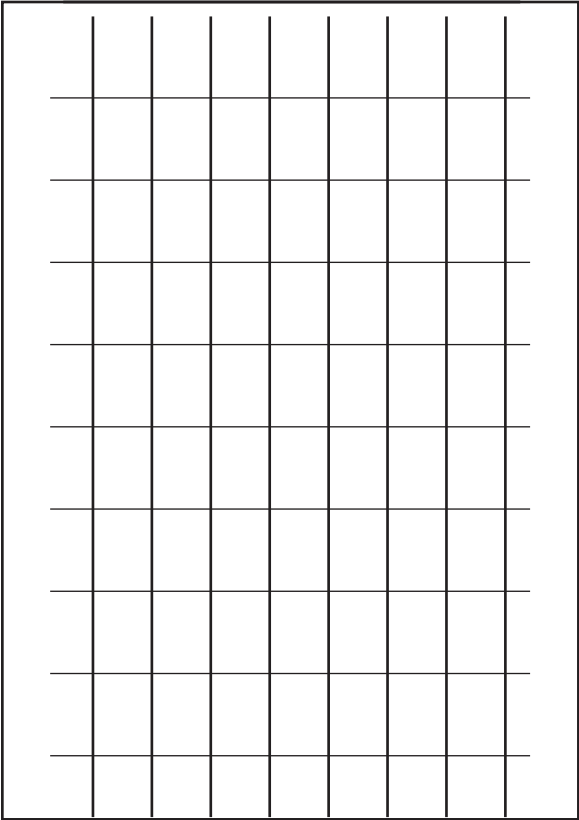
- No power to the printer.
- Power supply has tripped (over-current/over-voltage/temperature issue).
- Formatter not fully seated.
- Faulty component installed on the formatter (for example a WiFi PCA).
- Control panel connector not fully seated.
- Faulty formatter.
- Faulty DC controller (on the engine controller unit).
- Faulty control panel.

#### Troubleshooting a blank control panel (MFP M28-M31 only)

1. Verify that power is available to the printer. If the printer is plugged into a surge protector or uninterruptible power supply (UPS), remove it, and then plug the printer directly into a known operating wall receptacle (make sure that the wall receptacle provides the correct voltage and current for the printer).
2. Make sure that the power switch is in the *on* position.
3. Make sure that the motor runs briefly (at start up), which indicates that the power supply is operational.
4. Make sure that the control-panel display flat cable is connected.
5. Make sure that the formatter is operating correctly. Turn off the printer and remove the formatter. Reinstall the formatter, make sure the power switch is in the on position.
6. If the control panel display is blank, but the motor runs briefly after the printer power is turned on, try printing an engine-test page to determine whether the problem is with the control-panel display, formatter, or other printer assemblies.
  - ▲ With the printer on and in the Ready state, open and then close the cartridge door four times within 5 seconds. The printer prints one simplex engine test page.




Figure 2-3 Engine test page



If the engine test page prints, the print engine is operating normally (a failed engine test print page does not necessarily indicate that the ECU is defective).

- 7. If the print engine appears to be correctly operating (the engine test page successfully printed) and the control panel is still blank (MFP M28-M31 only), replace the ECU.

 **NOTE:** If the error persists after replacing these assemblies, escalate the problem to the Global Business Unit (GBU).

# Tools for troubleshooting

The section describes the tools that can help solve problems with the printer.

## Individual component diagnostics

### Tools for troubleshooting: Engine diagnostics

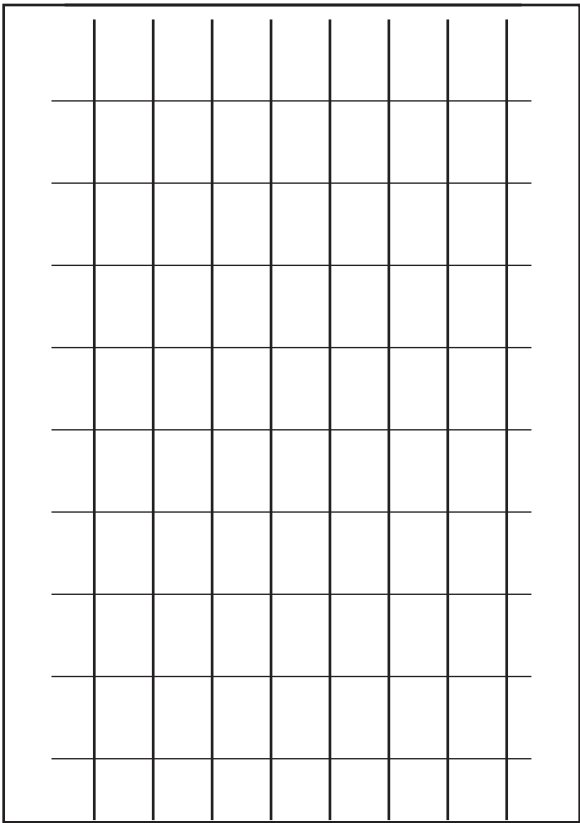
The printer contains extensive internal engine diagnostics that help in troubleshooting print quality, paper path, noise, assembly, and timing issues.

#### Engine test

To verify that the printer engine is functioning, print an engine test page. The test page should have a grid pattern on the printed page.

- ▲ With the printer on and in the Ready state, open and then close the cartridge door four times within 5 seconds. The printer prints one simplex engine test page.

Figure 2-4 Engine test page



## Half self-test functional check

The half self-test check determines which printing process is malfunctioning.

1. Send a print job to the printer.



**NOTE:** MFP M28-M31 only: Use the image scanner to make a copy.

2. Open the toner-cartridge door after the paper advances halfway through the printer (about 5 seconds after the motor begins rotating). The leading edge of the paper should have advanced past the toner cartridge.
3. Remove the toner cartridge.
4. Look at the photosensitive drum. If a dark and distinct toner image is present on the drum surface, assume that the first two functions of the electrophotographic process are functioning (image formation and development). Troubleshoot the failure as a transfer or fusing problem.
5. If there is no image on the photosensitive drum, do the following:
  - a. Make sure that the entire length of the sealing tape was removed before reinstalling the cartridge.
  - b. perform a drum rotation functional check to make sure that the drum is rotating.
6. Make sure that the high-voltage contacts are clean and not damaged.

## Drum rotation functional check

The photosensitive drum, located in the toner cartridge, must rotate for the print process to work. The main motor drives the photosensitive drum.



**NOTE:** This test is especially important if refilled toner cartridges are used.

1. Open the toner-cartridge door, and then remove the toner cartridge.
2. Mark the drive gear on the toner cartridge with a felt-tipped marker. Note the position of the mark.
3. Replace the toner cartridge and close the toner-cartridge door. The startup sequence should rotate the drum enough to move the mark.
4. Open the toner-cartridge door and inspect the gear that was marked in step 2. Verify that the mark moved.

If the mark did not move, inspect the drive gear in the printer to make sure it is meshing with the toner cartridge gear. If the gear appears functional and the drum does not move, replace the toner cartridge.

## Diagrams

Use the diagrams in this section to identify printer components.

- [Diagrams: Block diagrams](#)
- [Diagrams: Printed circuit assembly \(PCA\) connector locations](#)
- [Diagrams: External plug and port locations](#)
- [Diagrams: Locations of major components](#)
- [Diagrams: Timing chart](#)
- [Diagrams: Circuit diagrams](#)

## Diagrams: Block diagrams

### Sensors and switches

Figure 2-5 Sensors and switches

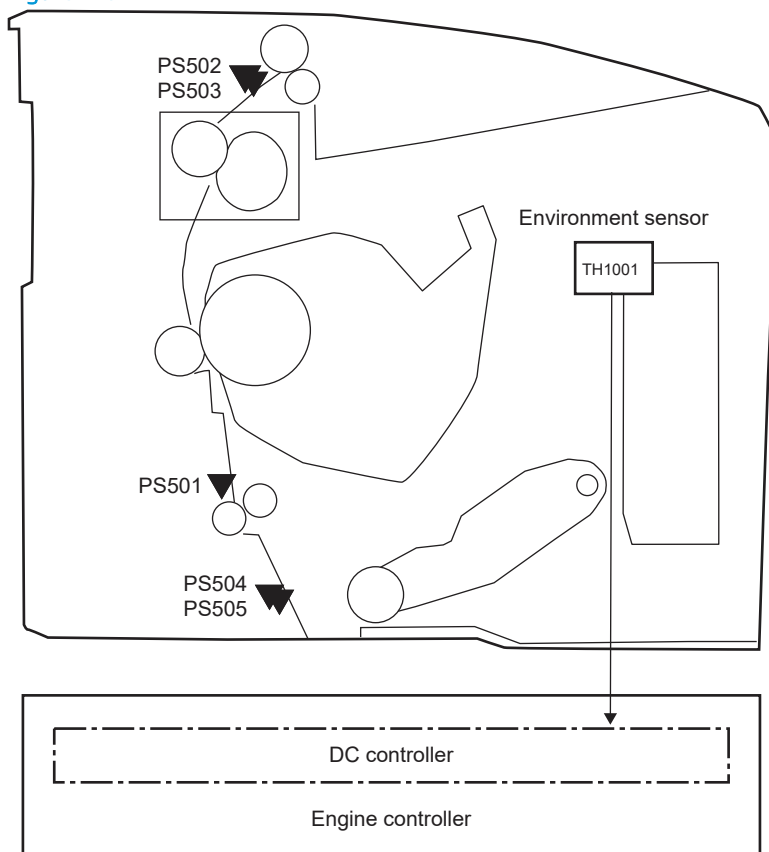


Table 2-2 Sensors and switches

Abbreviation	Component
PS501	Registration sensor <sup>2</sup>
PS502	Fuser output sensor <sup>2</sup>
PS503	Fuser media width sensor <sup>2</sup>
PS504	Tray 1 media out sensor <sup>1</sup>
PS505	Tray 1 media size sensor <sup>1</sup>
TH1001	Environmental sensor

<sup>1</sup> Only for HP LaserJet Pro M14-M17 wireless models and HP LaserJet Pro MFP M28-M31 models.

<sup>2</sup> This sensor is also a jam detection sensor.

Figure 2-6 Motor

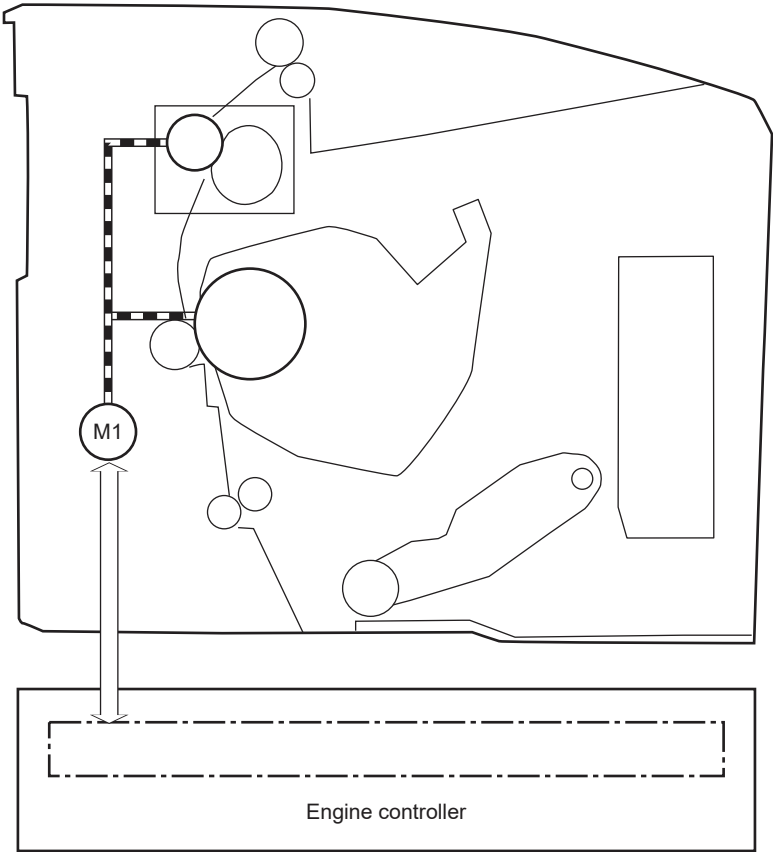
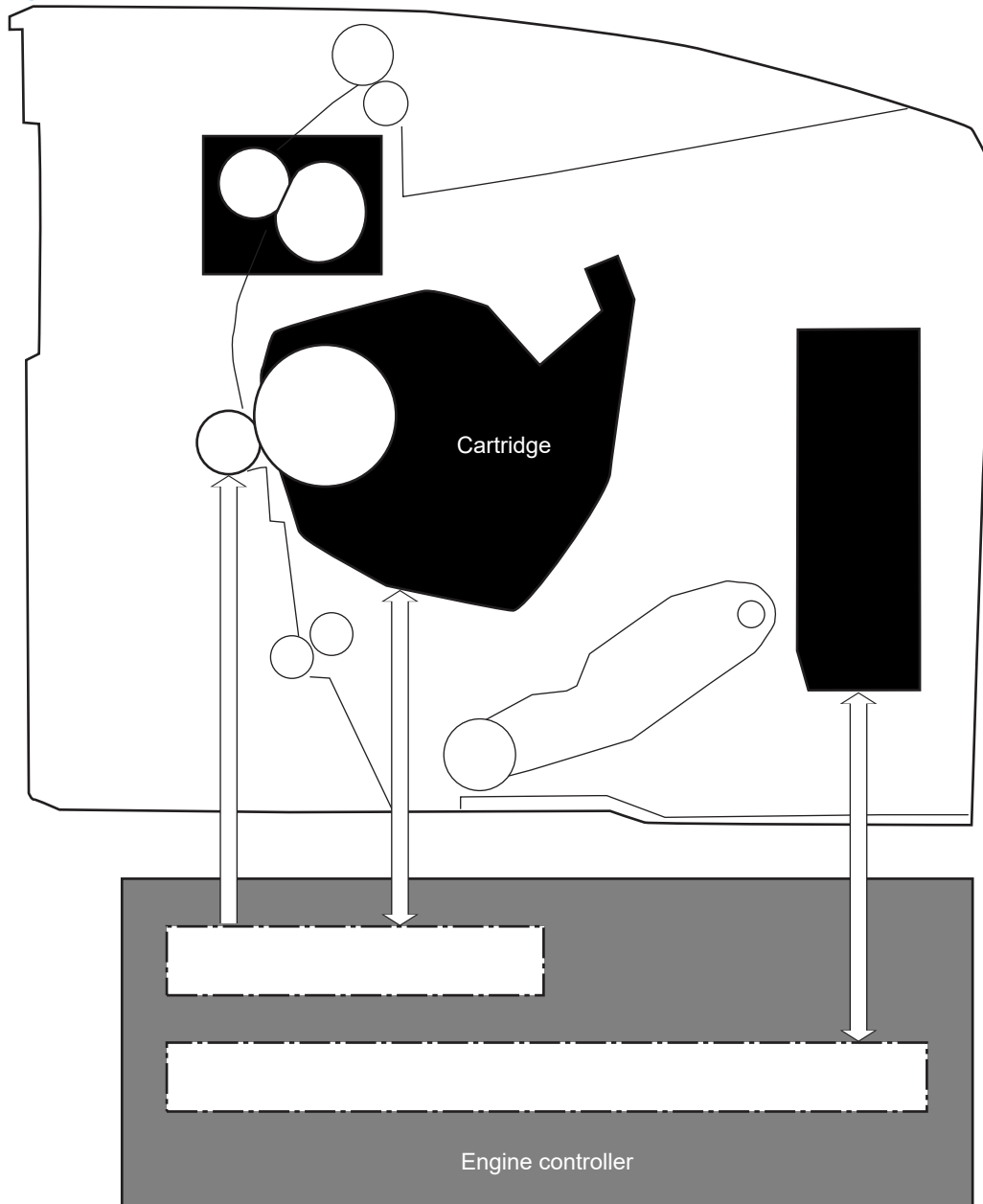


Table 2-3 Motor

Abbreviation	Component
M1	Main motor

## Image-formation system

Figure 2-7 Image-formation system



Diagrams: Printed circuit assembly (PCA) connector locations

- [Diagrams: Formatter connections](#)
- [Diagrams: Engine controller unit \(ECU\) connections](#)

Diagrams: Formatter connections

Figure 2-8 Formatter connections (M14-M17 models)

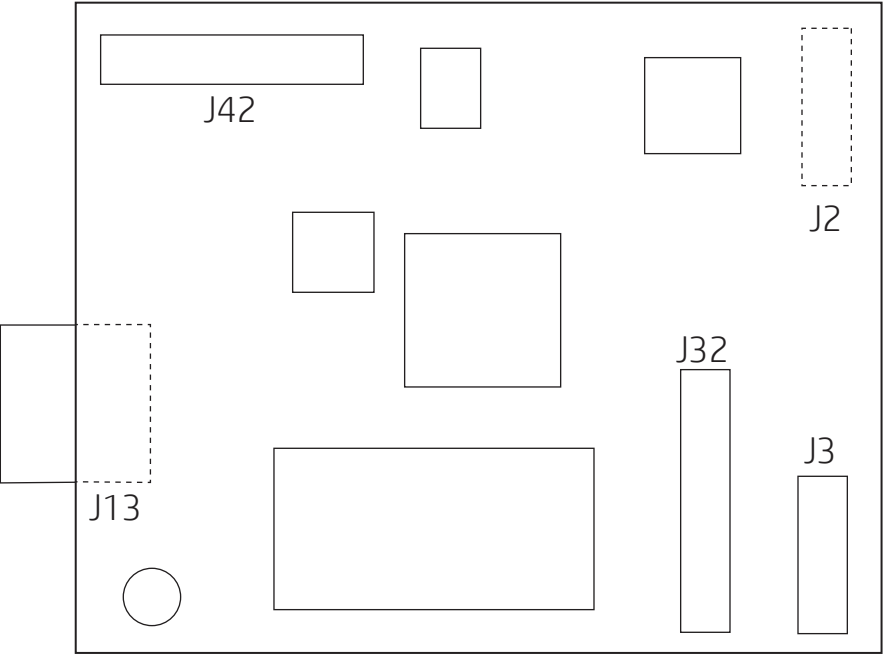


Table 2-4 Formatter connections (M14-M17 models)

Item	Description	Item	Description
J2	Wireless PCA	J32	Not used
<b>NOTE:</b> Connector is on the back of the formatter PCA.			
J3	Control panel	J42	Engine controller unit PCA (ECU)
J13	USB port		
<b>NOTE:</b> Connector is on the back of the formatter PCA.			



Figure 2-9 Formatter connections (MFP M28-M31 models)

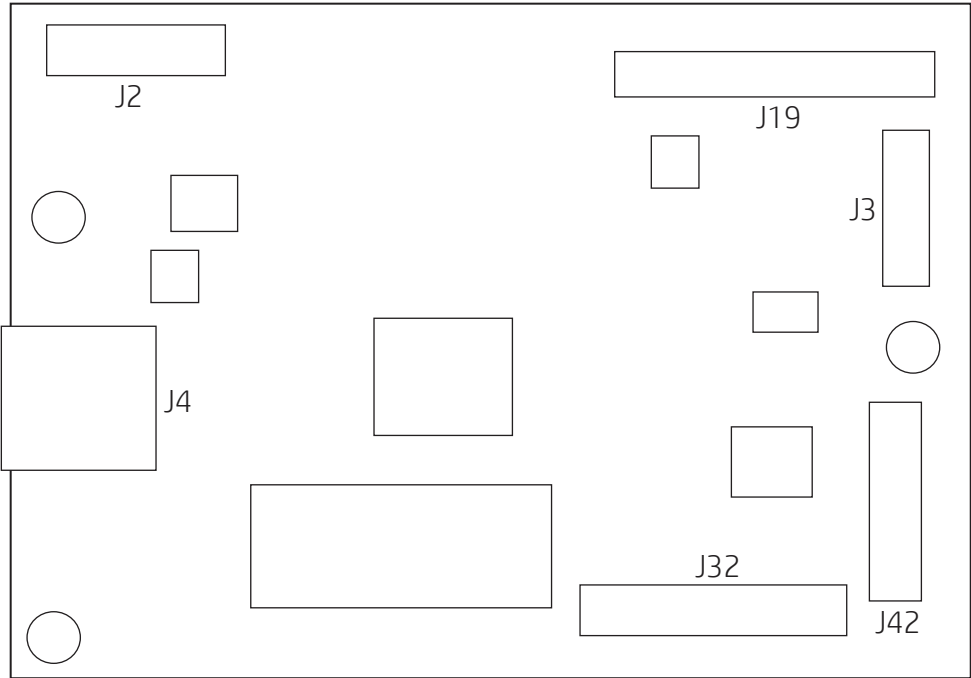


Table 2-5 Formatter connections (MFP M28-M31 models)

Item	Description	Item	Description
J2	Wireless PCA	J19	Image scanner
J3	Control panel	J32	Not used
J4	USB port	J42	Engine controller unit PCA (ECU)

Figure 2-10 Engine controller unit (ECU) connections

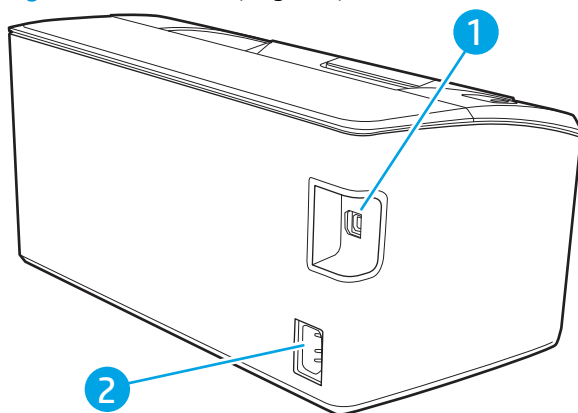


Table 2-6 Engine controller unit (ECU) connections

Item	Description	Item	Description
J103	Fuser	J604	Main Motor
J601	Formatter PCA	J605	Door switch PCA
J602	Laser BD PCA	J606	Fuser
J603	E-label	J610	Not Used

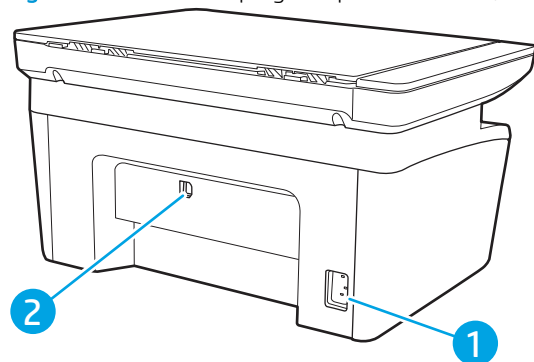
## Diagrams: External plug and port locations

Figure 2-11 External plug and port locations (M14-M17)



- |   |                       |
|---|-----------------------|
| 1 | Hi-Speed USB 2.0 port |
| 2 | Power cord receptacle |

Figure 2-12 External plug and port locations (MFP M28-M31)



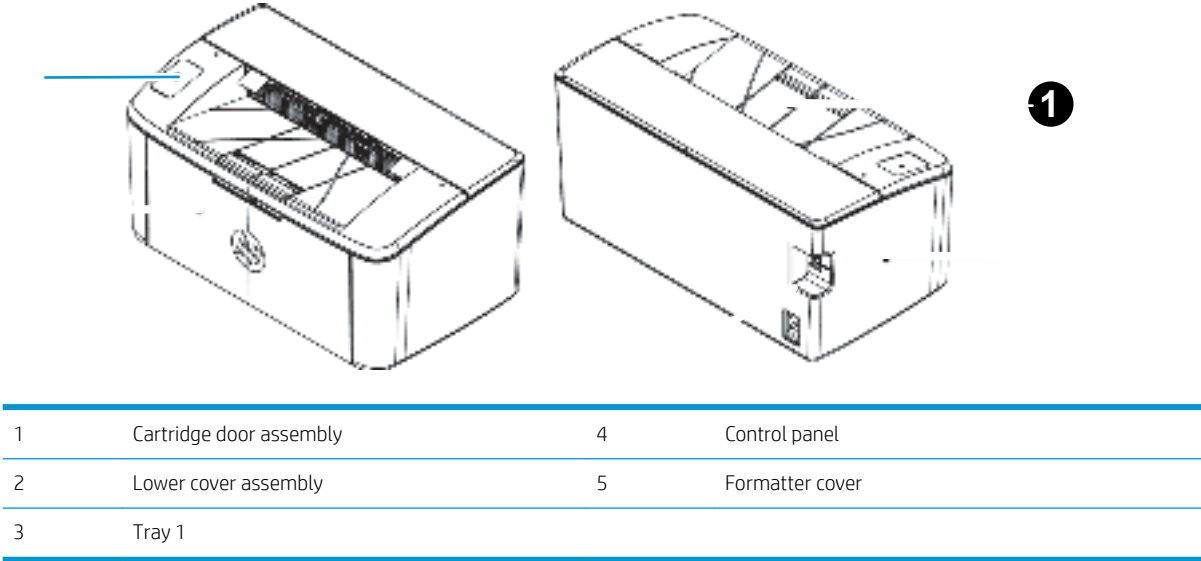
- |   |                       |
|---|-----------------------|
| 1 | Power cord receptacle |
| 2 | Hi-Speed USB 2.0 port |

Diagrams: Locations of major components

External panels, doors, and covers

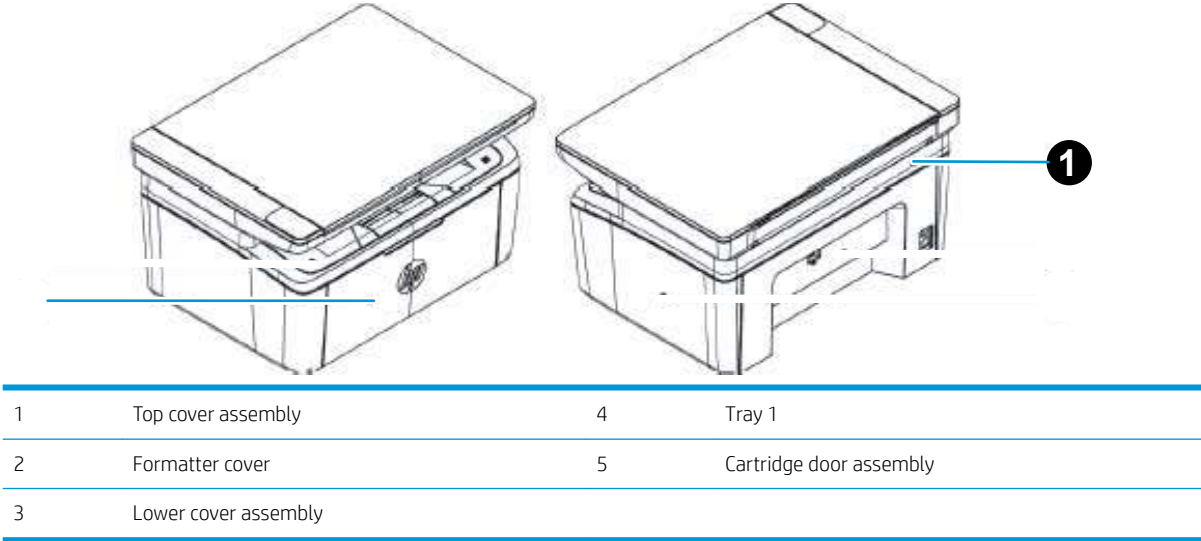
M14-M17

Figure 2-13 External panels, doors, and covers (M14-M17)



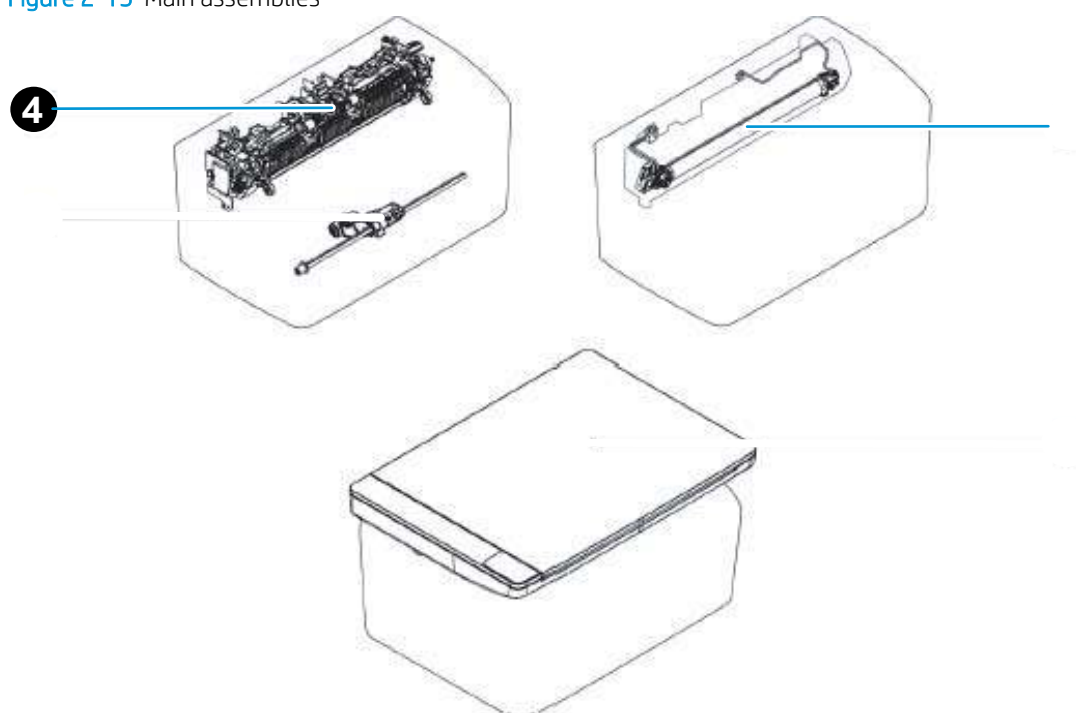
MFP M28-M31

Figure 2-14 External panels, doors, and covers (MFP M28-M31)



## Main assemblies

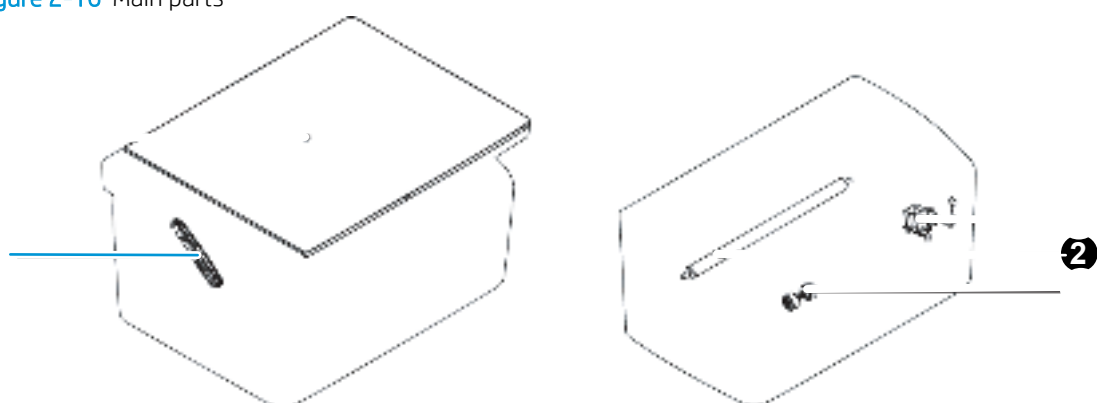
Figure 2-15 Main assemblies



1	Fuser film assembly	3	Pickup roller arm assembly
2	Image scanner (MFP M28-M31 only)	4	Fuser

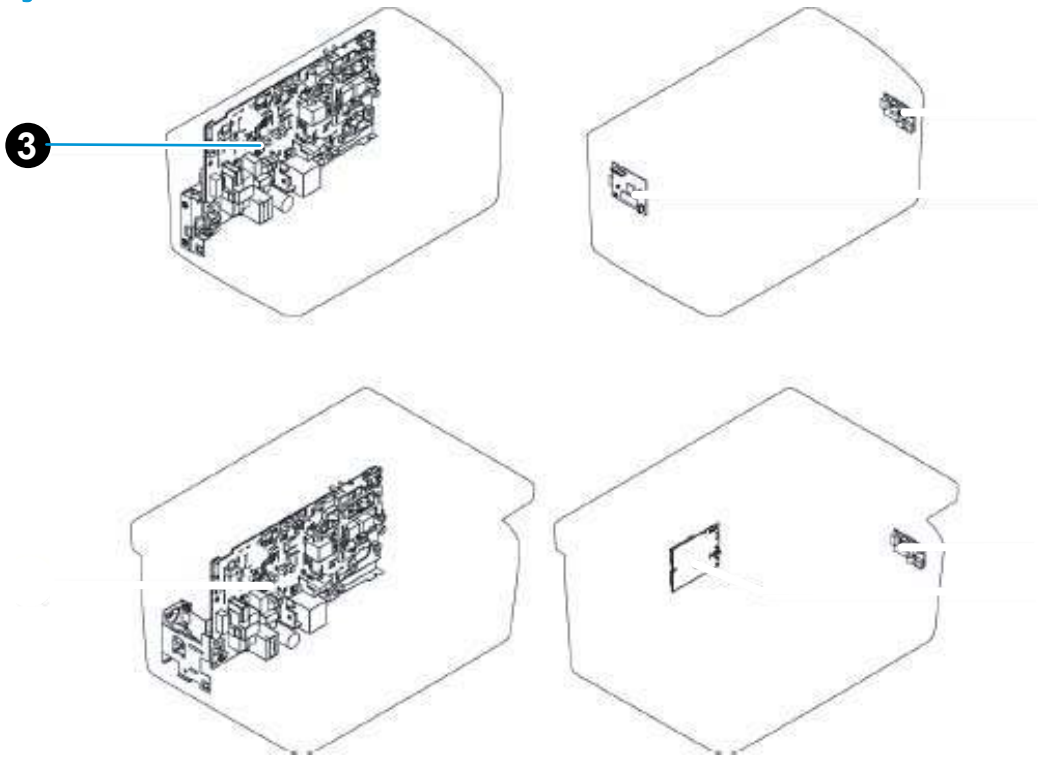
## Main parts

Figure 2-16 Main parts



1	Pickup solenoid	4	Hinge link (M28-M31)
2	Transfer roller	5	Document lid (M28-M31)
3	Pickup roller		

Figure 2-17 PCA



1	Door switch PCA	3	Engine controller assembly
2	Formatter PCA		

Figure 2-18 General timing chart

Timing chart two consecutive prints on LTR paper



D






## Advanced configuration with HP Embedded Web Server (EWS) and HP Device Toolbox (Windows)


Use the HP Embedded Web Server to manage printing functions from your computer instead of the printer control panel.

- View printer status information
- Determine the remaining life for all supplies and order new ones
- View and change tray configurations (paper types and sizes)
- View and change network configuration

The HP Embedded Web Server works when the printer is connected to an IP-based network. The HP Embedded Web Server does not support IPX-based printer connections. You do not have to have Internet access to open and use the HP Embedded Web Server.

When the printer is connected to the network, the HP Embedded Web Server is automatically available.







 **NOTE:** HP Device Toolbox is available only if you performed a full installation when you installed the printer. Depending on how the printer is connected, some features might not be available.

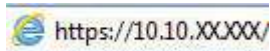
 **NOTE:** The HP Embedded Web Server is not accessible beyond the network firewall.

### Open the HP Embedded Web Server (EWS) from the Start menu

1. Click the **Start**, and then click the **Programs** item.
2. Click your HP printer group, and then click the **HP Device Toolbox** item.

### Open the HP Embedded Web Server (EWS) from a Web browser

1. **M14-M17 control panels:** Select and hold the Resume/Cancel  button until the Ready  light is blinking, and then release the Resume/Cancel  button. Find the IP address or host name of the printer on the configuration report.  
  
**MFP M28-M311 control panels:** Select and hold the Start Copy  button until the Ready  light begins blinking, and then release the Start Copy  button. Find the IP address or host name of the printer on the configuration report.
2. Open a Web browser, and in the address line, type the IP address or host name exactly as it appears on the printer control panel or the configuration report. Press the **Enter** key on the computer keyboard. The EWS opens.



 **NOTE:** If the web browser displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

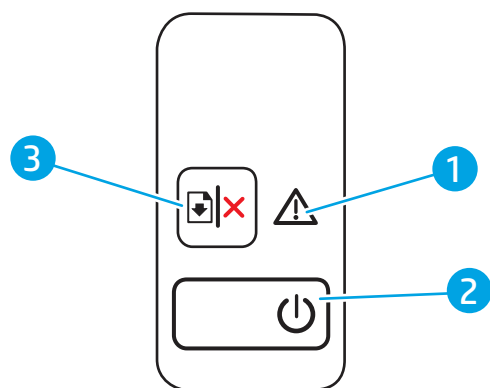
Tab or section	Description
<b>Home tab</b>  Provides printer, status, and configuration information.	<ul style="list-style-type: none"> <li>• <b>Device Status:</b> Shows the printer status and shows the approximate percent life remaining of HP supplies.</li> <li>• <b>Supplies Status:</b> Shows the approximate percent life remaining of HP supplies. Actual supply life remaining can vary. Consider having a replacement supply available to install when print quality is no longer acceptable. The supply does not need to be replaced unless the print quality is no longer acceptable.</li> <li>• <b>Device Configuration:</b> Shows the information found on the printer configuration report.</li> <li>• <b>Network Summary:</b> Shows the information found on the printer network configuration report.</li> <li>• <b>Event Log:</b> Shows a list of all printer events and errors.</li> </ul>
<b>System tab</b>  Provides the ability to configure the printer from your computer.	<ul style="list-style-type: none"> <li>• <b>Device Information:</b> Provides basic printer and company information.</li> <li>• <b>Paper Setup:</b> Change the default paper-handling settings for the printer.</li> <li>• <b>Energy Settings:</b> Change the default times for entering Sleep mode or Auto Power Down mode. Configure which events cause the printer to wake.</li> <li>• <b>Paper Types:</b> Configure print modes that correspond to the paper types that the printer accepts.</li> <li>• <b>System Setup:</b> Change the system defaults for the printer.</li> <li>• <b>Service:</b> Perform the cleaning procedure on the printer.</li> <li>• <b>Administration:</b> Set or change the printer password. Enable or disable printer features.</li> </ul> <p><b>NOTE:</b> The <b>System</b> tab can be password-protected. If this printer is on a network, always consult with the administrator before changing settings on this tab.</p>


## Control panel (layout and interpreting light patterns)

- [Control panel \(M14-M17\)](#)
- [Control panel \(MFP M28-M31\)](#)

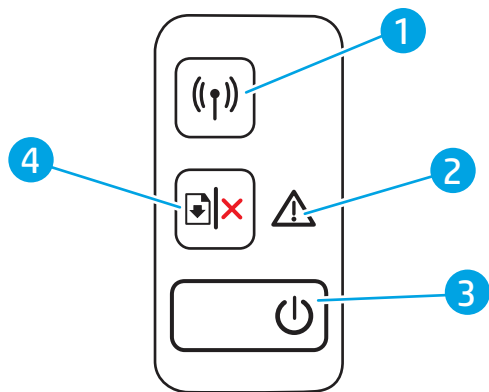
### Control panel (M14-M17)



#### Base model (M14-M17)



1	Attention LED	The Attention light blinks when the printer requires user attention. If the Attention light is on, the printer is in an error state.
2	Power button/Ready LED	Use this button to turn the printer on or off.  The Ready light is on when the printer is ready to print. It blinks when the printer is receiving print data and dims when the printer is in a low-power state.
3	Resume/Cancel  button	Press this button for the following actions: <ul style="list-style-type: none"><li>• If the printer is currently processing a job, with Attention LED off and Ready LED blinking, press the button to cancel the print job.</li><li>• If the printer is in a error or prompt state, with Ready LED On and Attention LED blinking, press the button to clear the error and resume printing.</li><li>• In manual duplex mode, press this button to print the second side of the page.</li></ul>




Wireless models (M14-M17)



1	Wireless  button and LED (wireless models only)	<p>Press this button to turn the wireless feature on or off, or to configure a WiFi Direct connection.</p> <p>Press and hold this button to configure a WPS connection.</p> <p>If the wireless LED light is on, there is a stable wireless connection. If it is blinking, there is currently no wireless connection, or there is either a WPS or WiFi Direct configuration process in progress. If it is blinking rapidly, there is an issue with the wireless connection.</p>
2	Attention LED	<p>The Attention light blinks when the printer requires user attention. If the Attention light is on, the printer is in an error state.</p>
3	Power button/Ready LED	<p>Use this button to turn the printer on or off.</p> <p>The Ready light is on when the printer is ready to print. It blinks when the printer is receiving print data and dims when the printer is in a low-power state.</p>
4	Resume/Cancel  button	<p>Press this button for the following actions:</p> <ul style="list-style-type: none"><li>• If the printer is currently processing a job, with Attention LED off and Ready LED blinking, press the button to cancel the print job.</li><li>• If the printer is in a error or prompt state, with Ready LED On and Attention LED blinking, press the button to clear the error and resume printing.</li><li>• In manual duplex mode, press this button to print the second side of the page.</li></ul>

## Interpret control-panel light patterns (M14-M17)

**Table 2-14 Status-light legend**

	Symbol for "light off"
	Symbol for "light on"
	Symbol for "light blinking"

**Table 2-15 Control-panel light patterns**

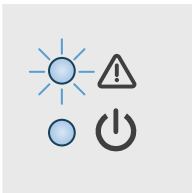








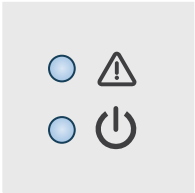
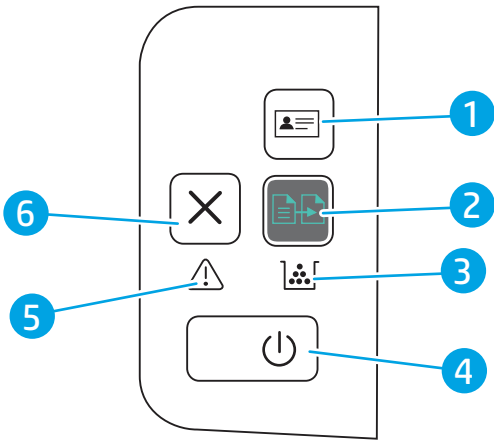
Light status	State of the printer	Action
	The printer is in manual-feed mode.	Load the correct paper type and size into the input tray. Press the Resume/Cancel  button to continue.
	The printer is processing a manual duplex job.	Load the pages into the input tray to print the second sides. Press the Resume/Cancel  button to continue.
	The input tray is empty.	Load the tray and press the Resume/Cancel  button to continue.  <b>NOTE:</b> Wireless models have a paper sensor and will continue automatically after paper is loaded.
	A door is open.	Verify that the toner-cartridge door is fully closed.
	The printer has failed to pick up a sheet of paper to process a print job.	Verify that paper is correctly loaded, and then press the Resume/Cancel  button to continue.
	Paper is jammed in the printer.	Check for jams in the input tray, the output bin, and the toner cartridge area. Clear the jam. Press the Resume/Cancel  button to continue.
	The toner cartridge is missing or incorrectly installed.	Verify that all supplies are in place and installed correctly.
	The toner cartridge is very low.	Replace the toner cartridge.  <b>NOTE:</b> There will be no attention state if the printer is configured to continue printing when the toner cartridge is very low.
	The toner cartridge is incompatible with the printer, possibly due to a missing or damaged memory chip.	Replace the toner cartridge.
	The toner cartridge has been protected on another printer.	Replace the toner cartridge.
	The printer has detected an unauthorized toner cartridge.	Replace the toner cartridge.

Table 2-15 Control-panel light patterns (continued)


Light status	State of the printer	Action
	The loaded paper is not the size needed for the print job.	Replace the paper, or press the Resume/Cancel  button to continue with the size currently loaded.
	The printer has experienced a general engine error.	Press the Resume/Cancel  button to continue.  If the error repeats, turn off the printer. Wait 30 seconds, and then turn on the printer.
	Incorrect firmware has been loaded.	Press the Resume/Cancel  button to continue, Load the correct firmware.
The Attention and Ready lights are on. 	The printer has experienced a fatal error from which it cannot recover.	<ol style="list-style-type: none"><li>1. Turn off the printer or disconnect the power cord from the printer.</li><li>2. Wait 30 seconds, and then turn on the printer or reconnect the power cord to the printer.</li><li>3. Wait for the printer to initialize.</li></ol> If the error persists, contact HP customer support.
The Attention and Ready lights are blinking.	The printer is initializing, cleaning, or cooling down.	

Control panel (MFP M28-M31)

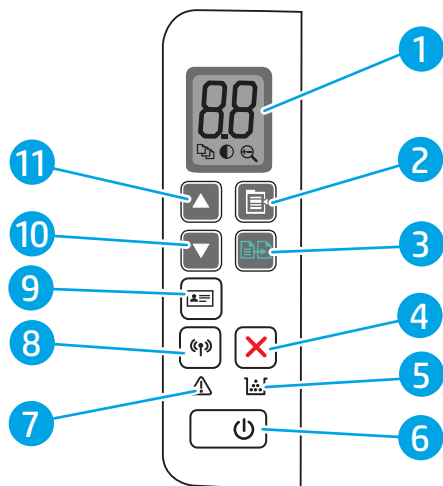
Base model (MFP M28-M31)







1	Copy ID button (HP LaserJet Pro MFP M29 only)	Use this button to copy an identification card.
2	Start Copy button	Use this button to start a copy job
3	Supplies LED	A supplies light blinks when a supply error occurs, and it glows without blinking when the supply is very low and replacement is required.

4	Power button/Ready LED	<ul style="list-style-type: none"> <li>Use this button to turn the printer on or off.</li> <li>The Ready light is on when the printer is ready to print. It blinks when the printer is receiving data and dims when the printer is in a low-power state.</li> </ul>
5	Attention LED	The Attention light blinks when the printer requires user attention. If the Attention light is on, the printer is in an error state.
6	Cancel  button	Press this button to cancel a job.

### Wireless models (MFP M28-M31)






1	Control panel LED display	The control panel LED shows numerical information for copy settings and event codes
2	Copy Setup button	Use this button to navigate through the Number of Copies, Lighter/Darker, and Reduce/Enlarge options. The default option is Number of Copies.
3	Start Copy button	Use this button to start a copy job.
4	Cancel  button	Press this button to cancel a job.
5	Supplies LED	A supplies light blinks when a supply error occurs, and it glows without blinking when the supply is very low and replacement is required.
6	Power button/Ready LED	<ul style="list-style-type: none"> <li>Use this button to turn the printer on or off.</li> <li>The Ready light is on when the printer is ready to print. It blinks when the printer is receiving data and dims when the printer is in a low-power state.</li> </ul>
7	Attention LED	The Attention light blinks when the printer requires user attention. If the Attention light is on, the printer is in an error state.
8	Wireless  button and LED (wireless models only)	<p>Press this button to turn the wireless feature on or off, or to configure a WiFi Direct connection.</p> <p>Press and hold this button to configure a WPS connection.</p> <p>If the wireless LED light is on, there is a stable wireless connection. If it is blinking, there is currently no wireless connection, or there is either a WPS or WiFi Direct configuration process in progress. If it is blinking rapidly, there is an issue with the wireless connection.</p>
9	Copy ID button	Use this button to copy an identification card.
10	Down Arrow  button	Use this button to decrease the value that appears on the display.
11	Down Arrow  button	Use this button to increase the value that appears on the display.


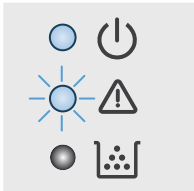





## Interpret control-panel light patterns (MFP M28-M31)

If the printer requires user confirmation, the LED control panel alternates between **Go** and a two-digit status code. If the printer requires attention, the LED control panel alternates between **Er** and a two-digit error code. Use the table below to determine any issues with the printer.

**Table 2-16** Status-light legend

	Symbol for "light off"
	Symbol for "light on"
	Symbol for "light blinking"

**Table 2-17** Control-panel light patterns

Light status	Error code	State of the printer	Action
The Attention light is blinking.	<b>Go/01</b>	The printer is in manual-feed mode.	Load the correct paper type and size into the input tray. Press the Start Copy  button to continue.
	<b>Go/02</b>	The printer is processing a manual duplex job.	Load the pages into the input tray to print the second sides. Press the Start Copy  button to continue.
	<b>Go/03</b>	The paper type or size of the print job is different than the tray settings.	Load the correct paper type and size into the input tray, or press the Start Copy  button to continue with the paper currently loaded.
	<b>Go/04</b>	The printer has received a request to register this printer with Google Cloud Print.	Press the Start Copy  button to acknowledge this request.
	<b>Go/05</b>	The printer has received a request to connect to this printer using Wi-Fi Direct.	Enter the PIN on the printed report on your mobile device.
	<b>Go/06</b>	The printer has received a request to connect to this printer using Wi-Fi Direct.	Press the Start Copy  button to connect.
	<b>Go/P2</b>	An ID Copy job has been started.	Turn over the identification card and press the ID Copy button to continue.
	<b>Er/01</b>	The input tray is empty.	Load the tray.
	<b>Er/02</b>	A door is open.	Verify that the top cover is fully closed.
	<b>Er/03</b>	The printer failed to pick a sheet of paper to print.	Press Start Copy  to continue.
	<b>Er/04</b>	Paper is jammed in the input tray.	Clear the jam.
	<b>Er/05</b>	Paper is jammed in the toner cartridge area.	Clear the jam.
	<b>Er/06</b>	Paper is jammed in the output bin area.	Clear the jam.

**NOTE:** The Supplies LED might or might not be on in this state depending on the supply status.



Table 2-17 Control-panel light patterns (continued)




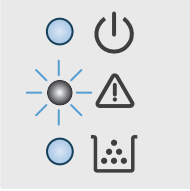
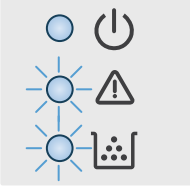
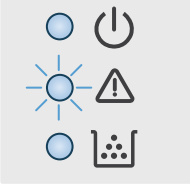
Light status	Error code	State of the printer	Action
	Er/25	The loaded paper is not the size needed for the print job.	Replace the paper, or press Start Copy  to continue with the size currently loaded.
	Er/26	The printer has experienced a general engine error.	Press Start Copy  to continue.  If the error repeats, turn off the printer. Wait 30 seconds, and then turn on the printer.
	Er/81	Incorrect firmware has been loaded.	Press Start Copy  to continue. Load the correct firmware.
The Attention light is blinking and the Ready light is on.  	Er/08	The supply has reached very low status and is configured to stop.	The cartridge needs to be replaced, or the cartridge setting needs to be changed to <b>Continue</b> in the EWS.. If the supply is configured to <b>Continue</b> , then the Supply light will be on but no error code will display.
The Attention and Supply lights are blinking, and the Ready light is on.  	Er/07	The supply is missing or incorrectly installed.	Install or reinstall the supply.
	Er/11	There is an issue with the cartridge.	Make sure the shipping material has been removed from the cartridge, and that the cartridge is compatible and not damaged.
	Er/14	The toner cartridge has been protected and is not allowed to be used in this printer.	Replace the cartridge.
	Er/17	An unauthorized toner cartridge is installed.	Replace the cartridge.
The Attention light is blinking, and Ready and Supply lights are on.  	Er/08	The supply has reached very low status and is configured to stop.	The cartridge needs to be replaced, or the cartridge setting needs to be changed to <b>Continue</b> in the EWS.. If the supply is configured to <b>Continue</b> , then the Supply light will be on but no error code will display.

Table 2-17 Control-panel light patterns (continued)

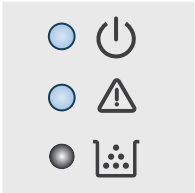
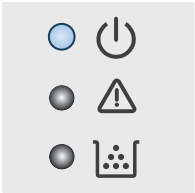
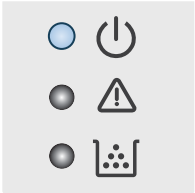
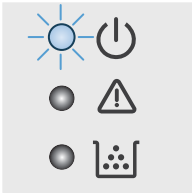
Light status	Error code	State of the printer	Action
Attention and Ready lights are on.	Er/30	There is an issue with the flatbed scanner.	Turn off the device and then turn it on. If the problem persists, contact HP support.
	Er/50	There is an issue with the print engine.	Turn off the device and then turn it on. If the problem persists, contact HP support.
	Er/51		
	Er/52		
	Er/54		
	Er/55		
	Er/58		
<b>NOTE:</b> The Supplies LED might or might not be on in this state depending on the supply status.	Er/59		
	Er/66	There is a problem with the wireless hardware.	Turn off the device and then turn it on. If the problem persists, contact HP support.
Attention light is off and Ready light is on.		The printer is in Ready mode. The LCD display will show the current value for the number of copies.	
			
<b>NOTE:</b> The Supplies LED might or might not be on in this state depending on the supply status.			
Attention light is off and Ready light is on but dim.		The printer is in Sleep mode.	
			
<b>NOTE:</b> The Supplies LED might or might not be on in this state depending on the supply status.			

Table 2-17 Control-panel light patterns (continued)

Light status	Error code	State of the printer	Action
Attention light if off and Ready light is blinking. 		The printer is currently processing a job. For print and scan jobs, the LCD display will show the current value for the number of copies. For copy jobs, the LCD display will show the copy number being processed. For ID copy jobs, the LCD display will show "P1" while scanning the front of the identification card, and show "P2" while scanning the back of the identification card.	
The Attention and Ready lights are blinking.		The printer is initializing, cleaning, or cooling down.	

## Improve print quality

- [Introduction](#)
- [Update the printer firmware](#)
- [Print from a different software program](#)
- [Check the paper-type setting for the print job](#)
- [Check toner-cartridge status](#)
- [Print a cleaning page](#)
- [Visually inspect the toner cartridge](#)
- [Check paper and the printing environment](#)
- [Try a different print driver](#)
- [Adjust Print Density](#)

### Introduction

The following information provides troubleshooting steps to resolve print-quality problems, including the following problems:

- Smears
- Fuzzy print
- Dark print
- Light print
- Streaks
- Missing toner
- Scattered dots of toner
- Loose toner
- Skewed images

To resolve these or other print-quality problems, try the following solutions in the order presented.

For information about resolving specific image defects, see the Print quality troubleshooting section of this manual.

### Update the printer firmware

Try upgrading the printer firmware. For more information, see the Firmware upgrades section of this manual.

### Print from a different software program

Try printing from a different software program. If the page prints correctly, the problem is with the software program from which you were printing.

## Check the paper-type setting for the print job

Check the paper type setting when printing from a software program and the printed pages have smears, fuzzy or dark print, curled paper, scattered dots of toner, loose toner, or small areas of missing toner.

### Check the paper type setting on the printer

1. Open the tray.
2. Verify that the tray is loaded with the correct type of paper.
3. Close the tray.

### Check the paper type setting (Windows)

1. From the software program, select the **Print** option.
2. Select the printer, and then click the **Properties** or **Preferences** button.
3. Click the **Paper/Quality** tab.
4. From the **Paper Type** drop-down list, click the **More...** option.
5. Expand the list of **Type is:** options.
6. Expand the category of paper types that best describes your paper.
7. Select the option for the type of paper you are using, and click the **OK** button.
8. Click the **OK** button to close the **Document Properties** dialog box. In the **Print** dialog box, click the **OK** button to print the job.

### Check the paper type setting (OS X)

1. Click the **File** menu, and then click the **Print** option.
2. In the **Printer** menu, select the printer.
3. By default, the print driver displays the **Copies & Pages** menu. Open the menus drop-down list, and then click the **Finishing** menu.
4. Select a type from the **Media Type** drop-down list.
5. Click the **Print** button.

## Check toner-cartridge status

Follow these steps to check the estimated life remaining in the toner cartridges and if applicable, the status of other replaceable maintenance parts.


### Step one: Find supplies information on configuration page (M14-M17)

Supplies information is included on the configuration page.

1. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
2. Release the Resume/Cancel  button.

### Step one: Find supplies information on configuration page (MFP M28-M31)

Supplies information is included on the configuration page.

1. Press and hold the Start Copy  button until the Ready  light begins blinking.
2. Release the Start Copy  button.

### Step two: Check supplies status

1. Look at the supplies status report to check the percent of life remaining for the toner cartridges and if applicable, the status of other replaceable maintenance parts.

Print quality problems can occur when using a toner cartridge that is at its estimated end of life. The supplies status page indicates when a supply level is very low. After an HP supply has reached the very low threshold, HP's premium protection warranty on that supply has ended.

The toner cartridge does not need to be replaced now unless the print quality is no longer acceptable. Consider having a replacement available to install when print quality is no longer acceptable.

If you determine that you need to replace a toner cartridge or other replaceable maintenance parts, the supplies status page lists the genuine HP part numbers.

2. Check to see if you are using a genuine HP cartridge.

A genuine HP toner cartridge has the words "HP" or "Hewlett-Packard" on it, or has the HP logo on it. For more information on identifying HP cartridges go to [www.hp.com/go/learnaboutsupplies](http://www.hp.com/go/learnaboutsupplies).

## Print a cleaning page

During the printing process paper, toner, and dust particles can accumulate inside the printer and can cause print-quality issues such as toner specks or spatter, smears, streaks, lines, or repeating marks.

Use the following procedure to print a cleaning page.

1. Open the HP Printer Assistant.
  - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
  - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.
  - **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
  - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
2. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.
3. On the **System** tab, click **Service**.
4. In the **Cleaning Mode** area, click **Start** to begin the cleaning process.

## Visually inspect the toner cartridge

Follow these steps to inspect the toner cartridge.

1. Remove the toner cartridges from the printer, and verify that the sealing tape has been removed.
2. Check the memory chip for damage.
3. Examine the surface of the green imaging drum.

---

 **CAUTION:** Do not touch the imaging drum. Fingerprints on the imaging drum can cause print-quality problems.

---

4. If you see any scratches, fingerprints, or other damage on the imaging drum, replace the toner cartridge.
5. Reinstall the toner cartridge, and print a few pages to see if the problem has resolved.

## Check paper and the printing environment

### Step one: Use paper that meets HP specifications

Some print-quality problems arise from using paper that does not meet HP specifications.

- Always use a paper type and weight that this printer supports.
- Use paper that is of good quality and free of cuts, nicks, tears, spots, loose particles, dust, wrinkles, voids, staples, and curled or bent edges.
- Use paper that has not been previously printed on.
- Use paper that does not contain metallic material, such as glitter.
- Use paper that is designed for use in laser printers. Do not use paper that is designed only for use in Inkjet printers.
- Use paper that is not too rough. Using smoother paper generally results in better print quality.

### Step two: Check the environment

The environment can directly affect print quality and is a common cause for print-quality or paper-feeding issues. Try the following solutions:

- Move the printer away from drafty locations, such as open windows or doors, or air-conditioning vents.
- Make sure the printer is not exposed to temperatures or humidity outside of printer specifications.
- Do not place the printer in a confined space, such as a cabinet.
- Place the printer on a sturdy, level surface.
- Remove anything that is blocking the vents on the printer. The printer requires good air flow on all sides, including the top.
- Protect the printer from airborne debris, dust, steam, grease, or other elements that can leave residue inside the printer.

## Try a different print driver

Try a different print driver when printing from a software program and the printed pages have unexpected lines in graphics, missing text, missing graphics, incorrect formatting, or substituted fonts.

Download any of the following drivers from the HP Web site: [www.hp.com/support/ljM14](http://www.hp.com/support/ljM14) and/or [www.hp.com/support/ljM28MFP](http://www.hp.com/support/ljM28MFP).

**Table 2-18 Supported operating systems and print drivers**

Windows 7, 32-bit and 64-bit	The HP PCLmS printer-specific print driver is installed for this operating system as part of the software installation.	
Windows 8, 32-bit and 64-bit	The HP PCLmS printer-specific print driver is installed for this operating system as part of the software installation.	Windows 8 RT support is provided through Microsoft IN OS Version 4, 32-bit driver.
Windows 8.1, 32-bit and 64-bit	The HP PCLm-S printer-specific print driver is installed for this operating system as part of the software installation.	Windows 8.1 RT support is provided through Microsoft IN OS Version 4, 32-bit driver.
Windows 10, 32-bit and 64-bit	The HP PCLm-S printer-specific print driver is installed for this operating system as part of the software installation.	
Windows Server 2008 R2, 64-bit	The HP PCLm.S printer-specific print driver is available for download from the printer-support website. Download the driver, and then use the Microsoft Add Printer tool to install it.	Microsoft retired mainstream support for Windows Server 2008 in January 2015. HP will continue to provide best effort support for the discontinued Server 2008 operating system.
Windows Server 2008 R2, SP1, 64-bit	The HP PCLm.S printer-specific print driver is installed for this operating system as part of the software installation.	
Windows Server 2012	The HP PCLmS printer-specific print driver is installed for this operating system as part of the software installation.	
Windows Server 2012 R2	The HP PCLm-S printer-specific print driver is installed for this operating system as part of the software installation.	
Windows Server 2016, 64-bit	The HP PCLmS printer-specific print driver is installed for this operating system as part of the software installation.	
OS X 10.11 El Capitan, OS X 10.12 Sierra, OS X 10.13	To install the print driver, download HP Easy Start from <a href="http://123.hp.com/LaserJet">123.hp.com/LaserJet</a> . Follow the steps provided to install the printer software and print driver.	

## Adjust Print Density

Complete the following steps to adjust the print density.

### Adjust Print Density (M14-M17)




1. Open the HP Embedded Web Server (EWS):

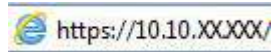


### Direct-connected printers

- a. Open the HP Printer Assistant.
  - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
  - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.
  - **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
  - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
- b. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.

### Network-connected printers

- a. Print a configuration page to determine the IP address or host name.
  - i. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
  - ii. Release the Resume/Cancel  button.
- b. Open a web browser, and in the address line, type the IP address or host name exactly as it displays on the printer configuration page. Press the **Enter** key on the computer keyboard. The EWS opens.



 **NOTE:** If the web browser displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

2. Click the **System** tab, and then select **System Setup** from the left navigation pane.
3. Select the correct density settings.
4. Click **Apply** to save the changes.

### Adjust Print Density (MFP M28-M31)




1. Open the HP Embedded Web Server (EWS):

### Direct-connected printers

- a. Open the HP Printer Assistant.
  - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
  - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.

- **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
  - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
- b. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.

#### Network-connected printers

- a. Print a configuration page to determine the IP address or host name.
- i. Press and hold the Start Copy  button until the Ready  light begins blinking.
  - ii. Release the Start Copy  button.
- b. Open a web browser, and in the address line, type the IP address or host name exactly as it displays on the printer configuration page. Press the **Enter** key on the computer keyboard. The EWS opens.



**NOTE:** If the web browser displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

2. Click the **System** tab, and then select **System Setup** from the left navigation pane.
3. Select the correct density settings.
4. Click **Apply** to save the changes.

# Print quality troubleshooting guide

- [Resolving print quality problems](#)
  - [Introduction](#)
  - [Troubleshoot print quality problems](#)
- [Printer-specific image defects](#)
  - [Repetitive image defects](#)
  - [Printer-specific print quality troubleshooting guide](#)

## Resolving print quality problems

- [Introduction](#)
- [Troubleshoot print quality problems](#)

### Introduction

The following information provides troubleshooting steps for solving image defect issues, including the following defects:

- Light print
- Gray background or dark print
- Blank pages
- Black pages
- Dark or light bands
- Dark or light streaks
- Missing toner
- Skewed images
- Curled paper

Troubleshoot print quality problems

Table 2-19 Image defects table quick reference



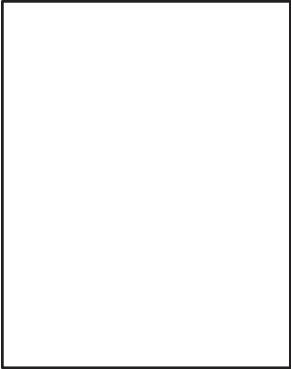
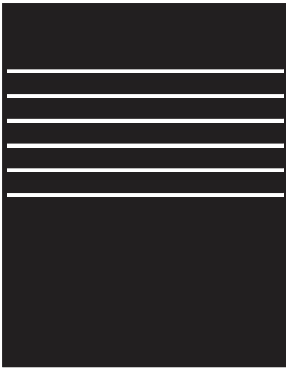
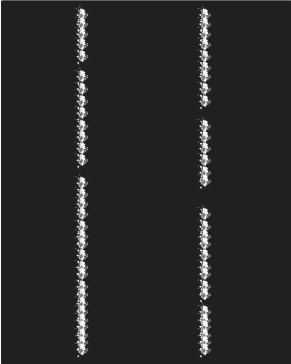
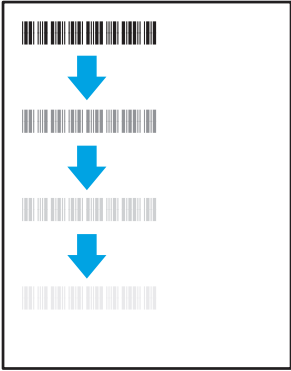



<p><a href="#">Table 2-20 Light print on page 73</a></p> 	<p><a href="#">Table 2-21 Gray background or dark print on page 74</a></p> 	<p><a href="#">Table 2-22 Blank page — No print on page 74</a></p> 
<p><a href="#">Table 2-23 Black page on page 75</a></p> 	<p><a href="#">Table 2-24 Banding defects on page 75</a></p> 	<p><a href="#">Table 2-25 Streak defects on page 76</a></p> 
<p><a href="#">Table 2-26 Fixing/fuser defects on page 77</a></p> 	<p><a href="#">Table 2-27 Image placement defects on page 77</a></p> 	<p><a href="#">Table 2-28 Output defects on page 78</a></p> 

Image defects, no matter the cause, can often be resolved using the same steps. Use the following steps as a starting point for solving image defect issues.

1. Reprint the document. Print quality defects can be intermittent in nature or can go away completely with continued printing.
2. Check the condition of the cartridge. If a cartridge is in a **Very Low** state (it has passed the rated life), replace the cartridge.
3. Make sure that the driver and tray print mode settings match the media that is loaded in the tray. Try using a different ream of media or a different tray. Try using a different print mode.
4. Make sure that the printer is within the supported operating temperature/humidity range.
5. Make sure that the paper type, size, and weight are supported by the printer. See the printer support page at [support.hp.com](http://support.hp.com) for a list of the supported paper sizes and types for the printer.

 **NOTE:** The term “fusing” refers to the part of the printing process where toner is affixed to paper.

The following examples depict letter-size paper that has passed through the printer short-edge first.

**Table 2-20** Light print


Description	Sample	Possible solutions
<p><b>Light print:</b></p> <p>The printed content on the entire page is light or faded.</p>		<ol style="list-style-type: none"><li>1. Reprint the document.</li><li>2. Remove the cartridge, and then shake it to redistribute the toner.</li><li>3. Make sure that the cartridge is installed correctly.</li><li>4. Print a configuration report and check for life and usage of the cartridge.</li><li>5. Replace the cartridge.</li><li>6. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol>

Table 2-21 Gray background or dark print


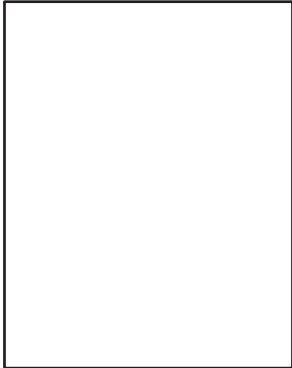

Description	Sample	Possible solutions
<p><b>Gray background or dark print:</b></p> <p>The image or text is darker than expected.</p>		<ol style="list-style-type: none"><li>1. Make sure that the paper in the trays has not already been run through the printer.</li><li>2. Use a different paper type.</li><li>3. Reprint the document.</li><li>4. <b>Mono models only:</b> From the printer EWS, go to the <a href="#">Adjust Toner Density</a> menu, and then adjust the toner density to a lower level.</li><li>5. Make sure that the printer is within the supported operating temperature and humidity range.</li><li>6. Replace the cartridge.</li><li>7. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol>

Table 2-22 Blank page — No print

Description	Sample	Possible solutions
<p><b>Blank page — No print:</b></p> <p>The page is completely blank and contains no printed content.</p>		<ol style="list-style-type: none"><li>1. Make sure that the cartridge is genuine HP cartridges.</li><li>2. Make sure that the cartridge is installed correctly.</li><li>3. Print with a different cartridge.</li><li>4. Check the paper type in the paper tray and adjust the printer settings to match. If necessary, select a lighter paper type.</li><li>5. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol>

**Table 2-23 Black page**

Description	Sample	Possible solutions
<b>Black page:</b>  The entire printed page is black.		<ol style="list-style-type: none"> <li>1. Visually inspect the cartridge to check for damage.</li> <li>2. Make sure that the cartridge is installed correctly.</li> <li>3. Replace the cartridge</li> <li>4. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li> </ol>

**Table 2-24 Banding defects**


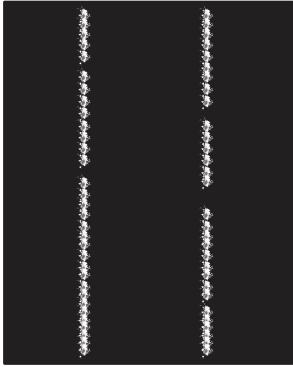
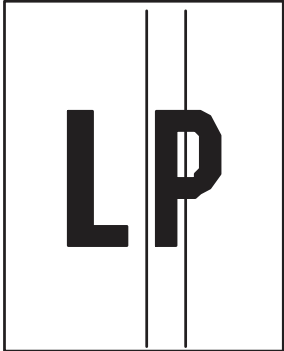
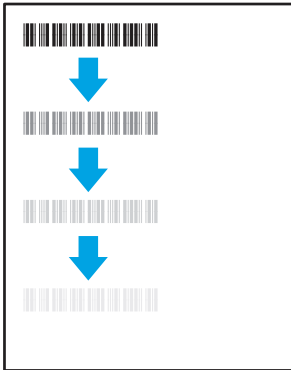
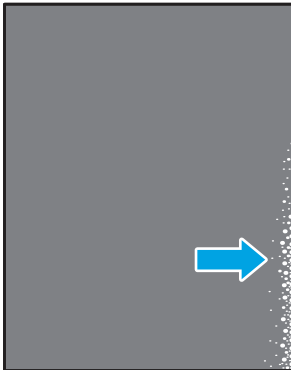
Description	Sample	Possible solutions
<b>Repetitive wide-pitch banding and Impulse bands:</b>  Dark or light lines which repeat down the length of the page. They might be sharp or soft in nature. The defect displays only in areas of fill, not in text or sections with no printed content.		<ol style="list-style-type: none"> <li>1. Reprint the document.</li> <li>2. Replace the cartridge.</li> <li>3. Use a different paper type.</li> <li>4. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li> </ol>

Table 2-25 Streak defects

Description	Sample	Possible solutions
<p><b>Light vertical streaks:</b></p> <p>Light streaks that usually span the length of the page. The defect displays only in areas of fill, not in text or sections with no printed content.</p>		<ol style="list-style-type: none"><li>1. Reprint the document.</li><li>2. Remove the cartridge, and then shake it to redistribute the toner.</li><li>3. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol> <p><b>NOTE:</b> Both light and dark vertical streaks can occur when the printing environment is outside the specified range for temperature or humidity. Refer to your printer's environmental specifications for allowable temperature and humidity levels.</p>
<p><b>Dark vertical streaks and ITB cleaning streaks (color models only):</b></p> <p>Dark lines which occur down the length of the page. The defect might occur anywhere on the page, in areas of fill or in sections with no printed content.</p>		<ol style="list-style-type: none"><li>1. Reprint the document.</li><li>2. Remove the cartridge, and then shake it to redistribute the toner.</li><li>3. Print a cleaning page.</li><li>4. Check the toner level in the cartridge.</li><li>5. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol>



**Table 2-26 Fixing/fuser defects**

Description	Fixing/fuser	Possible solutions
<p><b>Hot fuser offset (shadow):</b></p> <p>Slight shadows, or offsets, of the image repeated down the page. The repeated image might fade with each recurrence.</p>		<ol style="list-style-type: none"> <li>1. Reprint the document.</li> <li>2. Check the paper type in the paper tray and adjust the printer settings to match. If necessary, select a lighter paper type.</li> <li>3. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li> </ol>
<p><b>Poor fusing:</b></p> <p>Toner rubs off along either edge of page. This defect is more common at the edges of high-coverage jobs and on light media types but can occur anywhere on the page.</p>		<ol style="list-style-type: none"> <li>1. Reprint the document.</li> <li>2. Check the paper type in the paper tray and adjust the printer settings to match. If necessary, select a heavier paper type.</li> <li>3. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li> </ol>

**Table 2-27 Image placement defects**



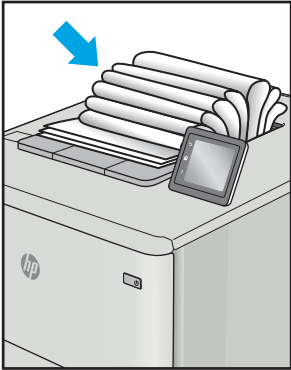
Description	Sample	Possible solutions
<p><b>Margins and skew:</b></p> <p>The image is not centered, or is skewed on the page. The defect occurs when the paper is not positioned properly as it is pulled from the tray and moves through the paper path.</p>		<ol style="list-style-type: none"> <li>1. Reprint the document.</li> <li>2. Remove the paper and then reload the tray. Make sure that all the paper edges are even on all sides.</li> <li>3. Make sure that the top of the paper stack is below the tray full indicator. Do not overfill the tray.</li> <li>4. Make sure that the paper guides are adjusted to the correct size for the paper. Do not adjust the paper guides tightly against the paper stack. Adjust them to the indentations or markings in the tray.</li> <li>5. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li> </ol>

Table 2-28 Output defects

Description	Sample	Possible solutions
<p><b>Output curl:</b></p> <p>Printed paper has curled edges. The curled edge can be along the short or long side of the paper. Two types of curl are possible:</p> <ul style="list-style-type: none"><li>• <b>Positive curl:</b> The paper curls toward the printed side. The defect occurs in dry environments or when printing high coverage pages.</li><li>• <b>Negative curl:</b> The paper curls away from the printed side. The defect occurs in high-humidity environments or when printing low coverage pages.</li></ul>		<ol style="list-style-type: none"><li>1. Reprint the document.</li><li>2. <b>Positive curl:</b> From the printer EWS, select a heavier paper type. The heavier paper type creates a higher temperature for printing.  <b>Negative curl:</b> From the printer EWS, select a lighter paper type. The lighter paper type creates a lower temperature for printing. Try storing the paper in a dry environment prior or use freshly opened paper.</li><li>3. Print in duplex mode.</li><li>4. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol>
<p><b>Output stacking:</b></p> <p>The paper does not stack well in the output tray. The stack might be uneven, skewed, or the pages might be pushed out of the tray and onto the floor. Any of the following conditions can cause this defect:</p> <ul style="list-style-type: none"><li>• Extreme paper curl</li><li>• The paper in the tray is wrinkled or deformed</li><li>• The paper is a non-standard paper type, such as envelopes</li><li>• The output tray is too full</li></ul>		<ol style="list-style-type: none"><li>1. Reprint the document.</li><li>2. Extend the output bin extension.</li><li>3. If the defect is caused by extreme paper curl, complete the troubleshooting steps for Output curl.</li><li>4. Use a different paper type.</li><li>5. Use freshly opened paper.</li><li>6. Remove the paper from the output tray before the tray gets too full.</li><li>7. If the problem persists, go to <a href="http://support.hp.com">support.hp.com</a>.</li></ol>


## Printer-specific image defects

- [Repetitive image defects](#)
- [Printer-specific print quality troubleshooting guide](#)

### Repetitive image defects

When troubleshooting the source of some print image defects, one solution is to identify if it is a repetitive defect (does the print quality defect appear multiple times on the printed page?). If this is the case, use a ruler to measure occurrences of repetitive image defects to help solve image-quality problems. For more information, see [Use a ruler to measure between repetitive defects on page 79](#).

Use a ruler to measure occurrences of repetitive image defects to help solve image-quality problems. Place the ruler next to the first occurrence of the defect on the page. Find the distance between identical defects and use the table below to identify the component that is causing the defect.

 **NOTE:** Do not use solvents or oils to clean rollers. Instead, rub the roller with lint-free paper. If dirt is difficult to remove, rub the roller with lint-free paper that has been dampened with water.

**Table 2-29** Repetitive image defects

Distance between identical defects	Component	Notes
26.0 mm (1.03 in)	Primary charging roller <sup>1</sup>	Appears in the form of dropouts.
29.0 mm (1.14 in)	Developer roller <sup>1</sup>	Appears in the form of dropouts or dirt on the page.
39.0 mm (1.18 in)	Transfer roller	Appears in the form of dropouts or dirt on the back of the page.
45.0 mm (1.77 in)	Pressure roller	Appears in the form of dirt on the page, dropouts, or dirt on the back of the page.
57.0 mm (2.24 in)	Fuser film	Appears in the form of dropouts or dirt on the page.
75.0 mm (2.96 in)	Photosensitive drum	Appears in the form of dropouts or dirt on the page.

<sup>1</sup> The primary charging roller, photosensitive drum, and developer roller cannot be cleaned. If any of these rollers are indicated, replace the toner cartridge.

### Use a ruler to measure between repetitive defects

The figures in this section show color repetitive defect pages. However, the process for measuring repetitive defects is valid for mono pages.

1. Identify a repetitive defect on the page.

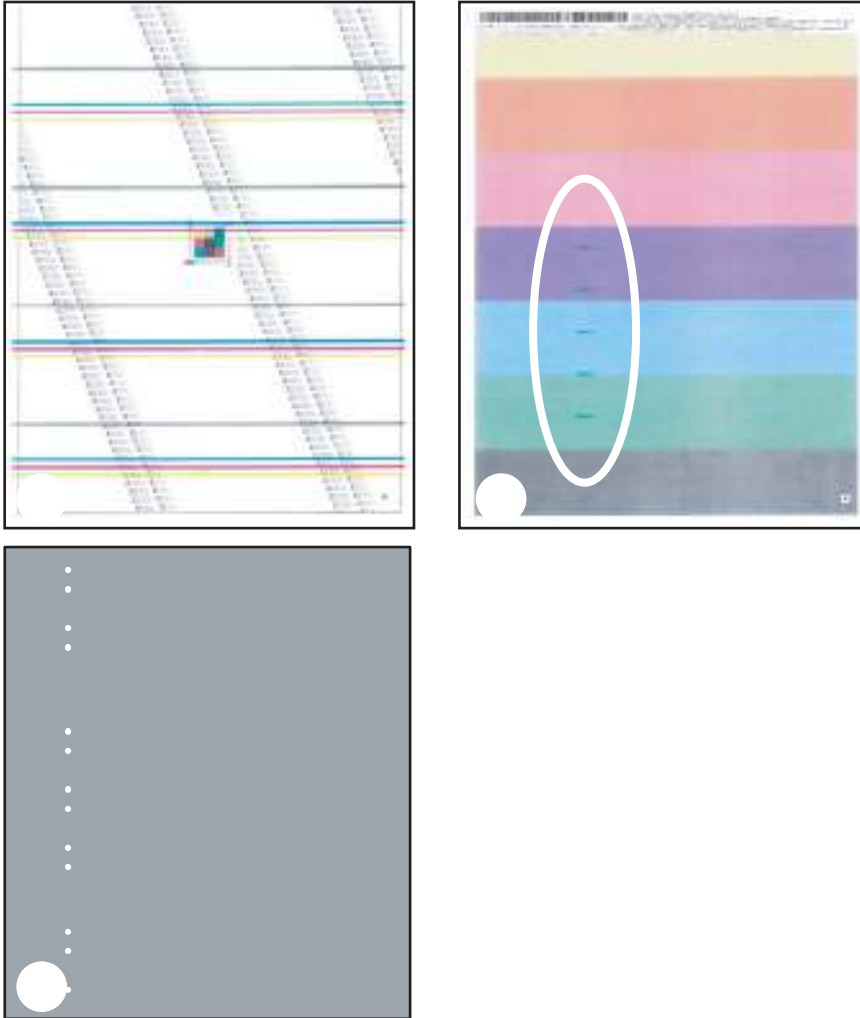
 **TIP:** Print a cleaning page to see if that resolves the defect.

The example pages below show the following types of repetitive defects.

 **NOTE:** These are examples only, other types of repetitive defects might appear on a page.

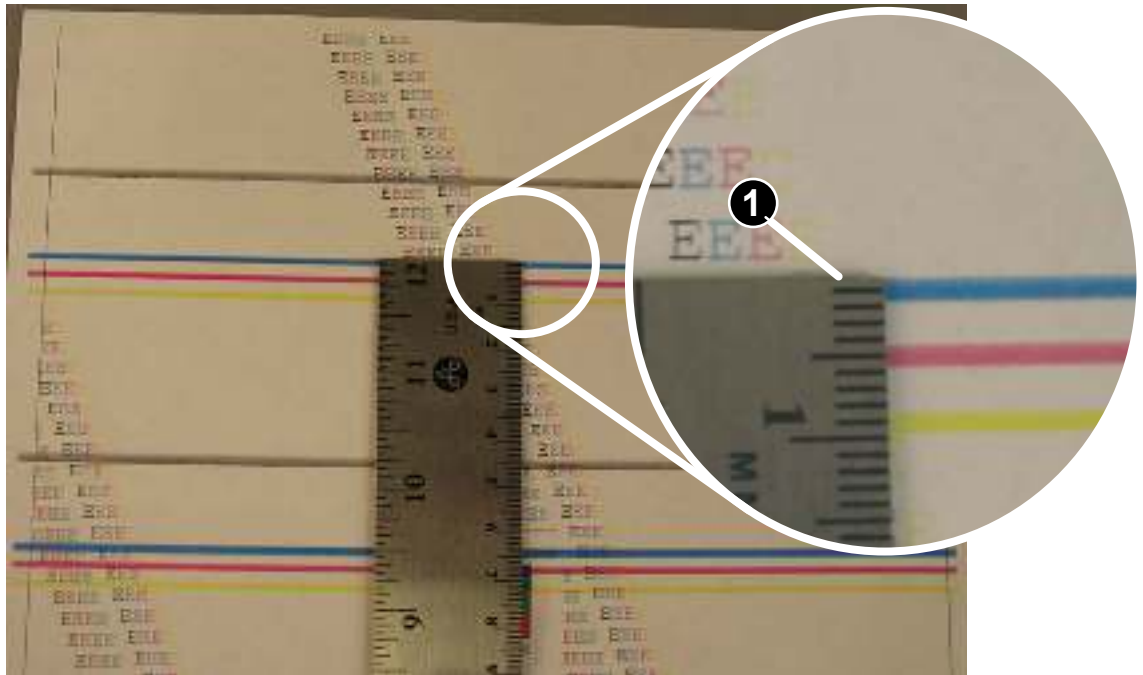
- Lines (callout 1)
- Smudges (callout 2)
- Dots or spots (callout 3)

Figure 2-20 Examples of repetitive defects



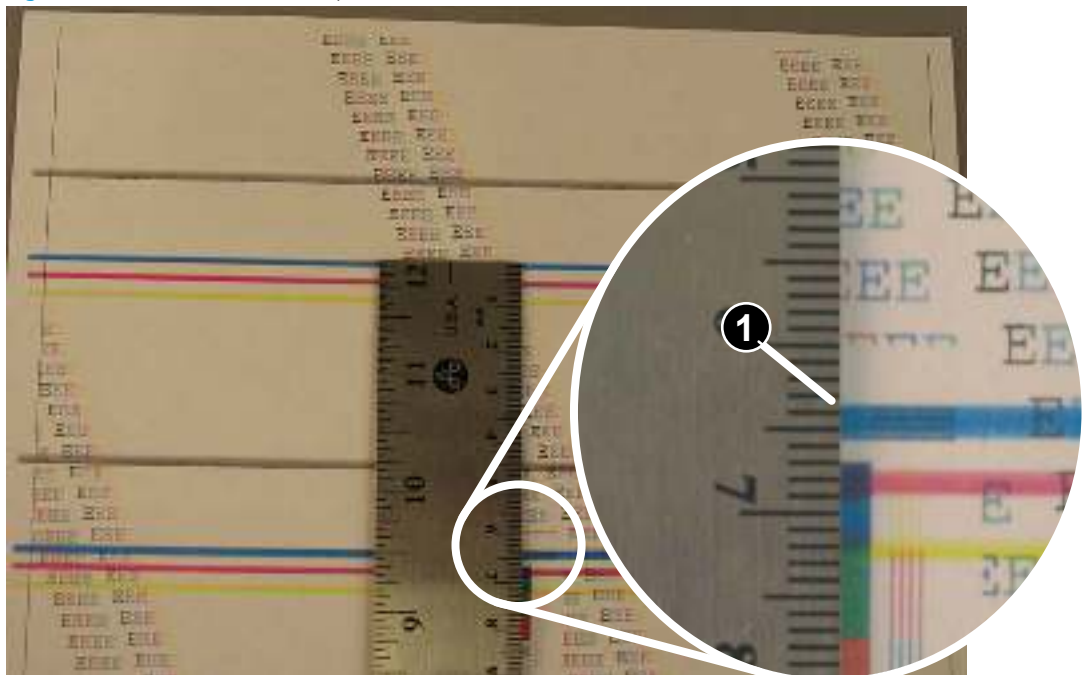
2. Position a metric ruler on the page with the “zero” ruler mark at one occurrence of the defect (callout 1).

Figure 2-21 Place the ruler on the page




3. Locate the next occurrence of the defect (callout 1).

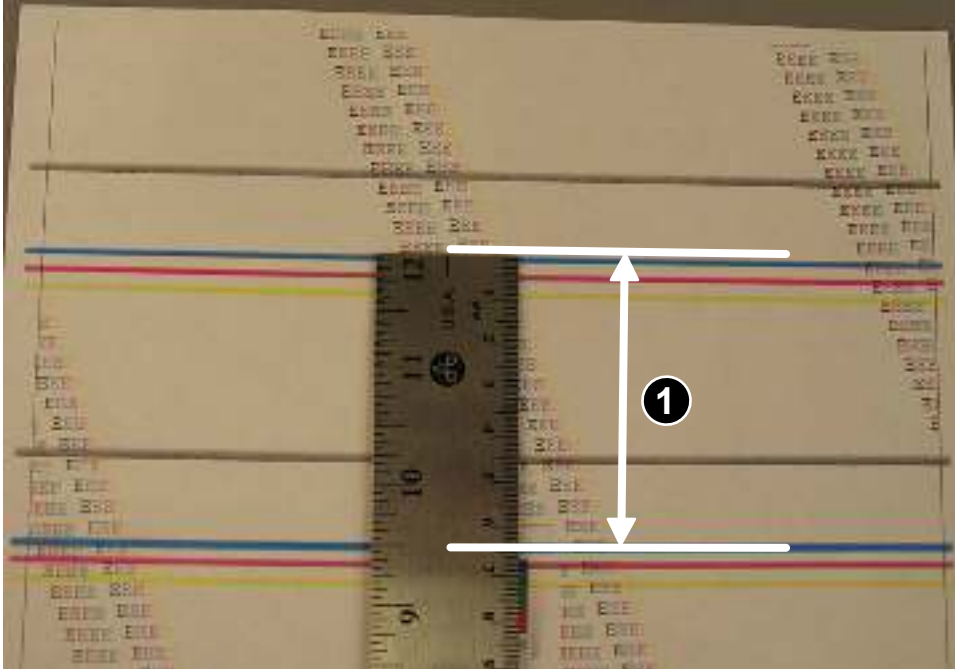
Figure 2-22 Locate the next repetitive defect



4. Measure the distance (in millimeters) between the two occurrences (callout 1), and then use [Table 2-29 Repetitive image defects on page 79](#) to determine the defective assembly.

 **TIP:** Always measure from and to the same point on the defects. For example, if the ruler is “zeroed” at the top edge of a defect, measure to the top edge of the next occurrence of that defect.

**Figure 2-23** Determine the defective assembly



## Printer-specific print quality troubleshooting guide

- [Light print](#)
- [Dark print](#)
- [Blank page](#)
- [All black](#)
- [White spots](#)
- [Dirt on the back of the page](#)
- [Vertical lines](#)
- [Vertical white lines](#)
- [Horizontal lines](#)
- [Horizontal white lines](#)
- [Dropouts](#)
- [Loose toner](#)
- [Toner smear](#)
- [Misformed or misplaced image](#)
- [Wrinkles or creases](#)
- [Dirt on the front of the page](#)
- [Vertical density variation](#)
- [Repetitive image defects](#)

## Light print

Figure 2-24 Light print (1 of 2)



## Description

Print is light on the entire page.

## Solution

Poor contact between the transfer roller contact and the transfer roller shaft.

Clean the contacts. If the problem remains after cleaning, check the contacts for deformation or damage. Replace any defective parts.

## Dark print

## Description

The image on the page is too dark.

## Solution

- Poor contact between the drum grounding contact and the toner cartridge.



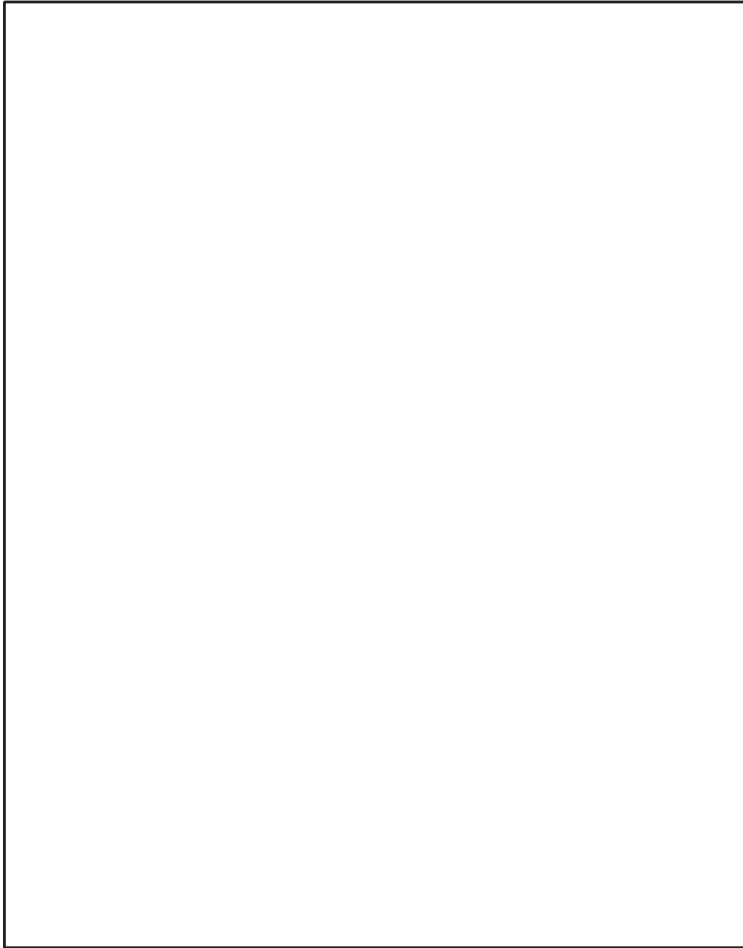
Clean the contacts. If the problem remains after cleaning, check the contacts for deformation or damage. Replace any defective parts.

- Poor contact between the primary charging bias contact and the toner cartridge.

Clean the contacts. If the problem remains after cleaning, check the contacts for deformation or damage. Replace any defective parts.

## Blank page

Figure 2-25 Blank page



### Description

The page is completely blank.

### Solution

- Poor contact between the developing bias contact and the toner cartridge.  
Clean the contacts. If the problem remains after cleaning, check the contacts for deformation or damage. Replace any defective parts.
- The high-voltage power supply is defective (no developing bias).  
Replace the engine controller PCA.

## All black

Figure 2-26 All black page



### Description

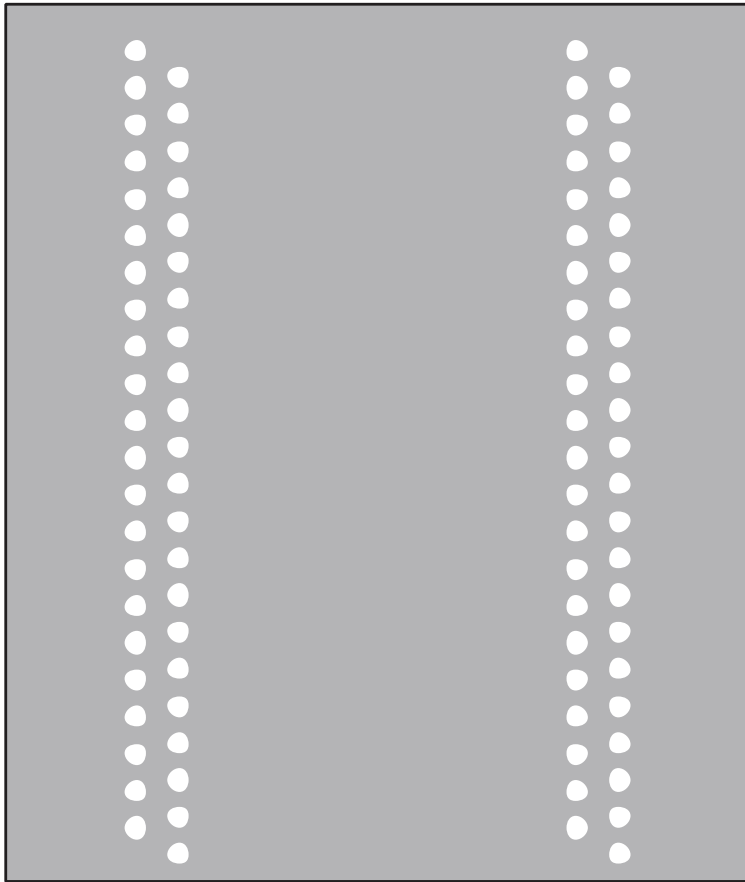
The page is all black.

### Solution

- Poor contact between the primary charging bias contact and the toner cartridge.  
Clean the contacts. If the problem remains after cleaning, check the contacts for deformation or damage. Replace any defective parts.
- The primary charging roller is defective.  
Replace the toner cartridge.

## White spots

Figure 2-27 White spots



## Description

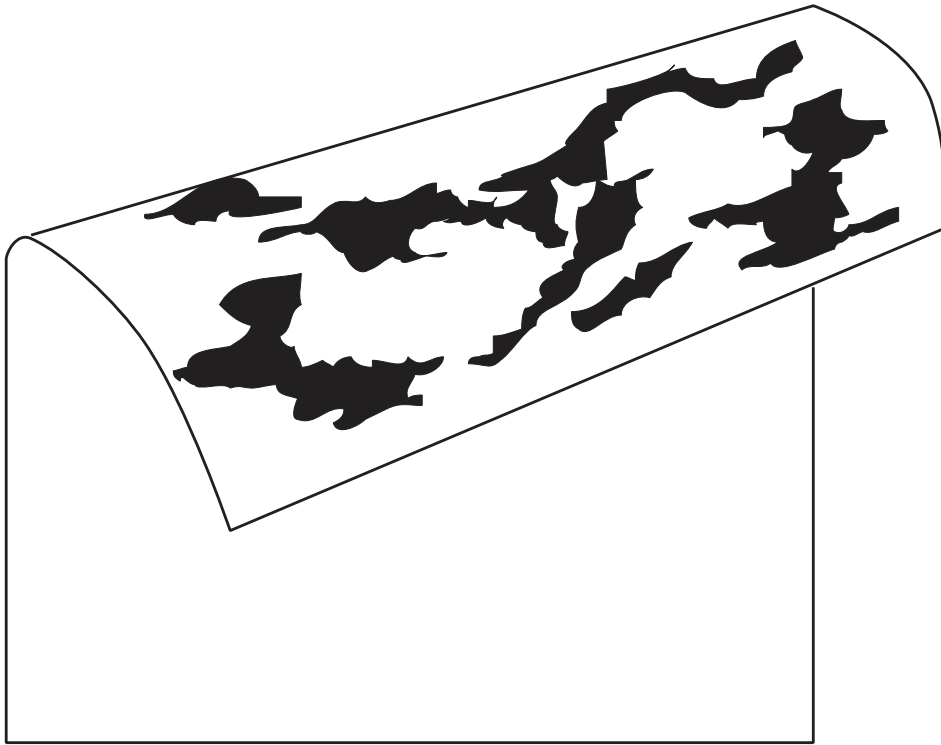
White spots appear on the page.

## Solution

- The static charge eliminator is dirty.  
Clean the static charge eliminator.
- The transfer roller is deformed or damaged.  
Replace the transfer roller.
- Poor contact between the transfer roller contact and the transfer roller shaft.  
Clean the contacts. If the problem remains after cleaning, check the contacts for deformation or damage.  
Replace any defective parts.
- The static charge eliminator is deformed or damaged.  
Replace the printer.

## Dirt on the back of the page

Figure 2-28 Dirt on the back of the page



### Description

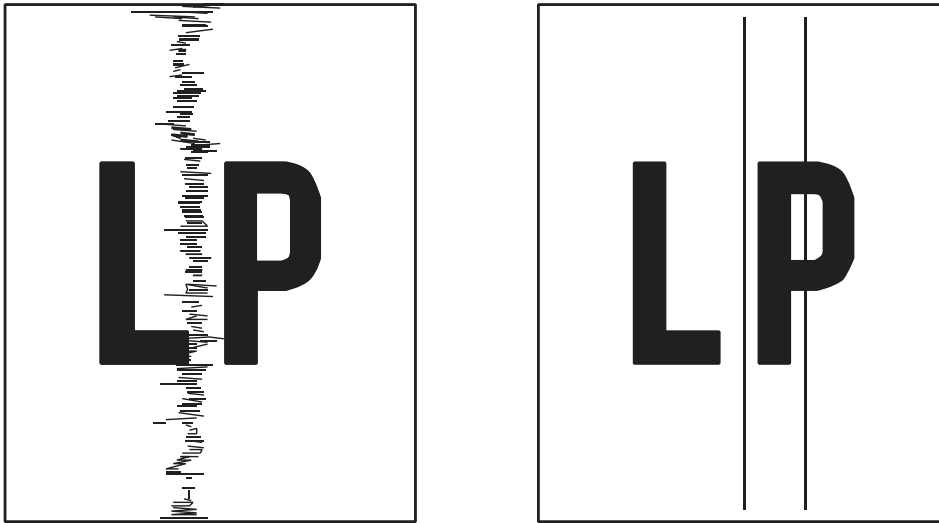
The back of the page is dirty.

### Solution

- The transfer roller is dirty.  
Replace the transfer roller.
- The fuser inlet guide or separation guide is dirty.  
Clean the dirty parts. If the contamination does not come off, replace the fuser.
- The pressure roller is dirty.  
Perform a **Fuser Roller Cleaning** operation in multipurpose mode. If the contamination does not come off, replace the fuser.

## Vertical lines

Figure 2-29 Vertical lines



## Description

Vertical bands or streaks appear on the page.

## Solution

- Inspect the toner cartridge.  
If scratches are present on the surface of the photosensitive drum, replace the toner cartridge.
- Inspect the fuser film.  
If scratches are present on the surface of the film, replace the fuser.

## Vertical white lines

Figure 2-30 Vertical white lines



### Description

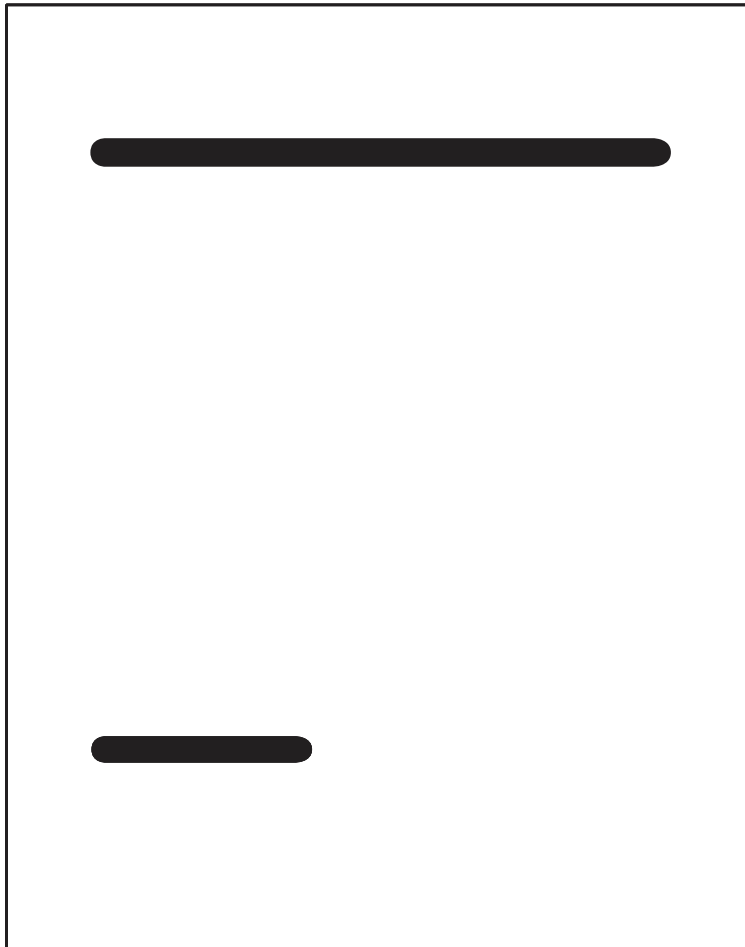
Vertical white lines appear on the page.

### Solution

- Inspect the toner cartridge.  
If scratches are present on the developer roller or photosensitive drum in the toner cartridge, replace the toner cartridge.
- The laser scanner mirror is dirty.  
Replace the printer.

## Horizontal lines

Figure 2-31 Horizontal lines



### Description

Horizontal lines appear on the page.

### Solution

- If the lines are repeating down the page, see [Use a ruler to measure between repetitive defects on page 79](#) for instructions on how to measure the distance between the lines and associate a printer component with that measurement.  
  
Clean any contamination off of the identified roller. If the contamination cannot be removed, replace the roller or corresponding printer component.
- Horizontal scratches are present on the photosensitive drum.  
  
Replace the toner cartridge.
- Horizontal scratches are present on the fuser film.  
  
Replace the fuser.



## Horizontal white lines

Figure 2-32 Horizontal white lines



### Description

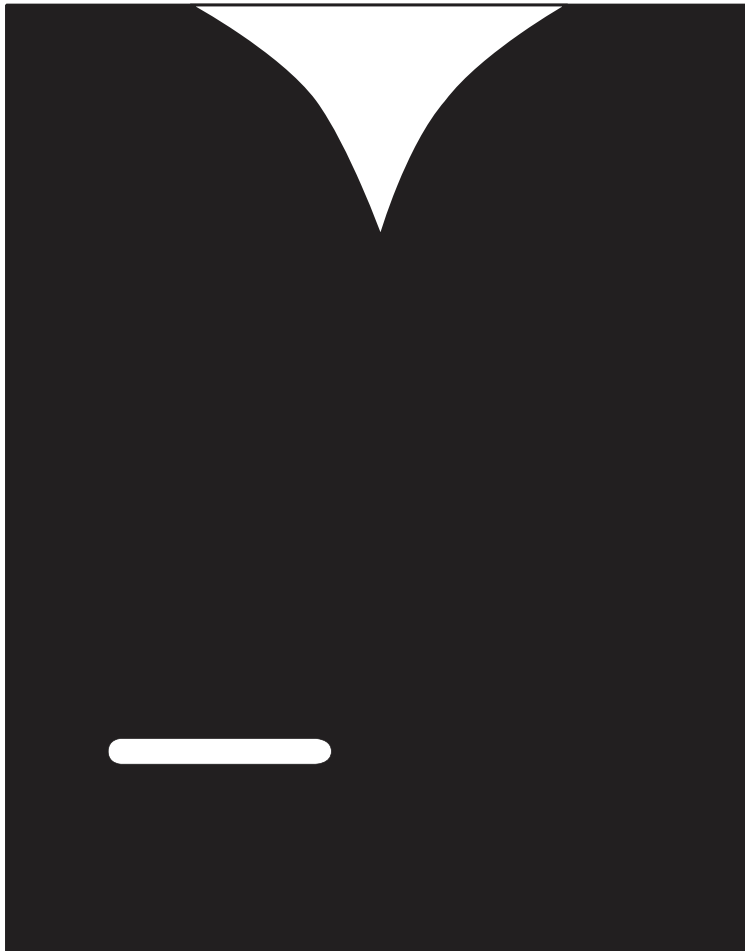
Horizontal white lines appear on the page.

### Solution

- If the lines are repeating down the page, see [Use a ruler to measure between repetitive defects on page 79](#) for instructions on how to measure the distance between the lines and associate a printer component with that measurement.  
  
Clean any contamination off of the identified roller. If the contamination cannot be removed, replace the roller or corresponding printer component.
- Horizontal scratches are present on the photosensitive drum.  
  
Replace the toner cartridge.

## Dropouts

Figure 2-33 Dropouts



### Description

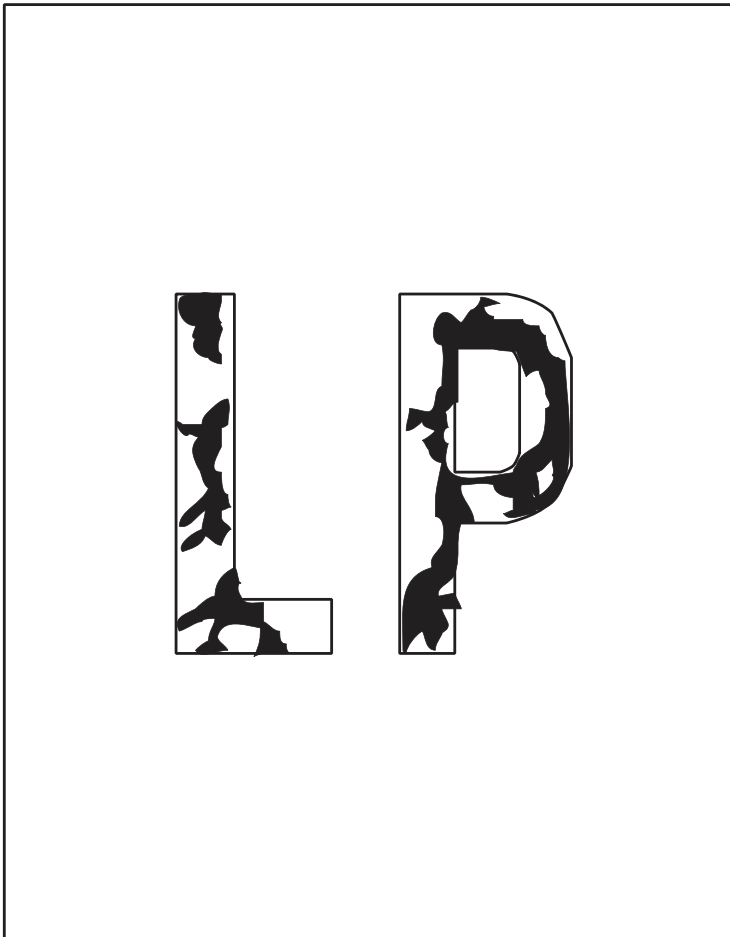
Portions of the image are missing.

### Solution

- If transfer roller is deformed or has deteriorated.  
Replace the transfer roller
- If the primary charging roller, developer roller, or photosensitive drum in the toner cartridge are deformed or have deteriorated.  
Replace the toner cartridge.
- The fuser film is deformed or has deteriorated.  
Replace the fuser.
- The high-voltage power supply is defective (no transfer bias output).  
Replace the engine controller assembly.

## Loose toner

Figure 2-34 Loose toner



### Description

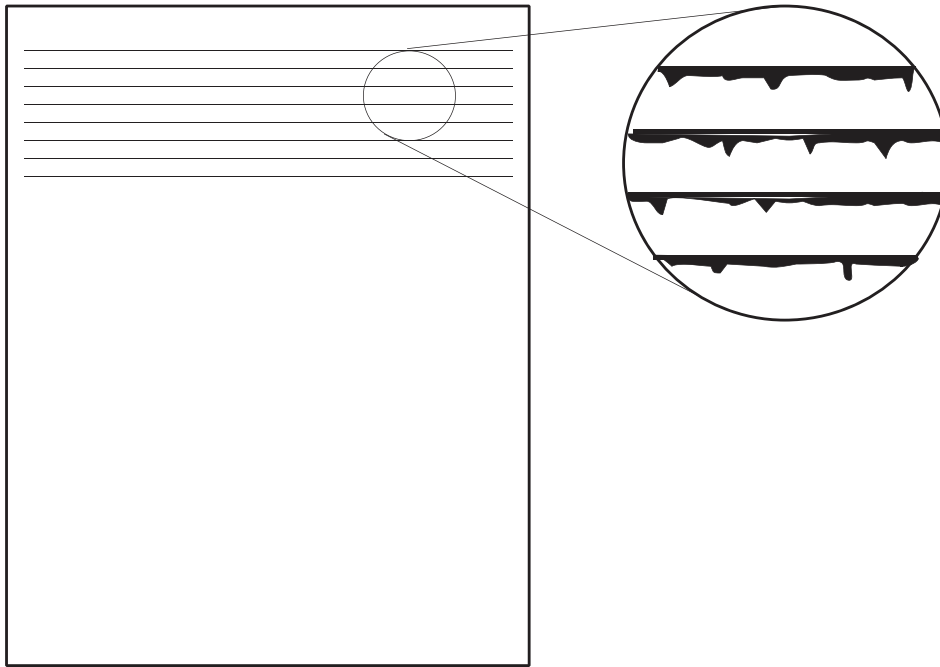
Toner is not fully fused to the paper.

### Solution

- The fuser film or pressure roller is scarred or deformed.  
Replace the fuser.
- If the thermistor is defective.  
Replace the fuser.
- The fuser heater is defective.  
Replace the fuser.
- The fuser control circuit is defective.  
Replace the engine controller assembly.

## Toner smear

Figure 2-35 Toner smear



### Description

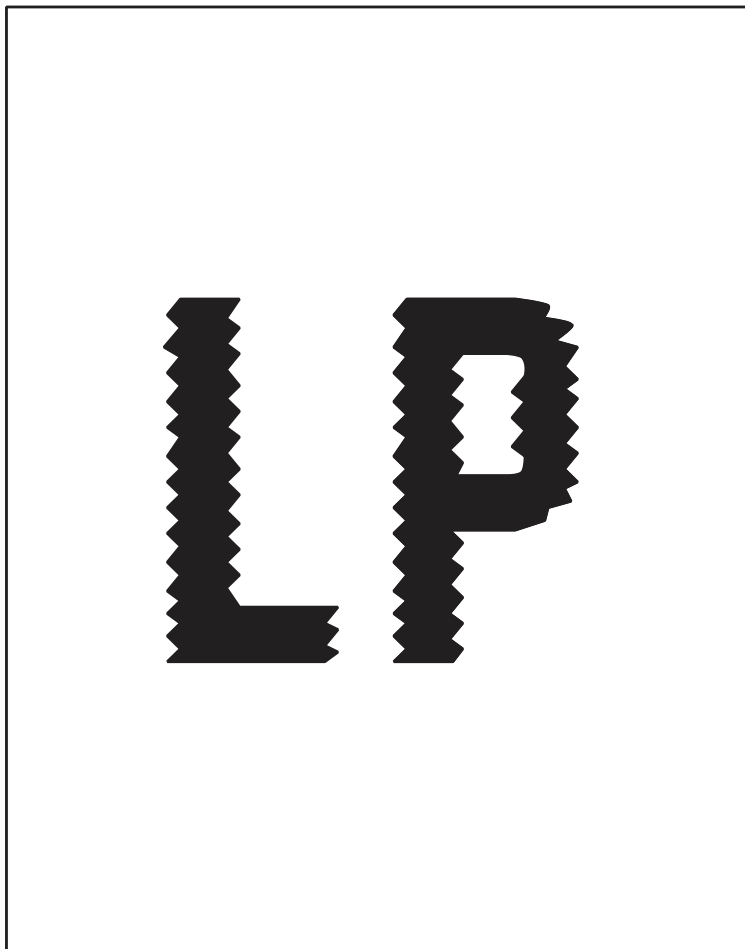
Toner is smeared on the paper.

### Solution

- Residual paper present in the printer.  
Remove residual paper.
- Poor toner cartridge grounding contact.
- A foreign substance is adhered to the fuser inlet guide or the guide is dirty.  
Clean the fuser inlet guide. If the contamination does not come off, replace the fuser.

## Misformed or misplaced image

Figure 2-36 Malformed or misplaced image



### Description

An image on the page is misformed or incorrectly placed.

### Solution

- The laser scanner assembly is defective.  
Replace the printer.

## Wrinkles or creases

Figure 2-37 Wrinkles or creases



### Description

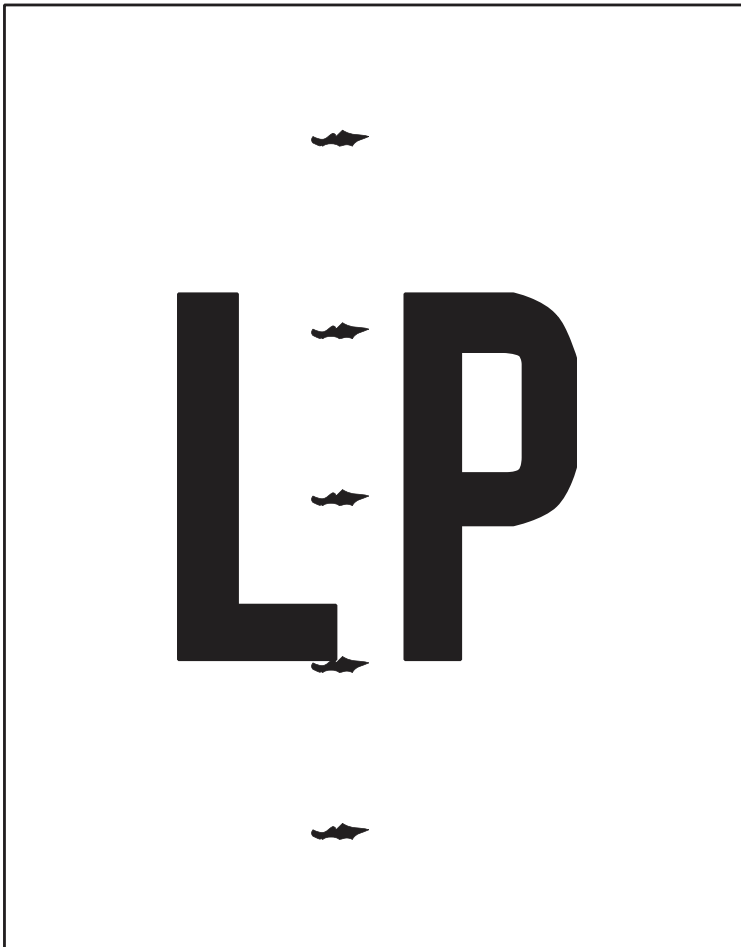
The printed page contains wrinkles or creases.

### Solution

- The feed roller or paper feed guide are dirty.  
Clean any dirty parts.
- A foreign substance is adhered to the fuser inlet guide or the guide is dirty.

## Dirt on the front of the page

Figure 2-38 Dirt on the front of the page



### Description

The front of the page is dirty (stray toner marks).

### Solution

- If the photosensitive drum or the developer roller is dirty.  
Replace the toner cartridge.
- The fuser film or pressure roller is contaminated.  
Perform a **Fuser Roller Cleaning** operation in multipurpose mode. If the contamination does not come off, replace the fuser.

## Vertical density variation

Figure 2-39 Vertical density variation



### Description

The vertical density varies on images on the page.

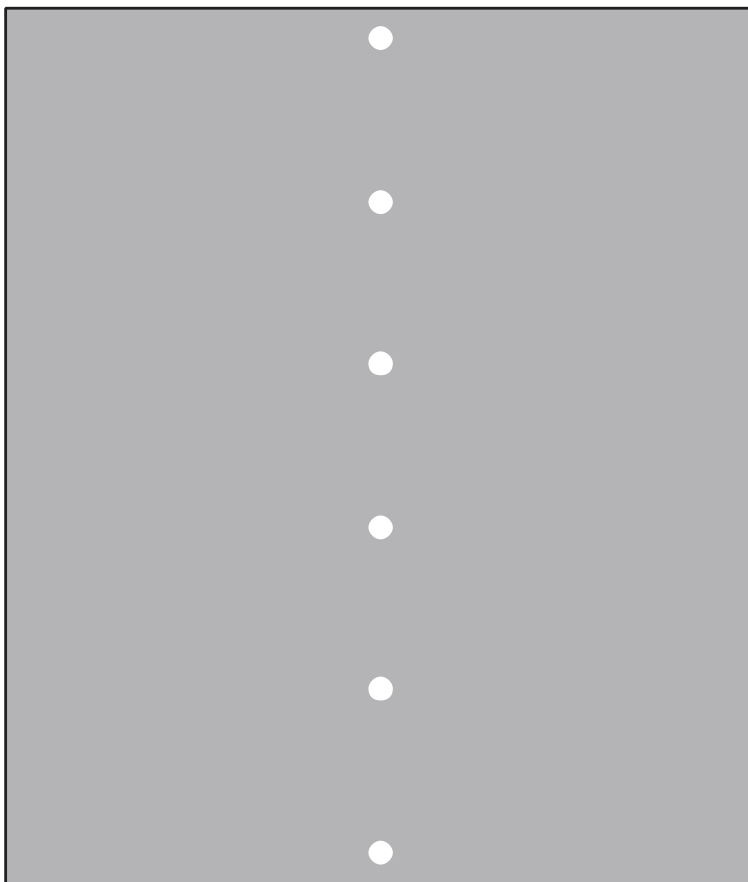
### Solution

- The photosensitive drum surface has deteriorated.  
Replace the toner cartridge.
- The laser scanner assembly is defective.  
Replace the printer.



## Repetitive image defects

Figure 2-40 Repetitive image defects



### Description

Repetitive white spots appear in an image.

### Solution

- If the lines are repeating down the page, see [Use a ruler to measure between repetitive defects on page 79](#) for instructions on how to measure the distance between the lines and associate a printer component with that measurement.  
  
Clean any contamination off of the identified roller. If the contamination cannot be removed, replace the roller or corresponding printer component.
- The transfer roller is deformed or has deteriorated.  
  
Replace the transfer roller.
- A foreign substance is adhered to the primary charging roller or photosensitive drum.  
  
Replace the toner cartridge.

# Improve copy and scan image quality (MFP M28-M31)

## Introduction

If the printer is having image quality problems, first make sure you are using high-quality originals. If the problem still exists, try the following solutions in the order presented to resolve the issue.

- [Check the scanner glass for dirt and smudges](#)
- [Check the paper settings](#)
- [Optimize for text or pictures](#)
- [Edge-to-edge copying](#)


If the issue is not resolved, see “Improve print quality” for further solutions.

## Check the scanner glass for dirt and smudges

Over time, specks of debris might collect on the scanner glass and white plastic backing, which can affect performance. Use the following procedure to clean the scanner.

1. Press the power button to turn the printer off, and then disconnect the power cable from the electrical outlet.
2. Open the scanner lid.
3. Clean the scanner glass and the white plastic backing underneath the scanner lid with a soft cloth or sponge that has been moistened with nonabrasive glass cleaner.

---

 **CAUTION:** Do not use abrasives, acetone, benzene, ammonia, ethyl alcohol, or carbon tetrachloride on any part of the printer; these can damage the printer. Do not place liquids directly on the glass or platen. They might seep and damage the printer.

---

4. Dry the glass and white plastic parts with a chamois or a cellulose sponge to prevent spotting.
5. Connect the power cable to an outlet, and then press the power button to turn the printer on.

## Check the paper settings

1. Open the HP Embedded Web Server (EWS):
  - a. Open the HP Printer Assistant.
    - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
    - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.

- **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
  - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
- b. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.
2. On the **Systems** tab, click **Paper Setup**.
3. Change the necessary settings, and then click **Apply**.

## Optimize for text or pictures

1. Open the HP Embedded Web Server (EWS):
  - a. Open the HP Printer Assistant.
    - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
    - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.
    - **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
    - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
  - b. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.
2. On the **Copy** tab, select the **Optimize** drop-down list.
3. Select the setting you want to use.
  - **Mixed:** Use this setting for documents that contain a mixture of text and graphics.
  - **Text:** Use this setting for documents that contain mostly text.
  - **Picture:** Use this setting for documents that contain mostly graphics.
4. Change the necessary settings, and then click **Apply**.

## Edge-to-edge copying

The printer cannot print fully edge-to-edge. There is a 4 mm (1/6 in) unprintable border around the page.

Considerations for printing or scanning documents with cropped edges:

- When the original is smaller than the output size, move the original 4 mm (1/6 in) away from the corner indicated by the icon on the scanner. Recopy or scan in this position.
- When the original is the size of the printed output that you want, use the [Reduce/Enlarge](#) feature to reduce the image so the copy is not cropped.

## Clean the printer

Over time, particles of toner and paper accumulate inside the printer. This can cause print-quality problems during printing. Cleaning the printer eliminates or reduces these problems.

Clean the paper path and toner-cartridge areas every time that the toner cartridge is changed or whenever print-quality problems occur. As much as possible, keep the printer free from dust and debris.

To clean the printer exterior, use a soft, water-moistened cloth.

### Print a cleaning page

During the printing process paper, toner, and dust particles can accumulate inside the printer and can cause print-quality issues such as toner specks or spatter, smears, streaks, lines, or repeating marks.

Use the following procedure to print a cleaning page.


1. Open the HP Printer Assistant.
  - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
  - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.
  - **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
  - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
2. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.
3. On the **System** tab, click **Service**.
4. In the **Cleaning Mode** area, click **Start** to begin the cleaning process.

### Clean the scanner glass and platen (MFP M28-M31)

Over time, specks of debris might collect on the scanner glass and white plastic backing, which can affect performance. Use the following procedure to clean the scanner glass and white plastic backing.

1. Use the power switch to turn off the printer, and then unplug the power cable from the electrical socket.
2. Open the scanner lid.
3. Clean the scanner glass and the white plastic backing with a soft cloth or sponge that has been moistened with nonabrasive glass cleaner.

---

 **CAUTION:** Do not use abrasives, acetone, benzene, ammonia, ethyl alcohol, or carbon tetrachloride on any part of the printer; these can damage the printer. Do not place liquids directly on the glass or platen. They might seep and damage the printer.

---

4. Dry the glass and white plastic backing with a chamois or a cellulose sponge to prevent spotting.
5. Connect the printer, and then use the power switch to turn on the printer.

## Clean the pickup rollers

1. Turn off the printer, unplug the power cable from the printer, and then remove the toner cartridge.



---

**NOTE:** Also remove any paper in the input tray.

---

2. Dab a lint-free cloth in isopropyl alcohol, and then scrub the rollers.



---

**WARNING!** Alcohol is flammable. Keep the alcohol and cloth away from an open flame. Before you close the printer and connect the power cable, allow the alcohol to dry completely.

---



---

**NOTE:** In certain areas of California (USA), air pollution control regulations restrict the use of liquid isopropyl alcohol (IPA) as a cleaning agent. In those areas of California, please disregard the previous recommendations and use a dry, lint free cloth, moistened with water, to clean the pickup roller.

---

3. Use a dry lint free cloth to remove loose dirt from the rollers.

# Solve paper-handling problems

## Printer does not pick up paper or misfeeds

### Introduction

The following solutions can help solve problems if the printer is not picking up paper from the tray or is picking up multiple sheets of paper at one time. Either of these situations can result in paper jams.

- [The product does not pick up paper](#)
- [The product picks up multiple sheets of paper](#)

### The product does not pick up paper

If the product does not pick up paper from the tray, try these solutions.

1. Open the product and remove any jammed sheets of paper.
2. Load the tray with the correct size of paper for your job.
3. Make sure the paper size and type are set correctly on the product control panel.
4. Make sure the paper guides in the tray are adjusted correctly for the size of paper. Adjust the guides to the appropriate indentation in the tray.
5. The rollers above the tray might be contaminated. Clean the rollers with a lint-free cloth dampened with warm water.

### The product picks up multiple sheets of paper

If the product picks up multiple sheets of paper from the tray, try these solutions.

1. Remove the stack of paper from the tray and flex it, rotate it 180 degrees, and flip it over. *Do not fan the paper.* Return the stack of paper to the tray.
2. Use only paper that meets HP specifications for this product.
3. Use paper that is not wrinkled, folded, or damaged. If necessary, use paper from a different package.
4. Make sure the tray is not overfilled. If it is, remove the entire stack of paper from the tray, straighten the stack, and then return some of the paper to the tray.
5. Make sure the paper guides in the tray are adjusted correctly for the size of paper. Adjust the guides to the appropriate indentation in the tray.
6. Make sure the printing environment is within recommended specifications.

### Prevent paper jams

To reduce the number of paper jams, try these solutions.

- Use only paper that meets HP specifications for this printer.
- Use paper that is not wrinkled, folded, or damaged. If necessary, use paper from a different package.
- Use paper that has not previously been printed or copied on.

- Make sure the tray is not overfilled. If it is, remove the entire stack of paper from the tray, straighten the stack, and then return some of the paper to the tray.
- Make sure the paper guides in the tray are adjusted correctly for the size of paper. Adjust the guides so they are touching the paper stack without bending it.
- Make sure that the tray is fully inserted in the printer.
- When printing on heavy, embossed, or perforated paper, use the manual feed feature and feed sheets one at a time.
- From the Home screen on the printer control panel, navigate to the [Paper Setup](#) menu. Verify that the tray is configured correctly for the paper type and size.
- Make sure the printing environment is within recommended specifications.

## Clear paper jams

### Introduction

The following information includes instructions for clearing paper jams from the printer.

- [Paper path jam sensor locations](#)
- [Experiencing frequent or recurring paper jams?](#)
- [Paper jam locations](#)
- [Clear jams from the input tray](#)
- [Clear jams from inside the product](#)
- [Clear jams from the output areas](#)

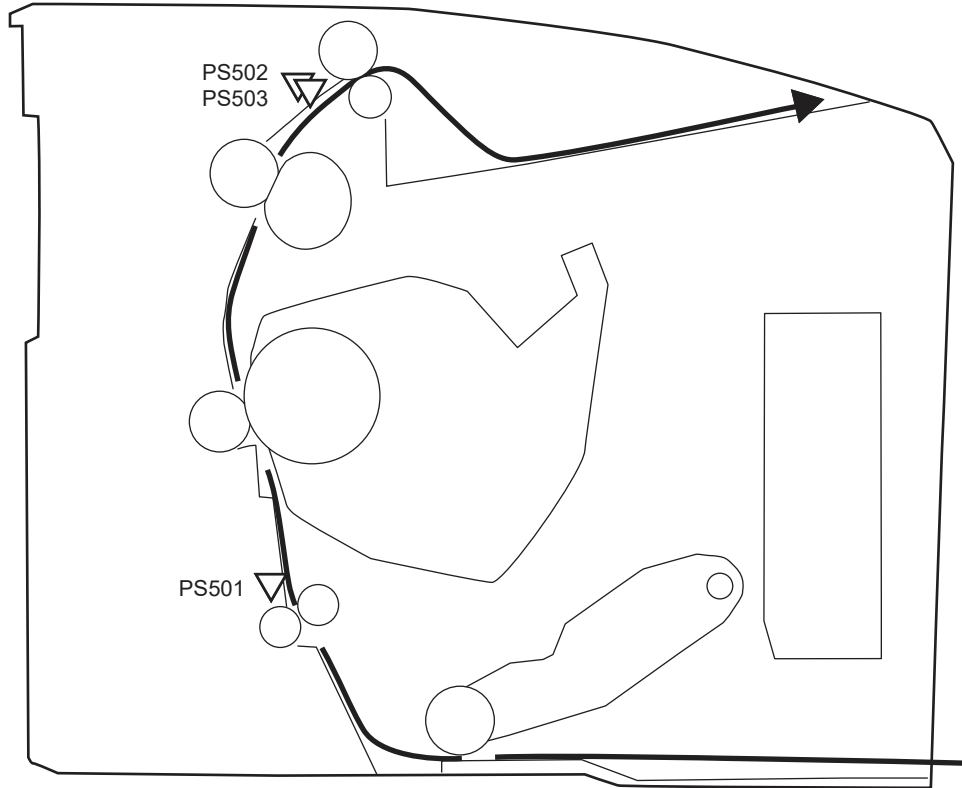
### Paper path jam sensor locations

The printer uses the following sensors to detect the paper as it moves through the paper path and to report to the DC controller if the paper has jammed.

- Registration sensor (PS501)
- Fuser output sensor (PS502)
- Fuser media width sensor (PS503)



**Figure 2-41** Paper path and (jam) sensor locations





### Experiencing frequent or recurring paper jams?




Follow these steps to solve problems with frequent paper jams. If the first step does not resolve the problem continue with the next step until you have resolved the problem.

1. If paper has jammed in the printer, clear the jam and then print a configuration page to test the printer.
2. Check that the tray is configured for the correct paper size and type. Adjust paper settings if necessary.
  - a. Print a configuration page to determine the IP address or host name.

#### Print a configuration page (M14-M17)

- i. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
- ii. Release the Resume/Cancel  button.

#### Print a configuration page (MFP M28-M31)

- i. Press and hold the Start Copy  button until the Ready  light begins blinking.
- ii. Release the Start Copy  button.


- b. Open a web browser, and in the address line, type the IP address or host name exactly as it displays on the printer configuration page. Press the **Enter** key on the computer keyboard. The EWS opens.






 **NOTE:** If the web browser displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

- c. Click the **System** tab, and then click the **Paper Setup** page.
  - d. Select the type of paper that is in the tray.
  - e. Select the size of paper that is in the tray.
3. Turn the printer off, wait 30 seconds, and then turn it on again.
  4. Print a cleaning page to remove excess toner from inside the printer.
    - a. Open the HP Printer Assistant.
      - **Windows 10:** From the **Start** menu, click **All Apps**, click **HP**, and then select the printer name.
      - **Windows 8.1:** Click the down arrow in lower left corner of the **Start** screen, and then select the printer name.
      - **Windows 8:** Right-click an empty area on the **Start** screen, click **All Apps** on the app bar, and then select the printer name.
      - **Windows 7:** From the computer desktop, click **Start**, select **All Programs**, click **HP**, click the folder for the printer, and then select the printer name.
    - b. In the HP Printer Assistant, select **Print**, and then select **HP Device Toolbox**.
    - c. On the **System** tab, click **Service**.
    - d. In the **Cleaning Mode** area, click **Start** to begin the cleaning process.
  5. Print a configuration page to test the printer.

#### Print a configuration page (M14-M17)

- a. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
- b. Release the Resume/Cancel  button.

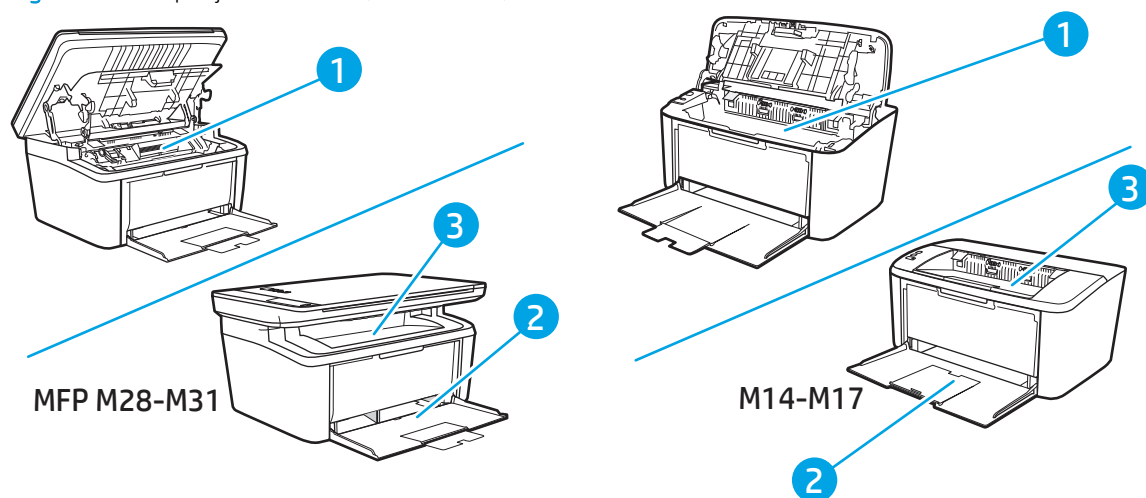
#### Print a configuration page (MFP M28-M31)

- a. Press and hold the Start Copy  button until the Ready  light begins blinking.
- b. Release the Start Copy  button.

If none of these steps resolves the problem, the printer might need service. Contact HP customer support.

## Paper jam locations

Figure 2-42 Paper jam locations (M153-M154)



1	Internal areas
2	Input tray
3	Output bin

## Clear jams from the input tray

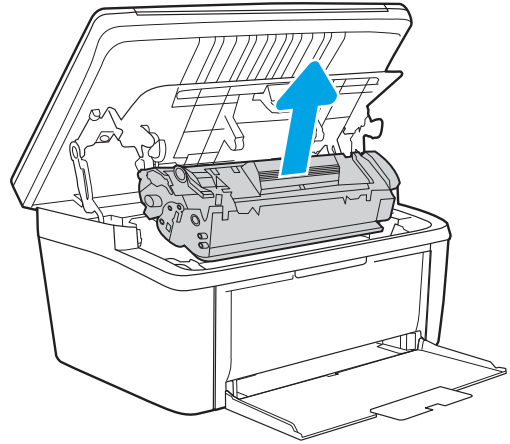
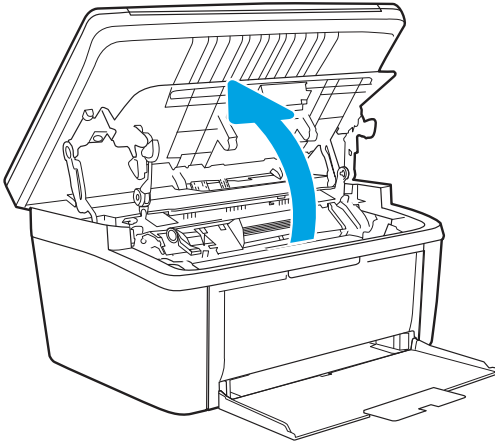
**CAUTION:** Do not use sharp objects, such as tweezers or needle-nose pliers, to remove jams. Damage caused by sharp objects will not be covered by the warranty.

When removing jammed media, pull the jammed media straight away from the product. Pulling jammed media out of the product at an angle can damage the product.

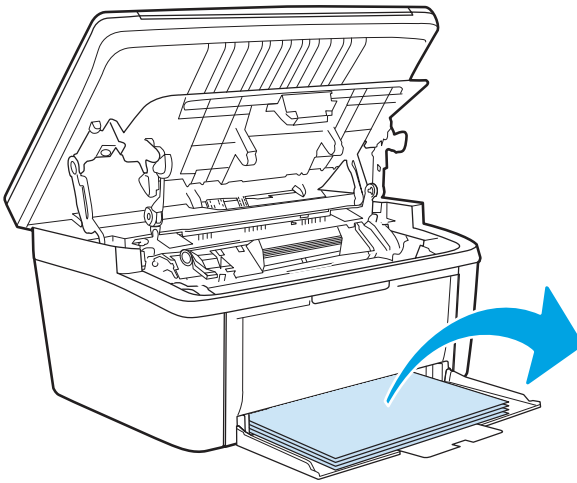
**NOTE:** Depending on where the jam is located, some of the following steps might not be necessary.

**TIP:** The HP LaserJet Pro MFP M28-M31 is shown in this procedure. However, the jam removal steps are valid for the HP LaserJet Pro M14-M17 printers

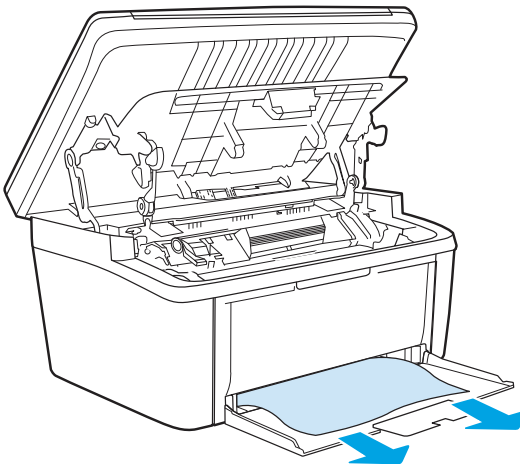
1. Open the print-cartridge door, and then remove the print cartridge.



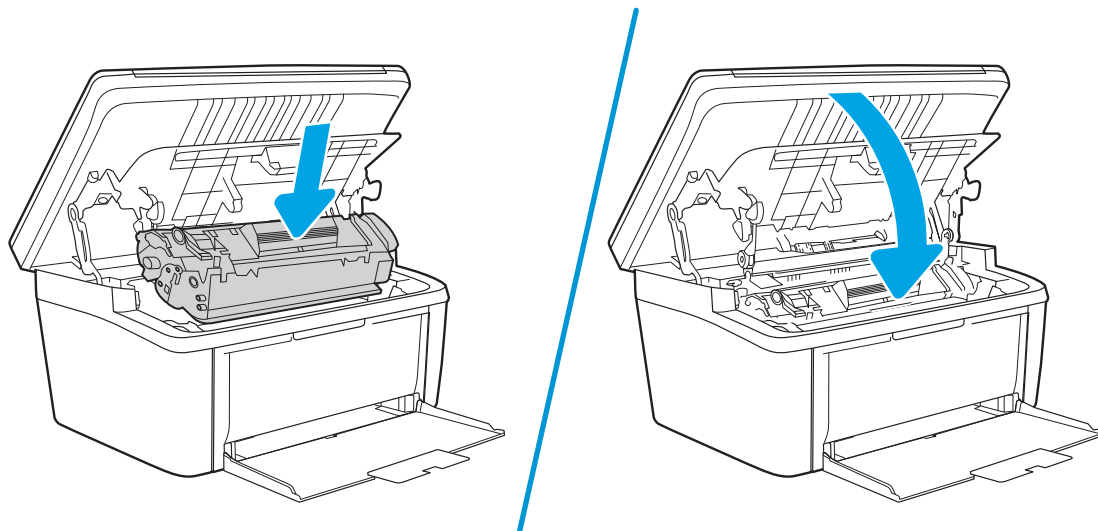
2. Remove the media stack from the input tray.




3. With both hands, grasp the side of the jammed media that is most visible (this includes the middle), and carefully pull it free from the product.



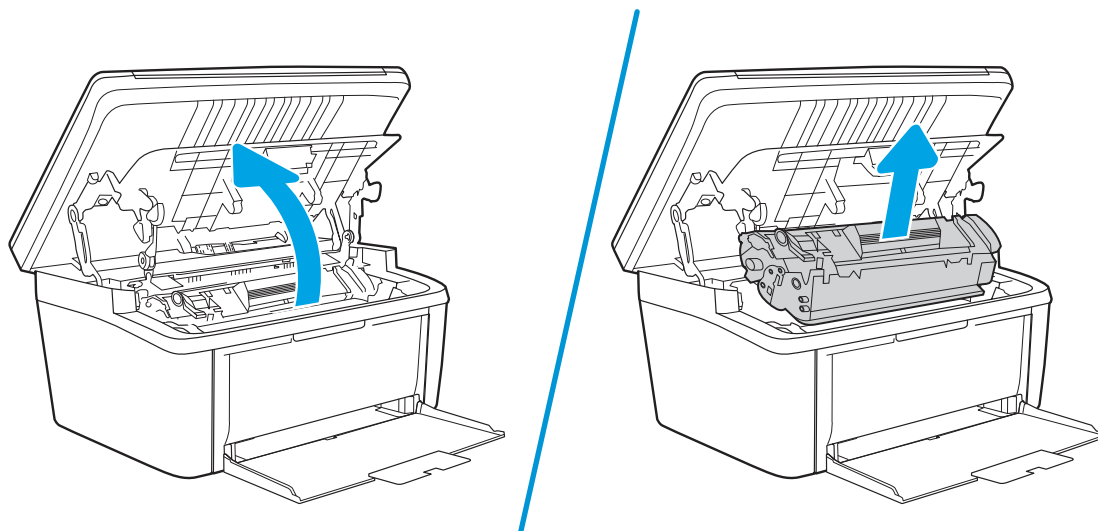
4. Reinstall the print cartridge, and then close the print-cartridge door.




### Clear jams from inside the product

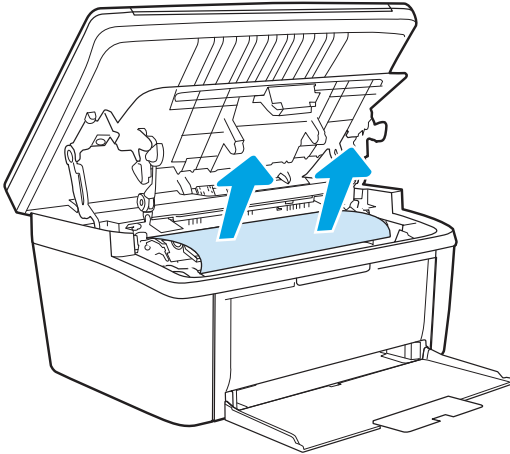
 **TIP:** The HP LaserJet Pro MFP M28-M31 is shown in this procedure. However, the jam removal steps are valid for the HP LaserJet Pro M14-M17 printers

1. Open the print-cartridge door, and then remove the print cartridge.

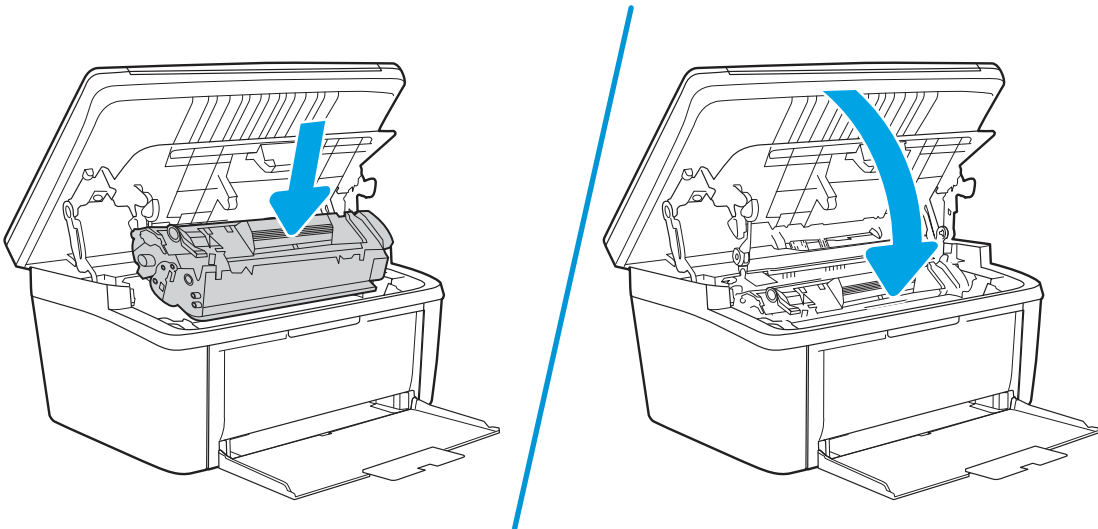


 **CAUTION:** To prevent damage, do not expose the print cartridge to light. Cover it with a piece of paper.

2. If you can see the jammed paper, carefully grasp the jammed paper, and slowly pull it out of the product.



3. Reinstall the print cartridge, and then close the print-cartridge door.

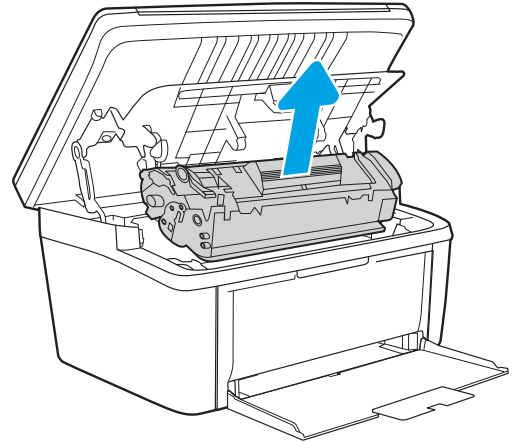
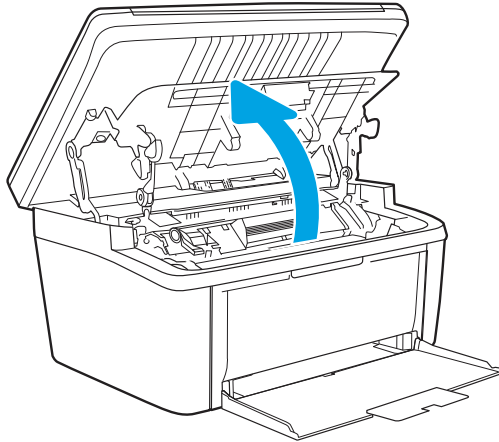


## Clear jams from the output areas

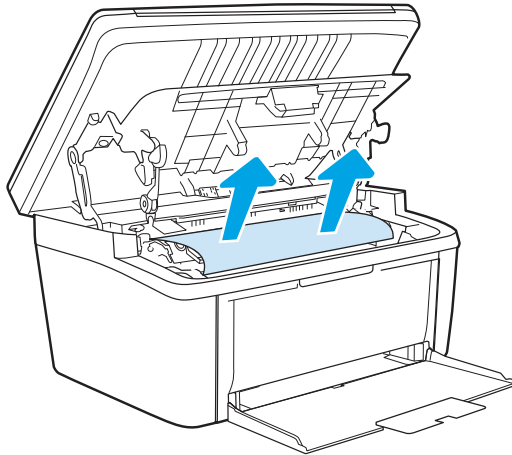
**CAUTION:** Do not use sharp objects, such as tweezers or needle-nose pliers, to remove jams. Damage caused by sharp objects will not be covered by the warranty.

**TIP:** The HP LaserJet Pro MFP M28-M31 is shown in this procedure. However, the jam removal steps are valid for the HP LaserJet Pro M14-M17 printers

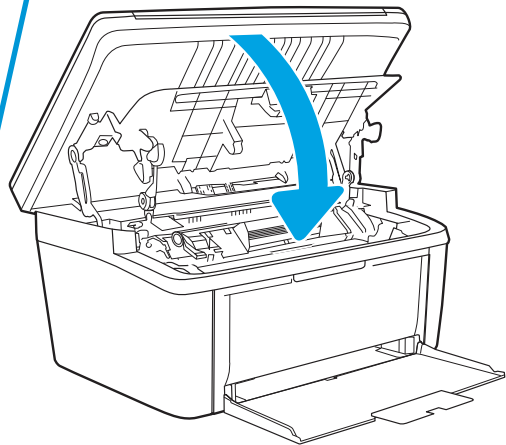
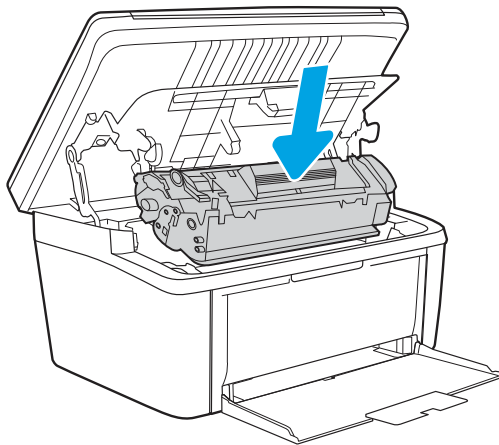
1. Open the print-cartridge door, and then remove the print cartridge.



2. Keep the print cartridge door open, and then with both hands, grasp the side of the jammed media that is most visible (this includes the middle), and carefully pull it free from the product.



3. Reinstall the print cartridge, and then close the print-cartridge door.



## Solve performance problems

**Table 2-30** Solve performance problems

Problem	Cause	Solution
Pages print but are totally blank.	The document might contain blank pages.	Check the original document to see if content is present on all of the pages.
	The printer might be malfunctioning.	To check the printer, print a configuration report.
Pages print very slowly.	Heavier paper types can slow the print job.	Print on a different type of paper.
	Complex pages can print slowly.	Proper fusing might require a slower print speed to ensure the best print quality.
	Large batches, narrow paper, and special paper such as gloss, transparency, cardstock, and HP Tough Paper can slow the print job.	Print in smaller batches, on a different type of paper, or on a different size of paper.
Pages did not print.	The printer might not be pulling paper correctly.	Make sure paper is loaded in the tray correctly.
	The paper is jamming in the printer.	Clear the jam.
	The USB cable might be defective or incorrectly connected.	<ul style="list-style-type: none"><li>• Disconnect the USB cable at both ends and reconnect it.</li><li>• Try printing a job that has printed in the past.</li><li>• Try using a different USB cable.</li></ul>
	Other devices are running on the host computer.	The printer might not share a USB port. If an external hard drive or network switchbox is connected to the same port as the printer, the other device might be interfering with the printer. To connect and use the printer, disconnect the other device or use two USB ports on the host computer.



# Solve connectivity problems

## Solve USB connection problems

If you have connected the printer directly to a computer, check the cable.

- Verify that the cable is connected to the computer and to the printer.
- Verify that the cable is not longer than 5 m (16.4 ft). Try using a shorter cable.
- Verify that the cable is working correctly by connecting it to another printer. Replace the cable if necessary.

## Solve wireless network problems

- [Introduction](#)
- [Wireless connectivity checklist](#)
- [The printer does not print after the wireless configuration completes](#)
- [The printer does not print, and the computer has a third-party firewall installed](#)
- [The wireless connection does not work after moving the wireless router or printer](#)
- [Cannot connect more computers to the wireless printer](#)
- [The wireless printer loses communication when connected to a VPN](#)
- [The network does not appear in the wireless networks list](#)
- [The wireless network is not functioning](#)
- [Perform a wireless network diagnostic test](#)
- [Reduce interference on a wireless network](#)

## Introduction

Use the troubleshooting information to help resolve issues.



**NOTE:** To determine if Wi-Fi Direct printing is enabled on your printer, print a configuration page from the printer control panel

## Wireless connectivity checklist

- Verify that the printer and the wireless router are turned on and have power. Also make sure that the wireless radio in the printer is turned on.



**NOTE:** Only the 2.4GHz frequency band is supported.

Many routers operate in both the 2.4GHz and 5.0GHz frequency bands. However, not all HP printers support both frequency bands. Make sure that the router is enabled and broadcasting the 2.4GHz frequency band.




If the router broadcasts using separate network names (SSIDs) for each frequency band, connect the printer to the 2.4GHz frequency band (SSIDs).

- Verify that the service set identifier (SSID) is correct. Print a configuration page to determine the SSID.

### Print a configuration page (M14-M17)

- a. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
- b. Release the Resume/Cancel  button.

### Print a configuration page (MFP M28-M31)

- a. Press and hold the Start Copy  button until the Ready  light begins blinking.
- b. Release the Start Copy  button.

If you are not sure the SSID is correct, run the wireless setup again

- With secured networks, verify that the security information is correct. If the security information is incorrect, run the wireless setup again.
- If the wireless network is working correctly, try accessing other computers on the wireless network. If the network has Internet access, try connecting to the Internet over a wireless connection.
- Verify that the encryption method (AES or TKIP) is the same for the printer as it is for the wireless access point (on networks using WPA security).
- Verify that the printer is within the range of the wireless network. For most networks, the printer must be within 30 m (100 ft) of the wireless access point (wireless router).
- Verify that obstacles do not block the wireless signal. Remove any large metal objects between the access point and the printer. Make sure poles, walls, or support columns containing metal or concrete do not separate the printer and wireless access point.
- Verify that the printer is located away from electronic devices that might interfere with the wireless signal. Many devices can interfere with the wireless signal including motors, cordless phones, security system cameras, other wireless networks, and some Bluetooth devices.
- Verify that the print driver is installed on the computer.
- Verify that you have selected the correct printer port.
- Verify that the computer and printer connect to the same wireless network.
- For OS X, verify that the wireless router supports Bonjour.

### The printer does not print after the wireless configuration completes

1. Make sure that the printer is turned on and in the ready state.
2. Turn off any third-party firewalls on your computer.
3. Make sure that the wireless network is working correctly.
4. Make sure that your computer is working correctly. If necessary, restart the computer.
5. Verify that you can open the printer HP Embedded Web Server from a computer on the network.

### The printer does not print, and the computer has a third-party firewall installed

1. Update the firewall with the most recent update available from the manufacturer.
2. If programs request firewall access when you install the printer or try to print, make sure you allow the programs to run.
3. Temporarily turn off the firewall, and then install the wireless printer on the computer. Enable the firewall when you have completed the wireless installation.

### The wireless connection does not work after moving the wireless router or printer

1. Make sure that the router or printer connects to the same network that your computer connects to.
2. Print a configuration page.
3. Compare the service set identifier (SSID) on the configuration page to the SSID in the printer configuration for the computer.
4. If the numbers are not the same, the devices are not connecting to the same network. Reconfigure the wireless setup for the printer.

### Cannot connect more computers to the wireless printer

1. Make sure that the other computers are within the wireless range and that no obstacles block the signal. For most networks, the wireless range is within 30 m (100 ft) of the wireless access point.
2. Make sure that the printer is turned on and in the ready state.
3. Make sure there are not more than 5 concurrent Wi-Fi Direct users.
4. Turn off any third-party firewalls on your computer.
5. Make sure that the wireless network is working correctly.
6. Make sure that your computer is working correctly. If necessary, restart the computer.

### The wireless printer loses communication when connected to a VPN

- Typically, you cannot connect to a VPN and other networks at the same time.

### The network does not appear in the wireless networks list


- Make sure the wireless router is turned on and has power.
- The network might be hidden. However, you can still connect to a hidden network.

### The wireless network is not functioning




1. To verify if the network has lost communication, try connecting other devices to the network.
2. Test network communication by pinging the network.
  - a. Open a command-line prompt on your computer.

- For Windows, click **Start**, click **Run**, type `cmd`, and then press **Enter**.
  - For OS X, go to **Applications**, then **Utilities**, and open **Terminal**.
- b. Type `ping` followed by the router IP address.
  - c. If the window displays round-trip times, the network is working.
3. Make sure that the router or printer connects to the same network that the computer connects to.
    - a. Print a configuration page.

#### Print a configuration page (M14-M17)

- i. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
- ii. Release the Resume/Cancel  button.

#### Print a configuration page (MFP M28-M31)

- i. Press and hold the Start Copy  button until the Ready  light begins blinking.
  - ii. Release the Start Copy  button.
- b. Compare the service set identifier (SSID) on the configuration report to the SSID in the printer configuration for the computer.
  - c. If the numbers are not the same, the devices are not connecting to the same network. Reconfigure the wireless setup for the printer.




## Perform a wireless network diagnostic test

A wireless network diagnostic test can be performed using the printer control panel or the Embedded Web Server (EWS). The wireless network diagnostic test provides information about the wireless network settings.

### Method one: Perform wireless network diagnostic test using the EWS

1. Open the HP Embedded Web Server (EWS):
  - a. Print a configuration page to determine the IP address or host name.

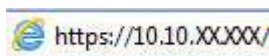
#### Print a configuration page (M14-M17)


- i. Press and hold the Resume/Cancel  button until the Ready  light begins blinking.
- ii. Release the Resume/Cancel  button.

#### Print a configuration page (MFP M28-M31)

- i. Press and hold the Start Copy  button until the Ready  light begins blinking.
- ii. Release the Start Copy  button.

- b. Open a web browser, and in the address line, type the IP address or host name exactly as it displays on the printer configuration page. Press the **Enter** key on the computer keyboard. The EWS opens.



 **NOTE:** If the displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

2. Select the **Networking** tab.
3. On the **Wireless Configuration** page, verify that the On option is selected.
4. Click the **Print Test Report** button to print a test page that shows test results.

#### Method two: Perform a wireless network diagnostic test using the printer control panel

- ▲ From the printer control panel, press and hold the wireless button for 20 seconds.

#### Reduce interference on a wireless network


The following tips can reduce interference in a wireless network:


- Keep the wireless devices away from large metal objects, such as filing cabinets, and other electromagnetic devices, such as microwaves and cordless telephones. These objects can disrupt radio signals.
- Keep the wireless devices away from large masonry structures and other building structures. These objects can absorb radio waves and lower signal strength.
- Position the wireless router in a central location in line of sight with the wireless printers on the network.

# Service mode functions


## Secondary service menu

Use the secondary service menu to print service-related reports and to run special tests.

 **NOTE:** Access the secondary service menu by using the HP Embedded Web Server (EWS)

 **TIP:** To toggle the USB speed between **High** and **Low**, use the HP EWS **Service** page (not the Secondary service menu).

- ▲ Open the secondary service menu.







 **NOTE:** HP Device Toolbox is software used to connect to the HP Embedded Web Server when the printer is connected to a computer via USB. It is available only if a full installation was performed when the printer was installed on a computer. Depending on how the printer is connected, some features might not be available.

The HP Embedded Web Server is not accessible beyond the network firewall.

### Open the HP EWS from the Start menu

- Click the **Start**, and then click the **Programs** item.
- Click your HP printer group, and then click the **HP Device Toolbox** item.
- After opening the HP EWS, go to the **Service** page, and then select the **Go to Secondary Service** item.

### Open the HP Embedded Web Server (EWS) from a Web browser

- M14-M17 control panels:** Select and hold the Resume  button until the Ready  light is blinking, and then release the Resume  button. Find the IP address or host name of the printer on the configuration report.  
  
**MFP M28-M311 LED control panels:** Select and hold the Start Mono Copy  button until the **Ready**  light begins blinking, and then release the Start Mono Copy  button. Find the IP address or host name of the printer on the configuration report.
- Open a Web browser, and in the address line, type the IP address or host name exactly as it appears on the printer control panel or the configuration report. Press the **Enter** key on the computer keyboard. The EWS opens.



 **NOTE:** If the web browser displays a message indicating that accessing the website might not be safe, select the option to continue to the website. Accessing this website will not harm the computer.

- After opening the HP EWS, go to the **Service** page, and then select the **Go to Secondary Service** item.

The following menu items appear in the secondary service menu:

**Table 2-31** Secondary service menu

Menu item	Sub-menu item	Description
Location	A list of available locations displays	This item sets certain printer parameters that are dependent on the location (for example, the default paper size).  Scroll to the appropriate location and select <b>Yes</b> to set the location. The printer automatically restarts after you change the location.
Auto-On / Auto-Off	Enabled* Disabled*	Use this item to enable or disable the auto-on / auto-off function.
Service Reports	Cont. Self-Test	This item prints a continuous configuration page.
	Error report	This item prints an error report that contains the last 5 instances of <b>49.xx.yy</b> or <b>79.xx.yy</b> errors.

## Printer resets

### Restore the factory-set defaults

Restoring the factory-set defaults returns all of the printer and network settings to the factory defaults. It will not reset the page count (the tray size and language settings are reset to factory defaults). To restore the printer to the factory-default settings, follow these steps.

---

 **CAUTION:** Restoring the factory-set defaults returns all of the settings to the factory defaults.

All onboard network settings are also reset. Be sure to print a configuration page before restoring defaults. Make note of the IP address that is listed on the configuration page. You might need to restore the IP address after restoring factory-set defaults.


---

### NVRAM initialization

Performing an NVRAM initialization resets the following settings and information:

- All menu settings are reset to factory default values.
- All localization settings, including language and country/region, are reset to factory defaults.

---

 **CAUTION:** All onboard network settings are also reset. Be sure to print a configuration page before restoring defaults. Make note of the IP address that is listed on the configuration page. You might need to restore the IP address after an NVRAM initialization.

---

After performing an NVRAM initialization, reconfigure any computers that print to this printer. Uninstall and then reinstall the product software on the computers.

### Super NVRAM initialization

A super NVRAM initialization restores the printer to the “generic printer mode” in which it arrived from the factory. This means that you will have to reset the language and country/region settings when the printer starts after the initialization. A super NVRAM initialization erases all data stored in the protected and unprotected NVRAM sections.




# Firmware upgrades

HP offers periodic printer updates, new Web Services apps, and new features to existing Web Services apps. Follow these steps to update the firmware for a single printer. When you update the firmware, Web Service apps will update automatically.

## Update the firmware using the Firmware Update Utility

Use these steps to manually download and install the Firmware Update Utility from HP.com.


---

 **NOTE:** This method is the only firmware update option available for printers connected to the computer via a USB cable.

---

1. Go to [www.hp.com/go/support](http://www.hp.com/go/support), click the **Drivers & Software** link, type the printer name in the search field, press the **ENTER** button, and then select the printer from the list of search results.
2. Select the operating system.
3. Under the **Firmware** section, locate the **Firmware Update Utility**.
4. Click **Download**, click **Run**, and then click **Run** again.
5. When the utility launches, select the printer from the drop-down list, and then click **Send Firmware**.

---

 **NOTE:** To print a configuration report to verify the installed firmware version before or after the update process, click **Print Config**.

---

6. Follow the on-screen instructions to complete the installation, and then click the **Exit** button to close the utility.



---

# A Certificates of volatility

- [Certificate of volatility \(M14-M17\)](#)
- [Certificate of volatility \(MFP M28-M31\)](#)

# Certificate of volatility (M14-M17)

Figure A-1 CoV HP LaserJet Pro M15a (1 of 2)

Hewlett-Packard Certificate of Volatility				
Model: HP LaserJet Pro M15a	Part Number: W2G50A		Address: Hewlett Packard Company 11311 Chinden Blvd Boise, ID 83714	
Volatile Memory				
Does the device contain volatile memory (Memory whose contents are lost when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (SRAM, DRAM, etc): SDRAM	Size: 8MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Used for temporary storage during the process of jobs, and for applications that are running on the OS.	Steps to clear memory: When the printer is powered off, the memory is erased.
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Non-Volatile Memory				
Does the device contain non-volatile memory (Memory whose contents are retained when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (Flash, EEPROM, etc): EEPROM	Size: 16KB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store customer setting data for backup/restore	Steps to clear memory: Perform NVRAM initialization according to service manual, it returns most system parameter in NVRAM to default factory setting.
Type (Flash, EEPROM, etc): Nor-Flash	Size: 8MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store firmware code, File system, customer setting data for backup/restore	Steps to clear memory: Permanent storage requires special code to clear or update firmware- Typically not done by the user
Type (Flash, EEPROM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Mass Storage				
Does the device contain mass storage memory (Hard Disk Drive, Tape Backup)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (HDD, Tape, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
USB				
Does the item accept USB input and if so, for what purpose (i.e. Print Jobs, device firmware updates, scan upload)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				
Can any data other than scan upload be sent to the USB device)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				

Figure A-2 CoV HP LaserJet Pro M15a (2 of 2)

RF/RFID			
Does the item use RF or RFID for receive or transmit of any data including remote diagnostics. (e.g. Cellular phone, Bluetooth) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below			
Purpose:			
Frequency:		Bandwidth:	
Modulation:		Effective Radiate Power (ERP):	
Specifications:			

Other Transmission Capabilities	
Does the device employ any other methods of non-wired access to transmit or receive any data whatsoever (e.g. anything other than standard hard wired TCP/IP, direct USB, or parallel connections)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below:	
Purpose:	
Frequency:	Bandwidth:
Modulation:	Effective Radiate Power (ERP):
Specifications:	

Other Capabilities	
Does the device employ any other method of communications such as a Modem to transmit or receive any data whatsoever? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below:	
Purpose:	
Specifications:	

Author Information			
Name	Title	Email	Business Unit
Tebe Zhang	Technical Marketing Engineer		LES CA
Richard Wang	System Engineer		LES R&D
Date Prepared: Dec.28'2017			

Figure A-3 CoV HP LaserJet Pro M15w (1 of 2)

Hewlett-Packard Certificate of Volatility				
Model: HP LaserJet Pro M15w	Part Number: W2G51A		Address: Hewlett Packard Company 11311 Chinden Blvd Boise, ID 83714	
Volatile Memory				
Does the device contain volatile memory (Memory whose contents are lost when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (SRAM, DRAM, etc): SDRAM	Size: 16MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Used for temporary storage during the process of jobs, and for applications that are running on the OS.	Steps to clear memory: When the printer is powered off, the memory is erased.
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory: .
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Non-Volatile Memory				
Does the device contain non-volatile memory (Memory whose contents are retained when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (Flash, EEPROM, etc): EEPROM	Size: 16KB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store customer setting data for backup/restore	Steps to clear memory: Perform NVRAM initialization according to service manual, it returns most system parameter in NVRAM to default factory setting.
Type (Flash, EEPROM, etc): Nor-Flash	Size: 16MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store firmware code, File system, customer setting data for backup/restore	Steps to clear memory: Permanent storage requires special code to clear or update firmware- Typically not done by the user
Type (Flash, EEPROM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Mass Storage				
Does the device contain mass storage memory (Hard Disk Drive, Tape Backup)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (HDD, Tape, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
USB				
Does the item accept USB input and if so, for what purpose (i.e. Print Jobs, device firmware updates, scan upload)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				
Can any data other than scan upload be sent to the USB device)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				

Figure A-4 CoV HP LaserJet Pro M15w (2 of 2)

RF/RFID	
Does the item use RF or RFID for receive or transmit of any data including remote diagnostics. (e.g. Cellular phone, Bluetooth) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below	
Purpose:	
Frequency:	Bandwidth:
Modulation:	Effective Radiate Power (ERP):
Specifications:	

Other Transmission Capabilities	
Does the device employ any other methods of non-wired access to transmit or receive any data whatsoever (e.g. anything other than standard hard wired TCP/IP, direct USB, or parallel connections)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe below:	
Purpose: Wireless connection only for wireless models	
Frequency: 2.4GHz	Bandwidth: 1x1 802.11n 20MHz
Modulation: CCK, OFDM	Effective Radiate Power (ERP): <ul style="list-style-type: none"> <li>72/65 Mbps OFDM – 15 (+/- 1.5) dbm – 802.11n</li> <li>54 Mbps OFDM – 15 (+/- 1.5) dbm – 802.11g</li> <li>11 Mbps CCK – 18 (+/- 1.5) dbm – 802.11b</li> </ul>
Specifications: 802.11 a/b/g/n	

Other Capabilities	
Does the device employ any other method of communications such as a Modem to transmit or receive any data whatsoever? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below:	
Purpose:	
Specifications:	

Author Information			
Name	Title	Email	Business Unit
Tebe Zhang	Technical Marketing Engineer		LES CA
Richard Wang	System Engineer		LES R&D
Date Prepared: Dec.28'2017			

# Certificate of volatility (MFP M28-M31)

Figure A-5 CoV HP LaserJet Pro MFP M28a (1 of 2)

Hewlett-Packard Certificate of Volatility				
Model: HP LaserJet Pro MFP M28a		Part Number: W2G54A		Address: Hewlett Packard Company 11311 Chinden Blvd Boise, ID 83714
Volatile Memory				
Does the device contain volatile memory (Memory whose contents are lost when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (SRAM, DRAM, etc): DDR1-DRAM	Size: 32MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Used for temporary storage during the process of jobs, and for applications that are running on the OS.	Steps to clear memory: When the printer is powered off, the memory is erased.
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Non-Volatile Memory				
Does the device contain non-volatile memory (Memory whose contents are retained when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (Flash, EEPROM, etc): EEPROM	Size: 16KB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store customer setting data for backup/restore	Steps to clear memory: Perform NVRAM initialization according to service manual, it returns most system parameter in NVRAM to default factory setting.
Type (Flash, EEPROM, etc): Nor-Flash	Size: 16MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store firmware code, File system, customer setting data for backup/restore	Steps to clear memory: Permanent storage requires special code to clear or update firmware- Typically not done by the user
Type (Flash, EEPROM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Mass Storage				
Does the device contain mass storage memory (Hard Disk Drive, Tape Backup)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (HDD, Tape, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
USB				
Does the item accept USB input and if so, for what purpose (i.e. Print Jobs, device firmware updates, scan upload)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				
Can any data other than scan upload be sent to the USB device? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				



Figure A-6 CoV HP LaserJet Pro MFP M28a (2 of 2)

RF/RFID	
Does the item use RF or RFID for receive or transmit of any data including remote diagnostics. (e.g. Cellular phone, Bluetooth) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below	
Purpose:	
Frequency:	Bandwidth:
Modulation:	Effective Radiate Power (ERP):
Specifications:	

Other Transmission Capabilities	
Does the device employ any other methods of non-wired access to transmit or receive any data whatsoever (e.g. anything other than standard hard wired TCP/IP, direct USB, or parallel connections)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below:	
Purpose:	
Frequency:	Bandwidth:
Modulation:	Effective Radiate Power (ERP):
Specifications:	

Other Capabilities	
Does the device employ any other method of communications such as a Modem to transmit or receive any data whatsoever? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below:	
Purpose:	
Specifications:	

Author Information			
Name	Title	Email	Business Unit
Tebe Zhang	Technical Marketing Engineer		LES CA
Richard Wang	System Engineer		LES R&D
Date Prepared: Dec.28'2017			

Figure A-7 CoV HP LaserJet Pro MFP M28w (1 of 2)

Hewlett-Packard Certificate of Volatility				
Model: HP LaserJet Pro MFP M28w		Part Number: W2G55A		Address: Hewlett Packard Company 11311 Chinden Blvd Boise, ID 83714
Volatile Memory				
Does the device contain volatile memory (Memory whose contents are lost when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (SRAM, DRAM, etc): DDR1-DRAM	Size: 32MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Used for temporary storage during the process of jobs, and for applications that are running on the OS.	Steps to clear memory: When the printer is powered off, the memory is erased.
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory: .
Type (SRAM, DRAM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Non-Volatile Memory				
Does the device contain non-volatile memory (Memory whose contents are retained when power is removed)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (Flash, EEPROM, etc): EEPROM	Size: 16KB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store customer setting data for backup/restore	Steps to clear memory: Perform NVRAM initialization according to service manual, it returns most system parameter in NVRAM to default factory setting.
Type (Flash, EEPROM, etc): Nor-Flash	Size: 16MB	User Modifiable: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Function: Store firmware code, File system, customer setting data for backup/restore	Steps to clear memory: Permanent storage requires special code to clear or update firmware- Typically not done by the user
Type (Flash, EEPROM, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
Mass Storage				
Does the device contain mass storage memory (Hard Disk Drive, Tape Backup)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe the type, size, function, and steps to clear the memory below				
Type (HDD, Tape, etc):	Size:	User Modifiable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Function:	Steps to clear memory:
USB				
Does the item accept USB input and if so, for what purpose (i.e. Print Jobs, device firmware updates, scan upload)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe below				
Print files can be printed via a USB thumb drive. Scan files can be upload to a USB thumb drive.				
Can any data other than scan upload be sent to the USB device? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below				

Figure A-8 CoV HP LaserJet Pro MFP M28w (2 of 2)

RF/RFID	
Does the item use RF or RFID for receive or transmit of any data including remote diagnostics. (e.g. Cellular phone, Bluetooth) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe below	
Purpose: NFC wireless Information string	
Frequency: 13.56	Bandwidth: 106-848kbps
Modulation: 7-30% ASK	Effective Radiate Power (ERP): Not an internal radiator. Load modulation as passive tag emulation.
Specifications:	

Other Transmission Capabilities	
Does the device employ any other methods of non-wired access to transmit or receive any data whatsoever (e.g. anything other than standard hard wired TCP/IP, direct USB, or parallel connections)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes please describe below:	
Purpose: Wireless connection only for wireless models	
Frequency: 2.4GHz	Bandwidth: 1x1 802.11n 20MHz
Modulation: CCK, OFDM	Effective Radiate Power (ERP): <ul style="list-style-type: none"> <li>72/65 Mbps OFDM – 15 (+/- 1.5) dbm – 802.11n</li> <li>54 Mbps OFDM – 15 (+/- 1.5) dbm – 802.11g</li> <li>11 Mbps CCK – 18 (+/- 1.5) dbm – 802.11b</li> </ul>
Specifications: 802.11 b/g/n	

Other Capabilities	
Does the device employ any other method of communications such as a Modem to transmit or receive any data whatsoever? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes please describe below:	
Purpose:	
Specifications:	

Author Information			
Name	Title	Email	Business Unit
Tebe Zhang	Technical Marketing Engineer		LES CA
Richard Wang	System Engineer		LES R&D
Date Prepared: Dec.28'2017			



# Index

## A

- ACL (advanced control language) 5
- advanced control language (ACL) 5

## B

- basic printer operation 2
- bin, output
  - jams, clearing 114
- blank pages
  - troubleshooting 116
- browser requirements
  - HP Embedded Web Server 53

## C

- cables
  - USB, troubleshooting 116
- cartridge door assembly
  - locating 48
- cartridge door assembly (M14-M17)
  - locating 48
- cautions iii
- Channel partners support
  - HP Channel Services Network (CSN) v
- checklist
  - problems 28
  - wireless connectivity 117
- circuit diagrams 52
  - high-voltage power supply 13
- cleaning
  - glass 102
  - glass (MFP M28-M31) 105
  - paper path 66, 105
  - printer 105
- components
  - fuser 15
  - pickup, feed, and delivery 19
- configuration report 29, 38

- connectors, engine controller unit
  - locating 46
- connectors, formatter
  - locating 44
- control panel
  - LED light patterns (M14-M17) 57
  - LED light patterns (MFP M28-M31) 60
- control panel (M14-M17)
  - layout 55
  - locating 48
- control panel (MFP M28-M31)
  - layout 58
- conventions, document iii
- copying
  - edge-to-edge 104
  - optimizing for text or pictures 104
  - setting paper size and type 102
- counts 122
  - page, reset 122
  - reset after replacing formatter 122
  - See also* pages counts
- CPU 6

## D

- DC controller
  - operation sequence 9
  - sensors 11
  - solenoids 10
  - switches 10
- default settings, restoring
  - NVRAM initialization 124
- defaults, restoring 124
- defects, repeating 79
- demo page 38
- determine problem source 31

## diagrams

- block 40
- circuit 52
- external plug and port locations 47
- image-formation system 43
- motor 42
- PCA connections 44
- sensors 41
- timing 51
- Diagrams: engine controller unit
  - locating 46
- document conventions iii
- door switch assembly
  - locating 50

## E

- Embedded Web Server (EWS)
    - features 53
  - engine
    - drum rotation functional check 39
    - half self-test functional check 39
    - test page 38
  - engine controller assembly
    - locating 50
  - event log 38
    - EWS 29
    - Tool Box 29
  - Explorer, versions supported
    - HP Embedded Web Server 53
  - external panels, doors, and covers
    - locating 48
  - external plug and port locations
    - diagrams 47
- ## F
- factory defaults, restoring
    - NVRAM initialization 124

- factory-set defaults, restoring 124
- failure detection
  - low-voltage power supply 12
- flatbed
  - scanning and image capture (MFP M28-M31) 25
- flowcharts
  - troubleshooting 31
- formatter
  - resets after replacing 122
- formatter connectors
  - locating 44
- formatter cover (M28-M31)
  - locating 48
- formatter PCA
  - locating 50
- fuser 13
  - components 15
  - control-circuit function 13
  - locating 49
  - temperature protection 16
  - See also* fusing and delivery unit

**G**

- glass, cleaning 102
- glass, cleaning (MFP M28-M31) 105

**H**

- heater
  - fuser 15
- high-voltage power supply (HVPS)
  - operations 13
- HP Channel Services Network (CSN)
  - Channel partners support v
- HP Device Toolbox, using 53
- HP Embedded Web Server (EWS)
  - features 53
- HP EWS, using 53
- HP Jetdirect print server
  - NVRAM initialization 124
- HVPS (high-voltage power supply)
  - operations 13

**I**

- image capture system
  - scanning (MFP M28-M31) 25
- image quality
  - troubleshooting defects 79
- image quality issues
  - examples and solutions 71

- image scanner (MFP M28-M31)
  - locating 49
- image-formation system
  - block diagram 43
- individual component diagnostics 38
- initial rotation period 3
- initialization
  - NVRAM 124
- Internet Explorer, versions supported
  - HP Embedded Web Server 53

**J**

- jams
  - causes of 107
  - locations 111
  - output-bin, clearing 114
  - tray, clearing 111
- Jetdirect print server
  - NVRAM initialization 124

**L**

- laser scanner (engine)
  - failure detection 17
  - operations 17
- laser scanner assembly
  - locating 49
- last rotation period 3
- layout
  - control panel (M14-M17) 55
  - control panel (MFP M28-M31) 58
- LED 5
- locating
  - external panels, doors, and covers 48
  - main assemblies 49
  - main parts 49
  - PCA 50
- location
  - setting 123
- low-end data model (LED) 5
- low-voltage power supply (LVPS)
  - converted DC voltages 12
  - stops and interruptions 12
- lower cover assembly (M14-M17)
  - locating 48
- lower cover assembly (M28-M31)
  - locating 48
- LVPS (low-voltage power supply)
  - converted DC voltages 12
  - stops and interruptions 12

**M**

- main assemblies
  - locating 49
- main parts
  - locating 49
- memory
  - NVRAM initialization 124
- motor
  - block diagram 42
- motors
  - image-formation system 21
- movement of paper through printer.
  - See* pickup, feed, and delivery

**N**

- Netscape Navigator, versions
  - supported
    - HP Embedded Web Server 53
- notes iii
- NVRAM initialization 124

**O**

- operation sequence 3
- operations
  - laser scanner (engine) 17

**P**

- pages
  - blank 116
  - not printing 116
  - printing slowly 116
- pages count 122
  - reset 122
  - See also* counts
- paper
  - jams 107
  - selecting 67
- paper jams
  - locations 111
- paper movement
  - operation 19
- paper path
  - printer 19
- paper pickup problems
  - solving 107
- PCA
  - locating 50
- periods of the operation sequence 3
- pickup roller
  - locating 49

- pickup, feed, and delivery
  - components 19
  - overview 19
- power subsystem 33
- power supply 12
  - protective function 12
  - troubleshooting 33
- power-on troubleshooting overview 33, 34
- power-save mode. *See* sleep settings
- printer resets 124
- printing
  - period in operation sequence 3
  - troubleshooting 116

## Q

- quality
  - troubleshooting repetitive image defects 79

## R

- repeating defects, troubleshooting 79
- repetitive defects, troubleshooting 79
- reports
  - error 123
  - service 123
- resets
  - NVRAM initialization 124
- restoring default settings
  - NVRAM initialization 124
- restoring factory-set defaults 124
- ruler, repetitive defect 79

## S

- scanner
  - glass cleaning 102
  - glass cleaning (MFP M28-M31) 105
- scanning
  - image capture (MFP M28-M31) 25
- secondary service menu options 122
- sensors
  - block diagram 41
  - DC controller 11
  - pickup, feed, and delivery system 20
- service and support information
  - WISE and CSN v

- service mode functions 122
- settings
  - factory-set defaults, restoring 124
- sleep settings
  - voltage too high during 12
- solenoids
  - DC controller 10
- solve connectivity problems 117
- solve performance problems 116
- solve problems 27
- standby period 3
- status
  - control panel lights (M14-M17) 57
  - control panel lights (MFP M28-M31) 60
- status page 38
- sub-voltage
  - low-voltage power supply circuit 12
- supplies status 65
- switches
  - DC controller 10
  - pickup, feed, and delivery system 20
- system requirements
  - HP Embedded Web Server 53

## T

- table, repetitive defect 79
- temperature
  - fuser heater protection 16
- tests
  - drum rotation functional check 39
  - engine 38
  - half self-test functional check 39
- thermistor
  - fuser 15
- thermoswitches
  - fuser 15
- timing chart 51
- tips iii
- toner-cartridge status 65
- top cover assembly (M28-M31)
  - locating 48
- transfer roller
  - locating 49

- tray
  - jams, clearing 111
- Tray 1 (M14-M17)
  - locating 48
- Tray 1 (M28-M31)
  - locating 48
- troubleshooting 27
  - blank pages 116
  - checklist 28
  - configuration report 38
  - demo page 38
  - event log 38
  - flowchart 31
  - jams 107
  - LED, errors (M14-M17) 57
  - LED, errors (MFP M28-M31) 60
  - LED, light patterns (M14-M17) 57
  - LED, light patterns (MFP M28-M31) 60
  - NVRAM initialization 124
  - pages not printing 116
  - pages printing slowly 116
  - paper feed problems 107
  - power 33
  - process 31
  - repeating defects 79
  - reports and tools 38
  - status page 38
  - USB cables 116
  - USB connection 117
  - wireless network 117
- troubleshooting tools
  - Engine diagnostics 38

## U

- USB connection
  - troubleshooting 117
- USB port
  - troubleshooting 116

## W

- waiting period 3
- warnings iii
- Web browser requirements
  - HP Embedded Web Server 53
- Web-based Interactive Search Engine
  - WISE v
- wireless network
  - troubleshooting 117
- wireless network interference 121

WISE

Web-based Interactive Search  
Engine v