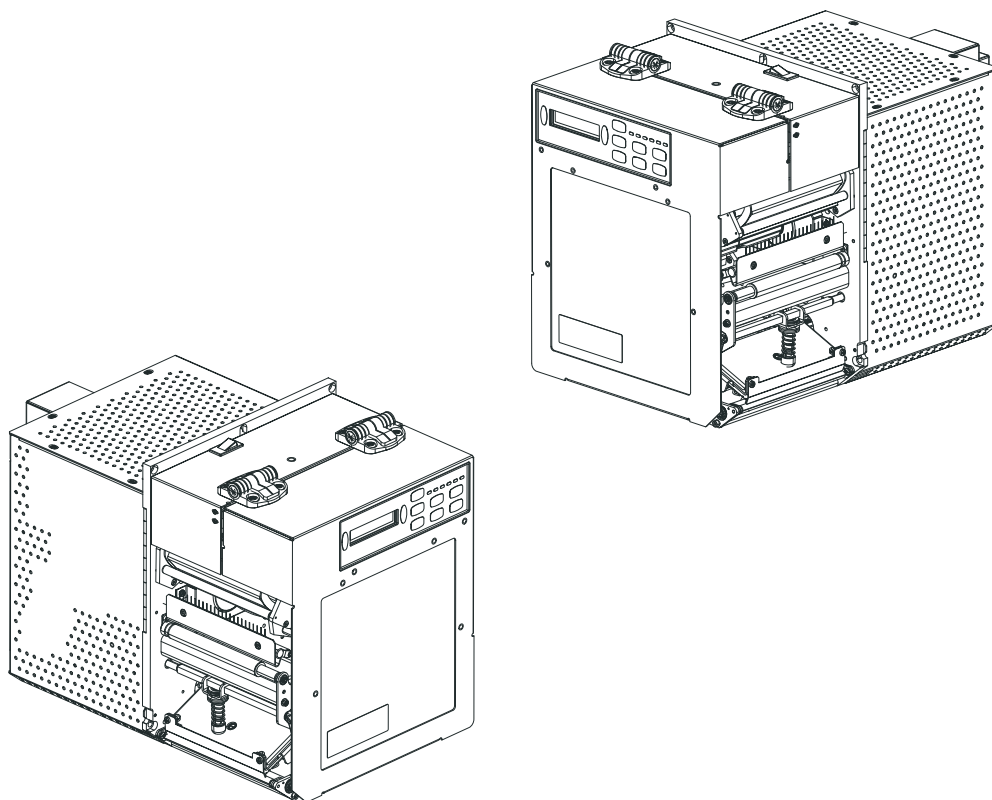




110PAX4™/R110PAX4™

Print Engine

User Guide



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This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

DECLARATION OF INCORPORATION

ZEBRA TECHNOLOGIES CORPORATION

Declares that the following Information Technology Equipment
Zebra PAX4 Series
 complies with the following applicable directives and standards for the
 ITE: Heavy Industry environment

Applicable Directives and Supporting Standards:

89/336/EEC EMC Directive, EN55022:1998 Class A, EN61000-6-2,
 EN61000-3-2, EN61000-3-3 W/Amendment 12
 73/23/EEC LVD Directive, EN60950-1:03, CB Scheme

FCC Part 15, Subpart B, Class A, ICES-003

NOM 019-SCFI-1998
 C-TICK, VCCI

Manufactured By: Zebra Technologies Corporation
 475 Half Day Road, Suite 500
 Lincolnshire, IL 60069 USA

The equipment specified conforms to all Directives and Standards listed above effective
 as of the date below.



January 4, 2005

Charles A. Derrow
 Manager, Compliance Eng
 Zebra Technologies Corporation
 475 Half Day Road, Suite 500
 Lincolnshire, IL 60069 USA



January 27, 2005

Rod Rodericks
 Managing Director
 Zebra Technologies Europe Limited
 Dukes Meadow, Millboard Road, Bourne End
 Buckinghamshire, SL8 5XF, UK

Effective Date: 1 Jan 2005

Compliance Information

FCC Compliance Statement

This device complies with Part 15 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for Class A Digital Devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the product manuals, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

The user is cautioned that any changes or modifications not expressly approved by Zebra Technologies could void the user's authority to operate the equipment. To ensure compliance, this print engine must be used with Shielded Communication Cables.

FCC Radiation Exposure Statement (for print engines with RFID encoders)

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Canadian DOC Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Contents



About This Document	9
Who Should Use This Document	10
How This Document Is Organized	10
Contacts	11
Document Conventions	12
1 • Introduction	15
Print Engine Exterior View	16
Control Panel	17
Control Panel Buttons	17
Control Panel Indicator Lights (LEDs)	18
Power On/Off Switch	20
2 • Print Engine Setup	21
Before You Begin	22
Handling the Print Engine	23
Unpack and Inspect the Print Engine	23
Store the Print Engine	23
Ship the Print Engine	23
Recycle the Print Engine	24
Print Engine Installation	25
Requirements	25
Dimensions and Clearance Needs	26
Install the Print Engine in an Applicator	29
Select a Data Communication Interface	31
Data Cables and Wireless Cards	32
Connect the Print Engine to a Power Source	33
Power Cord Specifications	34

Types of Media	35
Ribbon Overview.	37
When to Use Ribbon.	37
Coated Side of Ribbon	37
3 • Operations	39
Load Media	40
Load Ribbon	46
Remove Used Ribbon.	52
Calibrate the Print Engine	53
Adjust Ribbon and Media Sensors	55
Ribbon Sensor	55
Reflective Media Sensor	55
Transmissive Media Sensor	55
4 • Configuration	57
Setup Mode.	58
Enter and Use Setup Mode	58
Exit Setup Mode	59
Change Password-Protected Parameters	60
Default Password Value	60
Disable the Password Protection Feature	60
Print a Configuration Label	61
Print a Network Configuration Label	62
Control Panel Parameters.	63
How to View or Modify Parameters	63
Additional Parameters	63
5 • Routine Maintenance	89
Lubrication	90
Cleaning Schedule	90
Clean the Exterior	90
Clean the Media Compartment.	91
Clean the Sensors	91
Clean the Printhead and Platen Roller	93
Toggle Positioning.	95
Printhead Pressure Adjustment	97
Power Fuse Replacement.	99
6 • Troubleshooting	101
Troubleshooting Checklists.	102
LCD Error Messages	103
Memory Errors	107
Print Quality Problems	108

Communications Problems	112
Ribbon Problems	113
RFID Problems	114
Miscellaneous Print Engine Problems	117
Print Engine Diagnostics	119
Power-On Self Test	119
CANCEL Self Test	120
PAUSE Self Test	121
FEED Self Test	122
FEED and PAUSE Self Test	126
Communications Diagnostics Test	129
Sensor Profile	130
7 • Data Ports	131
Parallel Data Port	132
Parallel Cabling Requirements	132
Parallel Port Interconnections	132
Serial Data Port	134
Hardware Control Signal Descriptions	134
Pin Configuration	135
RS-232 Interface Connections	136
Applicator Interface Connector	138
Applicator Signals	138
Applicator Interface Connector Pin Configuration	140
Jumper Configurations and Pinouts for +5 V I/O Operation	143
Pinouts for +24-28 V I/O Operation	144
Fuse and Jumper Locations	145
8 • Specifications	147
General Specifications	148
Physical	148
Environmental Conditions	148
Electrical Specifications	148
Communications Specifications	149
Other Standard Features	150
Additional Options	150
Agency Approvals	151
110PAX4 Non-RFID or RFID-Ready without RFID Reader Installed	151
R110PAX4 or 110PAX4 with RFID Reader Installed	151
Media Specifications	153
Ribbon Specifications	154
Printing Specifications	155
Zebra Programming Language (ZPL II)	156

Bar Codes 156

Index 157

About This Document



This section provides you with contact information, document structure and organization, and additional reference documents.

Contents

Who Should Use This Document	10
How This Document Is Organized	10
Contacts	11
Document Conventions	12

Who Should Use This Document

This User Guide is intended for use by any person who needs to operate or troubleshoot problems with the print engine.

How This Document Is Organized

The User Guide is set up as follows:

Section	Description
Introduction on page 15	This chapter shows the operational controls and location of major components used when loading media and ribbon.
Print Engine Setup on page 21	This section provides the tasks that you must complete and the issues that you must consider before you load and configure your print engine.
Operations on page 39	If you have completed the tasks and resolved the issues in Print Engine Setup on page 21, follow the instructions in this chapter to load and calibrate your print engine.
Configuration on page 57	This section describes the control panel parameters that are used to configure the print engine for operation.
Routine Maintenance on page 89	This chapter provides routine cleaning and maintenance procedures.
Troubleshooting on page 101	This section provides information about errors that you might need to troubleshoot. Assorted diagnostic tests are included.
Data Ports on page 131	This section describes the standard communication ports available to connect the print engine to your computer or network.
Specifications on page 147	This chapter provides routine cleaning and maintenance procedures.

Contacts

Technical Support via the Internet is available 24 hours per day, 365 days per year.

Web Site: www.zebra.com

E-mail Back Technical Library:

E-mail address: emb@zebra.com

Subject line: Emaillist

Self Service Knowledge Base: www.zebra.com/knowledgebase

Online Case Registration: www.zebra.com/techrequest

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Technical Support For questions on the operation of Zebra equipment and software, please call your distributor. For additional assistance, contact us. <i>Please have your model and serial numbers available.</i>	T: +1 877 ASK ZEBRA (275 9327) F: +1 847 913 2578 Hardware: ts1@zebra.com Software: ts3@zebra.com Kiosk printers: T: +1 866 322 5202 E: kiosksupport@zebra.com	T: +44 (0) 1628 556039 F: +44 (0) 1628 556003 E: Tseurope@zebra.com	T: +65 6858 0722 F: +65 6885 0838 E: China: tschina@zebra.com All other areas: tsasiapacific@zebra.com
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Key: T: Telephone
F: Facsimile
E: E-mail

Document Conventions

The following conventions are used throughout this document to convey certain information.

Alternate Color (online only) Cross-references contain hot links to other sections in this guide. If you are viewing this guide online in .pdf format, you can click the cross-reference ([blue text](#)) to jump directly to its location.

LCD Display Examples Text from a print engine's Liquid Crystal Display (LCD) appears in **Bubbledot ICG** font.

Command Line Examples Command line examples appear in **Courier New** font. For example, type **ZTOOLS** to get to the Post-Install scripts in the **bin** directory.

Files and Directories File names and directories appear in **Courier New** font. For example, the **Zebra<version number>.tar** file and the **/root** directory.

Icons Used



Caution • Warns you of the potential for electrostatic discharge.



Caution • Warns you of a potential electric shock situation.



Caution • Warns you of a situation where excessive heat could cause a burn.



Caution • Advises you that failure to take or avoid a specific action could result in physical harm to you.

Caution • (No icon) Advises you that failure to take or avoid a specific action could result in physical harm to the hardware.



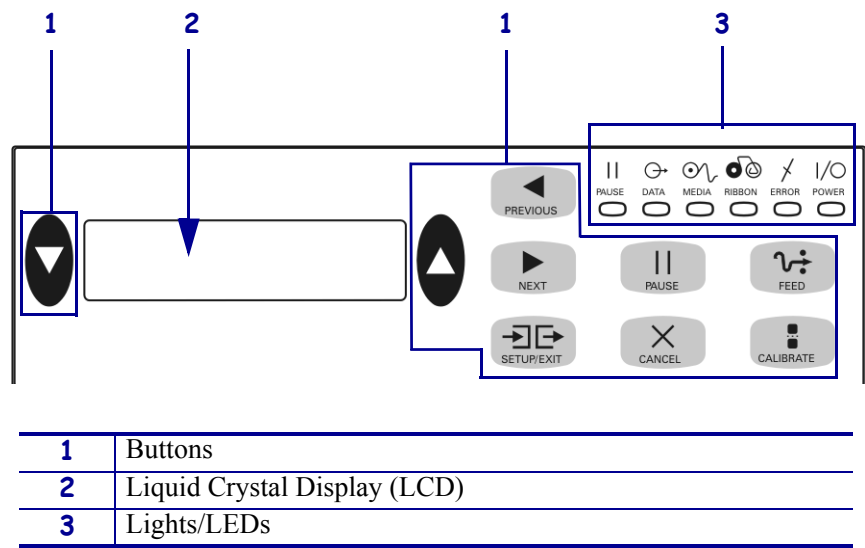
Important • Advises you of information that is essential to complete a task.



Note • Indicates neutral or positive information that emphasizes or supplements important points of the main text.



Example • Provides an example, often a scenario, to better clarify a section of text.





Notes • _____



Introduction

This chapter shows the operational controls and location of major components used when loading media and ribbon.

Contents

Print Engine Exterior View	16
Control Panel	17
Control Panel Buttons	17
Control Panel Indicator Lights (LEDs)	18
Power On/Off Switch	20

Print Engine Exterior View

Print engines are available in a right-hand configuration (media moves from left to right, [Figure 1](#)) and a left-hand configuration (media moves from right to left, [Figure 2](#)).

Figure 1 • Right-Hand (RH) Print Engine

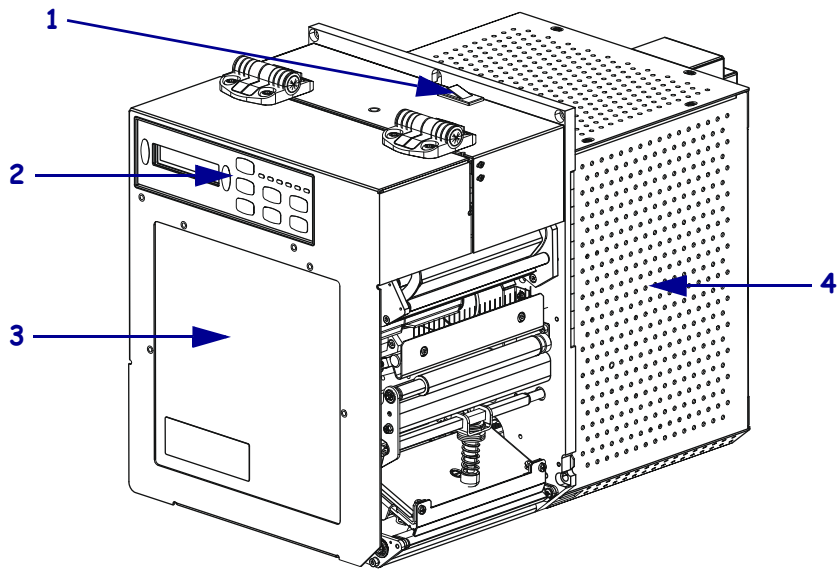
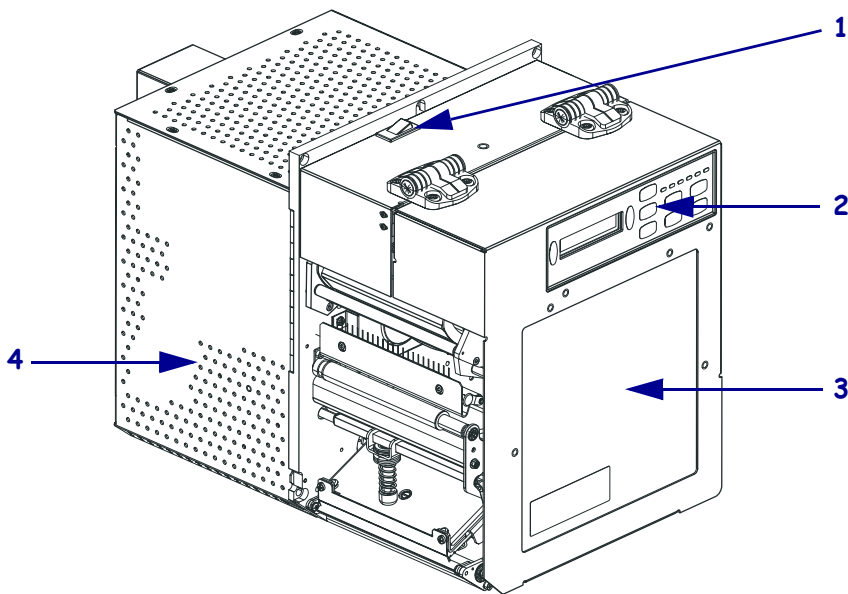


Figure 2 • Left-Hand (LH) Print Engine

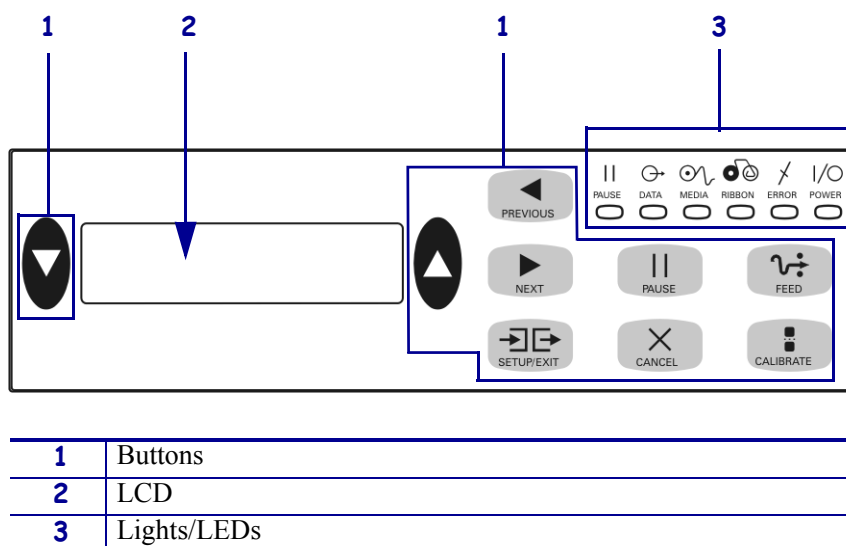


1	Power on/off switch
2	Control panel
3	Media door
4	Electronics cover

Control Panel

All controls and indicators for the print engine are located on the control panel (Figure 3). The Liquid Crystal Display (LCD) shows print engine operating status and feature parameters. The buttons are used to control the print engine operations and change parameters. The lights (LEDs) indicate the print engine's status.

Figure 3 • Control Panel (Right-Hand)



Control Panel Buttons

The control panel buttons are described in Table 1.

Table 1 • Control Panel Buttons

Button	Description/Function
LEFT and RIGHT OVAL	The left and right ovals are used to change parameter values for a parameter being displayed on the LCD. Common uses include increasing or decreasing a value, answering yes or no, indicating ON or OFF, and scrolling through choices.
PREVIOUS	Scrolls the LCD to the previous parameter.
NEXT	Scrolls the LCD to the next parameter.
SETUP/EXIT	Enters and exits configuration mode.
PAUSE	Stops and restarts the printing process or removes error messages and clears the LCD. If a label is printing, it is completed before the printing process stops. When the print engine is paused, the PAUSE light is ON.

Table 1 • Control Panel Buttons (Continued)

Button	Description/Function
CANCEL	CANCEL functions only in Pause mode. Pressing CANCEL has these effects: • Cancels the label format that is currently printing. • If no label format is printing, the next one to be printed is canceled. • If no label formats are waiting to be printed, CANCEL is ignored. To clear the print engine's entire label format memory, press and hold CANCEL until the DATA light turns off.
FEED	Feeds a blank label. • If the print engine is idle or paused, the label is fed immediately. • If the print engine is printing, the label is fed after the current batch prints.
CALIBRATE	CALIBRATE functions only in Pause mode. Press CALIBRATE to recalibrate for proper media length, to set media type (continuous/non-continuous), and to set print method (direct thermal/thermal transfer).

Control Panel Indicator Lights (LEDs)

The control panel lights are described in [Table 2](#).

Table 2 • Control Panel Lights

LED	OFF Indicates	ON Indicates	FLASHING Indicates
POWER (Green)	The print engine is OFF, or no power to print engine.	Power switch is ON, and power is being supplied to the print engine.	—
PAUSE (Yellow)	Normal operation.	One of the following: • The print engine is paused because of an error condition (printhead, ribbon, or paper error). Usually occurs in conjunction with another LED. • PAUSE was pressed. • A pause was requested from the Applicator Port. • A pause was received as part of the label format.	—
DATA (Green)	No data being received or processed.	Data is processing or printing is taking place. No data is being received.	The print engine is receiving data from or sending status information to the host computer.
MEDIA (Yellow)	Normal operation. Media properly loaded.	Out of media (print engine is paused, LCD displays error message, and PAUSE light is ON).	—

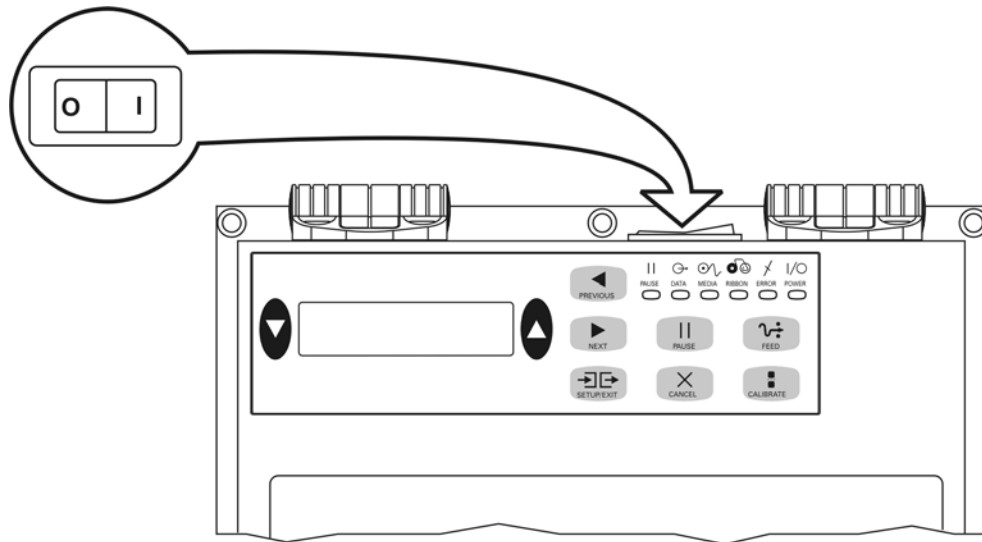
Table 2 • Control Panel Lights (Continued)

LED	OFF Indicates	ON Indicates	FLASHING Indicates
RIBBON (Yellow)	Normal operation. Ribbon properly loaded.	Ribbon in while print engine is in direct thermal mode, or no ribbon loaded while the print engine is in thermal transfer mode. The print engine is paused, LCD displays error message, and PAUSE light is ON.	—
ERROR (Orange)	No print engine errors.	—	A print engine error exists. Check the LCD for status.

Power On/Off Switch

The print engine power switch is located above the control panel, as shown in [Figure 4](#). When this switch is placed in the ON (I) position, the POWER light turns on, and the print engine automatically performs a Power-On Self Test (POST). For more information, see [Power-On Self Test](#) on page 119.

Figure 4 • Power Switch Location (Right-Hand)





Print Engine Setup

This section provides the tasks that you must complete and the issues that you must consider before you load and configure your print engine.

Contents

Before You Begin	22
Handling the Print Engine	23
Unpack and Inspect the Print Engine.	23
Store the Print Engine	23
Ship the Print Engine	23
Print Engine Installation	25
Requirements.	25
Dimensions and Clearance Needs	26
Install the Print Engine in an Applicator	29
Select a Data Communication Interface.	31
Data Cables and Wireless Cards	32
Connect the Print Engine to a Power Source.	33
Power Cord Specifications.	34
Types of Media.	35
Ribbon Overview	37
When to Use Ribbon	37
Coated Side of Ribbon.	37

Before You Begin

Review this checklist, and resolve any issues before you set up or use your print engine.

- ❑ **Unpack and Inspect the Print Engine** Have you unpacked the print engine and inspected it for damage? If you have not, see [Unpack and Inspect the Print Engine on page 23](#).
- ❑ **Install the Print Engine** Have you considered what factors will affect how the print engine is installed into an applicator? Is the print engine mounted in an applicator? For information, see [Print Engine Installation on page 25](#).
- ❑ **Connect to a Data Source** Have you determined how the print engine will connect to a data source (usually a computer)? For more information, see [Select a Data Communication Interface on page 31](#).
- ❑ **Attach a Power Cord** Do you have the correct power cord for your print engine? If you are unsure, see [Power Cord Specifications on page 34](#). To attach the power cord and connect the print engine to a power source, see [Connect the Print Engine to a Power Source on page 33](#).
- ❑ **Select Media** Do you have the correct media for your application? If you are unsure, see [Types of Media on page 35](#).
- ❑ **Select Ribbon** Do you need to use ribbon, and is the appropriate ribbon available, if needed? If you are unsure, see [Ribbon Overview on page 37](#).

Handling the Print Engine

This section describes how to handle your print engine.

Unpack and Inspect the Print Engine

When you receive the print engine, immediately unpack it and inspect for shipping damage.

- Save all packing materials.
- Check all exterior surfaces for damage.
- Raise the media door, and inspect the media compartment for damage to components.

If you discover shipping damage upon inspection:

- Immediately notify the shipping company and file a damage report.
- Keep all packaging material for shipping company inspection.
- Notify your authorized Zebra reseller



Important • Zebra Technologies is not responsible for any damage incurred during the shipment of the equipment and will not repair this damage under warranty.

Store the Print Engine

If you are not placing the print engine into immediate operation, repackage it using the original packing materials. You may store the print engine under the conditions shown in [Table 3](#).

Table 3 • Storage Temperature and Humidity

Temperature	Relative Humidity
–40°F to 160°F (–40° to 71°C)	5% to 95% non-condensing

Ship the Print Engine

If you must ship the print engine:

- Turn off (O) the print engine, and disconnect all cables.
- Remove any media, ribbon, or loose objects from the print engine interior.
- Close the printhead.
- Carefully pack the print engine into the original container or a suitable alternate container to avoid damage during transit. A shipping container can be purchased from Zebra if the original packaging has been lost or destroyed.

Recycle the Print Engine



This print engine is recyclable. If you must dispose of the print engine, do not do so in unsorted municipal waste. Please recycle according to your local standards. For more information, see <http://www.zebra.com/environment>.

Print Engine Installation

This section provides basic information for mounting the print engine into an applicator. The illustrations in this section show the print engine from different angles and include dimensions and clearance needs.

Requirements

Stability When the print engine is mounted, the complete assembly must be physically stable. When the print engine is loaded with ribbon and media, the equipment must not become physically unstable.

Ventilation and Temperature Provide ventilation for the print engine mounting enclosure to remove heat and ensure uninterrupted, trouble-free operation of the print engine. Ambient air temperature surrounding the print engine must not exceed the following:

- Temperature: 32° to 105°F (0° to 41°C)
- Relative humidity: 20% to 95% non-condensing

Power Requirements Consider the current rating of the print engine during installation. When power is applied to the print engine and the enclosing equipment, an overload condition must not be created.

Grounding Requirements Maintain reliable grounding of the print engine. Pay particular attention to the AC power supply connections so that earth ground is maintained through the AC power input connector.

Clearance for Cables and Connectors Allow ample space at the rear of the print engine for electronic connectors and dressing of the following cables: IEC power cord, serial and/or parallel host communication cable, optional host communication cable (Ethernet), and the discrete signal (applicator) interface cable.

Power Cord Requirements The IEC power cord does not have a strain relief on the print engine. If the operating characteristics of the applicator include vibration or strain on the power cord, provide an appropriate clamping mechanism to avoid unintentional disconnection of the power cord from the print engine.

Dimensions and Clearance Needs

Figure 5 • Front View of Right-Hand Print Engine

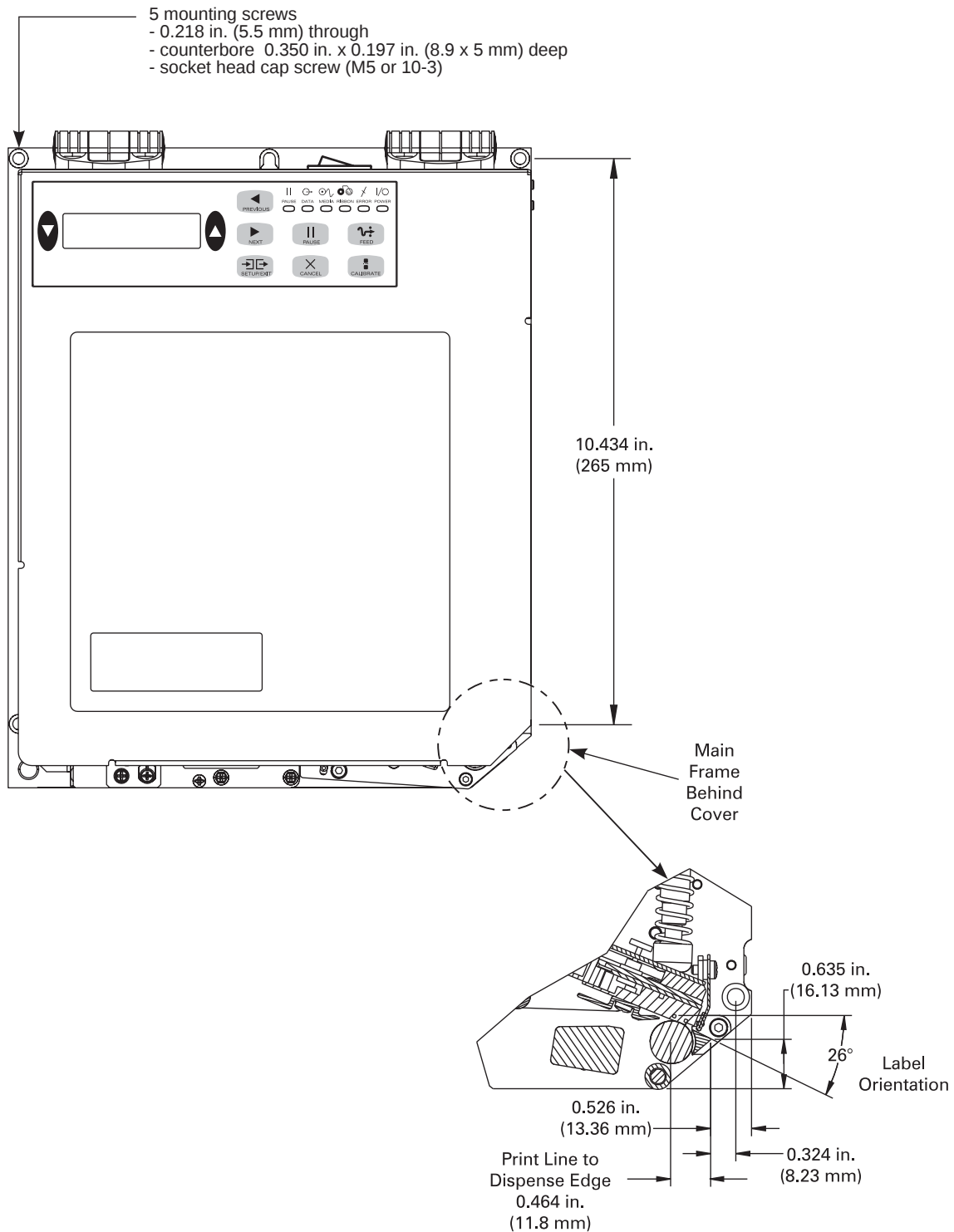


Figure 6 • Right Side View of Right-Hand Print Engine

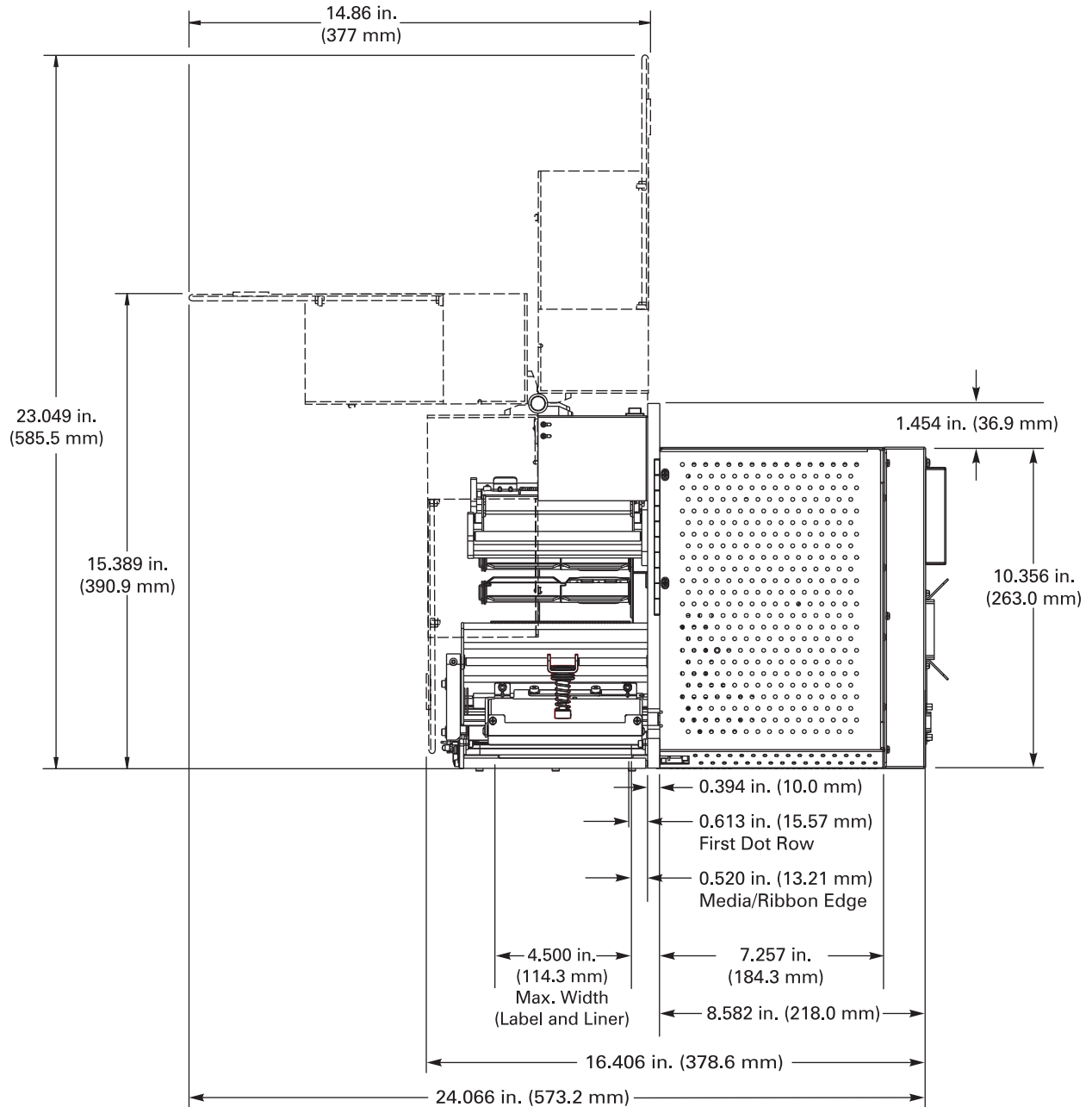


Figure 7 • Rear View of Right-Hand Print Engine

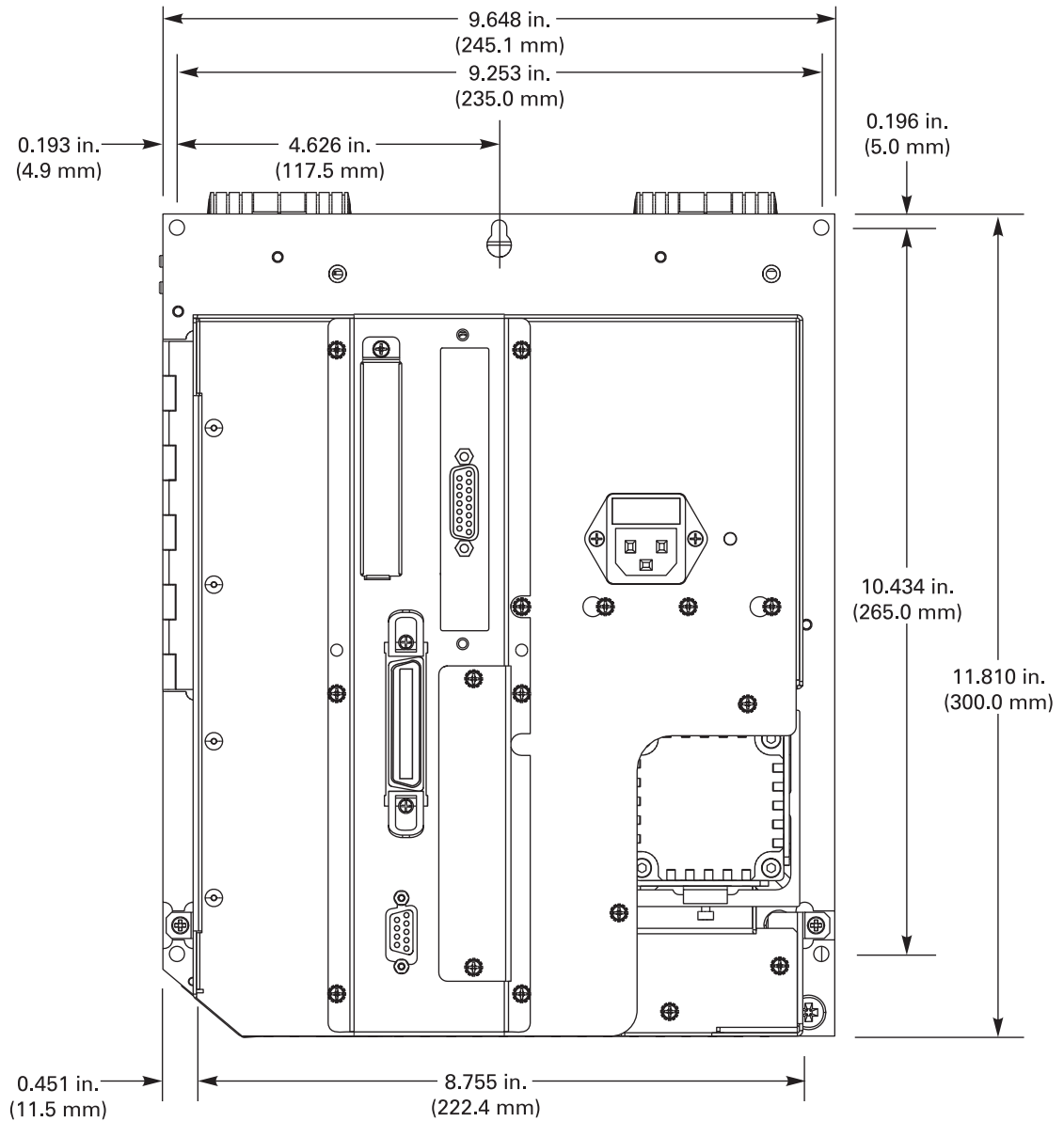
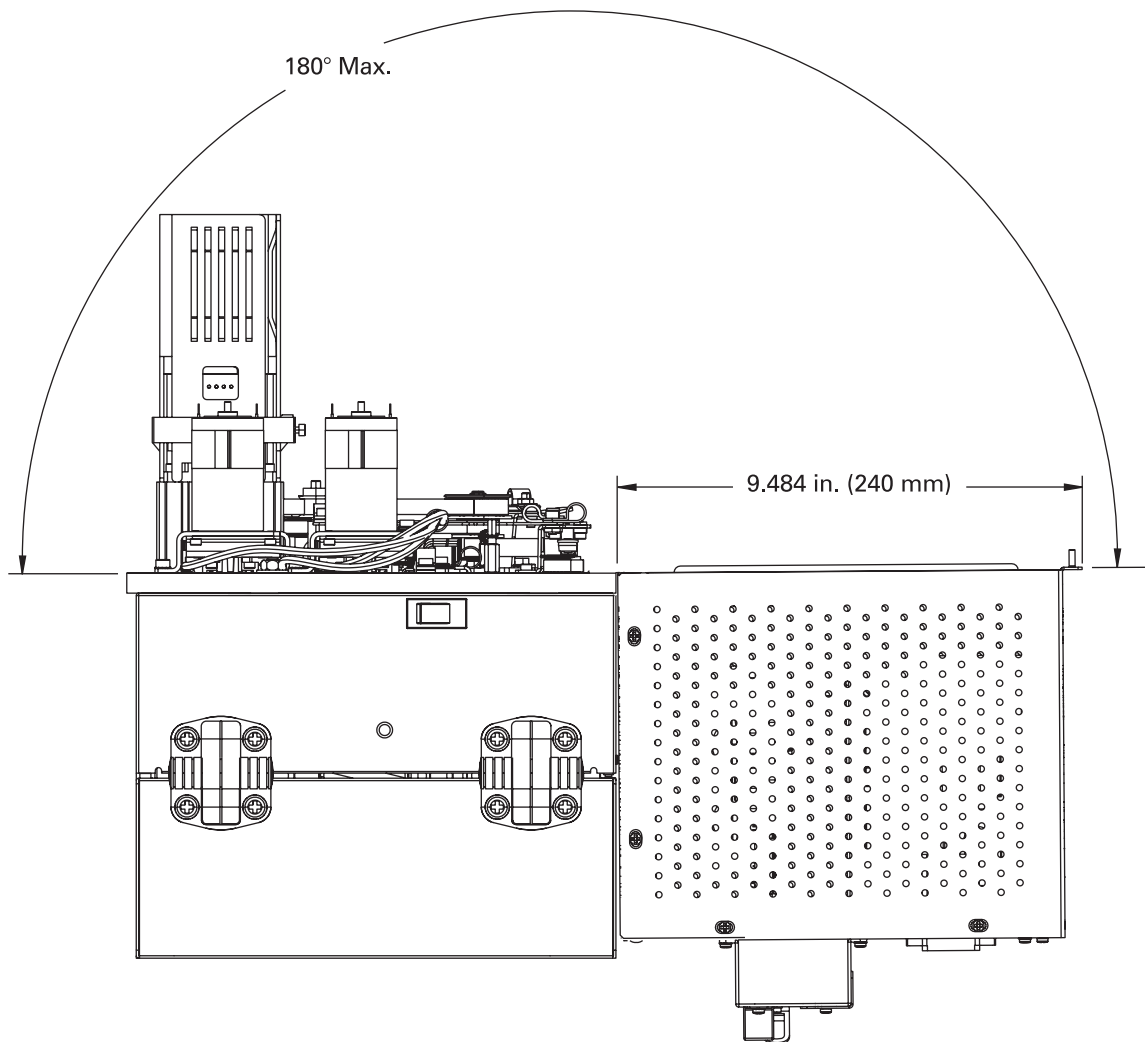


Figure 8 • Top View of Right-Hand Print Engine



Install the Print Engine in an Applicator

This section provides the basic instructions for installing the print engine into an applicator.



Caution • If the print engine is installed improperly, it could fall out of the applicator and cause injury. The center mounting bolt and four mounting screws must be installed and secured. See [Figure 9](#) for the location of the bolt and screws.

To install the print engine into an applicator, complete these steps:

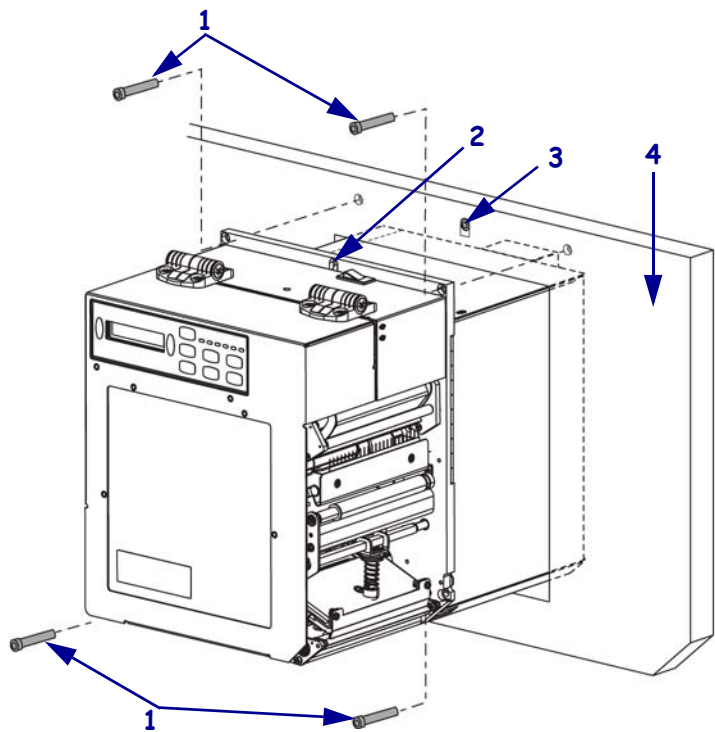
1. See [Figure 9](#). Install the center mounting bolt into the center hole on the applicator.
2. Carefully place the keyhole on the center mounting bolt.



Note • The keyhole and the center mounting bolt are designed to support the print engine and assist in installing and removing the four mounting screws.

3. Install the four corner mounting screws to secure the print engine to the applicator.

Figure 9 • Front View of Print Engine in Applicator



1	Mounting screws (four total)
2	Keyhole
3	Center mounting bolt (shown inside hole on applicator)
4	Applicator

Select a Data Communication Interface

Table 4 provides basic information about data communication interfaces that you can use to connect your print engine to a computer. You may send label formats to the print engine through any data communication interface that is available. Select an interface that is supported by both your print engine and your computer or your Local Area Network (LAN).

Table 4 also shows how to connect the different types of data cables to your print engine and computer. The connectors on the back of your computer may be in different locations than on the sample computer shown in this section.

Caution • Ensure that the print engine power is off (O) before connecting data communications cables. Connecting a data communications cable while the power is on (I) may damage the print engine.

Table 4 • Data Communication Interfaces

Interface	Standard or Optional	Description
RS-232 Serial	Standard	Limitations and Requirements - Maximum cable length of 50 ft (15.24 m). - You may need to change print engine parameters to match the host computer. - You need to use a null-modem adaptor to connect to the print engine if using a standard modem cable.
IEEE 1284 Bidirectional Parallel	Standard	Limitations and Requirements - Maximum cable length of 10 ft (3 m). - Recommended cable length of 6 ft (1.83 m). - No print engine parameter changes required to match the host computer.
Internal wired Ethernet print server	Optional	Limitations and Requirements - Can print to the print engine from any computer on your LAN. - Can communicate with the printer through the print engine's web pages when in ZPL mode. - The printer must be configured to use your LAN.
Wireless Ethernet print server	Optional	Limitations and Requirements - Can print to the print engine from any computer on your Wireless Local Area Network (WLAN). - Can communicate with the printer through the print engine's web pages when in ZPL mode. - The print engine must be configured to use your WLAN. Configuration Refer to the <i>ZebraNet Wireless User Guide</i> for configuration instructions. A copy of this manual is available at http://www.zebra.com/manuals or on the user CD that came with your print engine.

Data Cables and Wireless Cards

You must supply all data cables or removeable radio cards for your application. (Some wireless print servers come with an integrated radio card.)

Data Cables Ethernet cables do not require shielding, but all other data cables must be fully shielded and fitted with metal or metallized connector shells. Unshielded data cables may increase radiated emissions above the regulated limits.

To minimize electrical noise pickup in the cable:

- Keep data cables as short as possible.
- Do not bundle the data cables tightly with the power cords.
- Do not tie the data cables to power wire conduits.

Wireless Cards For supported wireless cards, refer to the *ZebraNet Wireless User Guide*. A copy of the manual is available at <http://www.zebra.com/manuals> or on the user CD that came with your print engine.

Connect the Print Engine to a Power Source

The power supply in the print engine automatically detects the applied line voltage and works in the 90 to 264 VAC, 47 to 63 Hz range.

The AC power cord must have a three-prong female connector on one end that plugs into the mating AC power connector at the rear of the print engine. If a power cable was not included with your print engine, refer to [Power Cord Specifications on page 34](#).

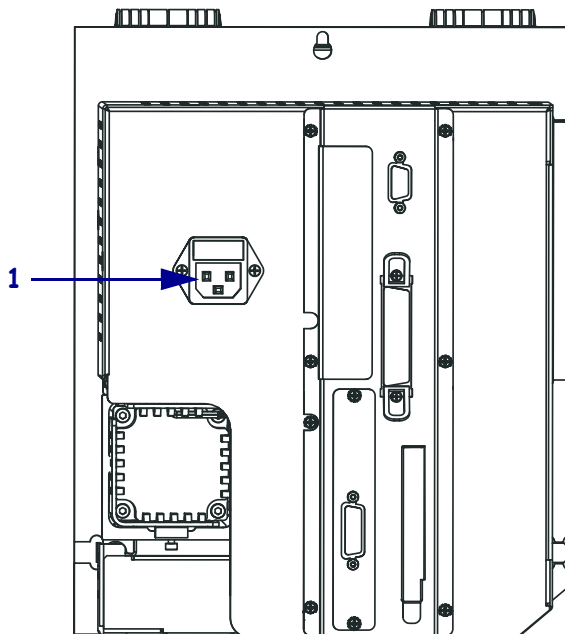


Caution • For personnel and equipment safety, always use an approved three-conductor power cord specific to the region or country intended for installation. This cord must use an IEC 320 female connector and the appropriate region-specific three-conductor grounded plug configuration.

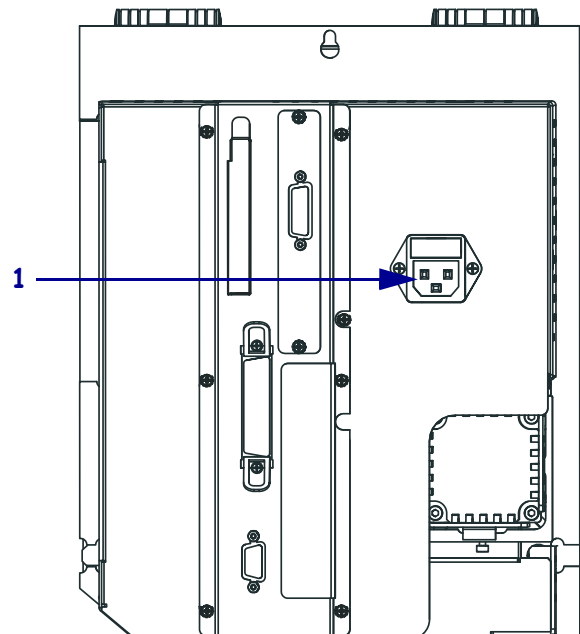
To connect the print engine to a power source, complete these steps:

1. Toggle the print engine power switch to the off (O) position.
2. Plug the power cord into the AC power connector (1) on the rear of the print engine.

Left-Hand



Right-Hand



1	AC power connector
---	--------------------

3. Plug the other end of the power cord into a power outlet near the print engine.
4. Turn on (I) the print engine.
The control panel LCD and lights activate, indicating that the printer is booting up.

Power Cord Specifications



Caution • For personnel and equipment safety, always use an approved three-conductor power cord specific to the region or country intended for installation. This cord must use an IEC 320 female connector and the appropriate region-specific, three-conductor grounded plug configuration.

Depending on how your print engine was ordered, a power cord may or may not be included. If one is not included or if the one included is not suitable for your requirements, see [Figure 10](#) and refer to the following guidelines:

- The overall cord length must be less than 9.8 ft. (3 m).
- The cord must be rated for at least 10 A, 250 V.
- The chassis ground (earth) **must** be connected to ensure safety and reduce electromagnetic interference.

Figure 10 • Power Cord Specifications

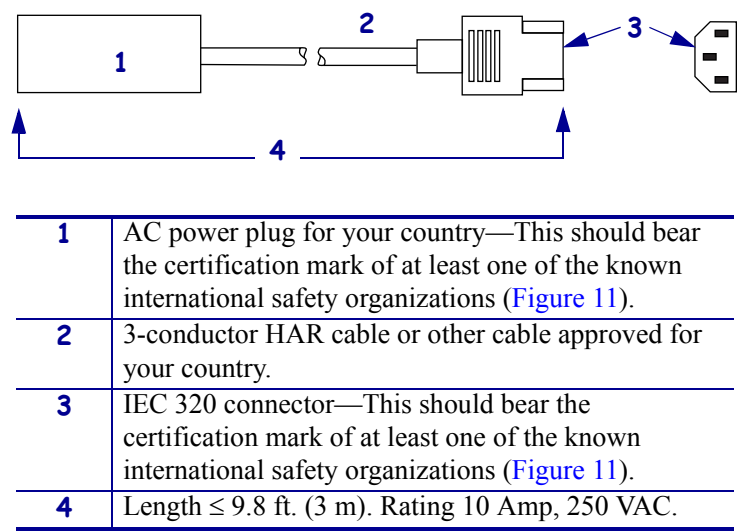


Figure 11 • International Safety Organization Certifications



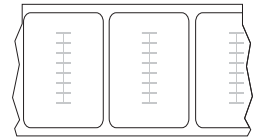
Types of Media



Important • Zebra strongly recommends the use of Zebra-brand supplies for continuous high-quality printing. A wide range of paper, polypropylene, polyester, and vinyl stock has been specifically engineered to enhance the printing capabilities of the print engine and to prevent premature printhead wear. To purchase supplies, go to <http://www.zebra.com/howtobuy>.

Your print engine can use various types of media:

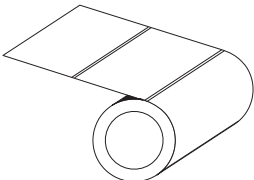
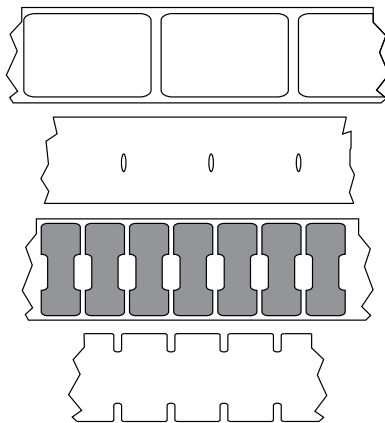
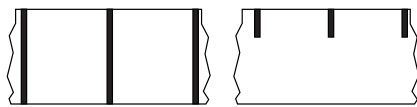
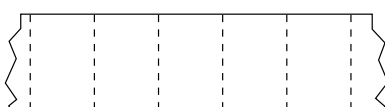
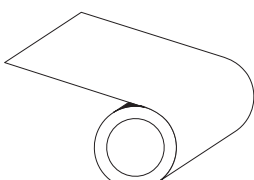
- *Standard media*—Most standard media uses an adhesive backing that sticks individual labels or a continuous length of labels to a liner.
- *Tag stock*—Tags are usually made from a heavy paper. Tag stock does not have adhesive or a liner, and it is typically perforated between tags.
- *Radio frequency identification (RFID) “smart” media*—RFID media can be used in a printer that is equipped with an RFID reader/encoder. RFID labels are made from the same materials and adhesives as non-RFID labels. Each label has an RFID transponder (sometimes called an “inlay”), made of a chip and an antenna, embedded between the label and the liner. The shape of the transponder varies by manufacturer and is visible through the label. All “smart” labels have memory that can be read, and many have memory that can be encoded.



Important • Transponder placement within a label depends on the transponder type and the printer model. Make sure that you are using the correct “smart” media for your printer. For more information, refer to the RFID Programming Guide. A copy is available at <http://www.zebra.com/manuals> or on the user CD that came with your print engine.

Table 5 describes roll and fanfold media. Roll media is loaded into the printer while fanfold media may be located inside or outside of the printer.

Table 5 • Roll and Fanfold Media

Media Type	How It Looks	Description
Non-Continuous Roll Media		Roll media is wound on a 3-in. (76-mm) core. Individual labels are separated by one or more of the following methods: • <i>Web media</i> separates labels by gaps, holes, or notches.  • <i>Black mark media</i> uses pre-printed black marks on the back side of the media to indicate label separations.  • <i>Perforated media</i> has perforations that allow the labels or tags to be separated from each other easily. The media may also have black marks or other separations between labels or tags. 
Continuous Roll Media		Roll media is wound on a 3-in. (76-mm) core. Continuous roll media does not have gaps, holes, notches, or black marks to indicate label separations. This allows the image to be printed anywhere on the label. Sometimes a cutter is used to cut apart individual labels.

Ribbon Overview

Ribbon is a thin film that is coated on one side with wax, resin, or wax resin, which is transferred to the media during the thermal transfer process. The media determines whether you need to use ribbon and how wide the ribbon must be.

When ribbon is used, it must be as wide as or wider than the media being used. If the ribbon is narrower than the media, areas of the printhead are unprotected and subject to premature wear.

When to Use Ribbon

Thermal transfer media requires ribbon for printing while direct thermal media does not. To determine if ribbon must be used with a particular media, perform a media scratch test.

To perform a media scratch test, complete these steps:

1. Scratch the print surface of the media rapidly with your fingernail.
2. Did a black mark appear on the media?

If a black mark...	Then the media is...
Does not appear on the media	Thermal transfer. A ribbon is required.
Appears on the media	Direct thermal. No ribbon is required.

Coated Side of Ribbon

Ribbon can be wound with the coated side on the inside or outside (Figure 12). This print engine can only use ribbon that is coated on the outside. If you are unsure which side of a particular roll of ribbon is coated, perform an adhesive test or a ribbon scratch test to determine which side is coated.

Figure 12 • Ribbon Coated on Outside or Inside



Adhesive Test

If you have labels available, perform the adhesive test to determine which side of a ribbon is coated. This method works well for ribbon that is already installed.

To perform an adhesive test, complete these steps:

1. Peel a label from its liner.
2. Press a corner of the sticky side of the label to the outer surface of the roll of ribbon.
3. Peel the label off of the ribbon.
4. Observe the results. Did flakes or particles of ink from the ribbon adhere to the label?

If ink from the ribbon...	Then...
Adhered to the label	The ribbon is coated on the outside and can be used in this printer.
Did not adhere to the label	The ribbon is coated on the inside and cannot be used in this print engine. To verify this, repeat the test on the other surface of the roll of ribbon.

Ribbon Scratch Test

Perform the ribbon scratch test when labels are unavailable.

To perform a ribbon scratch test, complete these steps:

1. Unroll a short length of ribbon.
2. Place the unrolled section of ribbon on a piece of paper with the outer surface of the ribbon in contact with the paper.
3. Scratch the inner surface of the unrolled ribbon with your fingernail.
4. Lift the ribbon from the paper.
5. Observe the results. Did the ribbon leave a mark on the paper?

If the ribbon...	Then...
Left a mark on the paper	The ribbon is coated on the outer surface.
Did not leave a mark on the paper	The ribbon is coated on the inner surface and cannot be used in this print engine. To verify this, repeat the test on the other surface of the roll of ribbon.



Operations

If you have completed the tasks and resolved the issues in [Print Engine Setup on page 21](#), follow the instructions in this chapter to load and calibrate your print engine.

Contents

Load Media	40
Load Ribbon	46
Remove Used Ribbon	52
Calibrate the Print Engine	53
Adjust Ribbon and Media Sensors	55
Ribbon Sensor	55
Reflective Media Sensor	55
Transmissive Media Sensor	55

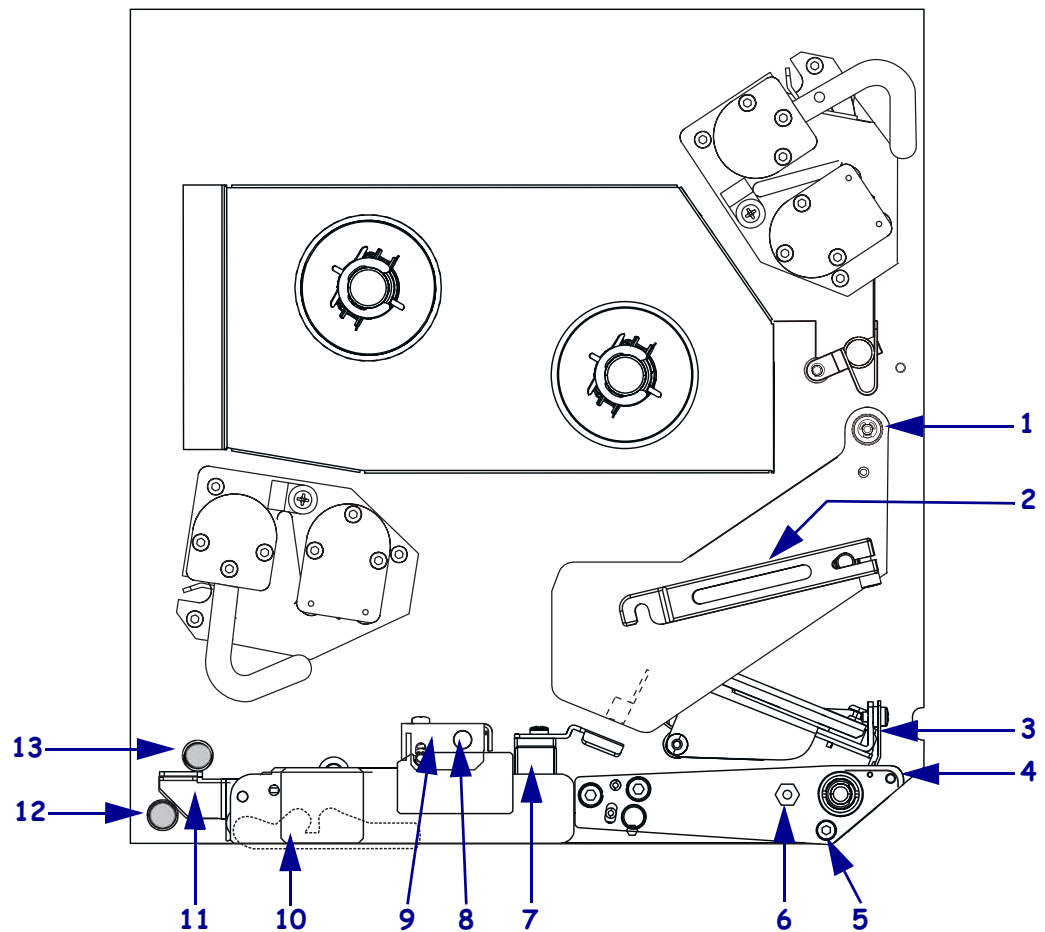
Load Media



Important • If the print engine power is Off (O), rollers in the print engine can turn if you pull on the media. This could cause loaded ribbon to become slack and possibly wrap around the auxiliary roller. If you load or unload media with the power off, inspect the auxiliary roller to make sure that no ribbon is wrapped around it before turning On (I) the power.

Figure 13 identifies the media-handling components. Figure 14 on page 41 shows the print engine with media loaded.

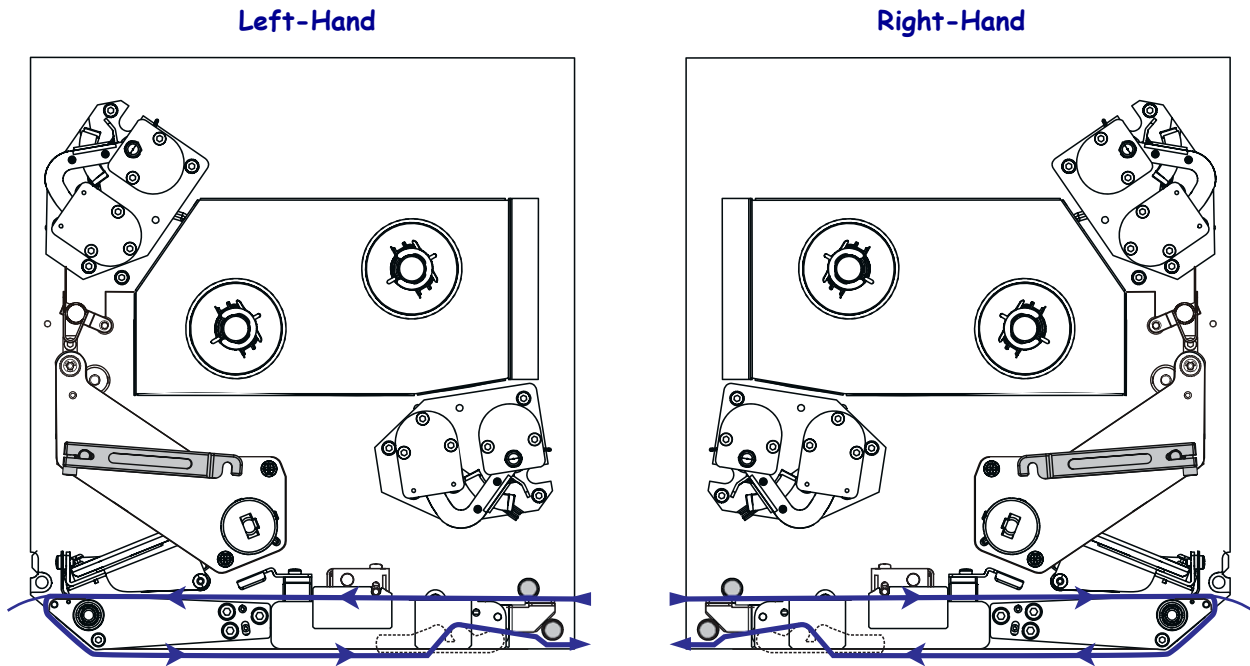
Figure 13 • Components for Media Loading



1	Auxiliary roller
2	Printhead latch
3	Printhead assembly
4	Peel bar
5	Media liner roller
6	Printhead locking pin
7	Outer media guide

8	Pinch roller release button
9	Pinch roller assembly
10	Peel roller assembly
11	Peel roller latch
12	Lower guide post
13	Upper guide post

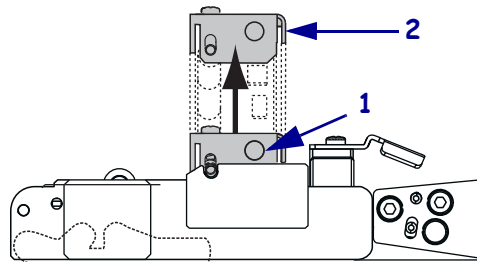
Figure 14 • Loaded Media



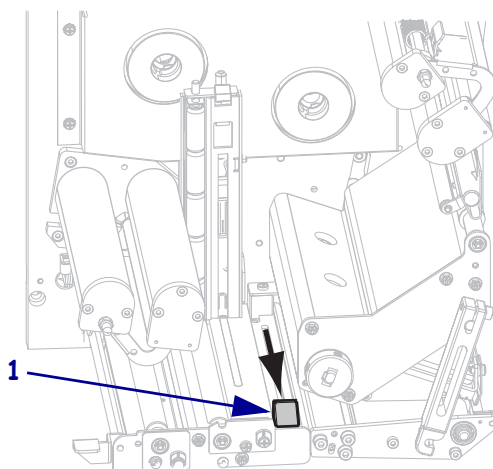
Caution • While performing any tasks near an open printhead, remove all rings, watches, hanging necklaces, identification badges, or other metallic objects that could touch the printhead. You are not required to turn off the printer power when working near an open printhead, but Zebra recommends it as a precaution. If you turn off the power, you will lose all temporary settings, such as label formats, and you must reload them before you resume printing.

To load media, complete these steps:

1. Load media on the media supply reel of the applicator (refer to the applicator's user guide).
2. Open the media door.
3. Press the release button (1) on the pinch roller assembly (2), and allow the assembly to pivot up.

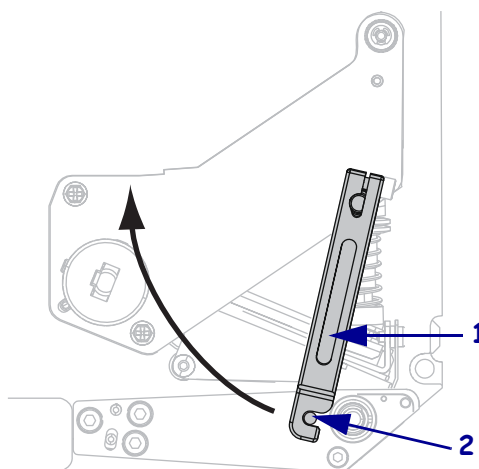


4. Slide the outer media guide (1) all the way out.

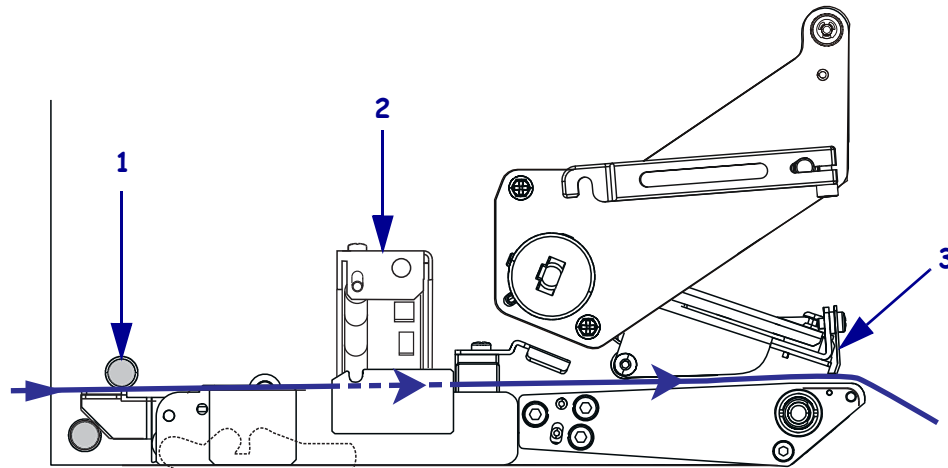


5. **Caution** • The printhead may be hot and could cause severe burns. Allow the printhead to cool.

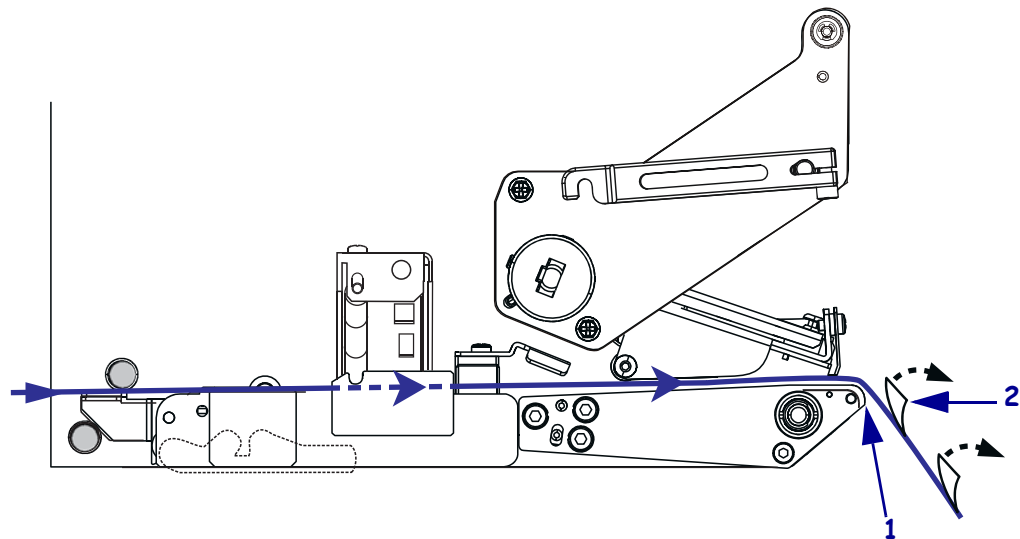
Open the printhead assembly by unlatching the printhead latch (1) from the locking pin (2).



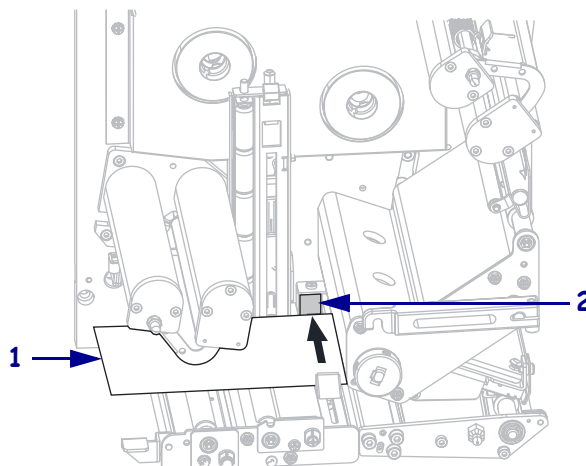
6. Thread the media under the upper guide post (1), below the pinch roller assembly (2), and under the printhead assembly (3).



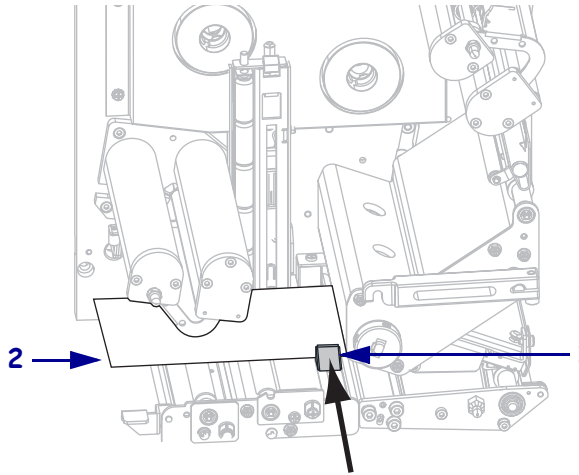
7. Extend approximately 30 in. (75 cm) of media past the peel bar (1). Remove and discard the labels (2) from this exposed media.



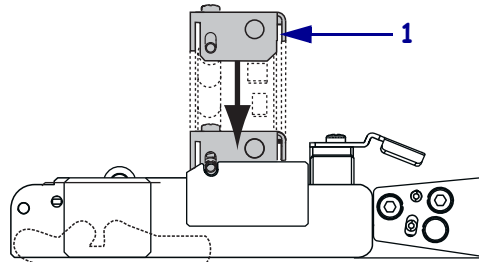
8. Position the media (1) so that it is aligned with and just touching the inner media guide (2).



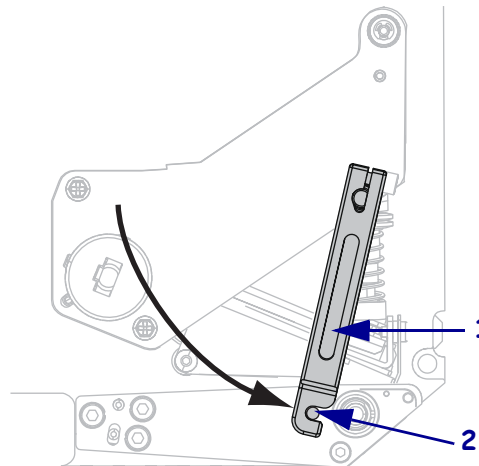
9. Position the outer media guide (1) so that it just touches the outer edge of the media (2).



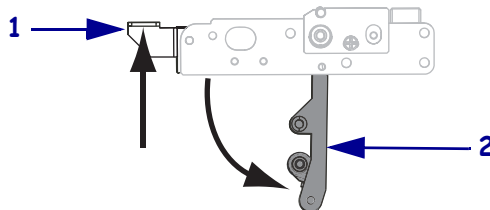
10. Press down on the pinch roller assembly (1) until it locks closed.



11. Close the printhead assembly by rotating the printhead latch (1) until it latches onto the locking pin (2).



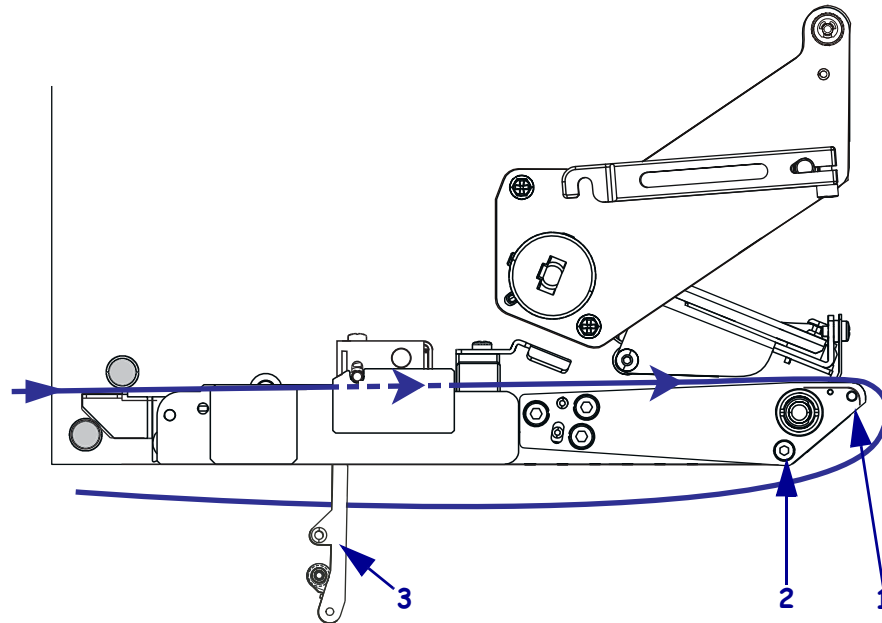
12. Raise the peel roller latch (1) so that the peel roller assembly (2) pivots down.



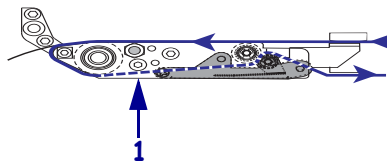
13. Thread the media liner around the peel bar (1), under the media liner roller (2), and through the peel roller assembly (3).



Note • If the applicator has an air tube, route the media liner between the air tube and the peel bar. Do not thread the media liner over the air tube.



14. Rotate the peel roller assembly (1) up until it locks into the closed position.



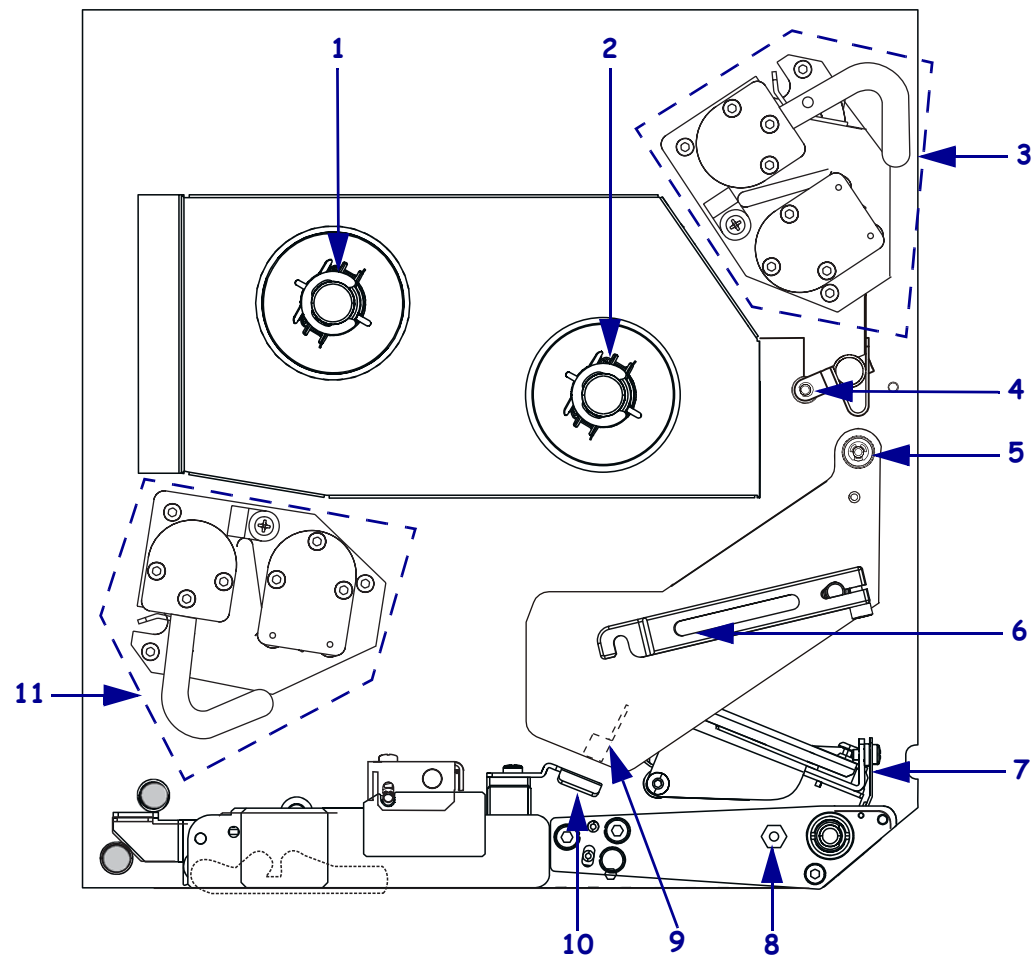
15. Thread the media liner around the take-up spindle of the applicator (refer to the applicator's user guide).
16. Close the media door.

Load Ribbon

Use ribbon with thermal transfer media. The ribbon must be coated on the outside and wider than the media. If the ribbon is narrower than the media, areas of the printhead are unprotected and subject to premature wear.

Figure 15 identifies the ribbon system components inside the media compartment of a right-hand print engine. A left-hand unit contains a mirror image of these components. Figure 16 on page 47 shows the print engine with ribbon loaded.

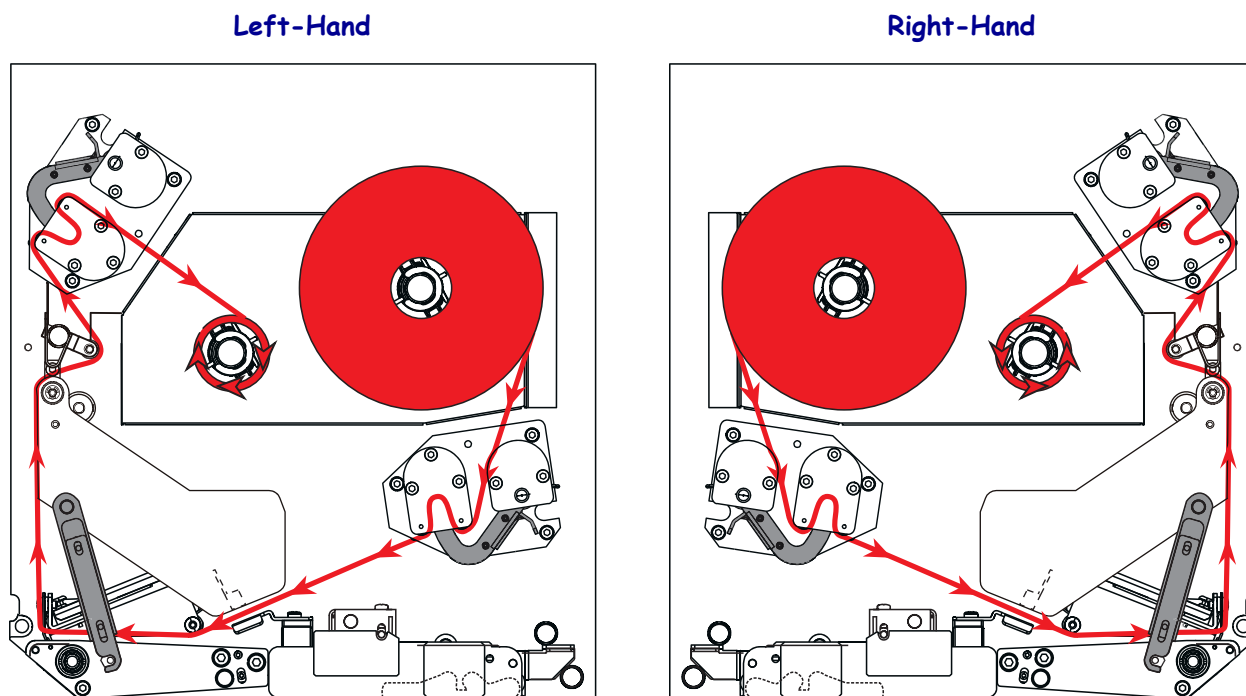
Figure 15 • Components for Ribbon Loading



1	Ribbon supply spindle
2	Ribbon take-up spindle
3	Upper dancer assembly
4	Idler roller
5	Auxiliary roller
6	Printhead latch

7	Printhead assembly
8	Locking pin
9	Ribbon sensor
10	Ribbon sensor reflector
11	Lower dancer assembly

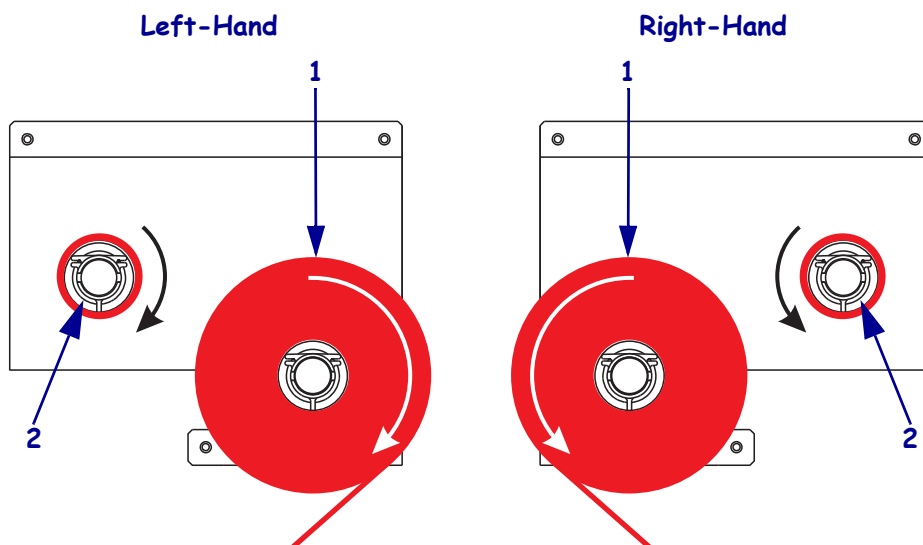
Figure 16 • Loaded Ribbon



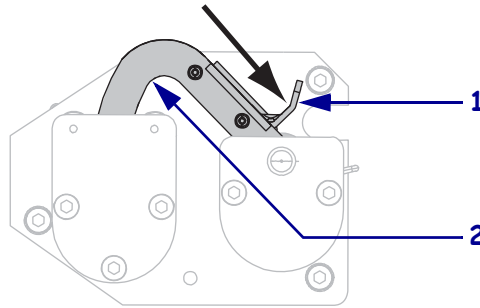
Caution • While performing any tasks near an open printhead, remove all rings, watches, hanging necklaces, identification badges, or other metallic objects that could touch the printhead. You are not required to turn off the printer power when working near an open printhead, but Zebra recommends it as a precaution. If you turn off the power, you will lose all temporary settings, such as label formats, and you must reload them before you resume printing.

To load ribbon, complete these steps:

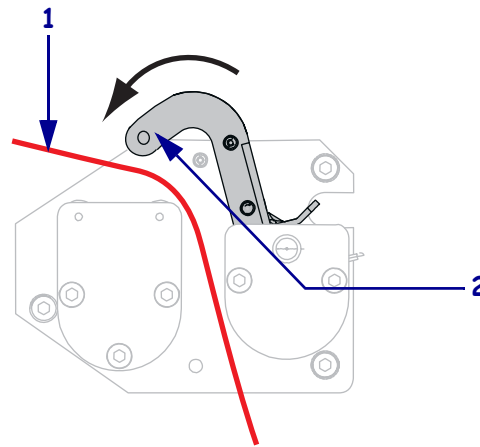
1. Place a full ribbon roll (1) onto the ribbon supply spindle (2) so that the ribbon rotates as shown, and then push the roll toward the print engine frame until it is fully seated.



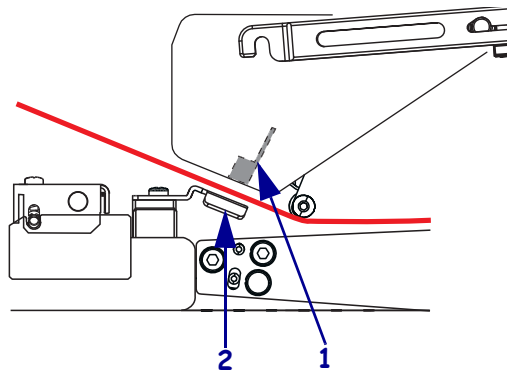
2. On the lower dancer assembly, squeeze the opening tabs (1) to pivot open the dancer arm (2).



3. Carefully thread the ribbon (1) through the lower dancer assembly, and then slowly release the dancer arm (2).



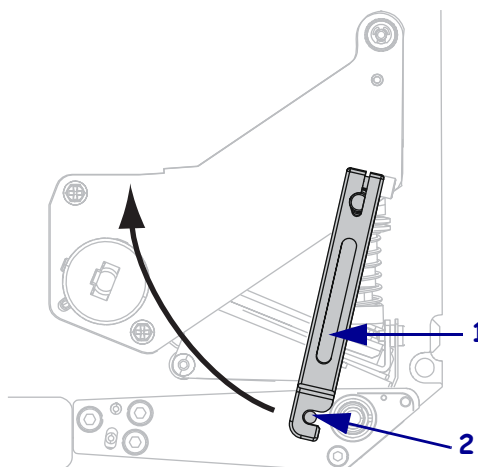
4. Thread the ribbon between the ribbon sensor (1) and the ribbon sensor reflector (2).



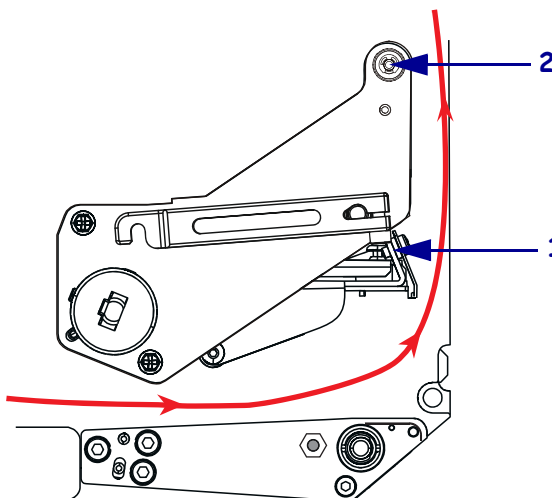


5. **Caution** • The printhead may be hot and could cause severe burns. Allow the printhead to cool.

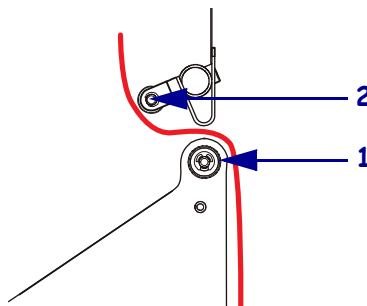
Open the printhead assembly by unlatching the printhead latch (1) from the locking pin (2).



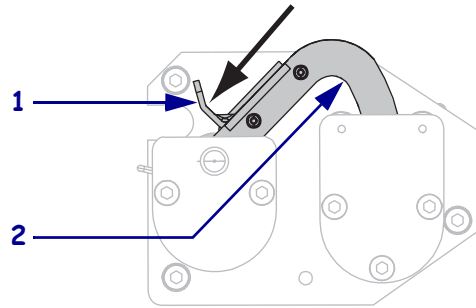
6. Thread the ribbon under the printhead assembly (1) and then up toward the auxiliary roller (2).



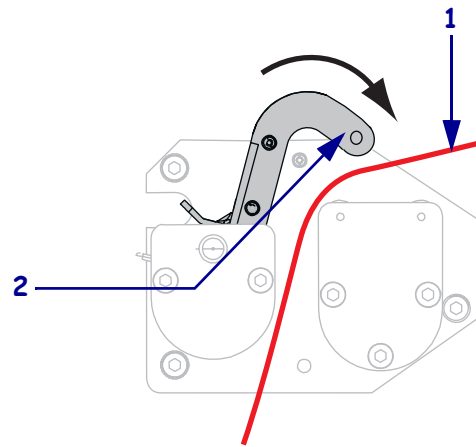
7. Thread the ribbon over the auxiliary roller (1), around the idler roller (2), and then up toward the upper dancer assembly.



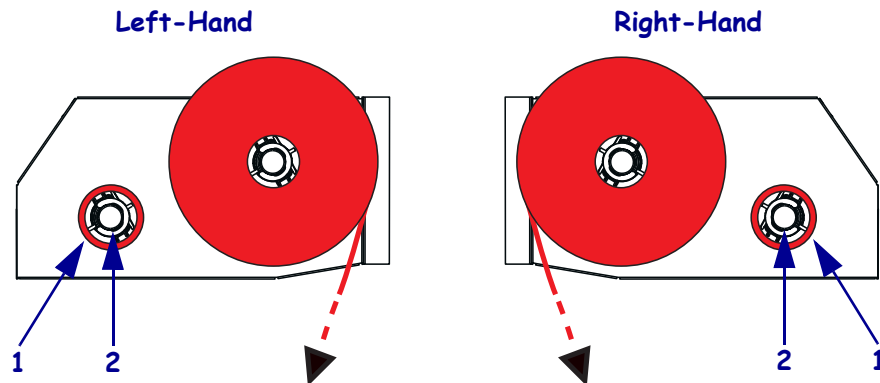
8. On the upper dancer assembly, squeeze the opening tabs (1) to pivot open the dancer arm (2).



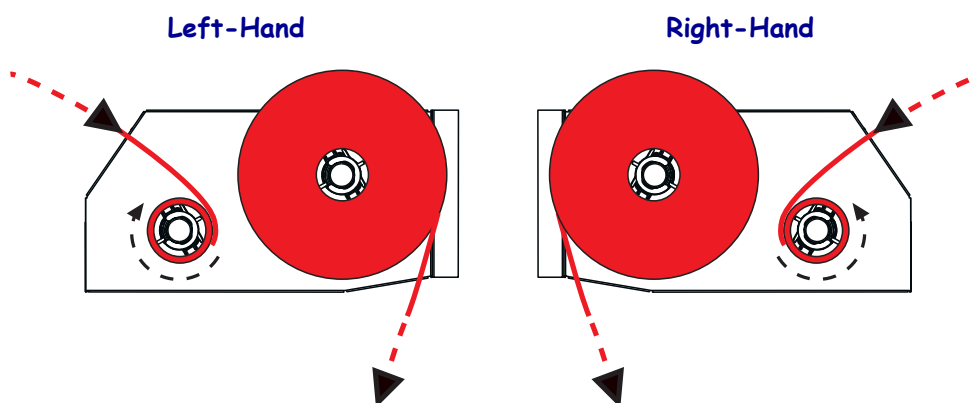
9. Carefully thread the ribbon (1) through the upper dancer assembly, and then slowly release the dancer arm (2).



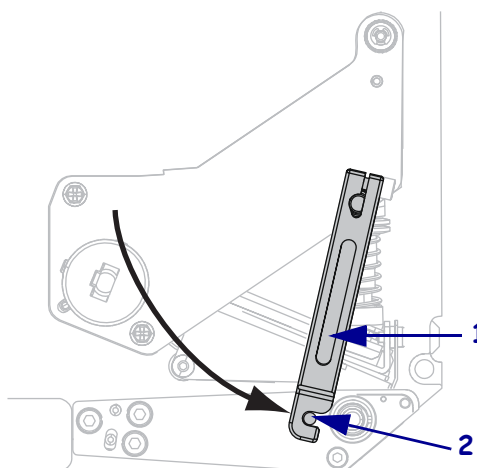
10. Place an empty ribbon core (1) onto the ribbon take-up spindle (2). Push the core toward the print engine frame until it is fully seated.



11. Attach the end of the ribbon to the empty ribbon core with adhesive tape or a label, and wind for several turns in the direction shown. Ensure that the ribbon winds evenly on the spindle.



12. Close the printhead assembly by rotating the printhead latch (1) until it latches onto the locking pin (2).



13. Close the media door.

Remove Used Ribbon

To remove used ribbon, complete these steps:

1. Open the media door.
2. Examine the ribbon. Did the ribbon run out?

If...	Then...
Yes	a. Remove the empty core from the ribbon supply spindle. Save the core to use on the ribbon take-up spindle when you load ribbon. b. Remove the used ribbon and core from the ribbon take-up spindle. c. Install new ribbon following the instructions in Load Ribbon on page 46.
No	a. Cut the ribbon near the ribbon take-up spindle. b. Remove the used ribbon and core from the ribbon take-up spindle. c. Locate an empty ribbon core. If necessary, remove and discard the used ribbon from the core removed in the previous step. d. Place the empty ribbon core onto the ribbon take-up spindle, and push the core toward the print engine frame until it is fully seated. e. Thread the remaining ribbon on the ribbon supply spindle following the instructions in Load Ribbon on page 46.

Calibrate the Print Engine

Calibrate the print engine when it is first put into service. Calibration allows the print engine to establish the proper settings for the specific media and ribbon used in your application. You may calibrate the print engine at other times as needed. [Table 6](#) shows the different methods for calibration.

Table 6 • Types of Calibration

Type of Calibration	Description	When/How It Occurs
Auto-calibration	The print engine automatically sets the value it detects for the spaces between labels.	Occurs at the following times: - When the print engine is first turned on if CALIBRATION is selected for MEDIA POWER UP (see Select Media Power-Up Option on page 81) - When the print engine feeds media after the printhead is closed if CALIBRATION is selected for HEAD CLOSE (see Select Head Close Option on page 82). - As part of both the sensor profile and media and ribbon sensor calibration procedures.
Long (Standard) Calibration	The print engine does the following: - feeds media and ribbon - sets the values it detects for media length, media type (continuous or non-continuous), and print mode (thermal transfer or direct thermal) - updates the sensor values	To perform a long calibration, do one of the following: - Press PAUSE on the control panel to pause the print engine, and then press CALIBRATE. - Select CALIBRATION for the MEDIA POWER UP or HEAD CLOSE parameter (see Select Media Power-Up Option on page 81 or Select Head Close Option on page 82).
Short Calibration	The print engine calibrates using the current sensor values rather than detecting the spaces between labels and resetting the sensors. This calibration sequence uses fewer labels than the long calibration sequence, but it is less reliable because the values that are stored in the sensors could be incorrect.	Select SHORT CAL for the MEDIA POWER UP or HEAD CLOSE parameter (see Select Media Power-Up Option on page 81 or Select Head Close Option on page 82).

Table 6 • Types of Calibration (Continued)

Type of Calibration	Description	When/How It Occurs
Sensor Profile Calibration	The print engine auto-calibrates and prints a media sensor profile. See Sensor Profile on page 130.	Select the SENSOR PROFILE option on the control panel. See Print Sensor Profile on page 76 for instructions.
Media and Ribbon Sensor Sensitivity Calibration	This calibration is one of the most common adjustments made to print engine settings. The print engine resets the sensitivity of the sensors specifically for the media and ribbon that you are using. If you change the type of ribbon and/or media, you might need to reset the sensitivity of the media and ribbon sensors. When the sensors are at their new sensitivity, the print engine performs an auto-calibration.	Select the MEDIA AND RIBBON CALIBRATE option on the control panel. See Calibrate Media and Ribbon Sensor Sensitivity on page 77 for instructions.

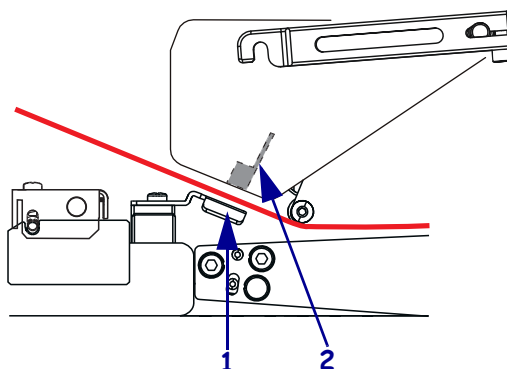
Adjust Ribbon and Media Sensors

This section describes how to adjust the sensors.

Ribbon Sensor

The ribbon sensor ([Figure 17](#)) is mounted in a fixed position, and no adjustment is required.

Figure 17 • Ribbon Sensor Location



1	Ribbon sensor reflector
2	Ribbon sensor

Reflective Media Sensor

Some types of media have black marks printed on the underside of the media liner, which act as “start of label” indicators. The reflective media sensor senses these black marks. The position of this sensor is not adjustable. If you use this type of media, refer to [Media Specifications on page 153](#) for information about black mark requirements.

Transmissive Media Sensor

The transmissive media sensor finds “start of label” indicators, such as notches or holes in the media or interlabel gaps. This sensor consists of a light source (positioned below the media) and a light sensor (positioned above the media).

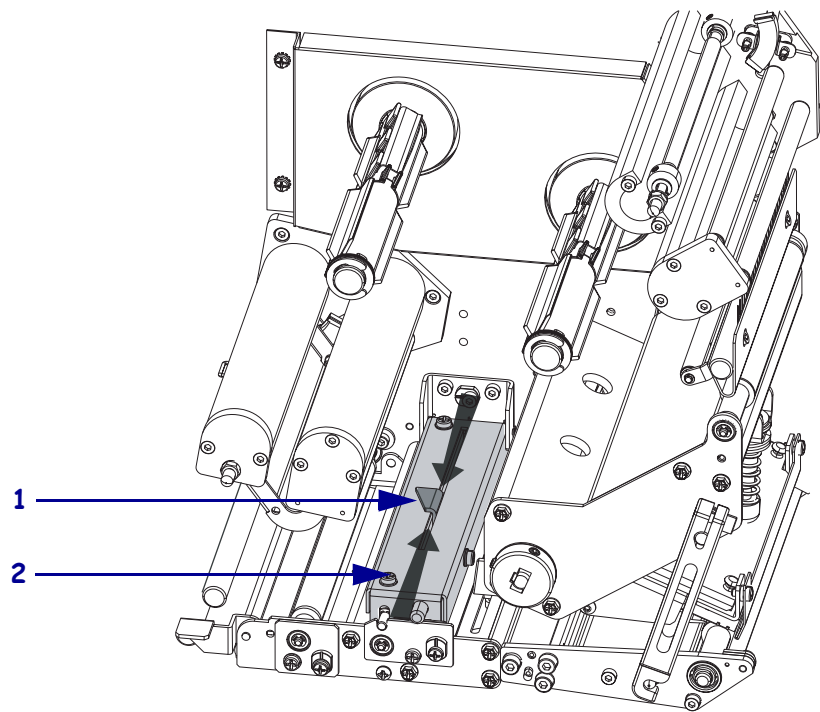
To position the sensor, complete these steps:

1. Refer to [Figure 18](#). Turn the adjustment knob on the media guide shelf assembly to move the media sensor.

2. How does the current media indicate the start of labels?

If the media...	Then...
Has notches or holes between labels	Align the sensor with the notch or hole in the media.
Uses interlabel gaps	Position the sensor approximately at the center of the media width.

Figure 18 • Media Sensor Adjustment (Right-Hand Unit Shown)



1	Sensor position indicator
2	Pinch roller assembly



Configuration

This section describes the control panel parameters that are used to configure the print engine for operation.

Contents

Setup Mode	58
Enter and Use Setup Mode	58
Exit Setup Mode.	59
Change Password-Protected Parameters	60
Default Password Value.	60
Disable the Password Protection Feature	60
Print a Configuration Label.	61
Print a Network Configuration Label	62
Control Panel Parameters	63
How to View or Modify Parameters	63
Additional Parameters	63
Standard Print Engine Parameters	64

Setup Mode

After you have installed the media and ribbon and the Power-On Self Test (POST) is complete, the control panel displays **PRINTER READY**. You may now set print engine parameters for your application using the control panel display and the buttons directly below it. If it becomes necessary to restore the initial print engine defaults, see [FEED and PAUSE Self Test on page 126](#).



Important • Certain printing conditions may require that you adjust printing parameters, such as print speed, darkness, or print mode. These conditions include (but are not limited to):

- printing at high speeds
- peeling the media
- the use of extremely thin, small, synthetic, or coated labels

Because these and other factors affect print quality, run tests to determine the best combination of print engine settings and media for your application. A poor match may limit print quality or print rate, or the print engine may not function properly in the desired print mode.



Note • If the print engine is operating on an IP network and you have a ZebraNet wired or wireless print server, you can change the print engine's parameters in these additional ways:

- with ZebraLink™ WebView. For information, see the appropriate print server user guide.
- with ZebraNet Bridge. For information, see the *ZebraNet Bridge Enterprise Printer Management User Guide*.

Enter and Use Setup Mode

Use the LCD on the control panel to view and adjust print engine settings through Setup mode. When a parameter is changed, an asterisk (*) appears in the upper left corner of the display to indicate that the value is different from the one currently active in the print engine.

Press this key...	To do the following...
SETUP/EXIT	enter or exit Setup mode.
SELECT	select or deselect a parameter.
PLUS (+)	continue to the next parameter.
MINUS (-)	return to the previous parameter in the cycle.

Exit Setup Mode

When you exit setup mode, you have several options for saving, changing, or not changing parameters.

To leave Setup mode, complete these steps:

1. While in Setup mode, press SETUP/EXIT.
The LCD displays **SAVE CHANGES**.
2. Press the left or right oval to display the save options:

LCD	Description
PERMANENT	Stores values in the print engine even when power is turned off.
TEMPORARY	Saves the changes until power is turned off.
CANCEL	Cancels all changes made since you entered Setup mode, except for changes made to the darkness and tear-off settings, which go into effect as soon as they are made.
LOAD DEFAULTS	Restores all parameters other than the network settings back to the factory defaults. Use care when loading defaults because you will need to reload all settings that you changed manually.  Note • On non-RFID printers, loading factory defaults causes the print engine to auto-calibrate.
LOAD LAST SAVE	Loads values from the last permanent save.
DEFAULT NET	Restores the wired and wireless network settings back to factory defaults.

3. Press NEXT to select the displayed choice.
When the configuration and calibration sequence is done, **PRINTER READY** displays.

Change Password-Protected Parameters

Certain parameters, including the communication parameters, are password-protected by factory default.

Caution • Do not change password-protected parameters unless you have a complete understanding of the parameters' functions. If the parameters are set incorrectly, the print engine may function unpredictably.

The first time that you attempt to change a password-protected parameter, the print engine displays **ENTER PASSWORD**. Before you can change the parameter, you must enter the four-digit numeric password. After you have entered the password correctly, you do not have to enter it again unless you leave Setup mode by pressing **SETUP/EXIT** or by turning off (O) the print engine.

To enter a password for a password-protected parameter, complete these steps:

1. At the password prompt, use the left oval to change the selected digit position.
2. When you have selected the digit that you wish to change, use the right oval to increase the selected digit value. Repeat these two steps for each digit of the password.
3. After entering the password, press **NEXT**.

The parameter you selected to change is displayed. If the password was entered correctly, you can change the value.

Default Password Value

The default password value is **1234**. The password can be changed using the Zebra Programming Language (ZPL) command **^KP** (Define Password) or using the print engine's web pages (ZebraNet[®] wired or wireless print server required).

Disable the Password Protection Feature

You can disable the password protection feature so that it no longer prompts you for a password by setting the password to **0000** via the **^KP** ZPL command. To re-enable the password-protection feature, send the ZPL command **^KPX**, where X can be any number from 1 to 9999.

Print a Configuration Label

A configuration label lists the print engine settings that are stored in configuration memory. After you load the media and ribbon (if necessary), print a configuration label as a record of your print engine's current settings. Keep the label to use when troubleshooting printing problems.

To print a configuration label, complete these steps:

1. On the control panel, press SETUP/EXIT.
2. Press NEXT or PREVIOUS to scroll through the parameters until you reach **LIST SETUP**.
3. Press the right oval to confirm printing.
A configuration label prints (Figure 19).

Figure 19 • Sample Configuration Label

PRINTER CONFIGURATION	
Zebra Technologies ZTC 170PAX4 RH-200dpi ZBR2325570	
00.0.....	DARKNESS
2 IPS.....	PRINT SPEED
2 IPS.....	SLEW SPEED
2 IPS.....	BACKFEED SPEED
-016.....	TEAR OFF
APPLICATOR.....	PRINT MODE
CONTINUOUS.....	MEDIA TYPE
WEB.....	SENSOR TYPE
THERMAL-TRANS.....	PRINT METHOD
2 094/203 IN.....	PRINT WIDTH
1600.....	LABEL LENGTH
39.0IN 989MM.....	MAXIMUM LENGTH
MEDIA DISABLED.....	EARLY WARNING
MAINT. OFF.....	EARLY WARNING
BIDIRECTIONAL.....	PARALLEL COMM.
RS232.....	SERIAL COMM.
9600.....	BAUD
8 BITS.....	DATA BITS
NONE.....	PARITY
XON/XOFF.....	HOST HANDSHAKE
NONE.....	PROTOCOL
000.....	NETWORK ID
NORMAL MODE.....	COMMUNICATIONS
<=> 7EH.....	CONTROL PREFIX
<=> 5EH.....	FORMAT PREFIX
<=> 2CH.....	DELIMITER CHAR
ZPL II.....	ZPL MODE
HIGH.....	RIBBON TENSION
CALIBRATION.....	MEDIA POWER UP
CALIBRATION.....	HEAD CLOSE
BEFORE.....	BACKFEED
+015.....	LABEL TOP
+0020.....	LEFT POSITION
0000.....	HEAD TEST COUNT
0615.....	HEAD RESISTOR
MODE 1.....	APPLICATOR PORT
PULSE MODE.....	START PRINT SIG
FEED MODE.....	RESINER MODE
25M.....	RIBBON LOW MODE
DISABLED.....	REPRINT MODE
046.....	WEB S.
079.....	MEDIA S.
071.....	RIBBON S.
050.....	MARK S.
000.....	MARK MED S.
081.....	MEDIA LED
095.....	RIBBON LED
009.....	MARK LED
+10.....	LCD ADJUST
DPSWFXM.....	MODES ENABLED
1344 8/MM FULL.....	MODES DISABLED
V60.13.0.5 ->.....	FIRMWARE
V30 33037 56.....	HARDWARE ID
CUSTOMIZED.....	CONFIGURATION
NONE.....A:	COMPACT FLASH
11776k.....R:	RAM
NONE.....B:	MEMORY CARD
2048k.....E:	ONBOARD FLASH
NONE.....	FORMAT CONVERT
*** APPLICATOR.....	P30 INTERFACE
005 DISPLAY.....	P31 INTERFACE
007 POWER SUPPLY.....	P32 INTERFACE
017 PAX170 RTS.....	P34 INTERFACE
FW VERSION.....	IDLE DISPLAY
09/30/04.....	RTC DATE
09:30.....	RTC TIME
115740 IN.....	NONRESET CNTR
115740 IN.....	RESET CNTR1
115740 IN.....	RESET CNTR2
293691 CM.....	NONRESET CNTR
293691 CM.....	RESET CNTR1
293691 CM.....	RESET CNTR2
46855 LABLS.....	NONRESET CNTR
46855 LABLS.....	RESET CNTR1
46855 LABLS.....	RESET CNTR2
HW 12418.04JDR080120.57340.D.VH1....	

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Print a Network Configuration Label

If you are using a print server, you can print a network configuration label after the print engine is connected to the network.

To print a network configuration label, complete these steps:

1. On the control panel, press SETUP/EXIT.
2. Press NEXT or PREVIOUS to scroll through the parameters until you reach **LIST NETWORK**.
3. Press the right oval to confirm printing.

A network configuration label prints (Figure 20). An asterisk designates whether the wired or wireless print server is active. If no wireless print server is installed, the wireless portion of the label does not print.

**Figure 20 • Sample Network Configuration Label
(with a Wireless Print Server installed)**

Network Configuration	
Zebra Technologies PRINTER NAME-200dpi ZBR3051375	
Wired.....	PRIMARY NETWORK
NO.....	LOAD FROM EXT?
Internal Wired.....	ACTIVE PRINTSRVR
External Wired	
ALL.....	IP PROTOCOL
000.000.000.000.....	IP ADDRESS
255.255.255.000.....	SUBNET MASK
000.000.000.000.....	DEFAULT GATEWAY
000.000.000.000.....	WINS SERVER IP
YES.....	TIMEOUT CHECKING
300.....	TIMEOUT VALUE
000.....	ARP INTERVAL
9100.....	BASE RAW PORT
Internal Wired*	
ALL.....	IP PROTOCOL
010.003.004.098.....	IP ADDRESS
255.255.255.000.....	SUBNET MASK
010.003.004.001.....	DEFAULT GATEWAY
010.003.001.098.....	WINS SERVER IP
YES.....	TIMEOUT CHECKING
300.....	TIMEOUT VALUE
000.....	ARP INTERVAL
9100.....	BASE RAW PORT
00074d2e8f6f.....	MAC ADDRESS
Wireless	
ALL.....	IP PROTOCOL
000.000.000.000.....	IP ADDRESS
255.255.255.000.....	SUBNET MASK
000.000.000.000.....	DEFAULT GATEWAY
000.000.000.000.....	WINS SERVER IP
YES.....	TIMEOUT CHECKING
300.....	TIMEOUT VALUE
000.....	ARP INTERVAL
9100.....	BASE RAW PORT
NO.....	CARD INSERTED
0000H.....	CARD MFG ID
0000H.....	CARD PRODUCT ID
000000000000.....	MAC ADDRESS
YES.....	DRIVER INSTALLED
INFRASTRUCTURE.....	OPERATING MODE
125.....	ESSID
100.....	TX POWER
ON.....	1 Mb/s
ON.....	2 Mb/s
ON.....	5.5 Mb/s
ON.....	11 Mb/s
11 Mb/s.....	CURRENT TX RATE
DIVERSITY.....	RECEIVE ANTENNA
DIVERSITY.....	XMIT ANTENNA
OPEN.....	WEP TYPE
NONE.....	WLAN SECURITY
1.....	WEP INDEX
020.....	POOR SIGNAL
LONG.....	PREAMBLE
NO.....	ASSOCIATED
ON.....	PULSE ENABLED
15.....	PULSE RATE
OFF.....	INTL MODE
07FFH.....	CHANNEL MASK
FIRMWARE IN THIS PRINTER IS COPYRIGHTED	

Control Panel Parameters

Use the LCD on the control panel to view and adjust print engine settings.

How to View or Modify Parameters

While viewing parameters, press NEXT to continue to the next parameter, or press PREVIOUS to return to the previous parameter in the cycle. When a parameter is changed, an asterisk (*) appears in the upper left corner of the display to indicate that the value is different from the one currently active in the print engine.



Note • Your label preparation software or the print engine driver may override adjustments made through the control panel. Refer to the software or driver documentation for more information.

Additional Parameters

Additional parameters appear in the following situations:

- When a wired print server is installed in the print engine. For more information, see the appropriate manual: the *ZebraNet 10/100 Print Server User and Reference Guide* or the *PrintServer II User and Reference Guide*.
- When a wireless print server is installed in the print engine. For more information, see the *ZebraNet Wireless User Guide*.
- When a Radio Frequency Identification (RFID) reader is installed. See the *RFID Programming Guide* for more information.

Copies of these manuals are available at <http://www.zebra.com/manuals> or on the user CD that came with your print engine.

Standard Print Engine Parameters

Table 7 shows parameters in the order in which they are displayed when you press NEXT after entering Setup mode.

Table 7 • Print Engine Parameters (Page 1 of 25)

Parameter	Action/Explanation
	Adjust Print Darkness Darkness (burn duration) settings depend on a variety of factors, including ribbon type, media type, and the condition of the printhead. You may adjust the darkness for consistent high-quality printing.  Important • Set the darkness to the lowest setting that provides good print quality. If the darkness is set too high, the ink may smear, the ribbon may burn through, or the printhead may wear prematurely. If printing is too light or if there are voids in printed areas, increase the darkness. If printing is too dark or if there is spreading or bleeding of printed areas, decrease the darkness. The FEED Self Test on page 122 can be used to determine the best darkness setting. You may want to adjust darkness while performing the PAUSE Self Test on page 121. Because the darkness setting takes effect immediately, you can see the results on labels that are currently printing. Darkness settings also may be changed by the driver or software settings. Default: +04.0 Range: 00.0 to +30.0 To change the value shown: 1. Press the right oval to increase darkness. 2. Press the left oval to decrease darkness.
	Adjust Print Speed Adjusts the speed for printing a label (given in inches per second). Slower print speeds typically yield better print quality. Print speed changes take effect upon exiting Setup mode. Range: 2 to 12 IPS for 203 dpi, 2 to 8 IPS for 300 dpi To change the value shown: 1. Press the right oval to increase the value. 2. Press the left oval to decrease the value.
	Adjust Slew Speed Adjusts the speed for feeding a blank label (given in inches per second). Default: 6 IPS Range: 1 to 12 IPS To change the value shown: 1. Press the right oval to increase the value. 2. Press the left oval to decrease the value.

Table 7 • Print Engine Parameters (Page 2 of 25)

Parameter	Action/Explanation				
BACKFEED SPEED 2 IPS +	Adjust Backfeed Speed If backfeed is on, adjusts the speed at which the label backs up before printing (given in inches per second). Default: 2 IPS Range: 1 to 12 IPS To change the value shown: - Press the right oval to increase the value. - Press the left oval to decrease the value.				
TEAR OFF +000 + - ■■■■■ +	Adjust the Tear-Off Position This parameter establishes the position of the media over the tear-off/peel-off bar after printing. See Figure 21. Higher numbers move the media out (the tear line moves closer to the leading edge of the next label), and lower numbers move the media in (the tear line moves closer to the edge of the label just printed). Figure 21 • Tear-Off Position Adjustment <table> <tr> <td>1</td><td>Media direction</td></tr> <tr> <td>2</td><td>Factory-set tear line location at position 00</td></tr> </table> Default: +0 Range: –120 to +120 To change the value shown: - Press the right oval to increase the value. Each press adjusts the tear-off position by four dot rows. - Press the left oval to decrease the value. Each press adjusts the tear-off position by four dot rows.	1	Media direction	2	Factory-set tear line location at position 00
1	Media direction				
2	Factory-set tear line location at position 00				

Table 7 • Print Engine Parameters (Page 3 of 25)

Parameter	Action/Explanation
PRINT MODE -APPLICATOR +	Select Print Mode Print mode settings tell the print engine the method of media delivery that you wish to use. Make sure that your print engine can support the selected option. Default: APPLICATOR Selections: TEAR-OFF, REWIND, APPLICATOR To change the value shown: Press the left or right oval to scroll through the options.
MEDIA TYPE -NON-CONTINUOUS +	Set Media Type This parameter tells the print engine the type of media that you are using (see Types of Media on page 35 for more information). Selecting continuous media requires that you include a label length instruction in your label format (^LLXXXX if you are using ZPL or ZPL II). When non-continuous media is selected, the print engine feeds media to calculate label length (the distance between two recognized registration points of the inter-label gap, webbing, or alignment notch or hole). Default: NON-CONTINUOUS Selections: CONTINUOUS, NON-CONTINUOUS To change the value shown: Press the left or right oval to toggle between the options.
PRINT METHOD -THERMAL-TRANS. +	Select Print Method The print method parameter tells the print engine the method of printing that you wish to use: direct thermal (no ribbon) or thermal transfer (using thermal transfer media and ribbon). Default: THERMAL TRANSFER Selections: THERMAL TRANSFER, DIRECT THERMAL  Note • Selecting direct thermal when using thermal transfer media and ribbon creates an error condition, but printing continues. To change the value shown: Press the left or right oval to toggle between the options.

Table 7 • Print Engine Parameters (Page 4 of 25)

Parameter	Action/Explanation
PRINT WIDTH - 168 0/8 MM +	Set Print Width Determines the printable area across the width of the label given the resolution of the print engine. Default: 168 0/8 MM for 203 dpi print engines; 168 0/12 MM for 300 dpi print engines  Note • Setting the width too narrow can result in portions of the label not being printed on the media. Setting the width too wide wastes formatting memory and can cause printing off the label and on the platen roller. This setting can affect the horizontal position of the label format if the image was inverted using the ^POI ZPL II command. To change the value shown: 1. Press the left oval to move the cursor. 2. Press the right oval to increase the value of the digit. To change the unit of measurement: 1. Press the left oval until the unit of measurement is active. 2. Press the right oval to toggle to a different unit of measure (mm, inches, or dots).

Table 7 • Print Engine Parameters (Page 5 of 25)

Parameter	Action/Explanation						
MAXIMUM LENGTH 39.0IN988MM	Set Maximum Label Length This parameter is used during the media portion of the calibration process. Always set maximum label length to a value that is at least 1.0 in. (25.4 mm) greater than the actual label length (Figure 22). If the value is set to a smaller value than the label length, the print engine assumes that continuous media is loaded, and the print engine cannot calibrate. For example, if the label length is 5.0 inches (126 mm) including the interlabel gap, set the parameter for 6.0 inches (152 mm). If the label length is 7.5 inches (190 mm), set the parameter for 9.0 inches (229 mm). Figure 22 • Label Length <table><tr><td>1</td><td>Label length (including interlabel gap)</td></tr><tr><td>2</td><td>Interlabel gap</td></tr><tr><td>3</td><td>Set maximum label length to approximately this value</td></tr></table> Default: 39.0 inches (988 mm). Range: Values are adjustable in one-inch (25.4 mm) increments. To change the value shown: - Press the right oval to increase the value. - Press the left oval to decrease the value.	1	Label length (including interlabel gap)	2	Interlabel gap	3	Set maximum label length to approximately this value
1	Label length (including interlabel gap)						
2	Interlabel gap						
3	Set maximum label length to approximately this value						

Table 7 • Print Engine Parameters (Page 6 of 25)

Parameter	Action/Explanation
EARLY WARNING MEDIA DISABLED	Set Early Warning for Media When this parameter is enabled, the print engine provides warnings when labels are running low.  Note • Update the number of labels per roll when beginning use of the Early Warning System. The print engine does not make any adjustments when power is turned off and on. Default: MEDIA DISABLED Selections: MEDIA DISABLED, MEDIA ENABLED To change the Early Warning settings: - When the LCD displays EARLY WARNING MEDIA, press the left or right oval to toggle between ENABLED and DISABLED. (If you are prompted for a password, enter your password using the instructions in Change Password-Protected Parameters on page 60.) - If you enable the Early Warning System, do the following: - Exit Setup mode and save changes to enable additional parameters. - Enter Setup mode again. The media and ribbon parameters (LABELS PER ROLL, MEDIA REPLACED, RIBBON LENGTH, and RIBBON REPLACED) appear. - Adjust the settings as necessary (descriptions of each of these parameters follows).
LABELS PER ROLL - 0900 +	Set Number of Labels Per Roll for Early Warning This parameter appears only when Early Warning for Media is enabled. This value should correspond to the number of labels per roll of the media that you are using. Default: 0900 Range: 100 to 9999 To change the value shown: - Press the left oval to move the cursor. - Press the right oval to increase the value of the digit. Based on the number entered, when the print engine detects that less than 15% of the labels remain, WARNING MEDIA LOW appears on the LCD. If the alert function is enabled, the print engine generates an alert. When the printhead is opened and then closed after a media warning is received, the LCD prompts with MEDIA REPLACED?. - If you replaced the media, press the right oval to select YES to clear the warning and reset the label counter. If you did not replace the media, press the left oval to select NO.

Table 7 • Print Engine Parameters (Page 7 of 25)

Parameter	Action/Explanation
MEDIA REPLACED? NO YES	Reset Media Counter for Early Warning This parameter appears only when Early Warning for Media is enabled. To reset the media counter: - Did you replace the media? - If you replaced the media, press the right oval to select YES. - If you did not replace the media, press the left oval to select NO.
RIBBON LENGTH - 450M 1476 FT +	Set Ribbon Length for Early Warning This parameter appears only when Early Warning for Media is enabled and the print engine is set for Thermal Transfer operation. Default: 450 M/1476 FT Range: 100 M/328 FT to 450 M/1476 FT in 50 M increments To change the value shown: Press the left or right oval to set the value to match the length of the ribbon that you are using. Based on the number entered, when the print engine detects that less than 15% of the ribbon remains, WARNING RIBBON LOW appears on the LCD. If the alert function is enabled, the print engine generates an alert. When the printhead is opened and then closed after a ribbon warning is received, the LCD prompts with RIBBON REPLACED?.
RIBBON REPLACED? NO YES	Reset Ribbon Counter for Early Warning This parameter appears only when Early Warning for Media is enabled and the print engine is set for Thermal Transfer operation. To reset the ribbon counter: - Did you replace the ribbon? - If you replaced the ribbon, press the right oval to select YES. - If you did not replace the ribbon, press the left oval to select NO.

Table 7 • Print Engine Parameters (Page 8 of 25)

Parameter	Action/Explanation
EARLY WARNING MAINT. OFF	Set Early Warning for Maintenance When this parameter is enabled, the print engine provides warnings when the printhead needs to be cleaned.  Note • If necessary, update the number of labels per roll when beginning use of the Early Warning System for Maintenance. The print engine does not make any adjustments when power is turned off and on. Default: MAINT. OFF Selections: MAINT. OFF, MAINTENANCE ON To change the Early Warning settings: - When the LCD displays EARLY WARNING MAINTENANCE, press the left or right oval to toggle between OFF and ON. (If you are prompted for a password, enter your password using the instructions in Change Password-Protected Parameters on page 60.) - Exit Setup mode and save changes to enable additional parameters related to the early warning system. - Enter Setup mode again and go to the following parameters to enter the printhead cleaning interval and the printhead life.
HEAD CLEANING - 450M 1476 FT +	Set Printhead Cleaning Interval for Early Warning This parameter appears only when Early Warning for Maintenance is enabled. This value should correspond to the length of the media or ribbon roll that you are using. Default: 450 M/1476 FT Range: 100 M/328 FT to 450 M/1476 FT in 50 M increments To change the value shown: Press the left or right oval to set the printhead cleaning interval to the desired number of inches of media or ribbon. When the printhead reaches the set length, WARNING CLEAN PRINTHEAD appears on the LCD. If the alert function is enabled, the print engine generates an alert. When the printhead is opened and then closed after a printhead cleaning warning is received, the LCD prompts with HEAD CLEANED?.
HEAD CLEANED? NO YES	Reset Printhead Cleaning Counter for Early Warning This parameter appears only when Early Warning for Maintenance is enabled. To reset the printhead cleaning counter: - Did you clean the printhead? - If you cleaned the printhead, press the right oval to select YES. - If you did not clean the printhead, press the left oval to select NO.

Table 7 • Print Engine Parameters (Page 9 of 25)

Parameter	Action/Explanation
HEAD LIFE - 1000000 IN +	Set Printhead Life for Early Warning This parameter appears only when Early Warning for Maintenance is enabled. Set this value to the number of inches of media that the printhead is expected to print. Default: 1,000,000 inches Range: 100 to 1,000,000 inches To change the value shown: - Press the left oval to move the cursor. - Press the right oval to increase the value of the digit. When the printhead reaches the set length, WARNING REPLACE HEAD appears on the LCD. If the alert function is enabled, the print engine generates an alert. When the printhead is opened and then closed after a printhead life warning is received, the LCD prompts with NEW PRINTHEAD?. - If you replaced the printhead, press the right oval to select YES to clear the warning and reset the printhead life counter. If you did not replace the printhead, press the left oval to select NO.
NEW PRINTHEAD? NO YES	Reset Printhead Life Counter for Early Warning This parameter appears only when Early Warning for Maintenance is enabled. To reset the printhead life counter: - Did you replace the printhead? - If you replaced the printhead, press the right oval to select YES. - If you did not replace the printhead, press the left oval to select NO.
LIST FONTS PRINT	List Fonts This option prints a label that lists the available fonts in the print engine, including standard print engine fonts plus any optional fonts. Fonts may be stored in RAM, Flash memory, optional PCMCIA font cards, or CompactFlash® cards. To print a list of the available fonts: Press the right oval to select PRINT.
LIST BAR CODES PRINT	List Bar Codes This option prints a label that lists the available bar codes in the print engine. Bar codes may be stored in RAM, Flash memory, optional PCMCIA cards, or Compact Flash cards. To print a list of the available bar codes: Press the right oval to select PRINT.

Table 7 • Print Engine Parameters (Page 10 of 25)

Parameter	Action/Explanation
LIST IMAGES PRINT	List Images This option prints a label that lists the available images stored in the print engine's RAM, Flash memory, optional memory card, PCMCIA cards, or Compact Flash cards. To print a list of the available images: 1. Press the right oval to select PRINT.
LIST FORMATS PRINT	List Formats This option prints a label that lists the available formats stored in the print engine's RAM, Flash memory, or optional memory card. To print a list of the available formats: 1. Press the right oval to select PRINT.
LIST SETUP PRINT	List Setup This option prints a configuration label (see Figure 19 on page 61), which lists the current print engine configuration. To print a configuration label: 1. Press the right oval to select PRINT.
LIST NETWORK PRINT	List Network Settings This option prints a network configuration label (see Figure 20 on page 62), which lists the settings for any print server that is installed. To print a network configuration label: 1. Press the right oval to select PRINT.
LIST ALL PRINT	List All This option prints labels that list the available fonts, bar codes, images, formats, and the current print engine and network configurations. To print labels for all settings: 1. Press the right oval to select PRINT.

Table 7 • Print Engine Parameters (Page 11 of 25)

Parameter	Action/Explanation
FORMAT CARD: A: B:	Format Memory Card This option erases all previously stored information from the optional PCMCIA card or Compact Flash card. Caution • This option completely erases the selected card. To format a memory card: - Press the left oval to select A: or the right oval to select B:. If your print engine is set to require a password, you are prompted to enter the password. - Enter the password. For instructions, see Change Password-Protected Parameters on page 60. - Press the appropriate button again to select the desired card. The display shows ARE YOU SURE?. - Do you wish to continue? - Press the left oval to select NO to cancel the request and return to FORMAT CARD prompt. - Press the right oval to select YES and begin initialization. When initialization is complete, the print engine automatically exits Setup mode, and the control panel displays PRINTER READY. If you exit Setup mode while initialization is still in process, the control panel display flashes between the phrases CHECKING B: MEMORY and PRINTER IDLE.  Note • Depending on the amount of memory in the memory card, initialization may take up to 5 minutes to complete.

Table 7 • Print Engine Parameters (Page 12 of 25)

Parameter	Action/Explanation
INIT FLASH MEM. YES	Initialize Flash Memory This option erases all previously stored information from Flash memory. Caution • This option completely erases the Flash memory. To initialize Flash memory: - Press the right oval to select YES. - Enter the password. For instructions, see Change Password-Protected Parameters on page 60. The display shows INITIALIZE FLASH? - Press the right oval to select YES. The display shows ARE YOU SURE?. - Do you wish to continue? - Press the left oval to select NO to cancel the request and return to the INITIALIZE FLASH prompt. - Press the right oval to select YES and begin initialization. When initialization is complete, the print engine automatically exits Setup mode, and the control panel displays PRINTER READY. If you exit Setup mode while initialization is still in process, the control panel display flashes between the phrases CHECKING E: MEMORY and PRINTER IDLE.  Note • Depending on the amount of free FLASH memory, initialization may take up to 1 minute to complete.

Table 7 • Print Engine Parameters (Page 13 of 25)

Parameter	Action/Explanation
SENSOR PROFILE PRINT	Print Sensor Profile A sensor profile shows sensor settings compared to actual sensor readings. This label (which will extend across several actual labels or tags) can be used to troubleshoot printing problems. To interpret the results of the sensor profile, see Sensor Profile on page 130. Figure 23 • Sensor Profile To print a sensor profile: - Press the right oval to start this standard calibration procedure and print a media sensor profile. - If the sensitivity of the sensors must be adjusted, perform Calibrate Media and Ribbon Sensor Sensitivity on page 77.

Table 7 • Print Engine Parameters (Page 14 of 25)

Parameter	Action/Explanation
MEDIA AND RIBBON CALIBRATE	Calibrate Media and Ribbon Sensor Sensitivity Use this procedure to adjust sensitivity of media and ribbon sensors.  Important • Follow this procedure exactly as presented. All of the steps must be performed even if only one of the sensors requires adjustment. You may press the left oval at any step in this procedure to cancel the process. To perform a media and ribbon sensor calibration: - Press the right oval to start the calibration procedure. The LOAD BACKING prompt displays. - Open the printhead. - Remove approximately 8 in. (203 mm) of labels from the backing, and pull the media into the print engine so that only the backing is between the media sensors. - Leave the printhead open. - Press the right oval PLUS (+) to continue. The REMOVE RIBBON prompt displays. - Remove the ribbon (if used). - Close the printhead. - Press the right oval to continue. The message CALIBRATING PLEASE WAIT displays. The print engine adjusts the scale (gain) of the signals that it receives from the media and ribbon sensors based on the specific media and ribbon combination being used. On the sensor profile, this essentially corresponds to moving the peak of the graph up or down to optimize the readings for your application. When calibration is complete, RELOAD ALL displays. - Open the printhead and pull the media forward until a label is positioned under the media sensor. - Reload the ribbon (if used). - Close the printhead. - Press the right oval to continue. The print engine performs an auto-calibration. During this process, the print engine checks the readings for the media and ribbon based on the new scale established, determines the label length, and determines the print mode. To see the new readings on the new scale, print a sensor profile.

Table 7 • Print Engine Parameters (Page 15 of 25)

Parameter	Action/Explanation
PARALLEL COMM. -BIDIRECTIONAL +	Set Parallel Communications Select the communications port that matches the one being used by the host computer. Default: BIDIRECTIONAL Selections: BIDIRECTIONAL, UNIDIRECTIONAL To change the value shown: Press the left or right oval to scroll through the options.
SERIAL COMM -RS232 +	Set Serial Communications Select the communications port that matches the one being used by the host computer. This setting applies only when the serial port is used.  Important • Do not change this parameter from the default. The print engine supports only RS-232. This parameter will be eliminated in a future version of the firmware. Default: RS232 Selections: RS232, RS422/485, RS485 MULTIDROP To change the value shown: Press the left or right oval to scroll through the options.
BAUD -9600 +	Set Baud This setting applies only when the serial port is used. The baud setting of the print engine must match the baud setting of the host computer for accurate communications to take place. Select the value that matches the one being used by the host computer. Default: 9600 Selections: 110, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200 To change the value shown: Press the left or right oval to scroll through the options.
DATA BITS - 8 BITS	Set Data Bits This setting applies only when the serial port is used. The data bits of the print engine must match the data bits of the host computer for accurate communications to take place. Set the data bits to match the setting being used by the host computer.  Note • Code Page 850 requires the data bits to be set to 8 bits. See the <i>ZPL II Programming Guide</i> for more information. Default: 8 BITS Selections: 7 BITS, 8 BITS To change the value shown: Press the left or right oval to toggle between the options.

Table 7 • Print Engine Parameters (Page 16 of 25)

Parameter	Action/Explanation
PARITY - NONE +	Set Parity This setting applies only when the serial port is used. The parity of the print engine must match the parity of the host computer for accurate communications to take place. Select the parity that matches the one being used by the host computer. Default: NONE Selections: EVEN, ODD, NONE To change the value shown: Press the left or right oval to scroll through the options.
HOST HANDSHAKE - XON/XOFF +	Set Host Handshake This setting applies only when the serial port is used. The handshake protocol of the print engine must match the handshake protocol of the host computer for communication to take place. Select the handshake protocol that matches the one being used by the host computer. Default: XON/XOFF Selections: XON/XOFF, DTR/DSR, RTS/CTS To change the value shown: Press the left or right oval to scroll through the options.
PROTOCOL - NONE +	Set Protocol Protocol is a type of error checking system. Depending on the selection, an indicator may be sent from the print engine to the host computer signifying that data has been received. Select the protocol that is requested by the host computer. Further details on protocol can be found in the <i>ZPL II Programming Guide</i>. Default: NONE Selections: NONE, ZEBRA, ACK_NAK  Note • ZEBRA is the same as ACK_NAK, except that ZEBRA response messages are sequenced. If ZEBRA is selected, the print engine must use DTR/DSR for host handshake protocol. To change the value shown: Press the left or right oval to scroll through the options.
NETWORK ID - 000 +	Set Network ID Network ID is used to assign a unique number to a print engine. This gives the host computer the means to address a specific print engine. This does not affect TCP/IP or IPX networks. Default: 000 Range: 000 to 999 To change the value shown: - Press the left oval to move to the next digit position. - Press the right oval to increase the value of the digit.

Table 7 • Print Engine Parameters (Page 17 of 25)

Parameter	Action/Explanation
	Set Communications Mode The communication diagnostics mode is a troubleshooting tool for checking the interconnection between the print engine and the host computer. For more information, see Communications Diagnostics Test on page 129. Default: NORMAL MODE Selections: NORMAL MODE, DIAGNOSTICS To select communication diagnostics mode: Press the left or right oval to toggle between the options.
	Set Control Prefix Character The print engine looks for this two-digit hex character to indicate the start of a ZPL/ZPL II control instruction. The “H” that is displayed indicates Hexadecimal and is not part of the value. Note • Do not use the same hex value for the control, format, and delimiter character. The print engine must see different characters to work properly. Default: 7E (tilde—displayed as a black square) Range: 00 to FF To change the value shown: - Press the left oval to move to the next digit position. - Press the right oval to increase the value of the digit.
	Set Format Prefix Character The format prefix is a two-digit hex value used as a parameter place marker in ZPL/ZPL II format instructions. The “H” that is displayed indicates Hexadecimal and is not part of the value. The print engine looks for this hex character to indicate the start of a ZPL/ZPL II format instruction. See the <i>ZPL II Programming Guide</i> for more information. Note • Do not use the same hex value for the control, format, and delimiter character. The print engine must see different characters to work properly. Default: 5E (caret) Range: 00 to FF To change the value shown: - Press the left oval to move to the next digit position. - Press the right oval to increase the value of the digit.

Table 7 • Print Engine Parameters (Page 18 of 25)

Parameter	Action/Explanation
DELIMITER CHAR - <, >2CH +	Set Delimiter Character The delimiter character is a two-digit hex value used as a parameter place marker in ZPL/ZPL II format instructions. See the <i>ZPL II Programming Guide</i> for more information.  Note • Do not use the same hex value for the control, format, and delimiter character. The print engine must see different characters to work properly. Default: 2C (comma) Range: 00 to FF To change the value shown: 1. Press the left oval to move to the next digit position. 2. Press the right oval to increase the value of the digit.
ZPL MODE - ZPL II +	Select ZPL Mode The print engine remains in the selected mode until it is changed by this parameter or by using a ZPL/ZPL II command. The print engine accepts label formats written in either ZPL or ZPL II, eliminating the need to rewrite any ZPL formats that already exist. See the <i>ZPL II Programming Guide</i> for more information on the differences between ZPL and ZPL II. Default: ZPL II Selections: ZPL II, ZPL To change the value shown: 1. Press the left or right oval to toggle between the options.
MEDIA POWER UP - CALIBRATION+	Select Media Power-Up Option This parameter sets the action of the media when you turn on the print engine. Default: CALIBRATION Selections: FEED, CALIBRATION, LENGTH, SHORT CAL, and NO MOTION • Feed—feeds the labels to the first registration point. • Calibration—determines the length of the label and adjusts the sensor settings. • Length—In continuous mode, feeds the last stored label length. In noncontinuous mode, calibrates based on the maximum label length setting (see Set Maximum Label Length on page 68). • Short Cal—calibrates label length using the current sensor settings. • No Motion—the media does not move. You must press FEED to cause the print engine to resynch to the start of the next label. To change the value shown: 1. Press the left or right oval to scroll through the options.

Table 7 • Print Engine Parameters (Page 19 of 25)

Parameter	Action/Explanation
HEAD CLOSE - CALIBRATION+	Select Head Close Option This parameter sets the action of the media when you close the printhead. Default: CALIBRATION Selections: FEED, CALIBRATION, LENGTH, SHORT CAL, and NO MOTION • Feed—feeds the labels to the first registration point. • Calibration—determines the length of the label and adjusts the sensor settings. • Length—In continuous mode, feeds the last stored label length. In noncontinuous mode, calibrates based on the maximum label length setting (see Set Maximum Label Length on page 68). • Short Cal—calibrates label length using the current sensor settings. • No Motion—the media does not move. You must press FEED to cause the print engine to resynch to the start of the next label. To change the value shown: 1. Press the left or right oval to scroll through the options.
BACKFEED - BEFORE +	Select Backfeed Sequence This parameter establishes when label backfeed occurs after a label is removed in applicator mode. It has no effect in Rewind mode. This setting is superseded by ~JS when received as part of a label format. See the <i>ZPL II Programming Guide</i> for more information. Default: BEFORE for non-RFID print engine, AFTER for print engine with RFID reader installed Selections: DEFAULT, AFTER, BEFORE, OFF To change the value shown: 1. Press the left or right oval to scroll through the options.
LABEL TOP +000 -■■■■■■■ +	Adjust Label Top Position This parameter adjusts the print position vertically on the label. Positive numbers adjust the label top position farther down the label (away from the printhead); negative numbers adjust the position up the label (toward the printhead). The displayed value represents dots. Default: +000 Range: -120 to +120 dots To change the value shown: 1. Press the right oval to increase the value. 2. Press the left oval to decrease the value.

Table 7 • Print Engine Parameters (Page 20 of 25)

Parameter	Action/Explanation
LEFT POSITION - ±0000 +	Adjust Left Position This parameter establishes how far from the left edge of a label the format begins to print by adjusting horizontal positioning on the label. Positive numbers adjust the printing away from the main frame by the number of dots selected; negative numbers shift printing toward the main frame. The displayed value represents dots. Default: 0000 Range: –9999 to +9999 dots To change the value shown: 1. Press the left oval to move the cursor. 2. Press the right oval to change between +/- and to increase the value of the digit. 3. For a negative value, enter the value before changing to the minus sign.
HEAD RESISTOR - 0500 OHMS +	Set the Printhead Resistor Value Caution • This parameter should be changed only by qualified service personnel. Do not set the value higher than that shown on the printhead. Setting a higher value may damage the printhead. This value is preset at the factory to match the resistance value of the printhead. It does not need to be changed unless the printhead or the main logic board is replaced. Initial Value: Factory-set to match the printhead shipped with your print engine. Default Value: 0500 Range: 0500 to 2000 To set the printhead resistor value: 1. Before replacing the printhead, look for the label that shows the resistance value (Ω value) of the new printhead. Make note of this setting before installing the new printhead. 2. Press the left oval to move to the next digit position. 3. Press the right oval to increase the value of the digit.

Table 7 • Print Engine Parameters (Page 21 of 25)

Parameter	Action/Explanation
APPLICATOR PORT - OFF +	Set Applicator Port Mode Determines the action of the applicator port.  Note • Set this value as suggested by the applicator manufacturer. Default: OFF Selections: OFF, MODE 1, MODE 2, MODE 3, MODE 4 • OFF: The applicator port is off. • MODE 1: Asserts the ~END_PRINT signal low while the print engine is moving the label forward. • MODE 2: Asserts the ~END_PRINT signal high while the print engine is moving the label forward. • MODE 3: Asserts the ~END_PRINT signal low for 20 milliseconds when a label has been completed and positioned. Not asserted during continuous printing modes. • MODE 4: Asserts the ~END_PRINT signal high for 20 milliseconds when a label has been completed and positioned. Not asserted during continuous printing modes. To change the value shown: 1. Press the left or right oval to scroll through the options.
ERROR ON PAUSE - ENABLED +	Set Applicator Error Signal When Print Engine Pauses When this option is enabled and the print engine is paused, the print engine sets the applicator error state. Default: ENABLED Selections: ENABLED, DISABLED To change the value shown: 1. Press the left or right oval to toggle between the options.

Table 7 • Print Engine Parameters (Page 22 of 25)

Parameter	Action/Explanation
START PRINT SIG - PULSE MODE +	Select Start Print Signal This parameter determines how the print engine reacts to the Start Print Signal input on pin 3 of the applicator interface connector at the rear of the print engine. Caution • Start Print Signal is set by the applicator manufacturer and should not be changed unless the factory defaults have been reloaded. Please make a note of it. While other choices are valid, the print engine must be returned to its designated setting for it to work properly. Default: PULSE MODE Selections: PULSE MODE, LEVEL MODE • PULSE MODE—Labels print when the signal transitions from HIGH to LOW. • LEVEL MODE—Labels print as long as the signal is asserted LOW. To change the value shown: 1. Press the left or right oval to toggle between the options.
RESYNCH MODE - FEED MODE +	Select Resynch Mode This parameter determines how the print engine reacts if the label synchronization is lost and the label top is not where expected. Default: FEED MODE Selections: FEED MODE, ERROR MODE • FEED MODE—If the label top is not where expected, the print engine feeds a blank label to find the label top position. • ERROR MODE—If the label top is not where expected, the print engine stops, enters Pause mode, displays the message Error Condition Feed Label, flashes the ERROR light, and asserts the Service Required signal (pin 10 on the Applicator Interface Connector). To resynch the media to the top of the label in Error mode, press PAUSE to exit Pause mode. The ERROR light stops flashing, and the Service Required signal is deactivated. The action of the print engine is determined by the Head Close configuration selection (see Select Head Close Option on page 82). To change the value shown: 1. Press the left or right oval to toggle between the options.

Table 7 • Print Engine Parameters (Page 23 of 25)

Parameter	Action/Explanation
RIBBON LOW MODE - 25M +	Set Ribbon Low Mode When the Ribbon Low feature is off, the output signal (Pin 9) does not function, the LOW RIBBON warning is not displayed, and the print engine continues to print until it runs out of ribbon. When the Ribbon Low feature is set to any of the lengths, output signal (Pin 9) on the applicator port is functional. When the amount of ribbon on the supply spindle reaches the specific length, the output signal asserts to provide a RIBBON LOW warning. For print engines with the RIBBON LOW OUTPUT parameter, set the output signal to assert HIGH or LOW. For print engines without this parameter, the signal asserts HIGH. Default: 25M Selections: OFF, 25M, 50M, 75M, 100M To change the value shown: Press the left or right oval to scroll through the options.
RIB LOW OUTPUT - ACTIVE HIGH +	Set Ribbon Low Output  Note • This parameter is not available on older 110PAX4 firmware and will be added to a future release of the R110PAX4. Check for the latest firmware at http://www.zebra.com/firmware. When the Ribbon Low feature is on, this parameter determines if the output signal on Pin 9 is HIGH or LOW. Default: ACTIVE HIGH Selections: ACTIVE HIGH, ACTIVE LOW
REPRINT MODE - DISABLED +	Set Reprint Mode When the Reprint feature is enabled, the reprint input signal (Pin 6) on the applicator port is functional. When the input signal is asserted, the last label printed is printed again. (This includes non-printing labels.) When the Reprint feature is disabled, the reprint input signal is ignored.  Note • The ^SP ZPL command is ignored when the Reprint feature is enabled. When the Reprint feature is disabled, the ^SP command can be used. In addition, when a received label format is canceled prior to printing, the reprint function for the previous label is also canceled. Refer to the <i>ZPL II Programming Guide</i> for additional information. Default: DISABLED Range: ENABLED, DISABLED To change the value shown: Press the left or right oval to toggle between the options.

Table 7 • Print Engine Parameters (Page 24 of 25)

Parameter	Action/Explanation
WEB S. 073 - ■■■■■■ + MEDIA S. 075 - ■■■■■■ + RIBBON S. 071 - ■■■■■■ + MARK S. 000 - ■ + MARK MED S. 000 - ■ + MEDIA LED 082 - ■ + RIBBON LED 008 - ■ + MARK LED 005 - ■ +	These parameters are automatically set during the calibration procedure and should be changed only by a qualified service technician. Refer to the <i>ZPL II Programming Guide</i> for information on these parameters. To skip these parameters: Press NEXT/SAVE repeatedly.
LCD ADJUST +10 - ■ +	Adjust LCD Display This parameter allows you to adjust the brightness of your LCD if it is difficult to read. Default: 10 Range: 00 to 19 To change the value shown: - Press the right oval to increase the value (increase brightness). - Press the left oval to decrease the value (reduce brightness).
FORMAT CONVERT - NONE +	Select Format Convert Selects the bitmap scaling factor. The first number is the original dots per inch (dpi) value; the second, the dpi to which you would like to scale. Default: NONE Selections: NONE, 150 → 300, 150 → 600, 200 → 600, 300 → 600 To change the value shown: Press the left or right oval to scroll through the options.
RTS TAKEUP ARM XXX	Set RTS Take-Up Dancer Arm Calibration Value This parameter is used as a diagnostic tool to monitor the voltage supplied to the Ribbon Tensioning System Take-Up Dancer Arm. Refer to the <i>Maintenance Manual</i> for information.

Table 7 • Print Engine Parameters (Page 25 of 25)

Parameter	Action/Explanation
RTS SUPPLY ARM XXX	Set RTS Supply Dancer Arm Calibration Value This parameter is used as a diagnostic tool to monitor the voltage supplied to the Ribbon Tensioning System Supply Dancer Arm. Refer to the <i>Maintenance Manual</i> for information.
IDLE DISPLAY - FW VERSION +	Select Idle Display This parameter selects the LCD options for the real-time clock.  Note • If the default value is not selected, pressing the left or right oval briefly displays the firmware version of the print engine. Default: FIRMWARE VERSION Selections: MM/DD/YY (24 HOUR), MM/DD/YY (12 HOUR), DD/MM/YY (24 HOUR), DD/MM/YY (12 HOUR), FW VERSION To change the value shown: Press the left or right oval to scroll through the options.
RTC DATE - 01/31/01 +	Set Real-Time Clock (RTC) Date This parameter allows you to set the date following the convention selected in IDLE DISPLAY. To change the value shown: - Press the left oval to move to the next digit position. - Press the right oval to change the value of the digit.
RTC TIME - 14:55 +	Set RTC Time This parameter allows you to set the time following the convention selected in IDLE DISPLAY. To change the value shown: - Press the left oval to move to the next digit position. - Press the right oval to change the value of the digit.
LANGUAGE - ENGLISH +	Select the Display Language This parameter changes the language displayed on the LCD. Default: ENGLISH Selections: ENGLISH, SPANISH, FRENCH, GERMAN, ITALIAN, NORWEGIAN, PORTUGUESE, SWEDISH, DANISH, SPANISH 2, DUTCH, FINNISH, JAPAN To change the value shown: Press the left or right oval to scroll through the options.



Routine Maintenance

This chapter provides routine cleaning and maintenance procedures.

Contents

Lubrication	90
Cleaning Schedule	90
Clean the Exterior	90
Clean the Media Compartment	91
Clean the Sensors	91
Clean the Printhead and Platen Roller	93
Toggle Positioning	95
Printhead Pressure Adjustment	97
Power Fuse Replacement	99

Lubrication

Caution • This print engine does not require lubrication. Applying lubricants may damage your print engine's finish and decrease the performance of its electromechanical parts.

Cleaning Schedule

Cleaning your print engine regularly maintains print quality and may extend the life of the print engine. The recommended cleaning schedule is shown in [Table 8](#). See the following pages for specific procedures.

Caution • Use only the cleaning agents indicated. Zebra is not responsible for damage caused by any other fluids being used on this print engine.

Table 8 • Recommended Print Engine Cleaning Schedule

Area	Method	Interval
Printhead	Solvent*	Perform these procedures at the following times: • When CLEAN HEAD NOW appears. • Direct Thermal Print Mode: After every roll of labels or 500 ft (150 m) of fanfold labels. • Thermal Transfer Print Mode: After every roll (1500 ft or 450 m) of ribbon.
Platen roller	Solvent*	
Transmissive media sensor	Air blow	
Reflective media sensor	Air blow	
Media path	Solvent*	
Ribbon sensor	Air blow	Monthly and as needed
Door-open sensors	Air blow	
Tear-off/peel-off bar	Solvent*	
Clear plastic antenna cover (RFID print engines)	Air blow	

* Use Preventative Maintenance kit (part number 47362) or a solution of 90% isopropyl alcohol and 10% deionized water.

Clean the Exterior

Clean the outside surfaces of the print engine with a lint-free cloth. Use a mild detergent solution or desktop cleaner sparingly, as needed.

Caution • Do not use harsh or abrasive cleaning agents or solvents.

Clean the Media Compartment

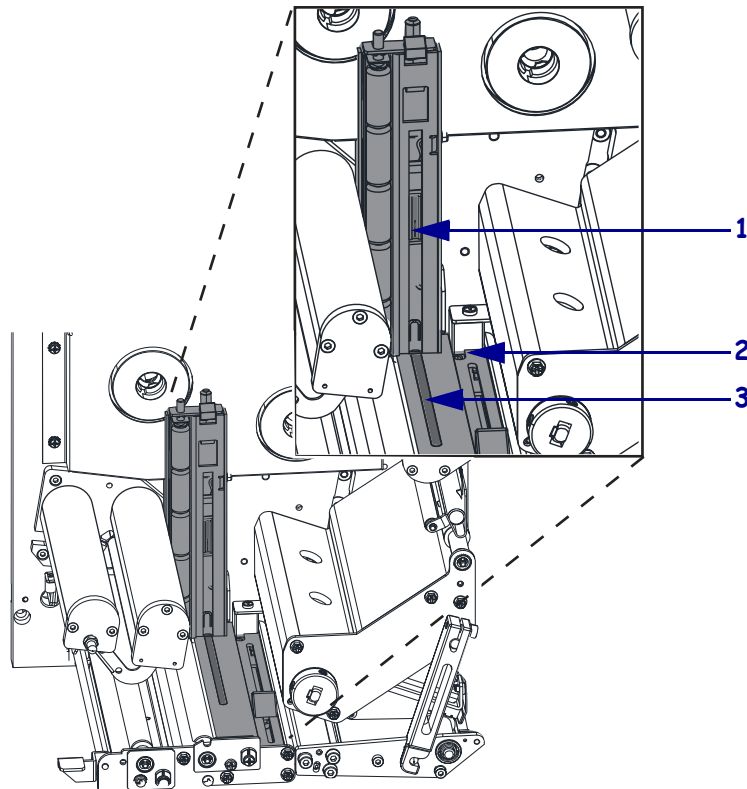
Remove any accumulated dirt and lint from the interior of the print engine using a soft bristle brush and/or vacuum cleaner. This area should be inspected every time a new ribbon is loaded.

Clean the Sensors

To ensure proper operation of the print engine, all sensors should be cleaned on a regular basis. The sensors are shown in the following:

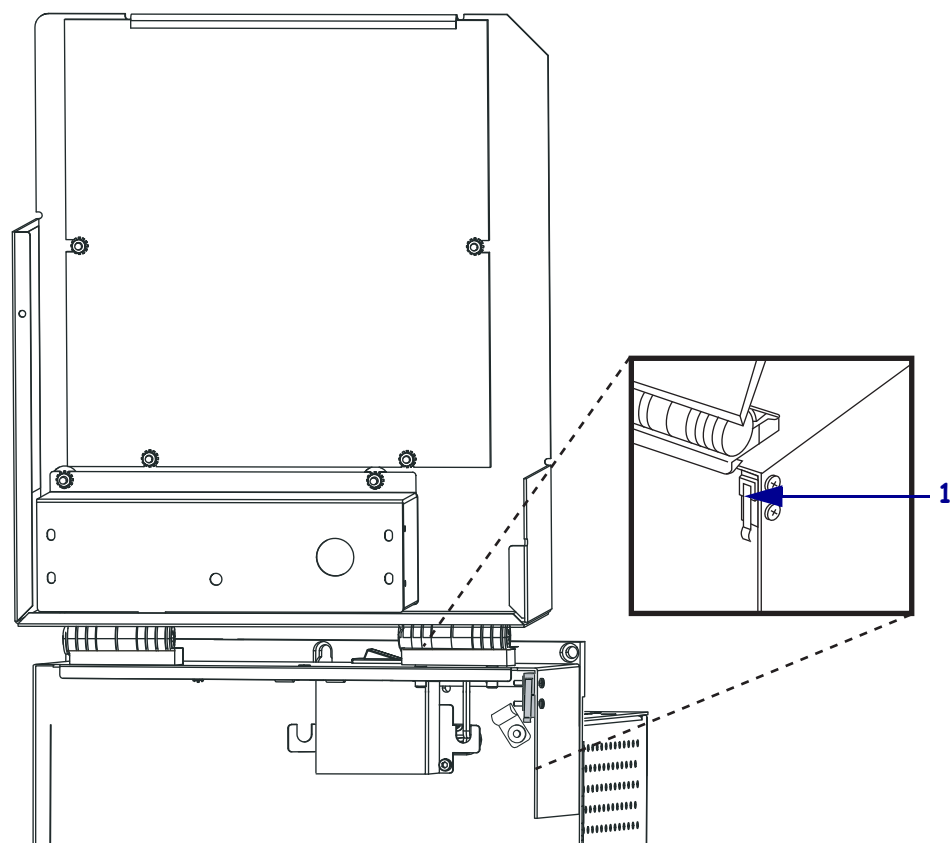
- See [Figure 24](#) for the media sensors.
- See [Figure 25 on page 92](#) for the door-open sensor.
- See [Figure 26 on page 92](#) for the ribbon sensor.

Figure 24 • Media Sensor Locations (Right-Hand Unit Shown)



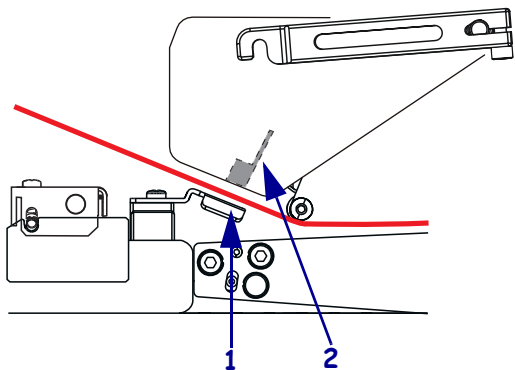
1	Upper transmissive media sensor
2	Reflective media sensor
3	Lower transmissive media sensor

Figure 25 • Door-Open Sensor Location (Right-Hand Unit Shown)



1	Door-open sensor
---	------------------

Figure 26 • Ribbon Sensor Location (Right-Hand Unit Shown)



1	Ribbon sensor reflector
2	Ribbon sensor

Clean the Printhead and Platen Roller

Clean the printhead and platen roller according to the schedule in [Table 8 on page 90](#). Clean the printhead more often if you see inconsistent print quality, such as voids or light print. Clean the platen roller if you see media movement problems.

To clean the printhead and platen roller, complete these steps:



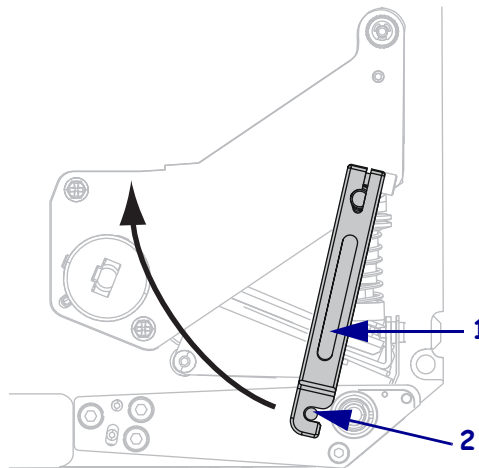
Caution • Observe proper electrostatic safety precautions when handling any static-sensitive components such as circuit boards and printheads.

1. Turn Off (O) the print engine.



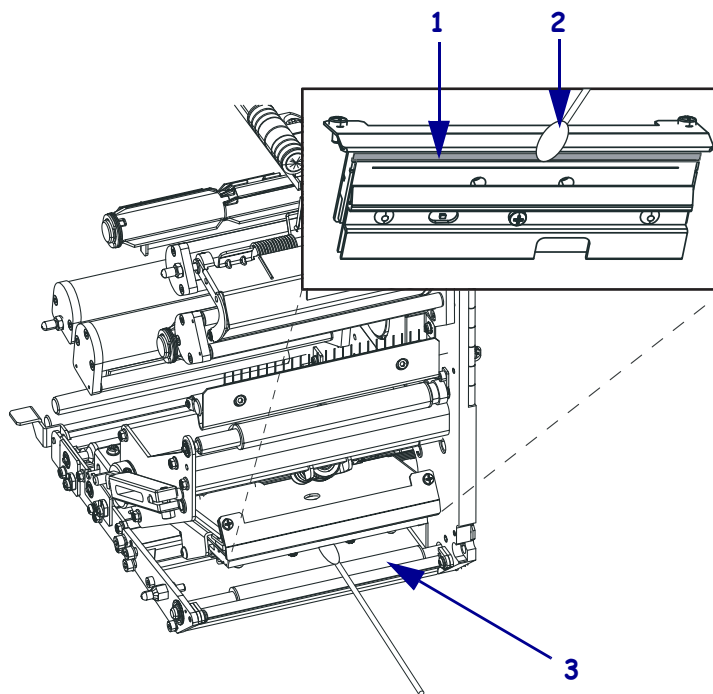
2. **Caution •** The printhead may be hot and could cause severe burns. Allow the printhead to cool.

Open the printhead assembly by unlatching the printhead latch (1) from the locking pin (2).



3. Remove the media and ribbon from the print engine.

4. Using Preventative Maintenance kit (part number 47362) or a solution of 90% isopropyl alcohol and 10% deionized water on a cotton swab, wipe the print elements from end to end. Allow the solvent to evaporate.



1	Printhead elements (gray strip)
2	Cotton swab
3	Platen Roller

5. Use a lint-free cloth moistened with alcohol to clean the platen roller and other rollers. Rotate the rollers while cleaning.
6. Reload the ribbon and media (if used).
7. Turn On (I) the print engine.



Note • If print quality does not improve after you perform this procedure, clean the printhead with *Save-a-Printhead* cleaning film. Call your authorized Zebra distributor for more information.

Toggle Positioning

Proper toggle positioning is important for proper print quality. The toggle should be positioned approximately midway across the width of the media.



Caution • Observe proper electrostatic safety precautions when handling any static-sensitive components such as circuit boards and printheads.

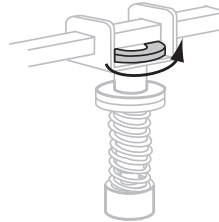
To adjust the toggle, complete these steps:

1. Print some labels at 2.4 in. (61 mm) per second by running the PAUSE Self Test (see [PAUSE Self Test on page 121](#)).
2. While printing labels, use the control panel to lower the darkness setting until the labels are printing gray instead of black (see [Adjust Print Darkness on page 64](#)).

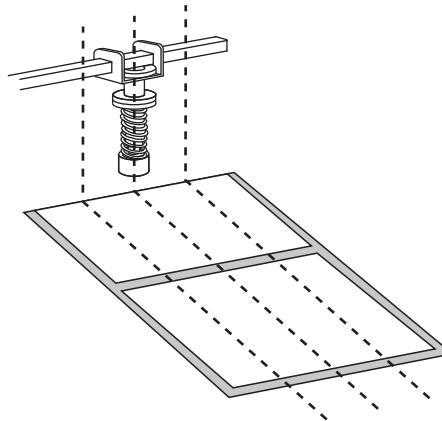


3. **Caution** • The printhead may be hot and could cause severe burns. Allow the printhead to cool.

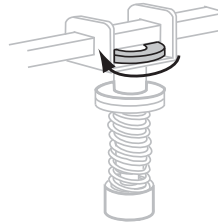
Loosen the locking nut at the top of the toggle assembly.



4. Position the toggle over the center of the labels.



5. Tighten the locking nut.



6. Print additional labels at 2.4 in. (61 mm) per second by again running the PAUSE Self Test. (Press and hold PAUSE while turning on (I) the printer.)
7. Do both sides of the label print at the same level of gray?

If...	Then...
Yes	The toggles are positioned correctly. Increase the darkness setting to the optimum level for the media being used.
No	a. Readjust the position of the toggle or toggles toward the side that printed lighter. b. Print additional labels at 2.4 in. (61 mm) per second by again running the PAUSE Self Test. (Press and hold PAUSE while turning on (I) the printer.) c. Repeat this step until both sides of the label print at the same level of gray. d. Increase the darkness setting to the optimum level for the media being used.

Printhead Pressure Adjustment

Before adjusting the printhead pressure, check that the toggles are positioned correctly. See [Toggle Positioning on page 95](#).

Printhead life and drive system life (belts and bearings) can be maximized by using the lowest pressure that produces the desired print quality without allowing the ribbon or media to slip. You may need to adjust the printhead pressure in the following instances:

- if there is noticeable bleed or swelling in the printed image (too much pressure)
- if there are voids (too little pressure)
- if the darkness setting (burn duration) is set properly, but printing is too light (too little pressure)
- if the ribbon slips (too little pressure)



Caution • Observe proper electrostatic safety precautions when handling any static-sensitive components such as circuit boards and printheads.

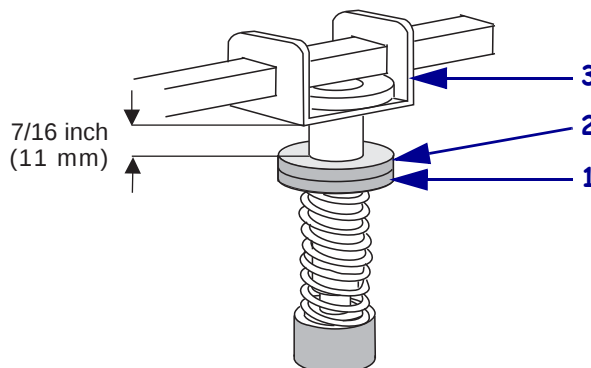
To adjust printhead pressure, complete these steps:

1. As needed throughout this procedure, refer to the [PAUSE Self Test on page 121](#) to print test labels.
2. Refer to [Adjust Print Darkness on page 64](#) to set the darkness value (burn duration) appropriately for your media and ribbon.

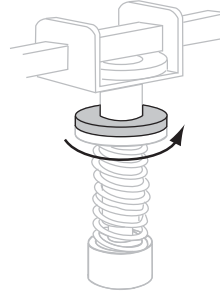


3. **Caution** • The printhead may be hot and could cause severe burns. Allow the printhead to cool.

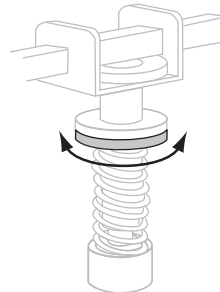
As a starting point for adjustment, set the position of the adjusting nut (1) and the locking nut (2) so that when the locking nut is tightened, it is approximately 7/16 in. (11 mm) from the yoke (3).



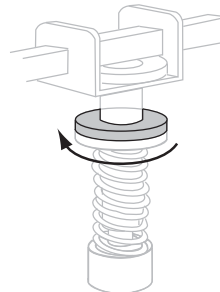
4. Loosen the locking nut on the toggle assembly.



5. Move the adjusting nut until the print quality is acceptable. Use the lowest pressure that provides the desired print quality.
- To increase printhead pressure, move the adjusting nut downward.
 - To decrease printhead pressure, move the adjusting nut upward.



6. To lock the toggle pressure, tighten the locking nut against the adjusting nut.



Power Fuse Replacement

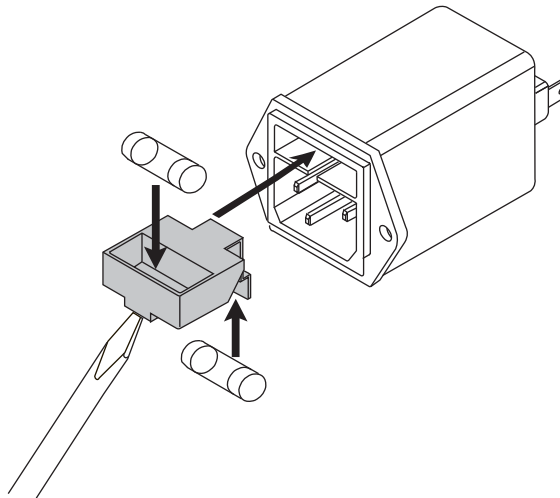
The print engine uses a metric-style fuse (5 × 20 mm IEC) rated for 5 Amps at 250 Volts that bears the certification mark of a known international safety organization (see [Figure 11 on page 34](#)). The power entry module comes with two approved fuses in the fuse holder: one is in-circuit, and the other is a spare.



Caution • Turn Off (O) the print engine and disconnect it from the power source before performing the following maintenance.

To replace a fuse, complete these steps:

1. Turn Off (O) the print engine and unplug the power cord from the back of the print engine.
2. Using a small-blade screwdriver, remove the fuse holder from the power entry module at the rear of the print engine.



3. Carefully remove the fuse from the in-circuit location.
4. To remove the spare fuse, gently push the point of a pencil or the end of a paperclip through one of the two holes in the fuse holder. Repeat through the other hole.
5. Insert the spare fuse in the in-circuit location.
6. Place a new fuse in the spare fuse location.
7. Reinstall the fuse holder into the power entry module at the rear of the print engine.
8. Reconnect the power cord, and then turn On (I) the print engine.

The print engine should be ready for operation and the POWER light should be on. If power is not restored, an internal component failure may have occurred, and the print engine may require servicing.



Notes •



Troubleshooting

This section provides information about errors that you might need to troubleshoot. Assorted diagnostic tests are included.

Contents

Troubleshooting Checklists	102
LCD Error Messages	103
Memory Errors	107
Print Quality Problems	108
Communications Problems	112
Ribbon Problems	113
RFID Problems	114
Miscellaneous Print Engine Problems	117
Print Engine Diagnostics	119
Power-On Self Test	119
CANCEL Self Test	120
PAUSE Self Test	121
FEED Self Test	122
FEED and PAUSE Self Test	126
Communications Diagnostics Test	129
Sensor Profile	130

Troubleshooting Checklists

If an error condition exists with the print engine, review this checklist:

- ☐
- ☐ Is there an error message on the LCD? If yes, see [LCD Error Messages on page 103](#).
- ☐ Are noncontinuous labels being treated as continuous labels? If yes, see [Calibrate Media and Ribbon Sensor Sensitivity on page 77](#).
- ☐ Is the CHECK RIBBON light on when ribbon is loaded properly? If yes, see [Calibrate Media and Ribbon Sensor Sensitivity on page 77](#).
- ☐ Are you experiencing problems with print quality? If yes, see [Print Quality Problems on page 108](#).
- ☐ Are you experiencing communications problems? If yes, see [Communications Problems on page 112](#).

If the labels are not printing or advancing correctly, review this checklist:

- ☐ Are you using the correct type of labels? Review the types of label in [Types of Media on page 35](#).
- ☐ Are you using a label that is narrower than the maximum print width? See [Set Print Width on page 67](#).
- ☐ Review the label- and ribbon-loading illustrations in [Load Media on page 40](#) and [Load Ribbon on page 46](#).
- ☐ Does the printhead need to be adjusted? See [Printhead Pressure Adjustment on page 97](#) for more information.
- ☐ Do the sensors need to be calibrated? See [Calibrate Media and Ribbon Sensor Sensitivity on page 77](#) for more information.

If none of the above suggestions correct the problem, review this checklist:

- ☐ Perform one or more of the self-tests given in [Print Engine Diagnostics on page 119](#). Use the results to help identify the problem.
- ☐ If you are still having problems, see [Contacts on page 11](#) for customer support information.

LCD Error Messages

The LCD displays messages when there is an error. See [Table 9](#) for LCD errors, the possible causes, and the recommended solutions.

Table 9 • LCD Error Messages

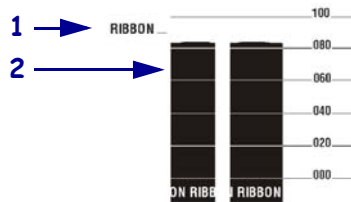
LCD Display/ Print Engine Condition	Possible Cause	Recommended Solution
ERROR CONDITION RIBBON OUT The print engine stops; the RIBBON light is on; the ERROR light flashes.	In thermal transfer mode, ribbon is not loaded or incorrectly loaded.	Load ribbon correctly.
	In thermal transfer mode, the ribbon sensor is not detecting ribbon.	1. Load ribbon correctly. 2. Calibrate the sensors. See Calibrate Media and Ribbon Sensor Sensitivity on page 77.
	In thermal transfer mode, media is blocking the ribbon sensor.	1. Load media correctly. 2. Calibrate the sensors. See Calibrate Media and Ribbon Sensor Sensitivity on page 77.
	In thermal transfer mode, the print engine did not detect the ribbon even though it is loaded correctly.	1. Print a sensor profile. See Print Sensor Profile on page 76. The ribbon out threshold (1) is likely too high, above the black area that indicates where the ribbon is detected (2). 
		2. Calibrate the sensors or load print engine defaults. See Calibrate Media and Ribbon Sensor Sensitivity on page 77 or LOAD DEFAULTS on page 59.
	If you are using direct thermal media, the print engine is waiting for ribbon to be loaded because it is incorrectly set for thermal transfer mode.	Set the print engine for Direct Thermal mode. See Select Print Method on page 66.

Table 9 • LCD Error Messages (Continued)

LCD Display/ Print Engine Condition	Possible Cause	Recommended Solution
WARNING RIBBON IN The RIBBON light is on; the ERROR light flashes.	Ribbon is loaded, but the print engine is set for direct thermal mode.	Ribbon is not required with direct thermal media. If you are using direct thermal media, remove the ribbon. This error message will not affect printing. If you are using thermal transfer media, which requires ribbon, set the print engine for Thermal Transfer mode. See Select Print Method on page 66
ERROR CONDITION PAPER OUT The print engine stops; the MEDIA light is on; the ERROR light flashes.	The media is not loaded or is loaded incorrectly.	Load media correctly.
	Misaligned media sensor.	Check position of the media sensor.
	The print engine is set for noncontinuous media, but continuous media is loaded.	Install proper media type, or reset print engine for current media type and perform calibration.
ERROR CONDITION HEAD OPEN The print engine stops; the ERROR light flashes.	The printhead is not fully closed.	Close printhead completely.
	The head open sensor is not working properly.	Call a service technician.
THERMISTOR FAULT The ERROR light flashes.	The printhead has a faulty thermistor.	Call a service technician.
WARNING HEAD COLD	 Caution • An improperly connected printhead data or power cable can cause these error messages. The printhead may be hot enough to cause severe burns. Allow the printhead to cool.	
THERMISTOR FAULT	The printhead data cable is not properly connected.	Caution • Turn off (O) the print engine before performing this procedure. Failure to do so can damage the printhead. 1. Turn off (O) the print engine. 2. Disconnect and reconnect the data cable to the printhead. 3. Ensure that the cable connector is fully inserted into the printhead connector. 4. Turn on (I) the print engine.
ERROR CONDITION HEAD ELEMENT BAD The print engine stops; the ERROR light is on; the print engine cycles through these three messages.		
	The printhead has a faulty thermistor.	Call a service technician.

Table 9 • LCD Error Messages (Continued)

LCD Display/ Print Engine Condition	Possible Cause	Recommended Solution
WARNING HEAD COLD The print engine prints while the ERROR light flashes.	 Caution • An improperly connected printhead data or power cable can cause this error message. The printhead may be hot enough to cause severe burns. Allow the printhead to cool.	
	The printhead temperature is approaching its lower operating limit.	Continue printing while the printhead reaches the correct operating temperature. If the error remains, the environment may be too cold for proper printing. Relocate the print engine to a warmer area.
	The printhead data cable is not properly connected.	Caution • Turn off (O) the print engine before performing this procedure. Failure to do so can damage the printhead. 1. Turn off (O) the print engine. 2. Disconnect and reconnect the data cable to the printhead. 3. Ensure that the cable connector is fully inserted into the printhead connector. 4. Turn on (I) the print engine.
	The printhead has a faulty thermistor.	Call a service technician.
WARNING HEAD TOO HOT The print engine stops; the ERROR light flashes.	 Caution • The printhead may be hot enough to cause severe burns. Allow the printhead to cool.	
	The printhead is over temperature.	Allow the print engine to cool. Printing automatically resumes when the printhead elements cool to an acceptable operating temperature.

Table 9 • LCD Error Messages (Continued)

LCD Display/ Print Engine Condition	Possible Cause	Recommended Solution
DEFRAGMENTING The print engine stops.	The print engine is defragmenting memory.	Caution • Do NOT turn off the print engine power during defragmenting. Doing so can damage the print engine. Allow the print engine to finish defragmenting. If you get this error message frequently, check your label formats. Formats that write to and erase memory frequently may cause the printer to defragment often. Using properly coded label formats usually minimizes the need for defragmenting. If this error message does not go away, contact Technical Support. The print engine requires service.
OUT OF MEMORY (function)	There is not enough memory to perform the function specified on the second line of the error message.	Free up some of the print engine's memory by adjusting the label format or print engine parameters. One way to free up memory is to adjust the print width to the actual width of the label instead of leaving the print width set to the default. See Set Print Width on page 67. Ensure that the device, such as FLASH memory or PCMCIA card, is installed and not write protected or full. Ensure that the data is not directed to a device that is not installed or is unavailable. Refer to the <i>Maintenance Manual</i> for more information about the specified function.

Memory Errors

The memory errors in [Table 10](#) indicate that the print engine does not have enough memory to perform the function shown on the second line of the LCD.

Table 10 • Memory Errors

Problem/LCD Display	Possible Cause	Recommended Solution
OUT OF MEMORY CREATING BITMAP	Creating Bitmap The bitmap size (label length/width) does not fit in available memory.	You may do any of the following: - Press PAUSE. Send a ~HM ZPL command to the print engine to display the amount of free memory. Then redesign the graphic/format to fit available memory, or remove items from memory to create more space. - Press PAUSE to skip the formatting step in process and proceed to the next step. With the print engine paused, press CANCEL. The print engine skips the current label formatting process and goes to the next label. - Turn the print engine off (O) and then on (I) to clear the print engine's memory.
OUT OF MEMORY STORING BITMAP	Storing Bitmap Not enough memory is available to store the bitmap created.	
OUT OF MEMORY BUILDING FORMAT	Building Format Label is too complex.	
OUT OF MEMORY STORING FORMAT	Storing Format Format is too large to fit in available memory.	
OUT OF MEMORY STORING GRAPHIC	Storing Graphic The graphic image is too large to fit in available memory.	
OUT OF MEMORY STORING FONT	Storing Font Not enough memory available to store the font.	

Print Quality Problems

Table 11 identifies problems with print quality, the possible causes, and the recommended solutions.

Table 11 • Print Quality Problems

Problem	Possible Cause	Recommended Solution
General print quality issues	The print engine is set at the incorrect print speed.	For optimal print quality, set the print speed to the lowest possible setting for your application via control panel, the driver, or the software. See Adjust Print Speed on page 64 . You may want to perform the FEED Self Test on page 122 .
	You are using an incorrect combination of labels and ribbon for your application.	1. Switch to a different type of media or ribbon to try to find a compatible combination. 2. If necessary, consult your authorized Zebra reseller or distributor for information and advice.
	The print engine is set at an incorrect darkness level.	For optimal print quality, set the darkness to the lowest possible setting for your application via the control panel, the driver, or the software. See Adjust Print Darkness on page 64 . You may want to perform the FEED Self Test on page 122 to determine the ideal darkness setting.
	The printhead is dirty.	Clean the printhead. See Clean the Printhead and Platen Roller on page 93 .
	Incorrect or uneven printhead pressure.	Set the printhead pressure to the minimum needed for good print quality. See Printhead Pressure Adjustment on page 97 .
	The printhead is improperly balanced.	Call a service technician.
Long tracks of missing print on several labels	Print element damaged.	Call a service technician.
	Wrinkled ribbon.	See wrinkled ribbon causes and solutions in this table.

Table 11 • Print Quality Problems (Continued)

Problem	Possible Cause	Recommended Solution
Wrinkled ribbon	Ribbon was fed through the ribbon system incorrectly.	Load the ribbon correctly. See Load Ribbon on page 46 .
	Incorrect burn temperature.	Set the darkness to the lowest possible setting for good print quality. See Adjust Print Darkness on page 64 .
	Incorrect or uneven printhead pressure.	Set the printhead pressure to the minimum needed for good print quality. See Printhead Pressure Adjustment on page 97 .
	Media not feeding properly; “walking” from side to side.	Make sure that media is snug by adjusting the media guide, or call a service technician.
	The strip plate needs adjusting.	Call a service technician.
	The printhead needs vertical adjustment.	Call a service technician.
	The printhead is improperly balanced.	Call a service technician.
	The printhead and platen roller need to be realigned.	Call a service technician.
Fine, angular gray lines on blank labels	Wrinkled ribbon.	See wrinkled ribbon causes and solutions in this table.
The image prints on the platen roller instead of on the label.	Incorrect print width.	If you are using a label that is narrower than the maximum width (based on dpi) with a right-hand print engine, you must set the print width to the correct value. If you do not do so, the image will print too far to the left. See Set Print Width on page 67 .
Only the right side of the image prints on the left side of the label. The image is shifted to the left.		
Light printing or no printing on the left or right side of the label	Printhead pressure needs adjustment, printhead out of alignment, or toggle in incorrect position.	See Toggle Positioning on page 95 and Printhead Pressure Adjustment on page 97 .
		Call a service technician.

Table 11 • Print Quality Problems (Continued)

Problem	Possible Cause	Recommended Solution
Printing too light or too dark over the entire label	The media or ribbon is not designed for high-speed operation.	Replace supplies with those recommended for high-speed operation.
	You are using an incorrect combination of media and ribbon for your application.	1. Switch to a different type of media or ribbon to try to find a compatible combination. 2. If necessary, consult your authorized Zebra reseller or distributor for information and advice.
	You are using ribbon with direct thermal media.	Direct thermal media does not require ribbon. To check if you are using direct thermal media, perform the label scratch test in When to Use Ribbon on page 37 .
	Incorrect or uneven printhead pressure.	Set the pressure to the minimum needed. See Printhead Pressure Adjustment on page 97 .
Smudge marks on labels	The media or ribbon is not designed for high-speed operation.	Replace supplies with those recommended for high-speed operation.
Misregistration/skips labels	The print engine is not calibrated.	Recalibrate the print engine.
	Improper label format.	Use correct label format.
Misregistration and misprint of one to three labels	The platen roller is dirty.	See Clean the Printhead and Platen Roller on page 93 .
	Media does not meet specifications.	Use media that meets specifications.
Vertical drift in top-of-form position	The print engine is out of calibration.	Calibrate the print engine.
	Normal tolerances of mechanical parts and print engine modes.  Note • A vertical drift of ± 4 to 6 dot rows (approximately 0.5 mm) is within normal tolerances.	1. Calibrate the print engine. See Calibrate Media and Ribbon Sensor Sensitivity on page 77. 2. Adjust the label top position setting. See Adjust Label Top Position on page 82.
	The platen roller is dirty.	Clean the platen roller. See Clean the Printhead and Platen Roller on page 93 .

Table 11 • Print Quality Problems (Continued)

Problem	Possible Cause	Recommended Solution
Vertical image or label drift	The print engine is using non-continuous labels but is configured in continuous mode.	Configure the print engine for non-continuous and run calibration routine, if necessary.
	The media sensor is calibrated improperly.	See <i>Calibrate Media and Ribbon Sensor Sensitivity</i> on page 77.
	The platen roller is dirty.	Clean the platen roller. See <i>Clean the Printhead and Platen Roller</i> on page 93.
	Improper printhead pressure settings (toggles).	Adjust the printhead pressure to ensure proper functionality.
	Improperly loaded ribbon or media.	Verify that the print engine is loaded properly.
	Incompatible media.	Ensure that the interlabel gaps or notches are 2 to 4 mm and consistently placed. Media must not exceed minimum specifications for mode of operation.
The bar code printed on a label does not scan.	The bar code is not within specifications because the print is too light or too dark.	Perform the <i>FEED Self Test</i> on page 122. Adjust the darkness or print speed settings as necessary.
	Not enough blank space around the bar code.	Leave at least 1/8 in. (3.2 mm) between the bar code and other printed areas on the label and between the bar code and the edge of the label.

Communications Problems

Table 12 identifies problems with communications, the possible causes, and the recommended solutions.

Table 12 • Communications Problems

Problem	Possible Cause	Recommended Solution
A label format was sent to the print engine but was not recognized. The DATA light does not flash.	The communication parameters are incorrect.	Check the print engine driver or software communications settings (if applicable).
		If you are using serial communication, check the serial port setting in the control panel menu. See Set Serial Communications on page 78 .
		If you are using serial communication, make sure that you are using a null modem cable or a null modem adapter.
		Using the control panel menu, check the protocol setting. It should be set to NONE . See Set Protocol on page 79 .
		If a driver is used, check the driver communication settings for your connection.
A label format was sent to the print engine. Several labels print, then the print engine skips, misplaces, misses, or distorts the image on the label.	The serial communication settings are incorrect.	Ensure that the flow control settings match.
		Check the communication cable length. See Table 4 on page 31 for requirements.
		Check the print engine driver or software communications settings (if applicable).
A label format was sent to the print engine but was not recognized. The DATA light flashes but no printing occurs.	The prefix and delimiter characters set in the print engine do not match the ones in the label format.	Verify the prefix and delimiter characters. See Set Format Prefix Character on page 80 and Set Delimiter Character on page 81 for the requirements.
	Incorrect data is being sent to the print engine.	Check the communication settings on the computer. Ensure that they match the print engine settings.
		Ensure that ZPL II is being used.
		If the problem continues, check the ZPL II format for changes to ^CC, ^CT, and ^CD.

Ribbon Problems

Table 13 identifies problems that may occur with ribbon, the possible causes, and the recommended solutions.

Table 13 • Ribbon Problems

Problem	Possible Cause	Recommended Solution
Broken or melted ribbon	Darkness setting too high.	1. Reduce the darkness setting. 2. Clean the printhead thoroughly.
	The ribbon is coated on the wrong side and cannot be used in this print engine.	Replace the ribbon with one coated on the correct side. For more information, see Coated Side of Ribbon on page 37 .
Ribbon tension dancer(s) oscillate erratically	Ribbon core is not standard size and is slipping on the spindle.	Replace ribbon with one that has a standard core size.
The printer does not detect when the ribbon runs out. In thermal transfer mode, the printer did not detect the ribbon even though it is loaded correctly.	The printer was calibrated without ribbon. Later, ribbon was inserted without the user recalibrating the printer or loading printer defaults.	Calibrate the printer, this time using ribbon, or load printer defaults. See Calibrate Media and Ribbon Sensor Sensitivity on page 77 or LOAD DEFAULTS on page 59 .
The ribbon light is on even though ribbon is loaded correctly.	The print engine was not calibrated for the label and ribbon being used.	Perform the calibration procedure in Calibrate Media and Ribbon Sensor Sensitivity on page 77 .

RFID Problems

Table 14 identifies problems that may occur with RFID print engines, the possible causes, and the recommended solutions. For more information about RFID, refer to the *RFID Programming Guide*. A copy of the manual is available at <http://www.zebra.com/manuals> or on the user CD that came with your print engine.

Table 14 • RFID Problems

Problem	Possible Cause	Recommended Solution
The RFID-enabled print engine voids every label.	The print engine is not calibrated for the media being used.	Calibrate the print engine. See <i>Calibrate Media and Ribbon Sensor Sensitivity</i> on page 77.
	The print engine is set for the wrong tag type.	Refer to the <i>RFID Programming Guide</i> , and check the tag types supported by your print engine. If the tag type is not supported, you may not be able to use the labels with your print engine. If necessary, set the print engine for the correct tag type.
	The print engine is unable to communicate with the RFID reader.	1. Turn off (O) the print engine. 2. Wait 10 seconds. 3. Turn on (I) the print engine. 4. If the problem persists, you may have a bad RFID reader or a loose connection between the RFID reader and the print engine. Contact Technical Support or an authorized Zebra RFID service technician for assistance.
	The print engine is unable to communicate with the encoding module.	1. Turn off (O) the print engine. 2. Wait 10 seconds. 3. Turn on (I) the print engine. 4. If the problem persists, you may have a bad encoding module or a loose connection between the encoding module and the print engine. Contact Technical Support or an authorized Zebra RFID service technician for assistance.
	Radio frequency (RF) interference from another RF source.	Do one or more of the following as necessary: • Move the print engine away from fixed RFID readers or other RF sources. • Make sure that the media door is closed at all times during RFID programming.
	The settings are incorrect in your label designer software.	The software settings override the print engine settings. Make sure that the software and print engine settings match.
<i>(Continued on next page.)</i>		

Table 14 • RFID Problems (Continued)

Problem	Possible Cause	Recommended Solution
The RFID-enabled print engine voids every label.	<i>(Continued from previous page.)</i>	
	You are using an incorrect programming position, particularly if the tags being used are within print engine specifications.	Do one or more of the following as necessary: • Check the RFID programming position, or the program position setting in your label designer software. If the position is incorrect, change the setting. • Restore the RFID programming position back to the default value. Refer to the <i>RFID Programming Guide</i> for more information.
	You are sending RFID ZPL or SGD commands that are incorrect.	Check your label formats. Refer to the <i>RFID Programming Guide</i> for more information.
Low yields. Too many RFID tags per roll are voided.	The RFID labels are not within specifications for the print engine, which means that the transponder is not in an area that can be programmed consistently.	Make sure that the labels meet transponder placement specifications for your print engine. See http://www.zebra.com/transponders for transponder placement information. Refer to the <i>RFID Programming Guide</i> or contact an authorized Zebra RFID reseller for more information.
	Some RFID tags are more sensitive than others and may require special printer settings.	1. Verify that the printer is set for the correct write power. See http://www.zebra.com/transponders for the recommended power setting for each tag type. 2. If necessary, run the ^HR command to manually calibrate the transponder position. 3. If the problem persists, consider using a different tag type. Refer to the <i>RFID Programming Guide</i> or contact an authorized Zebra RFID reseller for more information.
	Incorrect read and write power levels for the RFID tag type.	Change the RFID read and write power levels. Refer to the <i>RFID Programming Guide</i> for instructions.
	Radio frequency (RF) interference from another RF source.	Do one or more of the following as necessary: • Move the print engine away from fixed RFID readers. • Make sure that the media door is closed at all times during RFID programming.
	The print engine is using outdated print engine firmware and reader firmware versions.	Go to http://www.zebra.com/firmware for updated firmware.

Table 14 • RFID Problems (Continued)

Problem	Possible Cause	Recommended Solution
The print engine stops at the RFID inlay.	The print engine calibrated the label length only to the RFID inlay instead of to the interlabel gap.	1. Select FEED for the MEDIA POWER UP and HEAD CLOSE parameters (see Select Media Power-Up Option on page 81 or Select Head Close Option on page 82) 2. Calibrate the print engine. See Calibrate Media and Ribbon Sensor Sensitivity on page 77.
The DATA light flashes indefinitely after you attempt to download print engine or reader firmware.	The download was not successful. For best results, cycle power on the print engine before downloading any firmware.	1. Turn off (O) the print engine. 2. Wait 10 seconds. 3. Turn on (I) the print engine. 4. Attempt to download the firmware again. 5. If the problem persists, contact Technical Support.
RFID parameters do not appear in Setup mode, and RFID information does not appear on the print engine configuration label.	The print engine was powered off (O) and then back on (I) too quickly for the RFID reader to initialize properly.	Wait at least 10 seconds after turning the print engine power off before turning it back on. 1. Turn off (O) the print engine. 2. Wait 10 seconds. 3. Turn on (I) the print engine. 4. Check for the RFID parameters in Setup mode or for RFID information on a new configuration label.
The printer does not void RFID labels that are not programmed correctly.	An incorrect version of print engine or reader firmware was loaded on the printer.	1. Verify that the correct firmware version is loaded on your printer. Refer to the <i>RFID Programming Guide</i> for more information. 2. Download the correct print engine or reader firmware if necessary. 3. If the problem persists, contact Technical Support.
	The print engine is unable to communicate with the RFID subsystem.	1. Turn off (O) the print engine. 2. Wait 10 seconds. 3. Turn on (I) the print engine. 4. If the problem persists, you may have a bad RFID reader or a loose connection between the RFID reader and the print engine. Contact Technical Support or an authorized service technician for assistance.

Miscellaneous Print Engine Problems

Table 15 identifies miscellaneous problems with the print engine, the possible causes, and the recommended solutions.

Table 15 • Miscellaneous Print Engine Problems

Problem	Possible Cause	Recommended Solution
The LCD displays a language that I cannot read	The language parameter was changed through the control panel or a ZPL command.	1. Press SETUP/EXIT to enter configuration mode. 2. Press the left oval. The print engine displays the LANGUAGE parameter in the current language. Even if you cannot recognize the characters displayed, you can still scroll to another language. 3. Press the left or right oval to scroll through the choices. 4. Press SETUP/EXIT. The LCD displays SAVE CHANGES in the original language. 5. Press NEXT to exit configuration mode and save the changes (if the language does not change, you may need to scroll to a different save option by pressing the left or right oval in the previous step). 6. Repeat this process, if necessary, until you reach the desired language.
The LCD is missing characters or parts of characters	The LCD may need replacing.	Call a service technician.
Changes in parameter settings did not take effect	Parameters are set incorrectly.	1. Set parameters and save permanently. 2. Turn the print engine off (O) and then on (I).
	A ZPL command turned off the ability to change the parameter.	Refer to the <i>ZPL Programming Guide</i> , or call a service technician.
	A ZPL command changed the parameter back to the previous setting.	Refer to the <i>ZPL Programming Guide</i> , or call a service technician.
	If the problem continues, there may be a problem with the main logic board.	Call a service technician.

Table 15 • Miscellaneous Print Engine Problems (Continued)

Problem	Possible Cause	Recommended Solution
The print engine fails to calibrate or detect the top of the label.	The print engine was not calibrated for the label being used.	Perform the calibration procedure in Calibrate Media and Ribbon Sensor Sensitivity on page 77 .
	The print engine is configured for continuous media.	Set the media type to noncontinuous media. See Set Media Type on page 66 .
	The driver or software configuration is not set correctly.	Driver or software settings produce ZPL commands that can overwrite the print engine configuration. Check the driver or software media-related setting.
Non-continuous labels are being treated as continuous labels.	The print engine was not calibrated for the media being used.	Perform the calibration procedure in Calibrate Media and Ribbon Sensor Sensitivity on page 77 .
	The print engine is configured for continuous media.	Set the media type to noncontinuous media. See Set Media Type on page 66 .
All lights are on, but nothing displays on the LCD, and the print engine locks up.	Internal electronic or firmware failure.	Call a service technician.
The print engine locks up while running the Power-On Self Test.	Main logic board failure.	Call a service technician.

Print Engine Diagnostics

Self tests and other diagnostics provide specific information about the condition of the print engine. The self tests produce sample printouts and provide specific information that helps determine the operating conditions for the print engine. The most commonly used are the Power-On and the CANCEL self tests.



Important • Use full-width media when performing self tests. If your media is not wide enough, the test labels may print on the platen roller. To prevent this from happening, check the print width using [Set Print Width on page 67](#), and ensure that the width is correct for the media that you are using.

Each self test is enabled by pressing a specific control panel key or combination of keys while turning on (I) the print engine power. Keep the key(s) pressed until the first indicator light turns off. The selected self test automatically starts at the end of the Power-On Self Test.



Note •

- When performing these self tests, do not send data to the print engine from the host.
- If your media is shorter than the label to be printed, the test label continues on the next label.
- When canceling a self test prior to its actual completion, always reset the print engine by turning it off (O) and then on (I).
- If print engine is in applicator mode and the liner is being taken up by the applicator, the operator must manually remove the labels as they become available.

Power-On Self Test

A Power-On Self Test (POST) is performed each time the print engine is turned on (I). During this test, the control panel lights (LEDs) turn on and off to ensure proper operation. At the end of this self test, only the POWER LED remains lit. When the Power-On Self Test is complete, the media is advanced to the proper position.

To initiate the Power-On Self Test, complete these steps:

1. Turn on (I) the print engine.

The POWER LED illuminates. The other control panel LEDs and the LCD monitor the progress and indicate the results of the individual tests. All messages during the POST display in English; however, if the test fails, the resulting messages cycle through the international languages as well.

CANCEL Self Test

The CANCEL self test prints a configuration label (Figure 27).

To perform the CANCEL Self Test, complete these steps:

1. Turn off (O) the print engine.
 2. Press and hold CANCEL while turning on (I) the print engine. Hold CANCEL until the first control panel light turns off.
- A print engine configuration label prints (Figure 27).

Figure 27 • Sample Configuration Label

PRINTER CONFIGURATION	
Zebra Technologies ZTC 170PAX4 RH-200dpi ZBR2325570	
00.0.....	DARKNESS
2 IPS.....	PRINT SPEED
2 IPS.....	SLEW SPEED
2 IPS.....	BACKFEED SPEED
016.....	TEAR OFF
APPLICATOR.....	PRINT MODE
CONTINUOUS.....	MEDIA TYPE
WEB.....	SENSOR TYPE
THERMAL-TRANS.....	PRINT METHOD
2 094/203 IN.....	PRINT WIDTH
1600.....	LABEL LENGTH
39.0IN 988MM.....	MAXIMUM LENGTH
MEDIA DISABLED.....	EARLY WARNING
MAINT. OFF.....	EARLY WARNING
BIDIRECTIONAL.....	PARALLEL COMM.
RS232.....	SERIAL COMM.
9600.....	BAUD
8 BITS.....	DATA BITS
NONE.....	PARITY
XON/XOFF.....	HOST HANDSHAKE
NONE.....	PROTOCOL
000.....	NETWORK ID
NORMAL MODE.....	COMMUNICATIONS
<~> 7EH.....	CONTROL PREFIX
<~> 5EH.....	FORMAT PREFIX
<~> 2CH.....	DELIMITER CHAR
ZPL II.....	ZPL MODE
HIGH.....	RIBBON TENSION
CALIBRATION.....	MEDIA POWER UP
CALIBRATION.....	HEAD CLOSE
BEFORE.....	BACKFEED
+015.....	LABEL TOP
+0020.....	LEFT POSITION
0000.....	HEAD TEST COUNT
0615.....	HEAD RESISTOR
MODE 1.....	APPLICATOR PORT
PULSE MODE.....	START PRINT SIG
FEED MODE.....	RESYNCH MODE
25M.....	RIBBON LOW MODE
DISABLED.....	REPRINT MODE
046.....	WEB S.
079.....	MEDIA S.
071.....	RIBBON S.
050.....	MARK S.
000.....	MARK MED S.
081.....	MEDIA LED
035.....	RIBBON LED
008.....	MARK LED
+10.....	LCD ADJUST
DPSWFXM.....	MODES ENABLED
1344 8/MM FULL.....	MODES DISABLED
V60.13.0.5 ->.....	RESOLUTION
V30 33037 56.....	FIRMWARE
CUSTOMIZED.....	HARDWARE ID
NONE.....	CONFIGURATION
11776k.....	COMPACT FLASH
NONE.....	RAM
2048k.....	MEMORY CARD
NONE.....	ONBOARD FLASH
*** APPLICATOR.....	FORMAT CONVERT
005 DISPLAY.....	P30 INTERFACE
007 POWER SUPPLY.....	P31 INTERFACE
017 PAX170 RTS.....	P32 INTERFACE
FW VERSION.....	P34 INTERFACE
09/30/04.....	IDLE DISPLAY
09:30.....	RTC DATE
115740 IN.....	RTC TIME
115740 IN.....	NONRESET CNTR
115740 IN.....	RESET CNTR1
293691 CM.....	RESET CNTR2
293691 CM.....	NONRESET CNTR
293691 CM.....	RESET CNTR1
46855 LABLS.....	RESET CNTR2
46855 LABLS.....	NONRESET CNTR
46855 LABLS.....	RESET CNTR1
46855 LABLS.....	RESET CNTR2
HW 12418.04JDR080120.57340.D.VH1....	

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FEED Self Test

Different types of media may require different darkness settings. This section contains a simple but effective method for determining the ideal darkness for printing bar codes that are within specifications.

During the FEED self test, labels are printed at different darkness settings at two different print speeds. The relative darkness and the print speed are printed on each label. The bar codes on these labels may be ANSI-graded to check print quality.

The darkness value starts at three settings lower than the print engine's current darkness value (relative darkness of -3) and increase until the darkness is three settings higher than the current darkness value (relative darkness of +3).

The speed at which labels are printed during this print quality test depends on the dot density of the printhead.

- 300 dpi print engines: 7 labels are printed at the 2 ips and 8 ips print speeds.
- 203 dpi print engines: 7 labels are printed at the 2 ips and 12 ips print speeds.

To perform a FEED self test, complete these steps:

1. Print a configuration label to show the print engine's current settings.
2. Turn off (O) the print engine.
3. Press and hold FEED while turning on (I) the print engine. Hold FEED until the first control panel light turns off.

The print engine prints a series of labels ([Figure 29](#)) at various speeds and at darkness settings higher and lower than the darkness value shown on the configuration label.

Figure 29 • FEED Test Label



4. See [Figure 30](#) and [Table 16](#). Inspect the test labels and determine which one has the best print quality for your application. If you have a bar code verifier, use it to measure bars/spaces and calculate the print contrast. If you do not have a bar code verifier, use your eyes or the system scanner to choose the optimal darkness setting based on the labels printed in this self test.

Figure 30 • Bar Code Darkness Comparison

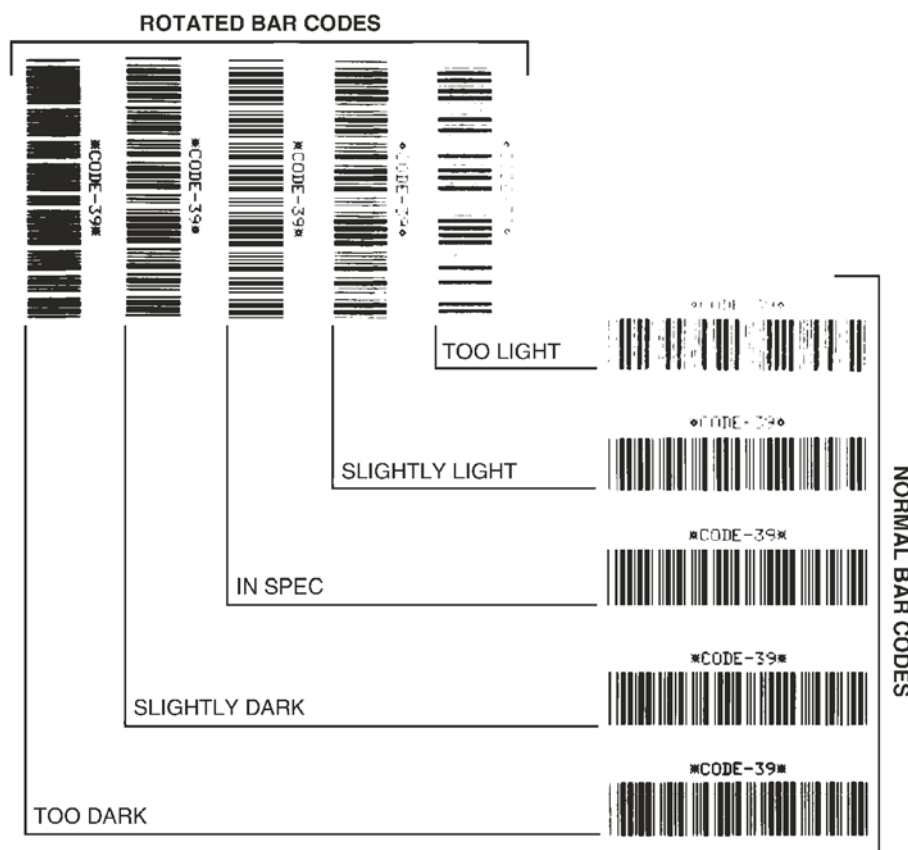


Table 16 • Judging Bar Code Quality

Print Quality	Description
Too dark	Labels that are too dark are fairly obvious. They may be readable but not “in-spec.” • The normal bar code bars increase in size. • The openings in small alphanumeric characters may fill in with ink. • Rotated bar code bars and spaces run together.
Slightly dark	Slightly dark labels are not as obvious. • The normal bar code will be “in-spec.” • Small character alpha numerics will be bold and could be slightly filled in. • The rotated bar code spaces are small when compared to the “in-spec” code, possibly making the code unreadable.

Table 16 • Judging Bar Code Quality (Continued)

Print Quality	Description
“In-spec”	The “in-spec” bar code can only be confirmed by a verifier, but it should exhibit some visible characteristics. • The normal bar code will have complete, even bars and clear, distinct spaces. • The rotated bar code will have complete, even bars and clear, distinct spaces. Although it may not look as good as a slightly dark bar code, the bar code will be “in-spec.” • In both normal and rotated styles, small alphanumeric characters look complete.
Slightly light	Slightly light labels are, in some cases, preferred to slightly dark ones for “in-spec” bar codes. • Both normal and rotated bar codes will be in spec, but small alphanumeric characters may not be complete.
Too light	Labels that are too light are obvious. • Both normal and rotated bar codes have incomplete bars and spaces. • Small alphanumeric characters are unreadable.

5. Note the relative darkness value and the print speed printed on the best test label.
6. Add or subtract the relative darkness value from the darkness value specified on the configuration label. The resulting numeric value (0 to 30) is the best darkness value for that specific label/ribbon combination and print speed.
7. If necessary, change the darkness value to the darkness value on the best test label. See [Adjust Print Darkness on page 64](#).
8. If necessary, change the print speed to the same speed as on the best test label. See [Adjust Print Speed on page 64](#).

FEED and PAUSE Self Test

Performing this self test temporarily resets the print engine configuration to the factory default values. These values are active only until power is turned off unless you save them permanently in memory. If the factory default values are permanently saved, a media calibration procedure must be performed, and you must reset the head resistance value and the applicator port setting to their required values.

To perform a FEED and PAUSE self test, complete these steps:

1. Turn off (O) the print engine.
2. Press and hold FEED and PAUSE while turning on (I) the print engine.
3. Hold FEED and PAUSE until the first control panel light turns off.

The print engine configuration is temporarily reset to the factory default values. No labels print at the end of this test.

Table 17 indicates which print engine function controls each of the configuration parameters:

Table 17 • Control of Parameters

Parameter	Controlled By
Darkness	Configuration, ZPL, and WebView
Tear Off	Configuration, ZPL, and WebView
Print Mode	Configuration, ZPL, and WebView
Media Type	Calibration, Configuration, ZPL, and WebView
Sensor Type	Configuration, ZPL, and WebView
Print Method	Calibration, Configuration, ZPL, and WebView
Print Width	Configuration, ZPL, and WebView
Label Length	Calibration, Configuration, ZPL, and WebView
Maximum Length	Configuration, and WebView and Memory Size
Host Port	Configuration, and WebView
Baud	Configuration, ZPL, and WebView
Data Bits	Configuration, ZPL, and WebView
Parity	Configuration, ZPL, and WebView
Stop Bits	Configuration, ZPL, and WebView
Host Handshake	Configuration, ZPL, and WebView
Protocol	Configuration, ZPL, and WebView
Network ID	Configuration, ZPL, and WebView
Communications	Configuration, ZPL, and WebView
Control Prefix	Configuration, ZPL, and WebView
Format Prefix	Configuration, ZPL, and WebView
Delimiter Character	Configuration, ZPL, and WebView

Table 17 • Control of Parameters (Continued)

Parameter	Controlled By
ZPL Mode	Configuration, ZPL, and WebView
Media Power Up	Configuration, ZPL, and WebView
Head Close	Configuration, ZPL, and WebView
Backfeed	Configuration, ZPL, and WebView
Label Top	Configuration, ZPL, and WebView
Left Position	Configuration, ZPL, and WebView
Head Resistance	Configuration (must match head resistance label value), ZPL, and WebView
Verifier Port	Configuration, ZPL, and WebView
Applicator Port	Configuration, ZPL, and WebView
Start Print Signal	Configuration, ZPL, and WebView
Resynch Mode	Configuration, ZPL, and WebView
Ribbon Low Mode	Configuration, ZPL, and WebView
Reprint Mode	Configuration, ZPL, and WebView
Web Sensor	Configuration, ZPL, and WebView
Media Sensor	Configuration, ZPL, and WebView
Ribbon Sensor	Configuration, ZPL, and WebView
Mark Sensor	Configuration, ZPL, and WebView
Mark Media Sensor	Configuration, ZPL, and WebView
Media LED	Configuration, ZPL, and WebView
Ribbon LED	Configuration, ZPL, and WebView
Mark LED	Configuration, ZPL, and WebView
LCD Adjust	Configuration, and WebView
Modes Enabled	ZPL, and WebView
Modes Disabled	ZPL, and WebView
Resolution	Fixed (head type switch)
Socket 1 ID	Fixed (option EPROMS)
Firmware	Fixed (code EPROMS)
Configuration	Configuration, and WebView
Memory	Fixed (SIMM size and 1 MB standard)
B:Memory	Fixed (option card)
J12 Interface	Fixed
J11 Interface	Fixed
J10 Interface	Fixed
J9 Interface	Fixed

Table 17 • Control of Parameters (Continued)

Parameter	Controlled By
J8 Interface	Fixed
J7 Interface	Fixed
Twinax/Coax ID	ZPL

Communications Diagnostics Test

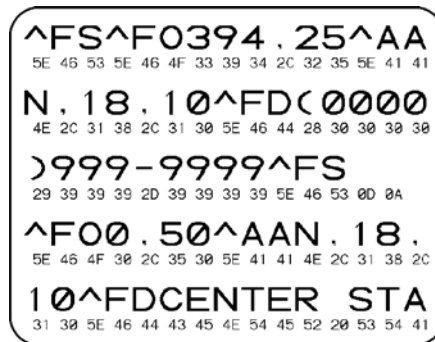
The communication diagnostics test is a troubleshooting tool for checking the interconnection between the print engine and the host computer.

When the printer is in diagnostics mode, it prints all data received from the host computer as straight ASCII characters with the hex values below the ASCII text. The print engine prints all characters received, including control codes such as CR (carriage return). [Figure 31](#) shows a typical test label from this test.



Note • The test label prints upside-down.

Figure 31 • Communications Diagnostics Test Label



To use communications diagnostics mode, complete these steps:

1. Set the print width equal to or less than the label width being used for the test. See [Set Print Width on page 67](#) for more information.
2. Set the printer to **DIAGNOSTICS**. For instructions, see [Set Communications Mode on page 80](#).
The printer enters diagnostics mode and prints any data received from the host computer on a test label
3. Check the test label for error codes. For any errors, check that your communication parameters are correct.
Errors show on the test label as follows:
 - FE indicates a framing error.
 - OE indicates an overrun error.
 - PE indicates a parity error.
 - NE indicates noise.
4. Turn the print engine off (**O**) and then back on (**I**) to exit this self test and return to normal operation.

Sensor Profile

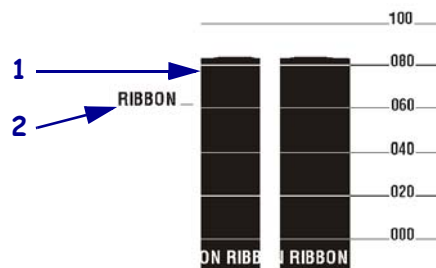
Use the sensor profile label to troubleshoot the following types of problems:

- If the media sensor experiences difficulty in determining gaps (web) between labels.
- If the media sensor incorrectly identifies preprinted areas on a label as gaps (web).
- If the ribbon sensor cannot detect ribbon.

For instructions on printing a sensor profile, see [Print Sensor Profile on page 76](#). If the sensitivity of the sensors must be adjusted, perform [Calibrate Media and Ribbon Sensor Sensitivity on page 77](#).

Ribbon Sensor Profile (Figure 32) The bars (1) on the sensor profile indicate the ribbon sensor readings. The ribbon sensor threshold setting is indicated by the word RIBBON (2). If the ribbon readings are below the threshold value, the print engine does not acknowledge that ribbon is loaded.

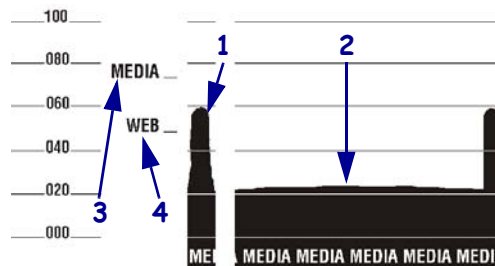
Figure 32 • Sensor Profile (Ribbon Section)



Media Sensor Profile (Figure 33) The media sensor readings are shown as bars and flat areas on the sensor profile. The bars (1) indicate gaps between labels (the web), and the low areas (2) indicate where labels are located. If you compare the sensor profile printout to a blank length of your media, the bars should be the same distance apart as the gaps on the media. If the distances are not the same, the print engine may be having difficulty determining where the gaps are located.

The media sensor threshold settings are shown by the words MEDIA (3) for the media threshold and WEB (4) for the web threshold. Use the numbers to the left of the sensor readings to compare the numeric readings to the sensor settings.

Figure 33 • Sensor Profile (Media Section)





Data Ports

This section describes the standard communication ports available to connect the print engine to your computer or network.

Contents

Parallel Data Port	132
Parallel Cabling Requirements	132
Parallel Port Interconnections	132
Serial Data Port	134
Hardware Control Signal Descriptions	134
Pin Configuration	135
RS-232 Interface Connections	136
Applicator Interface Connector	138
Applicator Signals	138
Applicator Interface Connector Pin Configuration	140
Jumper Configurations and Pinouts for +5 V I/O Operation	143
Pinouts for +24-28 V I/O Operation	144
Fuse and Jumper Locations	145

Parallel Data Port

The parallel data interface supports IEEE 1284 bidirectional parallel communications in nibble mode. The parallel interface provides a means of communication that typically is faster than the serial interface methods. In this method, the bits of data that make up a character are sent all at one time over several wires in the cable, one bit per wire.

When communicating via the parallel port, the values selected on the print engine must be the same as those used by the host equipment connected to the print engine. Port selection for status information is determined by the channel sending the request. The parallel port can be set for bidirectional or unidirectional communication. The default setting is bidirectional.

Parallel Cabling Requirements

A standard 36-pin parallel connector is available on the back of the print engine for connection to the data source. An IEEE-1284 compatible bidirectional parallel data cable is required when this communication method is used. The required cable must have a standard 36-pin parallel connector on one end that is plugged into the mating connector located at the rear of the print engine. The other end of the cable connects to the print engine connector at the host computer. Port selection for status information is determined each time the print engine is turned on.

Parallel Port Interconnections

Table 18 shows the pin configuration and function of a standard computer-to-printer parallel cable.

Table 18 • Parallel Cable Pin Configuration

36-Pin Connectors	Description
1	nStrobe/HostClk
2–9	Data Bits 1–8
10	nACK/PtrClk
11	Busy/PtrBusy
12	PError/ACKDataReq
13	Select/Xflag
14	nAutoFd/HostBusy
15	Not used
16, 17	Ground
18	+5 V at 750 mA The maximum current draw may be limited by option configuration.
	 To enable this capability, a qualified service technician must install a jumper on the print engine's main logic board on JP1, pins 2 and 3.

Table 18 • Parallel Cable Pin Configuration (Continued)

36-Pin Connectors	Description
19–30	Ground
31	nInit
32	nFault/NDataAvail
33, 34	Not used
35	+5 V through a 1.8 K Ω Resistor
36	NSelectin/1284 active

Serial Data Port

To communicate using the serial data port of the print engine, you must choose the number of data bits, parity, and handshaking. Parity applies only to data transmitted by the print engine because the parity of received data is ignored.

The values selected must be the same as those used by the host equipment connected to the print engine. Default print engine settings are 9600 baud, 8 data bits, no parity, and XON/XOFF. The print engine will accept any host setting for stop bits.

Hardware Control Signal Descriptions

For all RS-232 input and output signals, the print engine follows both the Electronics Industries Association (EIA) RS-232 and the Consultative Committee for International Telegraph and Telephone (CCITT) V.24 standard signal level specifications.

When DTR/DSR handshaking is selected, the Data Terminal Ready (DTR) control signal output from the print engine controls when the host computer may send data. DTR ACTIVE (positive voltage) permits the host to send data. When the print engine places DTR in the INACTIVE (negative voltage) state, the host must not send data.



Note • When XON/XOFF handshaking is selected, data flow is controlled by the ASCII Control Codes DC1 (XON) and DC3 (XOFF). The DTR Control lead has no effect.

Request To Send (RTS) is a control signal from the print engine that is connected to the Clear To Send (CTS) input at the host computer.

Pin Configuration

Connect the serial data cable to the female DB-9 connector on the back of the print engine. For all RS-232 connections through a DB-25 cable, use a DB-9 to DB-25 interface module (see [DB-9 to DB-25 Connections on page 137](#)).

Table 19 shows the pin configuration of the serial data connector.

Table 19 • Serial Connector Pin Configuration

Pin No.	Name	Description
1	–	Unused and unterminated
2	RXD	Receive data—data input to print engine
3	TXD	Transmit data—data output from print engine
4	DTR	Data terminal ready—output from print engine
5	SG	Signal ground
6	DSR	Data set ready—input to print engine
7	RTS	Request to send—output from print engine
8	CTS	Clear to send—input to print engine
9	+5 VDC	+5 VDC at 750 mA The maximum current draw may be limited by option configuration.  Important • To enable this capability, a qualified service technician must install a jumper on the print engine's main logic board on JP1, pins 2 and 3.

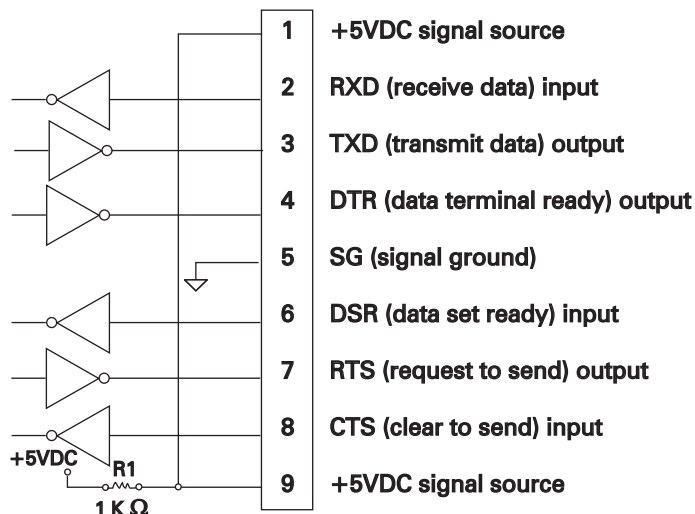
RS-232 Interface Connections

The print engine is configured as Data Terminal Equipment (DTE). Figure 34 shows the internal connections of the print engine's RS-232 connector.



Note • Use a null modem (crossover) cable to connect the print engine to a computer or any other DTE device.

Figure 34 • RS-232 DB9 MLB Connections



Pin 9 is also available as a +5 VDC signal source at 750 mA. The maximum current draw may be limited by option configuration.

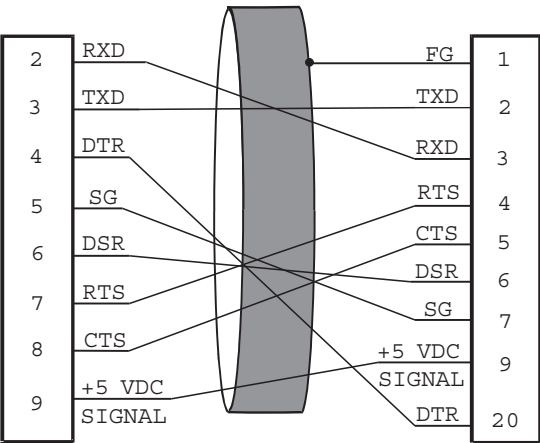


Important • To enable this capability, a qualified service technician must install a jumper on the print engine's main logic board on JP1, pins 2 and 3.

DB-9 to DB-25 Connections

To connect the print engine’s RS-232 DB-9 interface to a DB-25 connector, an interface adapter is required. A generic DB-25 adapter can be used, although the +5 VDC signal source would not be passed through the adapter. [Figure 35](#) shows the connections required for the DB-9 to DB-25 interface.

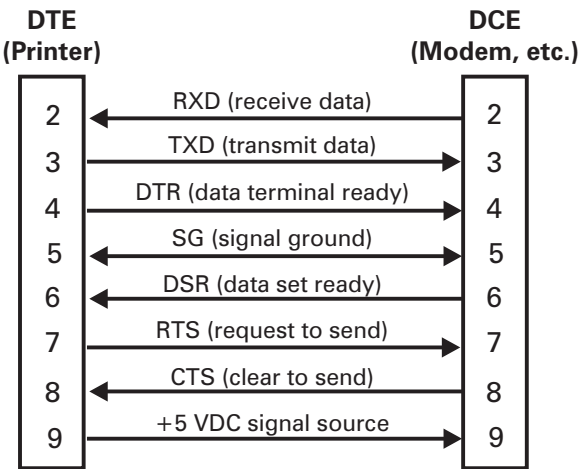
Figure 35 • DB-9 to DB-25 Cable Connections



Modem Connection

When the print engine is connected via its RS-232 interface to Data Communication Equipment (DCE) such as a modem, use a standard RS-232 (straight-through) interface cable. [Figure 36](#) shows the connections required for this cable.

Figure 36 • RS-232 Cable Connections



NOTE: Pin 1 is unused and unterminated at the printer.

Applicator Interface Connector

An external DB-15 connector is present on the rear panel of the print engine for communication with a customer applicator. An optional DB-15 to DB-9 adapter cable (Zebra part number 49609) is available to accommodate existing DB-9 interfaces.

Applicator Signals

The print engine communicates with a customer applicator through a series of signals on the pins in the DB-15 connector. Each pin causes different things to happen when the signal is active (asserted) or not active (deasserted). [Applicator Interface Connector Pin Configuration on page 140](#) provides additional information about each pin and signal.

The following timing diagrams show how applicator signals function in each applicator mode during the stages of printing a non-RFID label. For more information about the applicator modes (which affect the end print signal), see [Set Applicator Port Mode on page 84](#). For more information about applicator signals during RFID operation, see the *RFID Programming Guide* (part number 58978L-001).

Figure 37 • Applicator Signals (Mode 1)

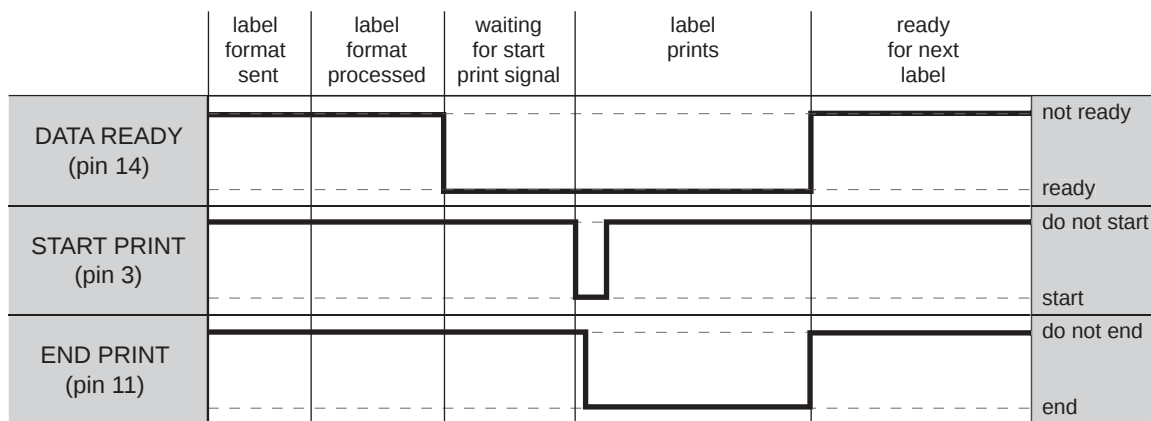


Figure 38 • Applicator Signals (Mode 2)

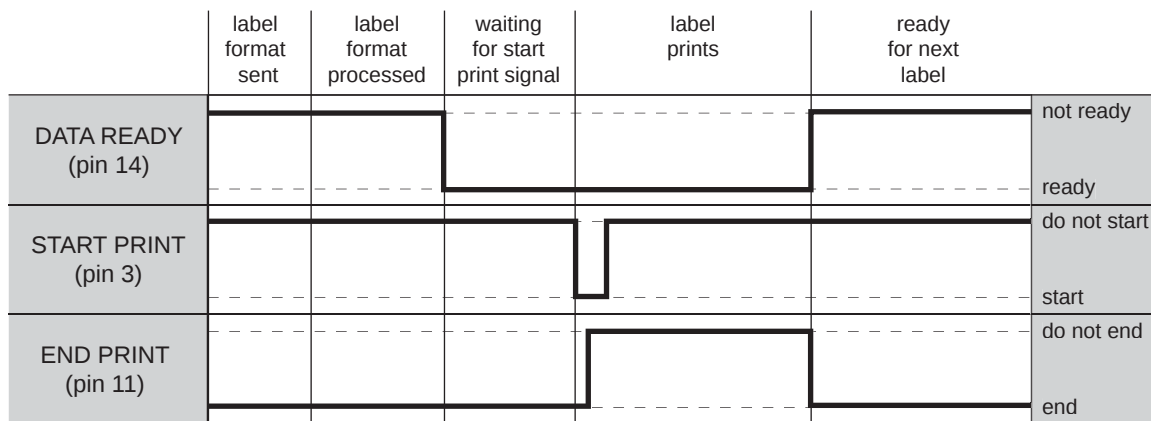


Figure 39 • Applicator Signals (Mode 3)

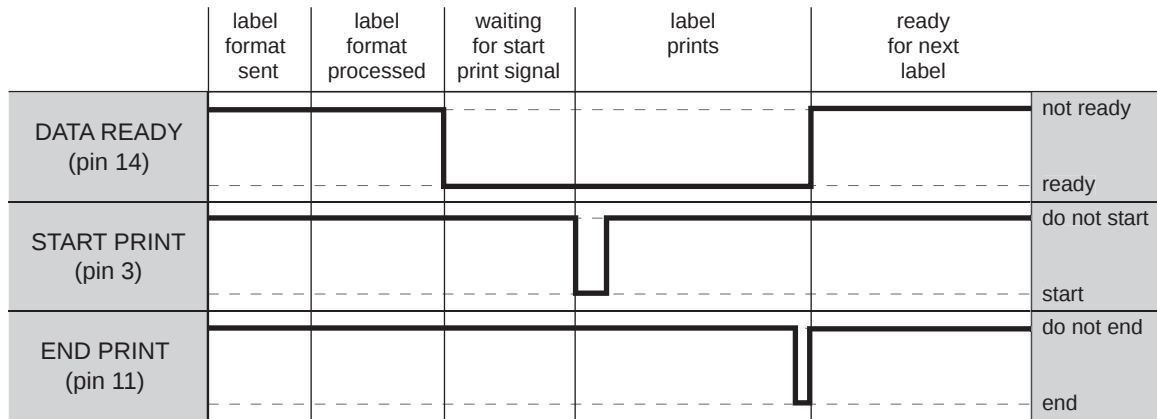
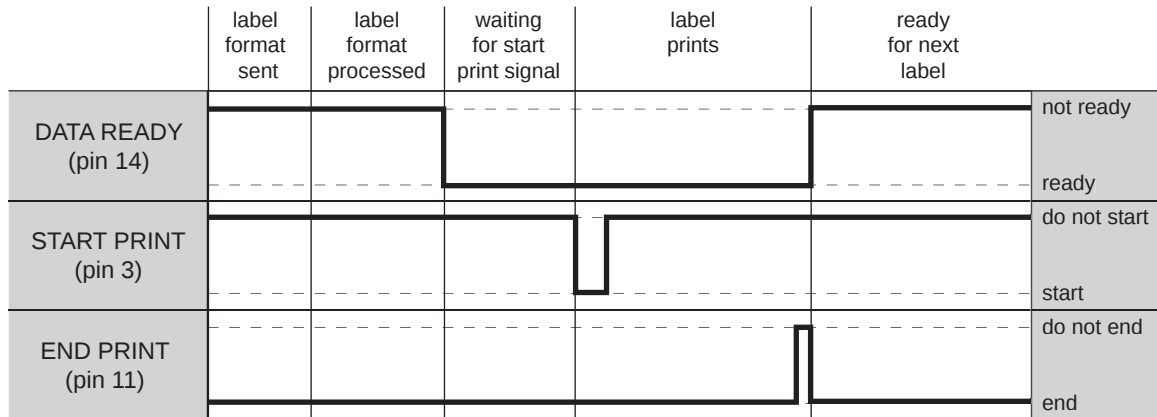


Figure 40 • Applicator Signals (Mode 4)



Applicator Interface Connector Pin Configuration

The Applicator Interface Assembly is available in two versions: a +5 V I/O and a +24–28 V I/O. [Table 20](#) lists the pin configurations and functions of the applicator interface connector for both +5 V and +24–28 V operation.

Table 20 • Applicator Interface Connector Pin Configuration

Pin No.	Signal Name	Signal Type	Description
1	I/O SIGNAL GROUND (+5V Return)	I/O Signal Ground	Using jumper J5, this pin can be configured as isolated or non-isolated from the print engine signal ground. See Jumper Configurations and Pinouts for +5 V I/O Operation on page 143 for more information.
1	I/O SIGNAL GROUND (+24-28V Return)	I/O Signal Ground	No jumpers to configure.  Important • Customer must provide this external ground. (This ground can come from pin 8) See Pinouts for +24-28 V I/O Operation on page 144 for more information.
2	+5V I/O (Fused at 1 A) Caution • Replace the fuse only with one of the same type and rating.	Power	See Figure 41 on page 145 for fuse location. Using jumper J4, this pin can be configured as isolated or non-isolated from the Applicator Interface Circuit +5 V Supply. See Jumper Configurations and Pinouts for +5 V I/O Operation on page 143 for more information.
2	+24-28V I/O	Power	No jumpers to configure. This +24-28V power source also supplies voltage for output signal pull-up resistors.  Important • Customer must provide this external power. (This power can come from pin 7) See Pinouts for +24-28 V I/O Operation on page 144 for more information.
3	START PRINT	Input	See Applicator Signals on page 138 for more information about the start and end print signals. • Pulse Mode—The label printing process begins on the HIGH to LOW transition of this signal if a format is ready. Deassert this signal HIGH to inhibit printing of a new label. • Level Mode—Assert LOW to enable the print engine to print if a label format is ready. When deasserted HIGH, the print engine completes the label that is printing then stops and waits for this input to be reasserted LOW.
4	FEED	Input	When the print engine is idle or has been paused, assert this input LOW to trigger repeated feeding of blank labels. Deassert HIGH to stop feeding blank labels and register to the top of the next label.

Table 20 • Applicator Interface Connector Pin Configuration (Continued)

Pin No.	Signal Name	Signal Type	Description
5	PAUSE	Input	To toggle the current Pause state, this input must be asserted LOW for 200 milliseconds, or until the SERVICE REQUIRED output (pin 10) changes state.
6	REPRINT	Input	- If the Reprint feature is enabled, this input must be asserted LOW to cause the print engine to reprint the last label. See Set Reprint Mode on page 86 for more information. - If the Reprint feature is disabled, this input is ignored.
7	+28 V (Fused at 500 mA. See Figure 41 on page 145 for fuse location.) Caution • Replace the fuse only with one of the same type and rating.	Power	The Interface Power Supply. Supplies power to external sensors as required.  Note • If operating with 28V signals only, pin 7 may be used to supply power to pin 2, which creates a non-isolated mode of operation.
8	POWER GROUND (+28 V DC Return)	Ground	The Interface Power Ground.  Note • If pin 7 is used to supply power to pin 2, use this pin to ground pin 1.
9	RIBBON LOW	Output	Asserted if the Ribbon Low feature is enabled and the amount of ribbon remaining on the supply spool is below a specific threshold level (see Set Ribbon Low Mode on page 86). - For print engines with the Ribbon Low Output parameter, asserted HIGH or LOW depending on the ribbon low output mode selected. See Set Ribbon Low Output on page 86 for more information. - For print engines without the Ribbon Low Output parameter, asserted HIGH. If the Ribbon Low feature is disabled, this output lead is disabled.
10	SERVICE REQUIRED	Output	Asserted LOW in the following circumstances: - the printhead is open - the ribbon or media is out - the print engine is paused (to disable this function, see Set Applicator Error Signal When Print Engine Pauses on page 84) - an operational fault occurs - a Resynch error occurs while the applicator Resynch mode is set to Error mode (see Select Resynch Mode on page 85)

Table 20 • Applicator Interface Connector Pin Configuration (Continued)

Pin No.	Signal Name	Signal Type	Description
11	END PRINT	Output	See Applicator Signals on page 138 for more information about the start and end print signals. See Set Applicator Port Mode on page 84 for more information about the modes.  Note • A format (^XA ... ^XZ) that does not print will signal that it is being processed. However, it will not trigger an End Print signal because no motion/printing is required. • MODE 0—The applicator port is OFF. • MODE 1—Asserted LOW only while the print engine is moving the label forward; otherwise deasserted HIGH. • MODE 2—Asserted HIGH only while the print engine is moving the label forward; otherwise deasserted LOW. • MODE 3—(Default) Asserted LOW for 20 milliseconds when a label is completed and positioned. Not asserted during continuous printing. • MODE 4—Asserted HIGH for 20 milliseconds when a label is completed and positioned. Not asserted during continuous printing.
12	MEDIA OUT	Output	Asserted LOW while there is no media in the print engine.
13	RIBBON OUT	Output	Asserted LOW while there is no ribbon in the print engine.
14	DATA READY	Output	See Applicator Signals on page 138 for more information about this signal. • Asserted LOW when sufficient data has been received to begin processing the next label format. • Deasserted HIGH when printing/processing stops after the current label format, either due to a pause condition or the absence of a label format.
15 (Non-RFID)	SPARE	Output	To be determined.
15 (RFID)	VOID	Output	• Asserted LOW when the RFID transponder over the antenna is “voided.” • Deasserted HIGH when the end print signal is asserted.

Jumper Configurations and Pinouts for +5 V I/O Operation

Jumpers J4 and J5 are used together to produce isolated or non-isolated modes of operation for applicator input and output control signals. J4 configures the +5 V source for the optoisolator circuits, and J5 configures the ground. For proper operation, when J4 is installed, J5 must be installed, and when J4 is removed, J5 must be removed.

Table 21 describes the pin and jumper configurations for +5 V I/O operation. See Figure 41 on page 145 for jumper locations.

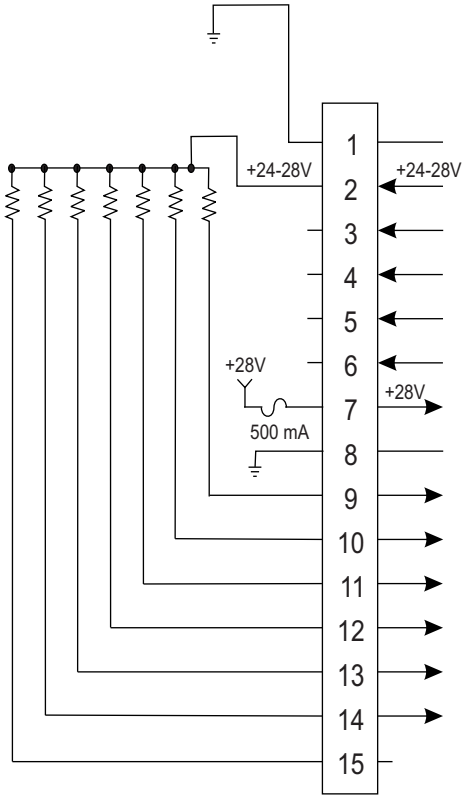
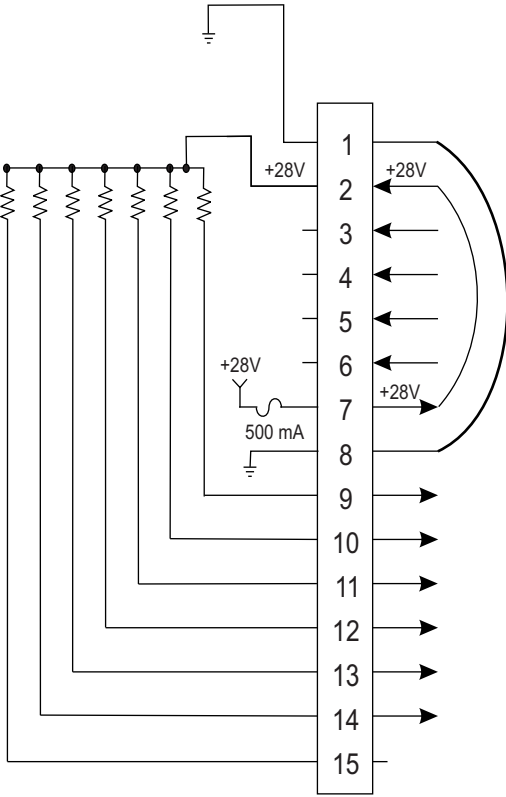
Table 21 • Non-Isolated and Isolated Modes for +5V Operation

	Non-Isolated (Jumpers In)	Isolated (Jumpers Out)
Pin 1	Ground +5V, Jumper J5 In I/O ground is connected to the print engine signal ground.	External Ground +5V, Jumper J5 Out I/O ground is disconnected from the print engine signal ground. Ground must be provided externally to this pin.
Pin 2	+5V Output, Jumper J4 In +5 V I/O is connected to the applicator interface circuit +5 V Supply.	External +5V Input, Jumper J4 Out +5 V I/O is disconnected from the applicator interface circuit +5 V Supply. The +5 V for the applicator interface optoisolator circuits must be provided externally. This input also supplies voltage for output signal pull-up resistors.
Pinouts		

Pinouts for +24-28 V I/O Operation

Table 22 describes the pin configurations for +24–28 V I/O operation. There are no jumpers to configure for this mode.

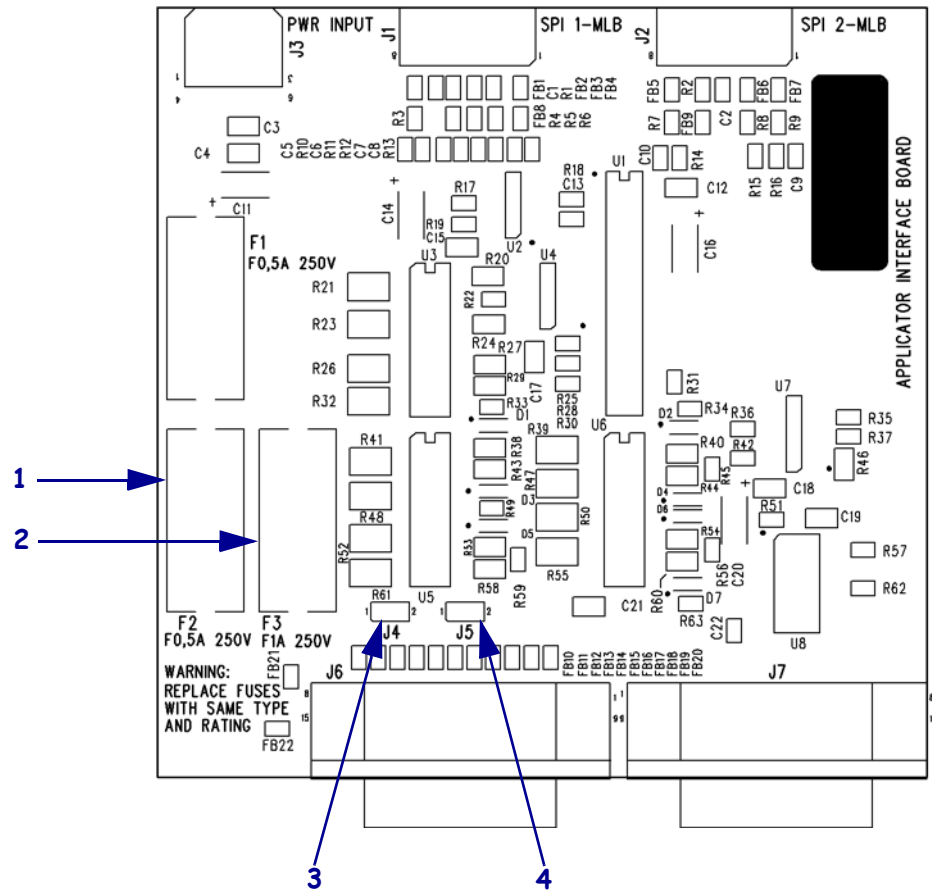
Table 22 • Non-Isolated and Isolated Modes for +24–28V Operation

	Isolated (External Power)	Non-Isolated (Internal Print Engine Power)
Pin 1	External Ground +24-28V I/O ground must be connected to an external ground.	Ground +28V from Pin 8 If pin 7 is used to supply power to pin 2, use pin 8 to ground pin 1.
Pin 2	+24-28V External Input +24-28 V I/O must be connected to an external power supply. This input also supplies voltage for output signal pull-up resistors.	+28V Input from Pin 7 If operating with 28V signals only, pin 7 may be shorted to pin 2, which creates a non-isolated mode of operation. This input also supplies voltage for output signal pull-up resistors.
Pinouts		

Fuse and Jumper Locations

Figure 41 shows the location of the fuses on the applicator interface board and the location of jumpers J4 and J5.

Figure 41 • Applicator Interface Board



1	Fuse F2 for +28 V at pin 7
2	Fuse F3 for +5 V at pin 2 (+5 V I/O only)
3	Jumper J4
4	Jumper J5



Notes •



Specifications

This chapter provides routine cleaning and maintenance procedures.

Contents

General Specifications	148
Physical	148
Environmental Conditions	148
Electrical Specifications	148
Communications Specifications	149
Other Standard Features	150
Additional Options	150
Agency Approvals	151
110PAX4 Non-RFID or RFID-Ready without RFID Reader Installed	151
R110PAX4 or 110PAX4 with RFID Reader Installed	151
Media Specifications	153
Ribbon Specifications	154
Printing Specifications	155
Zebra Programming Language (ZPL II)	156
Bar Codes	156

General Specifications

Physical

Height	11.8 in. (300 mm)
Width	9.6 in. (245 mm)
Depth	16.4 in. (417 mm)
Weight	36 lb (16.3 kg)

Environmental Conditions

Operating Temperature	
Thermal transfer	41° F to 104° F (5° C to 40° C)
Direct thermal	32° F to 104° F (0° C to 40° C)
Non-Condensing Relative Humidity	
Operation	20% to 95%
Storage	5% to 95%
Storage Temperature	–40° F to 160° F (–40° C to 71° C)

Electrical Specifications

Power Supply	Universal Power Supply with power-factor correcting 100–240 VAC, 47–63 Hz
Power Consumption	
Idle	19 W
Printing	375 W (maximum)
Fuses	5 Amp, 250 VAC, 5 × 20 mm IEC style, as supplied with the print engine

Communications Specifications

Parallel	High-speed bi-directional parallel interface, IEEE 1284:Compatibility mode, EPC, Nibble mode.
Serial	- Serial RS-232C with DTR hardware handshake via DB-9 connector (standard) - Serial RS-422/485 via 2- or 4-wire with XON/XOFF handshake on alternate pins of DB-9 connector (standard) - Configurable baud rates from 110 to 57.6K baud with 7 or 8 data bits, standard parity, 1 or 2 stop bits - Fused +5V @ 750 mA supplied at pin 9 of the DB-9 connector
Applicator Interface with DC15F Connector	The applicator interface provides status and control signals for applicators. - North America: 5V I/O port - Europe: 24-28V I/O port
Ethernet print server options	- ZebraNet wired print servers —Ethernet network print server (10BASE-T, 100BASE-TX) - ZebraNet wireless print servers —802.11b/g-compliant wireless print server

Other Standard Features

- Real Time Clock
- Fast 32 bit 133 MHz RISC processor
- 10MB RAM memory
- Flash memory including 2MB non-volatile memory storage for downloadable objects
- Type I & II Series C & D PC Card Interface, memory only
- Zebra printer driver for windows 3.X and 95/98/NT 2000 operating systems
- Advanced counter

Additional Options

- Radio Frequency Identification (RFID) capability. The R110PAX4 comes equipped with an RFID reader/antenna (see the *RFID Programming Guide* for information about programming RFID labels). You may install an RFID reader/antenna in RFID-ready print engines. Contact an authorized Zebra RFID reseller for more information about the RFID option.
- Linear PCMCIA cards available 8MB and 32MB.
- ATA-style PCMCIA or Compact Flash memory cards 32, 64, 128, 256MB.
- Additional fonts available
- UNICODE
- WGL4 through Swiss 721
- Firmware Support for Downloadable TrueType Font

Agency Approvals

The agency approvals and product markings provided in this section apply only to the print engines specified.

110PAX4 Non-RFID or RFID-Ready without RFID Reader Installed

The following apply only to print engines that do not have RFID readers installed.

Agency Approvals	• IEC 60950-1 • UL60950-1 • CAN/CSA-C22.2 No. 60950-1-03 • EN55022, Class A • EN61000-6-2	
Product Markings	• cULus • CE Mark • FCC-A • ICES-003 • VCCI • C-Tick	• CCC • Gost-R • S-Mark • MIC • NOM • BSMI

R110PAX4 or 110PAX4 with RFID Reader Installed

The following apply only to print engines that have RFID readers installed.

United States and Canada (902–928 MHz)

Agency Approvals	• UL60950-1 • CAN/CSA-C22.2 No. 60950-1-03 • FCC Part 15.107 and 15.109 Class A • FCC Part 15.247 (UHF applications) • Canadian ICES-003, Class A • IC RSS-210
Product Markings	• cULus • FCC-A • ICES-003

European Union and EFTA (869.7–870 MHz)

Agency Approvals	• EN 55022 • EN 61000-6-2 • EN 300 220-3 • EN 301 489-3 • EN 60950 • IEC 60950-1
Product Markings	• CE Mark

This device is intended for commercial and industrial use in all EU and EFTA member states.

Media Specifications

Media width (label and liner)	Minimum	Non-RFID	0.63 in. (16 mm)
		RFID “smart” labels	Minimum label widths for RFID “smart” labels varies for each transponder type.
	Maximum	4.5 in. (114 mm)	
Label length	Minimum	Non-RFID, applicator mode*	0.5 in. (12.7 mm) with backfeed on 0.25 in. (6.4 mm) with backfeed off
		Non-RFID, tear-off mode	0.5 in. (12.7 mm) with backfeed on 0.25 in. (6.4 mm) with backfeed off
		Non-RFID, rewind mode	0.25 in. (6.4 mm) (“loose loop”)
		RFID “Smart” labels	Minimum label length for RFID “smart” labels varies for each transponder type.
Registration tolerance (not including label/liner position tolerances)		Vertical (concurrent labels)	±0.040 in. (±1.0 mm) (in Applicator mode)
		Horizontal	±0.040 in. (±1.0 mm)
Total thickness (including liner)			0.0058 in. to 0.010 in. (0.148 mm to 0.256 mm)
Interlabel Gap (Transmissive Sensor)		Minimum	0.079 in. (2 mm)
		Preferred	0.118 in. (3 mm)
		Maximum	0.157 in. (4 mm)
Notch		Size (W x L)	0.25 in. × 0.12 in. (6 mm × 3 mm)
		Position	On inside edge, <0.8 in (<20 mm) from leading edge of media
Hole		Minimum	0.125 in. (3.2 mm)
		Position	0.25 to 3.0 in. (6.3 to 76.2 mm) from inside edge <0.8 in. (<20 mm) from leading edge of media
Black Mark (Reflective Sensor)		Vertical length (parallel to inside media edge)	0.12 in. to 0.43 in. (3 mm to 11 mm)
		Horizontal width (perpendicular to inside media edge)	0.43 in. (≥ 11 mm) minimum
		Position	One of the following: • within 0.04 in. (1 mm) of the inside edge and <0.8 in (20 mm) from leading edge of media • centered within 0.23 in. to 2.25 in. (5.8 to 57 mm) from the media inner edge
		Density	> 1.0 Optical Density Units (ODU) Maximum media density: 0.5 ODU
Print Line to Peel Bar Distance			0.464 in. (11.8 mm)

* PAX4 printers are not recommended for use with fanfold media in applicator mode.

Media Unwind Force	Steady State	Must be uniform and must not exceed 2 lb. (907 g)
	Transient (Start/Stop)	Must not exceed 4 lb (1814 g)
Media Rewind Force		Applicator take-up pull tension must be uniform from 1 to 4 lb (454 to 1818 g) and must not vary more than $\pm 20\%$ during operation.

* PAX4 printers are not recommended for use with fanfold media in applicator mode.

Ribbon Specifications

Thickness	4.5 microns
Width (wound coated side out)	1.0 in. to 4.2 in. (25.4 mm to 107 mm)
Maximum length	2955 ft (900 m)
Roll size	
Inner core diameter	1.0 in. (25.4 mm)
Maximum roll size	4.0 in. (101.6 mm)

Printing Specifications

Specification	203 DPI	300 DPI
Resolution	203 dots per inch (8 dots per mm)	300 dots per inch (12 dots per mm)
Dot size	0.0049 in. x 0.0049 in. (0.125 mm x 0.125 mm)	0.0033 in. x 0.0039 in. (0.084 mm x 0.100 mm)
Maximum print speed	12 ips	8 ips
First dot location (from inside media edge)	0.093 in. (2.4 mm)	0.093 in. (2.4 mm)
Maximum print width	4.1 in. (104 mm)	4.2 in. (106 mm)
Maximum print length (with full width media)		
Non-continuous	39 in. (990 mm)	39 in. (990 mm)
Continuous	150 in. (3810 mm)	100 in. (2540 mm)
Programmable constant printing speeds (per second)	2.4 in. (61 mm) 3 in. (76 mm) 4 in. (102 mm) 5 in. (127 mm) 6 in. (152 mm) 7 in. (178 mm) 8 in. (203 mm) 9 in. (229 mm) 10 in. (254 mm) 11 in. (279 mm) 12 in. (305 mm)	2.9 in. (74 mm) 3 in. (76 mm) 4 in. (102 mm) 5.5 in. (139 mm) 6 in. (152 mm) 7 in. (178 mm) 8 in. (203 mm)

Zebra Programming Language (ZPL II)

• Communicates in printable ASCII characters • Controlled via mainframe, mini, or PC • Downloadable graphics, scalable and bitmap fonts, label templates and formats • Object copying between memory areas (RAM and PC memory card) • Adjustable print cache • Data compression • Automatic memory allocation for “format while printing”	• Status messages to host upon request • Format inversion (white on black) • Mirror image printing • Four-position field rotation (normal/0°, 90°, 180°, and 270°) • Slew command • Programmable label quantities with print and pause control • Automatic serialization of fields • User-programmable password
---	--

Bar Codes

Bar code modulus “X” dimensions • Picket fence (non-rotated) orientation: • 203 dpi = 0.0049 in. mil to 0.049 in. • 300 dpi = 0.0033 in. mil to 0.033 in. • Ladder (rotated) orientation: • 203 dpi = 0.0049 in. mil to 0.049 in. • 300 dpi = 0.0039 in. mil to 0.039 in.	Linear bar codes • Code 11 • Code 39 • Code 93 • Code 128 with subsets A/B C and UCC Case Codes • ISBT-128 • UPC-A • UPC-E • EAN-8 • EAN-13 • UPC and EAN 2 or 5 digit extensions • Plessey • Postnet • Standard 2 of 5 • Industrial 2 of 5 • Interleaved 2 of 5 • LOGMARS • MSI • Codabar • RSS-14
Two-dimensional bar codes • Code 49 • Maxi Code • PDF-417 • QR Code • Codablock • DataMatrix • Micro-PDF417	
Bar code ratios • 2:1 • 7:3 • 5:2 • 3:1	

Index



A

- adhesive test for ribbon coating, 38
- adjustments
 - LCD, 87
 - left position, 83
 - media sensors, 55
 - print darkness, 64
 - printhead pressure, 97
 - tear-off position, 65
 - toggle positioning, 95
- agency approvals, 151
- applicator
 - +24-28V isolated and non-isolated modes, 144
 - +5V isolated and non-isolated modes, 143
 - applicator interface connector, 138
 - interface pin configuration, 140
 - signals during applicator modes, 138
- applicator port setting, 84
- auto-calibration, 53

B

- backfeed setting, 82
- bar codes
 - darkness comparison during FEED self test, 122
 - list available codes, 72
 - specifications, 156
- baud setting, 78
- before you begin setup, 22
- bitmap scaling factor, 87
- black mark media
 - described, 36
- buttons on control panel, 17

C

- calibration
 - CALIBRATE button description, 18
 - media and ribbon sensor, 77
 - methods, 53
 - setting for head close, 82
 - setting for media power up, 81
- CANCEL button
 - CANCEL self test, 120
 - description, 18
- checklist
 - before you begin, 22
 - troubleshooting, 102
- cleaning
 - exterior of print engine, 90
 - media compartment, 91
 - printhead and platen roller, 93
 - recommended schedule, 90
- communication interfaces, 31
- communications diagnostics test
 - overview, 129
 - selecting, 80
- communications problems, 112
- CompactFlash card
 - initialization, 74
- configuration
 - changing parameters, 63
 - enter and use Setup mode, 58
 - exit Setup mode, 59
 - software or printer driver, 63
- configuration label
 - printing using CANCEL self test, 120
 - printing using List Setup command, 73
- connect printer to computer or network, 31

- connect printer to power source, 33
- contacts, 11
- continuous media
 - described, 36
 - setting media type, 66
- control panel
 - buttons, 17
 - enter and use Setup mode, 58
 - exit Setup mode, 59
 - indicator lights, 18
 - LCD error messages, 103
 - parameters, 63
- control prefix setting, 80
- customer service, 11
- cutter
 - selecting Cutter mode, 66

D

- darkness setting, 64
- data bits setting, 78
- data cables, 32
- DATA light, 18
- data ports, 131
- data source
 - communication interfaces, 131
 - connections, 31
- date setting, 88
- DB-9 to DB-25 connection, 137
- declaration of incorporation, 3
- default password, 60
- defragmenting message, 106
- delimiter character setting, 81
- diagnostics, 119
- direct thermal mode
 - media scratch test, 37
 - setting, 66
- disable password protection, 60
- display language
 - changing from unreadable language, 117
 - selection, 88
- disposal of print engine, 24
- disposal of printer, 24
- door-open sensor
 - location, 91
 - when to clean, 90

- dpi format conversion, 87

E

- electrical specifications, 148
- enter Setup mode, 58
- environmental conditions, 148
- ERROR light, 19
- error messages, 103
- Ethernet
 - characteristics of internal wired connection, 31
 - characteristics of wireless connection, 31
- exit Setup mode, 59
- exterior cleaning, 90
- exterior view of print engine, 16

F

- factory defaults
 - reload parameters, 59
 - restore network settings, 59
- FCC radiation exposure limits, 2, 4
- FEED button
 - description, 18
 - FEED and PAUSE self test, 126
 - FEED self test, 122
- Flash memory, 75
- font list, 72
- format convert setting, 87
- format list, 73
- format memory card, 74
- format prefix setting, 80
- fuses
 - replacement, 99
 - specifications, 148

H

- hardware control signal descriptions, 134
- HEAD COLD** message
 - cycling with other messages, 104
 - displayed alone, 105
 - displaying alone, 105
- HEAD ELEMENT BAD** message, 104
- HEAD TOO HOT** message, 105
- host handshake setting, 79
- humidity requirements, 148

I

- idle display setting, 88
- images list, 73
- incorporation declaration, 3
- initialize Flash memory, 75
- initialize memory card, 74
- inspect for shipping damage, 23
- installation
 - procedure, 29
 - requirements, 25
- international safety organization marks, 34
- isolated mode for applicator control signals
 - +24-28V operation, 144
 - +5V operation, 143

J

- jumper configurations for +24-28V operation, 144
- jumper configurations for +5V operation, 143

L

- label length maximum setting, 68
- label top
 - printer cannot detect, 118
 - setting, 82
- labels did not print, 112
- language
 - changing from unreadable language, 117
 - selection, 88
- LCD messages
 - adjust LCD settings, 87
 - error messages, 103
 - language selection, 88
 - Setup mode, 63
- LEFT and RIGHT oval button descriptions, 17
- liability, 2
- lights on control panel, 18
- list settings
 - all settings, 73
 - bar codes, 72
 - fonts, 72
 - formats, 73
 - images, 73
 - network, 73
 - setup, 73
- load factory defaults, 59
- loading
 - media, 40
 - ribbon, 46
- long calibration, 53
- low ribbon warning, 86

M

- mark LED setting, 87
- Mark Med S. setting, 87
- maximum label length setting, 68
- media
 - black mark, 36
 - continuous roll media, 36
 - loading, 40
 - media LED setting, 87
 - non-continuous roll media, 36
 - ordering, 11
 - perforated, 36
 - RFID “smart” labels, 35
 - setting media type, 66
 - specifications, 153
 - tag stock, 35
 - types of media, 35
 - web, 36
- media and ribbon sensor calibration procedure, 77
- media compartment cleaning, 91
- MEDIA light, 18
- media path cleaning, 90
- media power up setting, 81
- Media S. setting, 87
- media scratch test, 37
- media sensor
 - adjustments, 55
 - locations, 91
 - print sensor profile, 76
 - sensor sensitivity calibration, 54
- modem connection, 137

N

- network configuration label
 - printing, 62
 - printing using List Network parameter, 73
- network ID setting, 79
- NEXT button description, 17
- non-continuous media
 - described, 36
 - setting media type, 66
- non-isolated mode for applicator control signals
 - +28V operation, 144
 - +5V operation, 143

O

- ordering ribbon and media, 11
- OUT OF MEMORY** message, 106

P

- PAPER OUT** message, 104
- parallel port
 - cabling requirements, 132
 - characteristics of parallel connection, 31
 - pin configuration, 132
 - setting parallel communications, 78
 - settings, 132
- parity setting, 79
- passwords
 - default, 60
 - disable, 60
 - entering, 60
- PAUSE** button
 - description, 17
 - FEED and **PAUSE** self test, 126
 - PAUSE** self test, 121
- PAUSE** light, 18
- PCMCIA card
 - initialization, 74
- peel-off bar cleaning, 90
- Peel-Off mode
 - selecting, 66
- perforated media, 36
- pin configuration
 - applicator interface, 140
 - parallel port, 132
 - serial port, 135
- platen roller
 - cleaning, 93
 - when to clean, 90
- ports, 131
- power
 - connect to power source, 33
 - electrical specifications, 148
 - on/off switch location, 20
 - power cord specifications, 34
- Power-On Self Test (POST), 119
- PREVIOUS** button description, 17
- print configuration label
 - CANCEL** self test, 120
 - List Setup command, 73
- print darkness setting, 64
- print engine setup
 - dimensions and clearance needs, 26
 - installation, 25
- print modes
 - selecting, 66
- print network configuration label
 - instructions and sample label, 62
 - using List Network parameter, 73
- print quality
 - troubleshooting, 108
- print server
 - characteristics of internal wired connection, 31
 - characteristics of wireless connection, 31
- print width setting, 67
- printer diagnostics, 119
- printer memory, 150
- printer options, 150
- printer settings
 - applicator port, 84
 - backfeed, 82
 - baud, 78
 - calibration methods, 53
 - control prefix, 80
 - data bits, 78
 - date, 88
 - delimiter character, 81
 - format convert, 87
 - format prefix, 80
 - head resistor, 83
 - host handshake, 79
 - idle display, 88
 - label top, 82
 - language, 88
 - LCD, 87
 - left position, 83
 - maximum label length, 68
 - media type, 66
 - network configuration label as baseline, 62
 - network ID, 79
 - parallel communications, 78
 - parity, 79
 - print darkness, 64
 - print method, 66
 - print width, 67
 - protocol, 79
 - resynch mode, 85
 - saving, 59
 - serial communications, 78
 - setting through control panel, 58
 - start print signal, 85
 - time, 88
 - ZPL mode, 81
- printhead
 - cleaning, 93
 - faulty thermistor, 104
 - head close setting, 82
 - head resistor value setting, 83
 - pressure adjustment, 97
 - when to clean, 90
- printing specifications, 155

product markings, 151
protocol setting, 79

R

radiation exposure limits, 2, 4
recycling the print engine, 24
recycling the printer, 24
reflective media sensor, 55
remove used ribbon, 52
report shipping damage, 23
reprint mode, 86
requirements for installation, 25
restore
 factory default settings, 59
 network settings, 59
resynch mode setting, 85
Rewind mode
 selecting, 66
RFID
 “smart” labels, 35
 troubleshooting, 114
ribbon
 adhesive test, 38
 determining coated side, 37
 loading, 46
 low ribbon output, 86
 low ribbon warning, 86
 ordering, 11
 removal, 52
 ribbon LED setting, 87
 RIBBON light, 19
 ribbon tensioning system parameters, 87
 scratch test, 38
 specifications, 154
 troubleshooting, 113
 when to use, 37
RIBBON IN message, 104
RIBBON OUT message, 103
Ribbon S. setting, 87
ribbon sensor
 adjusting, 55
 calibration procedure, 77
 location, 91
 sensitivity calibration, 54
 when to clean, 90
roll media described, 35
RS-232 serial interface
 connections, 136

RTC (real-time clock) setting
 date, 88
 idle display, 88
 time, 88

S

sales, 11
schedule for cleaning, 90
scratch test
 media type, 37
 ribbon coated side, 38
self tests, 119
 CANCEL, 120
 communications diagnostics, 129
 FEED, 122
 FEED and PAUSE, 126
 PAUSE, 121
 Power-On Self Test (POST), 119
sensor profile calibration
 description, 54
 selecting through control panel, 76
sensors
 adjustment, 55
 calibration methods, 53
 interpreting sensor profile, 130
 locations, 91
 print sensor profile, 76
serial port
 characteristics of serial connection, 31
 pin configuration, 135
 setting serial communications, 78
 settings, 134
setup
 checklist, 22
 unpack the print engine, 23
Setup mode
 enter and use Setup mode, 58
 exit Setup mode, 59
 LCD messages, 63
 passwords, 60
SETUP/EXIT button description, 17
shipping
 report damage, 23
 reshipping the print engine, 23
short calibration, 53
“smart” labels, 35

- specifications
 - agency approvals and markings, 151
 - bar codes, 156
 - communications options, 149
 - electrical, 148
 - environmental conditions, 148
 - fuses, 148
 - media, 153
 - physical, 148
 - power cord, 34
 - printing, 155
 - ribbon, 154
 - Zebra Programming Language (ZPL II), 156
- standard data ports, 131
- standard features, 150
- start print signal setting, 85
- storing the print engine, 23

T

- tag stock
 - described, 35
- Tear-Off mode
 - selecting, 66
 - tear-off bar cleaning, 90
 - tear-off position adjustment, 65
- technical support, 11
- temperature requirements, 148
- thermal transfer mode
 - media scratch test, 37
 - setting, 66
- THERMISTOR FAULT** message
 - cycling with other messages, 104
 - displayed alone, 104
- time setting, 88
- timing diagrams for applicator signals, 138
- toggle positioning, 95
- top of label
 - printer cannot detect, 118
 - setting, 82

- transmissive (media) sensor
 - adjusting, 55
 - when to clean, 90
- troubleshooting
 - checklist, 102
 - communications problems, 112
 - diagnostic tests, 119
 - LCD error messages, 103
 - memory errors, 107
 - print quality problems, 108
 - RFID problems, 114
 - ribbon problems, 113
- types of media
 - black mark media, 36
 - continuous roll media, 36
 - non-continuous roll media, 36
 - perforated media, 36
 - RFID “smart” labels, 35
 - tag stock, 35
 - web media, 36

U

- unpack the print engine, 23

W

- web media
 - described, 36
- Web S. setting, 87
- wired print server
 - characteristics, 31
 - view active print server, 62
- wireless cards, 32
- wireless print server
 - characteristics, 31
 - view active print server, 62

Z

- Zebra Programming Language (ZPL)
 - specifications, 156
 - ZPL mode setting, 81

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