Zebra® R110*PAX*4™
Print Engine

User Guide

Customer Order # 58981L-002

Manufacturer Part # 58981L-002 Rev. 1

Contents

About This Document

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

Contents

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
Print Engine Basics on page 7	This chapter provides a high-level overview of the print engine and its components. A print engine is a printer that is part of a labeling system. The print engine is mounted in a applicator, which includes components to apply labels automatically as they are printed.
Getting Started on page 13	This chapter provides the tasks that you must complete and the issues that you must consider before you load and configure your print engine.
Print Engine Operation on page 31	If you have completed the tasks and resolved issues in the checklist in Before You Begin on page 14, use this chapter to load the print engine, to calibrate the print engine, and to print configuration labels.
Print Engine Configuration on page 49	This chapter describes the front panel parameters that are used to configure the print engine for operation.
Routine Maintenance on page 121	This chapter provides routine cleaning and maintenance procedures.
Troubleshooting on page 131	This chapter provides you with information about LCD, print quality, communications, and other errors that you might need to troubleshoot. If you need technical assistance, contact your equipment supplier.
Print Engine Specifications on page 149	This appendix provides the features of and specifications for the print engine.
Data Ports on page 157	This appendix describes the standard communication ports available to connect the print engine to your computer or network.
Glossary on page 193	The glossary provides a list of common terms.

Contacts

You can contact Zebra Technologies at any of the following:

Visit us at: http://www.zebra.com

Our Mailing Addresses:
Zebra Technologies Corporation
333 Corporate Woods Parkway
Vernon Hills, Illinois 60061.3109 U.S.A
Telephone: +1 847.634.6700
Fax: +1 847.913.8766

Zebra Technologies Europe Limited
Zebra House
The Valley Centre, Gordon Road
High Wycombe
Buckinghamshire HP13 6EQ, UK
Telephone: +44 (0)1494 472872
Fax: +44 (0)1494 450103

Support

You can contact Zebra support at:

Web Address: www.zebra.com/SS/service_support.htm

Note • The web address is case-sensitive.

US Phone Number +1 847.913.2259

UK/International Phone Number +44 (0) 1494 768289

Document Conventions

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

Alternate Color (online only) Cross-references contain links to other sections in this guide. If you are viewing this guide online, click the blue text to jump to its location.

Command Line Examples All command line examples appear in `Courier New` font. For example, type the following to get to the Post-Install scripts in the `bin` directory:

```
Ztools
```

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

Cautions, Important, Note, and Example

Electrostatic Discharge Caution • Warns you of the potential for electrostatic discharge.

Electric Shock 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 • Advises you that failure to take or avoid a specific action could result in physical harm to the hardware.

Caution • Advises you need to wear protective eyeware.

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.

Tools • Tells you what tools you need to complete a given task.

Illustration Callouts Callouts are used when an illustration contains information that needs to be labeled and described. A table that contains the labels and descriptions follows the graphic. Figure 1 provides an example.

Figure 1 • Sample Figure with Callouts

1	SETUP/EXIT button
2	CALIBRATE button
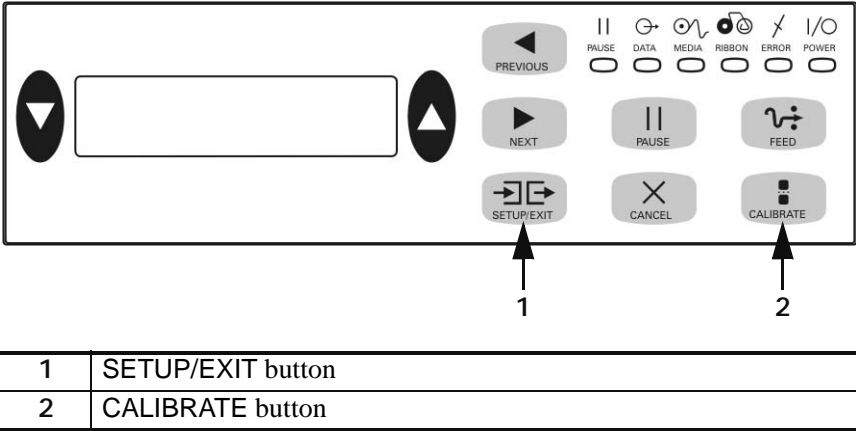
Related Documents

The following documents might be helpful references:

• *ZPL II® Programming Guide Volume I* (part number 45541L) and *Volume II* (part number 45542L).

Notes • _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

1

Print Engine Basics

This chapter provides a high-level overview of the print engine and its components. A print engine is a printer that is part of a labeling system. The print engine is mounted in a applicator, which includes components to apply labels automatically as they are printed.

Contents

Print Engine Exterior View

Print engines are available in a right-hand configuration (media moves from left to right, Figure 2) and a left-hand configuration (media moves from right to left, Figure 3).

Figure 2 • Right-Hand (RH) Print Engine
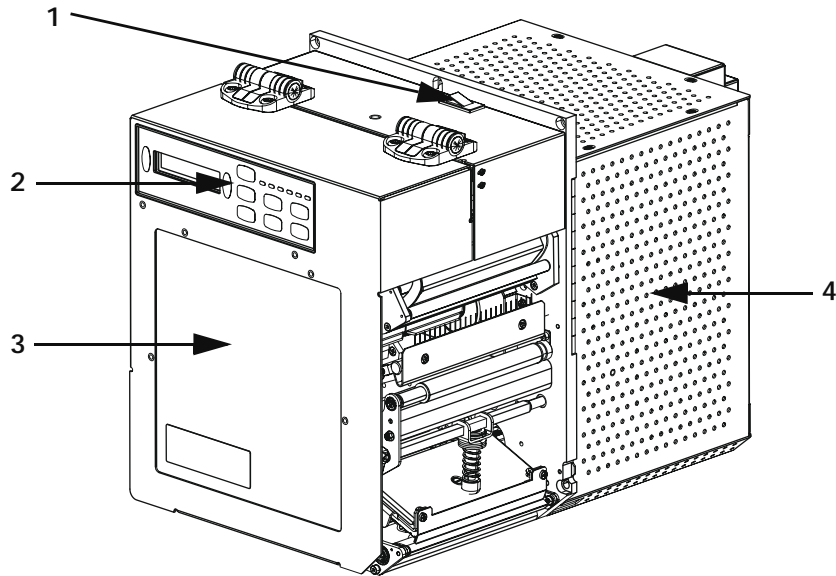
Figure 3 • Left-Hand (LH) Print Engine
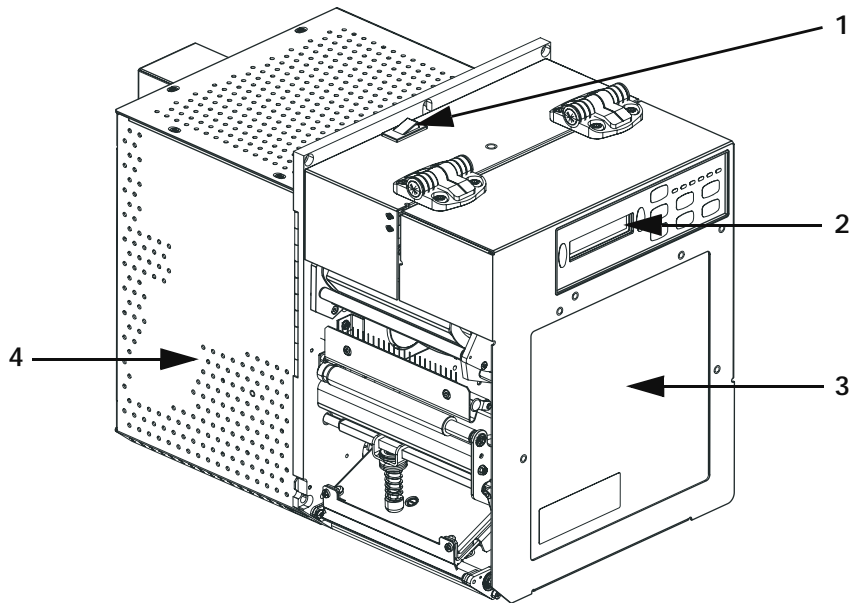
1	Power on/off switch
2	Front panel
3	Media door
4	Electronics cover

Front Panel

All controls and indicators for the print engine are located on the front panel (Figure 4). The Liquid Crystal Display (LCD) shows operating status and feature parameters. The front panel buttons are used to control the print engine operations and to set parameters. The front panel lights (LEDs) indicate the print engine's status.

Figure 4 • Front Panel

1	Buttons
2	LCD
3	Lights/LEDs
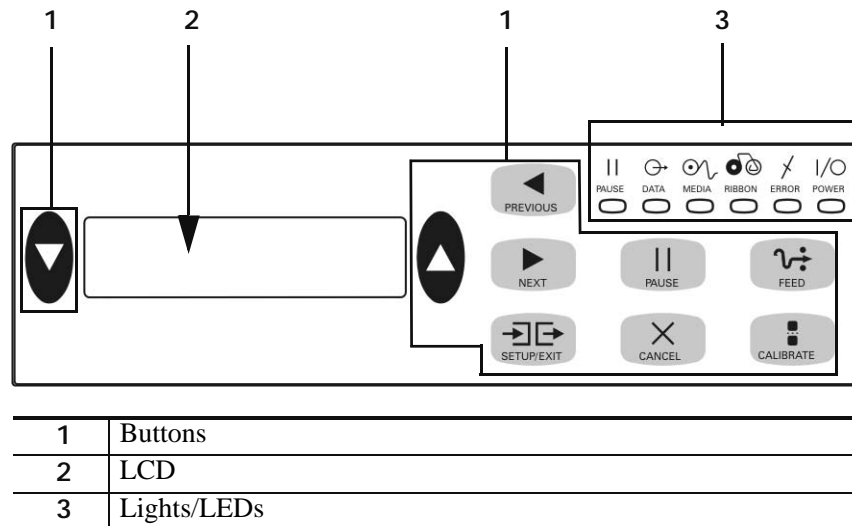
Front Panel Buttons

The front panel buttons are described in Table 1.

Table 1 • Front Panel Buttons

Button	Description/Function
BLACK OVALS	The two black ovals are used to change values for the parameter 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 Setup mode.
PAUSE	Stops and restarts the printing process or removes error messages and clears the LCD. When the print engine is paused, the PAUSE light is on. • If the print engine is idle, it enters Pause mode immediately. • If the print engine is printing, the label is completed before the printing process stops.

Table 1 • Front 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 finishes printing.
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).

Front Panel Indicator Lights (LEDs)

The front panel lights are described in Table 2.

Table 2 • Front Panel Lights

LED	OFF Indicates	ON Indicates	FLASHING Indicates
POWER (Green)	Power switch is off, or no power to print engine.	Power switch is on, and power is being supplied to print engine.	—
PAUSE (Yellow)	Normal operation.	One of the following: • Print engine 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.	Print engine is receiving data from or sending status information to the host computer.

Table 2 • Front Panel Lights (Continued)

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

Power On/Off Switch

The power on/off switch is located on the top of the print engine housing, as shown in Figure 5. 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 142.

Figure 5 • Print Engine Power Switch

2
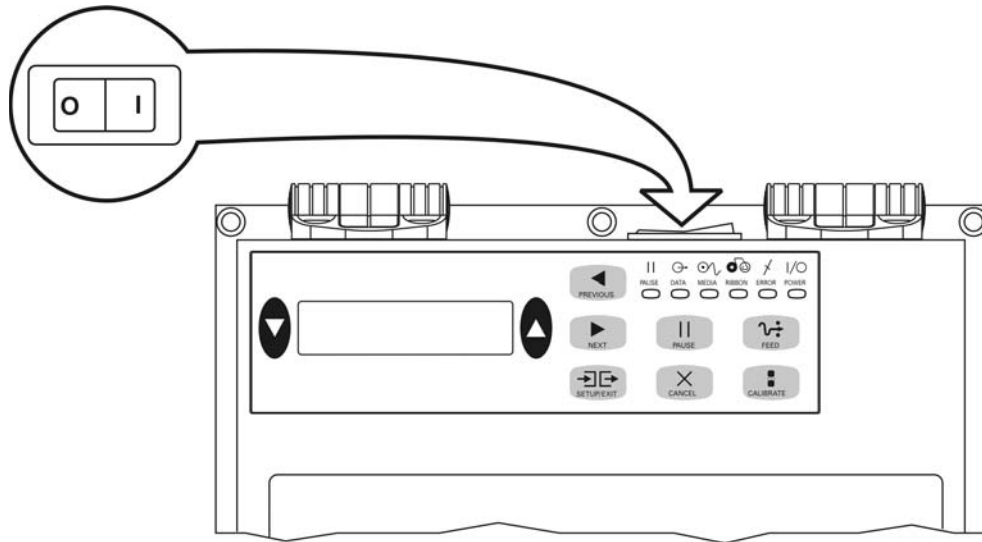
Getting Started

This chapter 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

Review this checklist, and resolve any issues before you begin setting up your print engine. When you are ready, continue with *Print Engine Operation* on page 31.

❑ **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 15.

❑ **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 16.

❑ **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 23. 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 22.

❑ **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 Communication Interface* on page 24.

❑ **Select Media** Do you have the correct media for your application? If you are unsure, see *Types of Media* on page 27.

❑ **Select Ribbon** Do you need to use ribbon, and is the appropriate ribbon available, if needed? If you are unsure, see *Ribbon* on page 29.

Unpack and Inspect the Print Engine

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

Inspect the Print Engine

Inspect the print engine for possible damage incurred during shipment:

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

Report Shipping Damage

If you discover shipping damage upon inspection:

- Immediately notify the shipping company of the damage, and file a damage report with them. Zebra is not responsible for any damage incurred during shipment of the equipment and does not repair this damage under warranty.
- Keep all packaging material for shipping company inspection.
- Notify your authorized Zebra reseller.

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 following conditions:

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

Shipping

If you must ship the print engine:

- Remove any ribbon from the spindles to avoid damaging the print engine.
- 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.

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 measurements 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.

Figure 6 • Front View of Right-Hand Print Engine

5 Mounting Screws
0.218 Thru, Counterbore 0.350 X 0.197 Deep
Socket Head Cap Screw
M5 OR 10-32

10.434 in.
(265 mm)

Main
Frame
Behind
Cover

0.635 in.
(16.13 mm)

26° Label
Orientation

0.526 in.
(13.36 mm)

0.324 in.
(8.23 mm)

Print Line to
Dispense Edge
0.464 in.
(11.8 mm)

Figure 7 • Right Side View of Right-Hand Print Engine

14.86 in.
(377 mm)

23.049 in.
(585.5 mm)

15.389 in.
(390.9 mm)

1.454 in. (36.9 mm)

10.356 in.
(263.0 mm)

0.394 in. (10.0 mm)

0.613 in. (15.57 mm)
First Dot Row

0.520 in. (13.21 mm)
Media/Ribbon Edge

4.500 in.
(114.3 mm)
Max. Width
(Label and Liner)

7.257 in.
(184.3 mm)

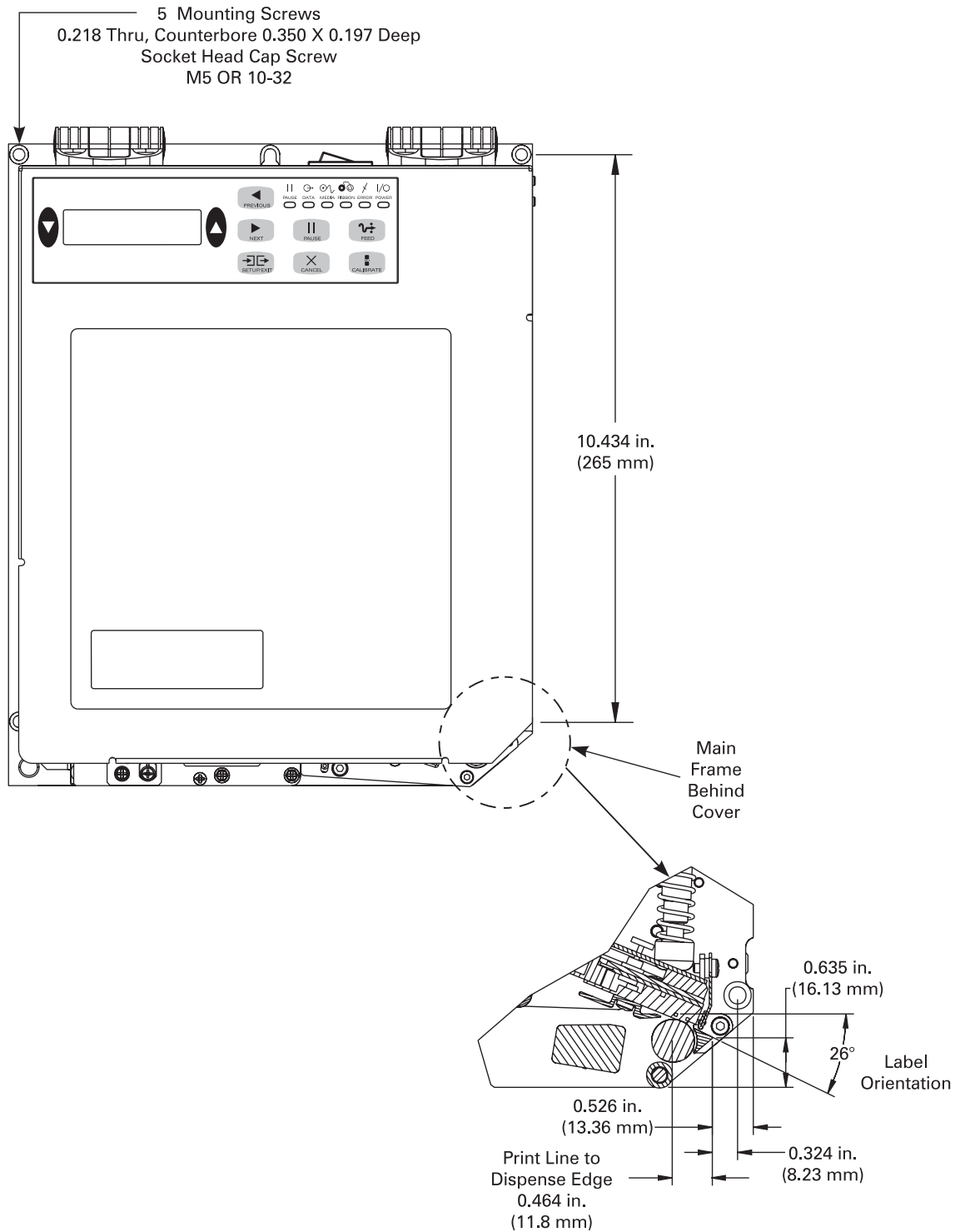8.582 in. (218.0 mm)

16.406 in. (378.6 mm)

24.066 in. (573.2 mm)
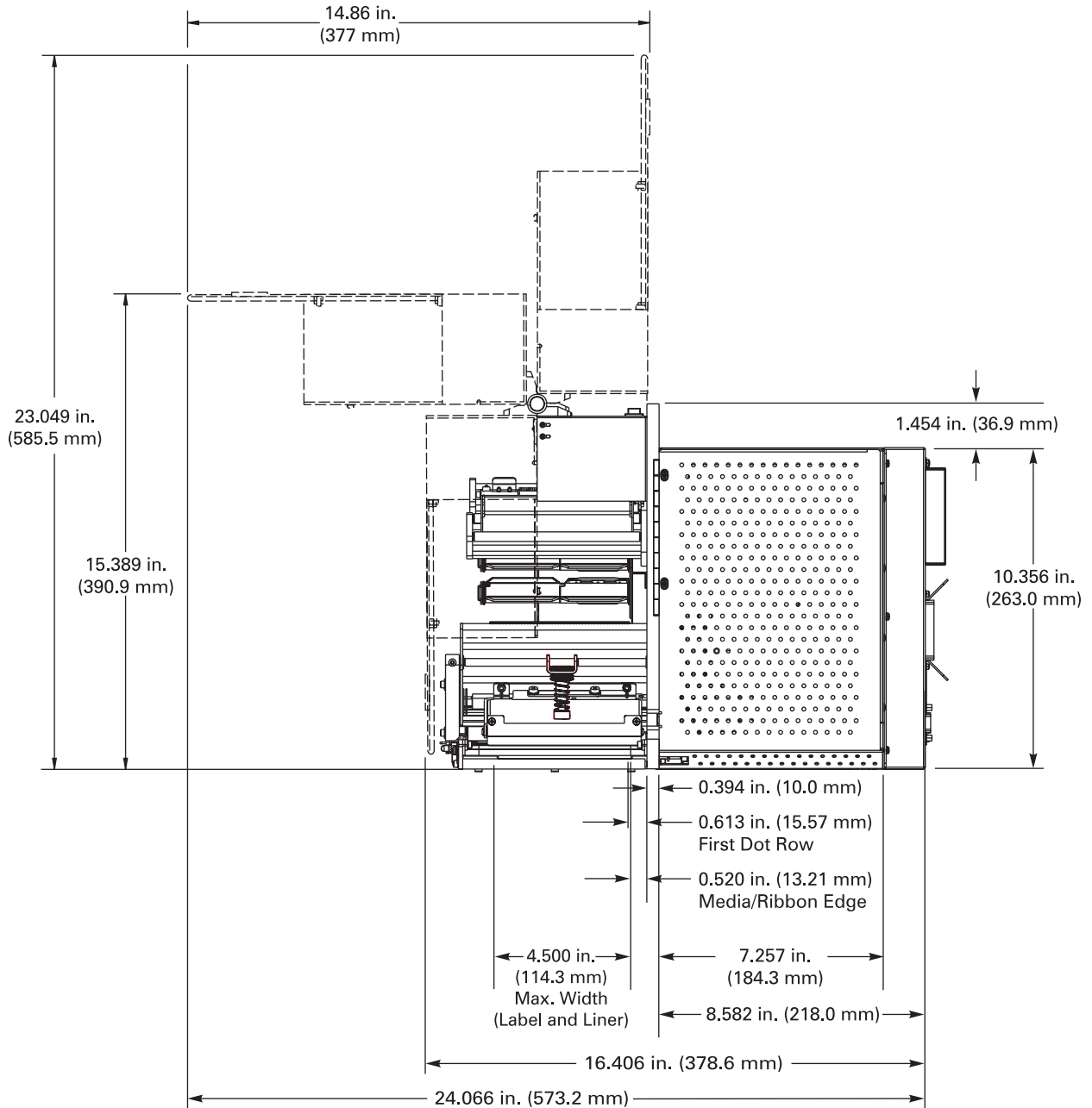
Figure 8 • Rear View of Right-Hand Print Engine
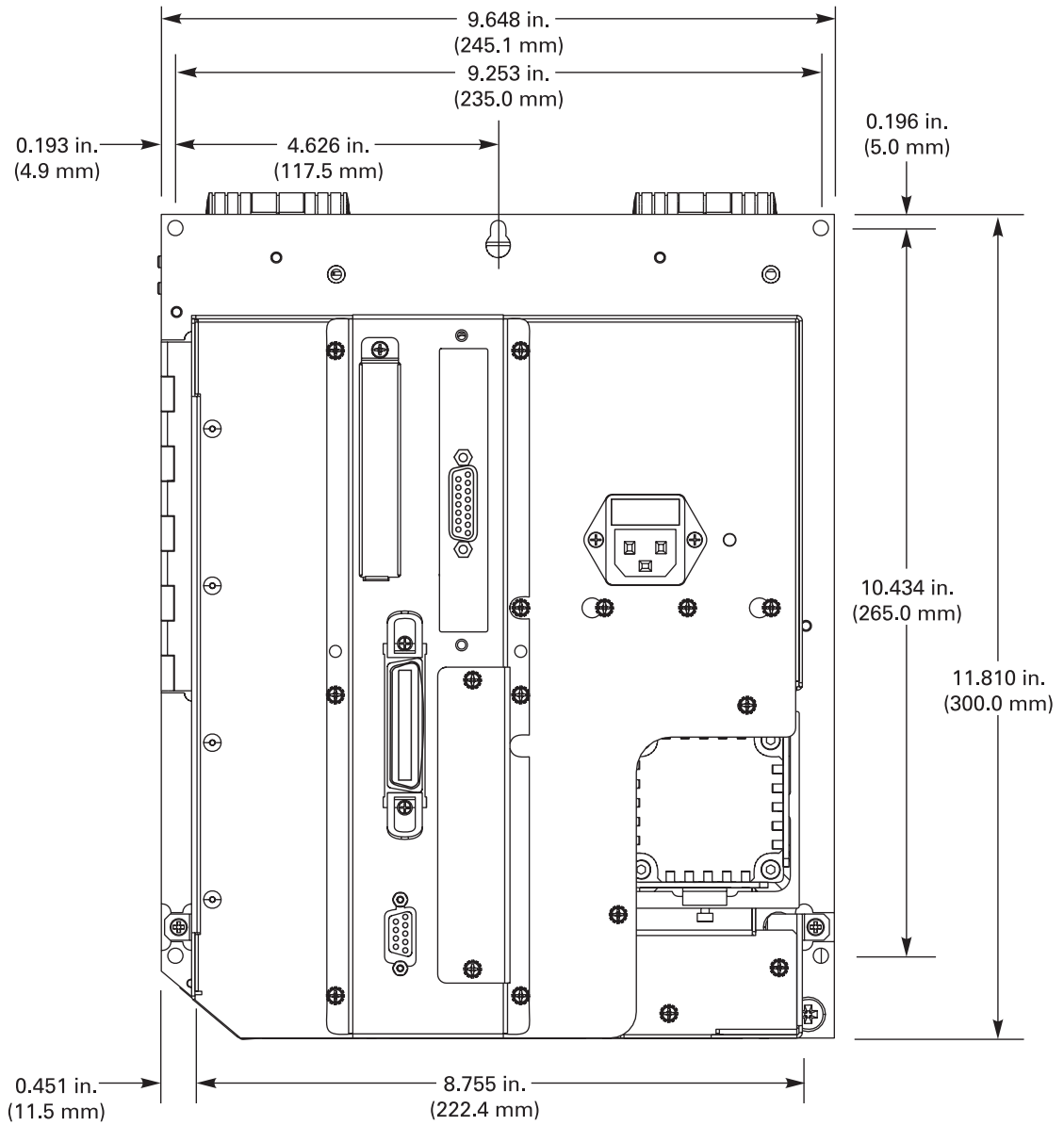
Figure 9 • Top View of Right-Hand Print Engine

180° Max.

9.484 in. (240 mm)
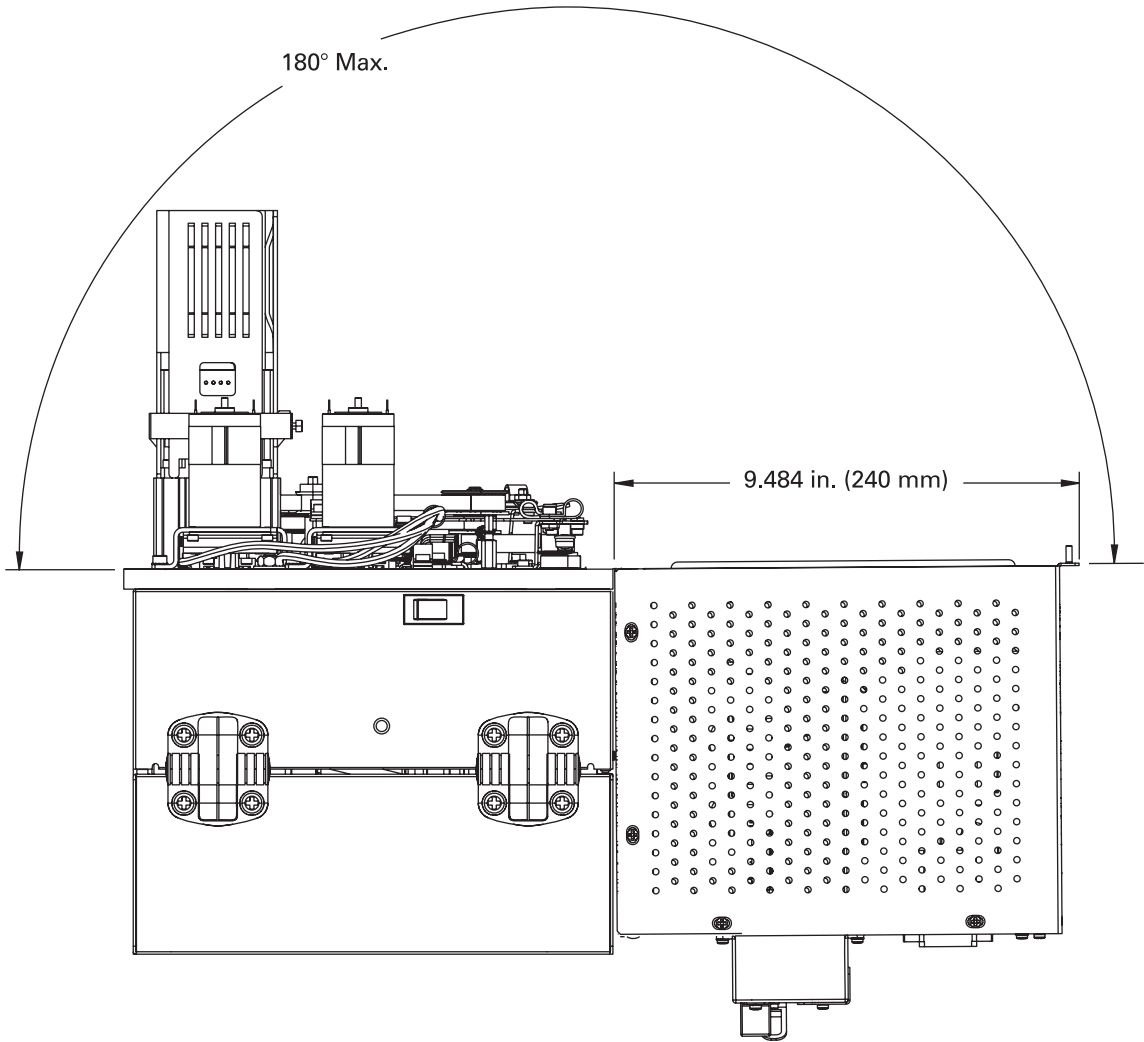
Install the Print Engine in an Applicator

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 10 for the location of the bolt and screws.

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

1. See Figure 10. 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 10 • Front View of 110*PAX*4 Print Engine in Applicator
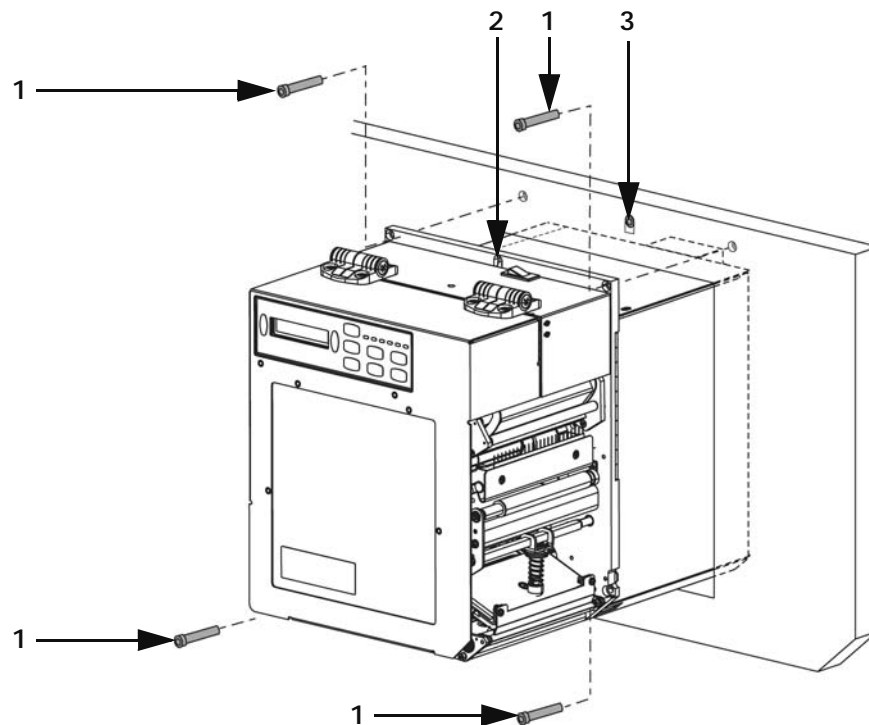
1	Mounting screws (four total)
2	Keyhole
3	Center mounting bolt (shown inside hole on applicator)

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, 48 to 62 Hz range.

Refer to Figure 11. 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 23.

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. Turn Off (**O**) the print engine power switch (located on the top of the print engine housing).

2. Plug the power cord into the AC power connector on the rear of the print engine.

Figure 11 • Power Connection

Left-Hand   Right-Hand
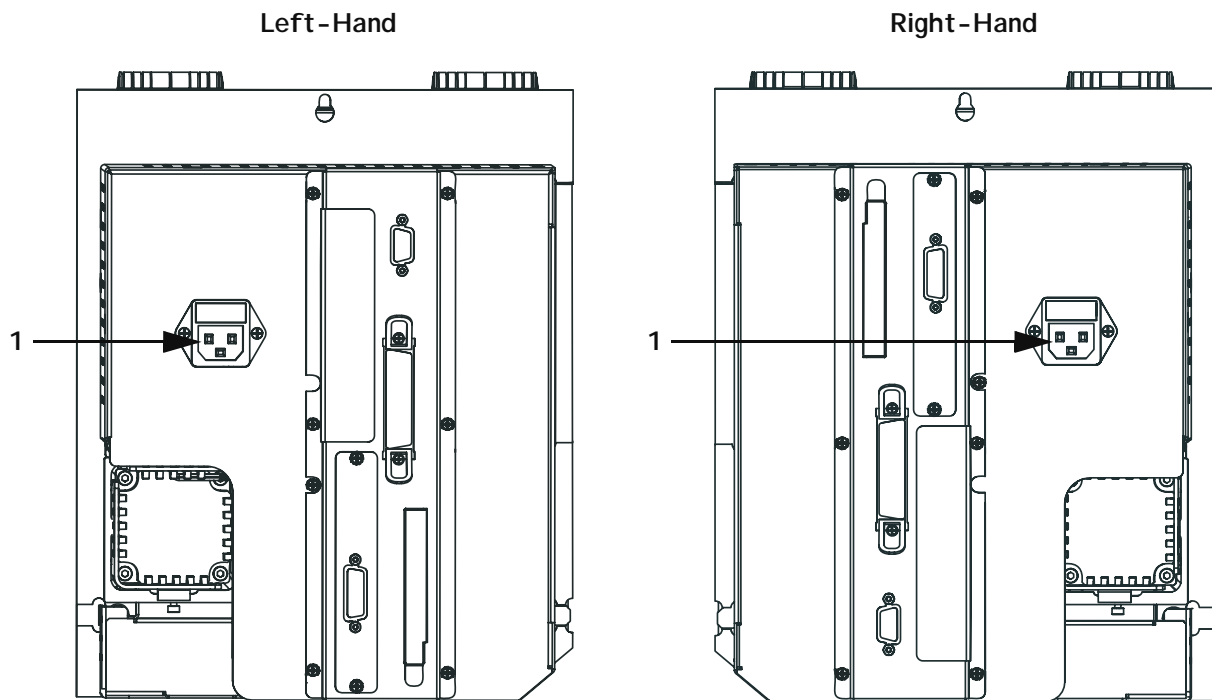
1	AC power connector

3. Plug the other end of the power cord into the power source.

Power Cord Specifications

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, refer to the following guidelines:

- The overall cord length must be less than 9.8 ft (3.0 m).
- The cord must be rated for at least 5 A, 250 V.
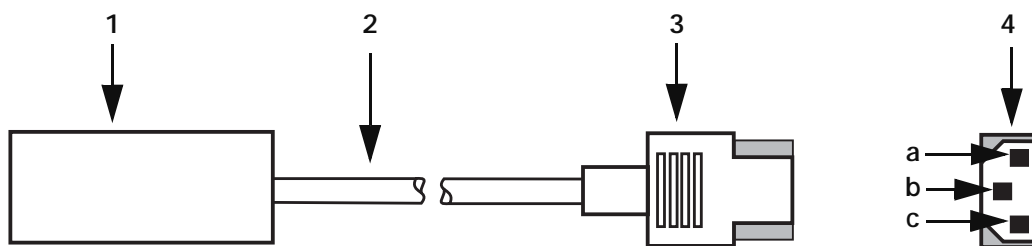- The chassis ground (earth) **must** be connected to ensure safety and reduce electromagnetic interference. The third wire in the power cord grounds the connection (Figure 12).

Figure 12 • Power Cord Specifications

1	AC power plug for your country
2	3-conductor HAR cable
3	IEC 320 connector
4	Contact view of plug—(a) neutral, (b) earth, (c) live

- The AC power plug and the IEC 320 connector must bear the certification mark of at least one of the known international safety organizations shown in Figure 13.

Figure 13 • International Safety Organization Marks
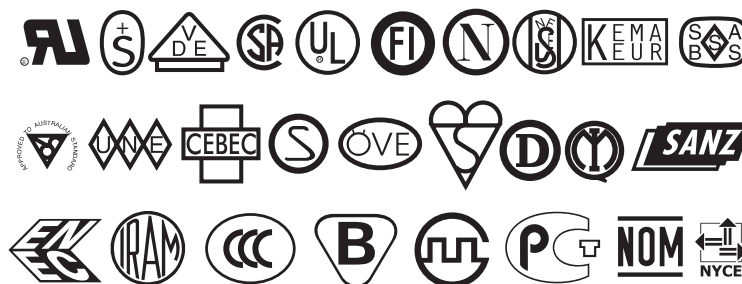
Select a Communication Interface

The way that you connect your print engine to a data source depends on the communication options installed in the print engine. See *Data Ports* on page 157 for control signal descriptions and other additional information.

Caution • Connecting a data communications cable while the power is ON may damage the print engine.

Note • You must supply all interface cables for your application. Refer to *Data Cable Requirements* on page 26 for specific cable requirements.

Standard Connections

Refer to Figure 14. The print engine comes standard with both an Electronics Industries Association (EIA) RS-232 serial interface (DB-9 connector) and an IEEE 1284 bi-directional parallel interface. You may use either of these interface methods to send commands and label formats from a host to the print engine.

Figure 14 • Cable Connections
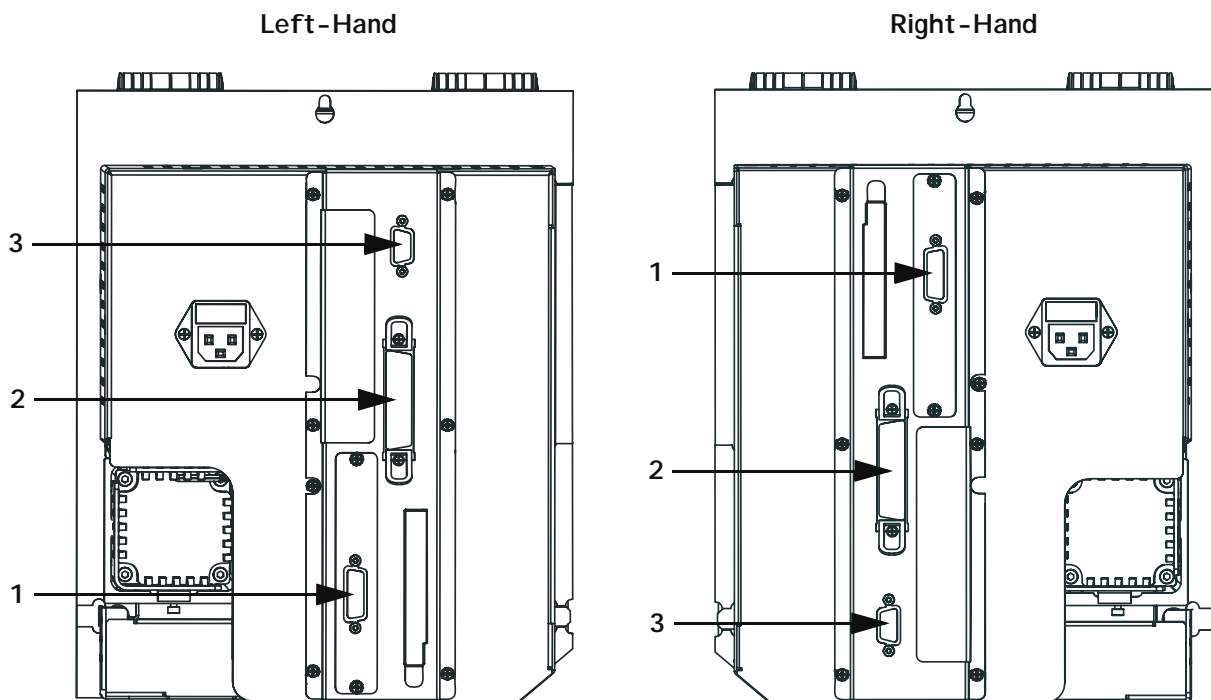
1	DB-15 applicator interface port
2	Parallel interface connector
3	DB-9 serial interface connector

Optional Print Servers

- ZebraNet Wireless Print Server. For more information on this option, see the *ZebraNet Wireless Print Server User Guide* (part number 13422L-001).
- ZebraNet 10/100 Print Server (10/100 PS). For more information on 10/100 PS, see the *ZebraNet 10/100 Print Server User and Reference Guide* (part number 47619L-001).

DB-15 Applicator Interface Connector

A DB-15 Applicator Interface Connector provides communication between the print engine and the associated applicator hardware. In some applications, control signal timing may be a critical element in the performance of the print engine.

System Considerations

Communications Code The print engine sends and receives American Standard Code for Information Interchange (ASCII). This code consists of 128 characters (256 for Code Page 850) including uppercase and lowercase letters, numbers, punctuation marks, and various control codes.

Interfaces The method of interfacing the print engine to a data source depends on the communication options installed in the print engine and the host. The standard interfaces are an RS-232 serial data port and an IEEE 1284 bi-directional parallel port.

Communication Specifications When communicating via an asynchronous serial data port (RS-232), the baud rate, number of data and stop bits, the parity, and the XON/XOFF or DTR control are user-selectable and should be set to match those of the host computer. When communicating via the IEEE 1284 bi-directional parallel port, the previously mentioned parameters do not apply. Refer to *Print Engine Configuration* on page 49 to configure the communication parameters for the print engine.

Interface Considerations

RS-232 A serial communication method consisting of data and control signals; available as a standard feature on most PCs and other hosts.

- *Advantages:* Cables and connectors are readily available from computer equipment stores and suppliers; easy to connect; two-way communication between the host and the print engine.
- *Disadvantages:* Slower than the parallel connection; limited to 50 feet (15.24 m) of cable.

IEEE 1284 Bi-directional Parallel A common communication method available on most PCs and other hosts.

- *Advantages:* Fastest of the four communication interfaces; cables and connectors are readily available from computer equipment stores and suppliers; two-way communication between the host and the print engine; easy to connect.
- *Disadvantages:* Shorter recommended cable length of 6 feet (1.83 m); many computers are equipped with only one parallel port, allowing only one IEEE 1284 bi-directional device to be connected at a time.

Data Cable Requirements

Data cables must be fully shielded and fitted with metal or metallized connector shells. Shielded cables and connectors are required to prevent radiation and reception of electrical noise.

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.

Note • Print engines comply with FCC Rules and Regulations, Part 15, Subpart J, for Class A equipment, using fully-shielded 6-foot (2-meter) data cables. Use of longer cables or unshielded cables may increase radiated emissions above the Class A limits.

Types of Media

The print engine can use various types of media (Table 3). We strongly recommend 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 printer and to ensure against premature printhead wear.
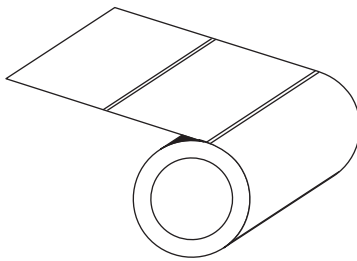
Table 3 • Types of Media
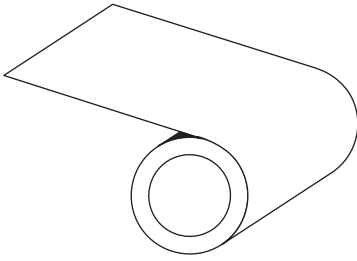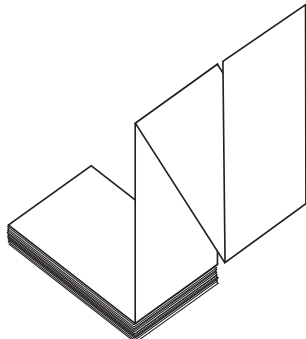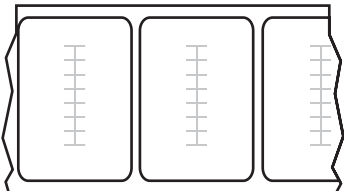
Media Type	How It Looks	Description
Non-Continuous Roll Media		The media is wound on a core. Individual labels are separated by a gap, black mark, notch, or hole, which enables you to see where one label ends and the next one begins. When using media that has holes or notches, position the media sensor directly over a hole or notch. Figure 15 and Figure 16 show different types of non-continuous media. **Figure 15 • Non-Continuous Web Media** **Figure 16 • Non-Continuous Black Mark Media**
Continuous Roll Media		The media is wound on a core and is without gaps, holes, notches, or black marks. This allows the image to be printed anywhere on the label.

Table 3 • Types of Media (Continued)

Media Type	How It Looks	Description
Fanfold Media		The media is folded in a zigzag pattern.
RFID "Smart" Media (for use with RFID-capable print engines only)		Each label has a radio frequency identification (RFID) chip and antenna inlay embedded between the label and the liner. The media is made from the same materials and adhesives as non-RFID labels. The outline of the transponder (which varies by manufacturer) can be seen through the label. All "smart" labels have memory that can be read, and many have memory that can be encoded.

Ribbon

Ribbon is a thin film that is coated on one side with wax 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 label scratch test, complete these steps:

1. Scratch the print surface of the media 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, though ribbon may be used to help protect the printhead from abrasion with the media.

Coated Side of Ribbon

Ribbon can be wound with the coated side on the inside or outside (Figure 17). 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 17 • Ribbon Coated on Outside or Inside

Outside   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 **outer** surface.
Did not adhere to the label	The ribbon is coated on the **inner** surface. To verify this, repeat the test on the inner surface of the roll of ribbon.

Ribbon Scratch Test

If you do not have labels available, perform the ribbon scratch test. This method works best for ribbon that is not installed.

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. To verify this, repeat the test on the other surface of the roll of ribbon.