3

Print Engine Operation

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.

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Load Media 32
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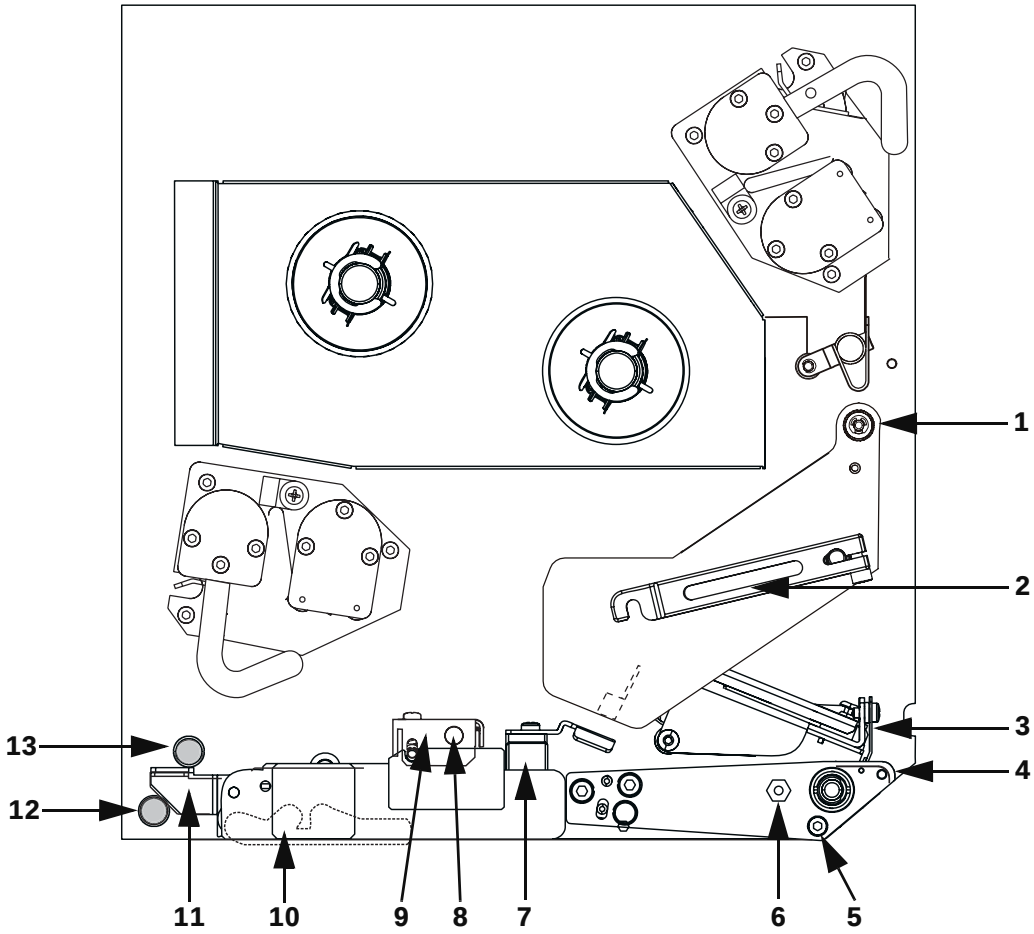
Load Media

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.

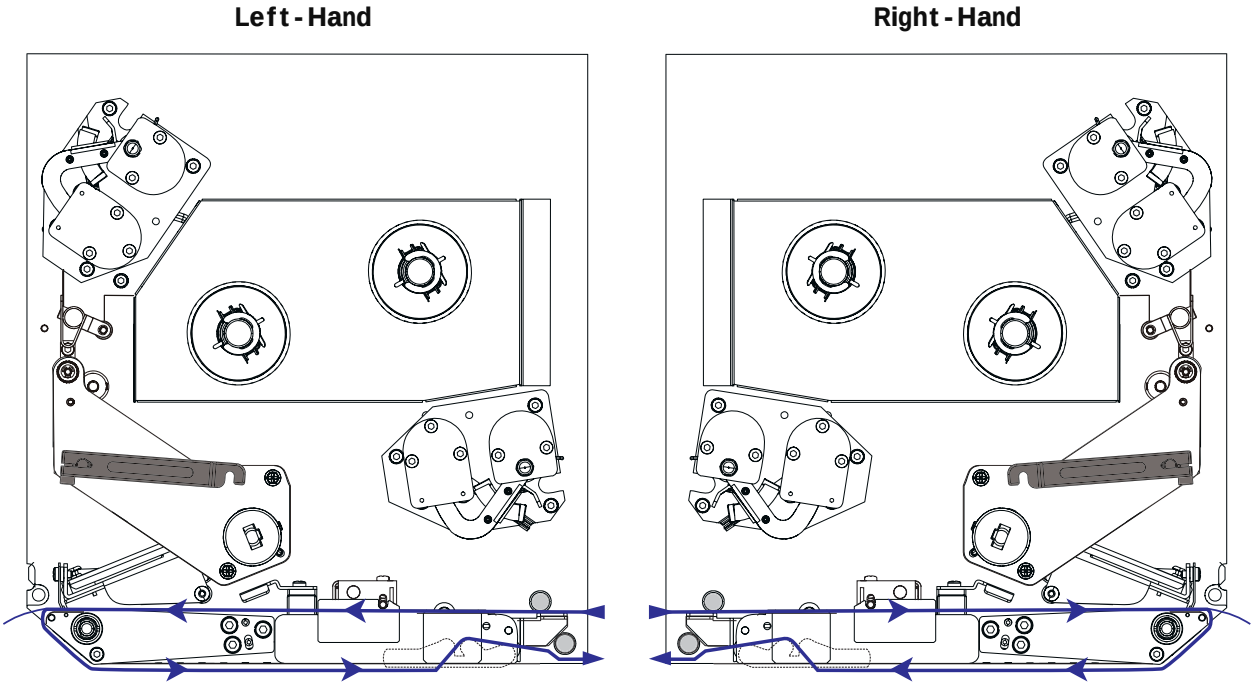
Figure 18 identifies the media-handling components of a right-hand print engine. A left-hand unit contains a mirror image of these components. Figure 19 on page 33 shows the print engine with media loaded.

Figure 18 • Components for Media Loading (Right-Hand)



1	Auxiliary roller	**8**	Pinch roller release button
2	Printhead latch	**9**	Pinch roller assembly
3	Printhead assembly	**10**	Peel roller assembly
4	Peel bar	**11**	Peel roller latch
5	Media liner roller	**12**	Lower guide post
6	Printhead locking pin	**13**	Upper guide post
7	Media guide		

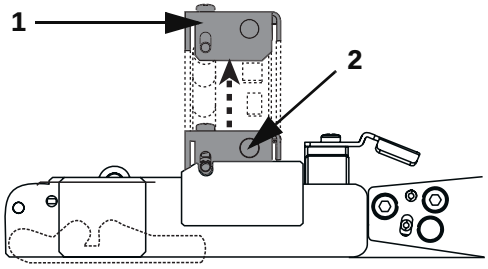
Figure 19 • Loaded Media



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. See Figure 20. Press the release button on the pinch roller assembly, and allow the assembly to pivot up.

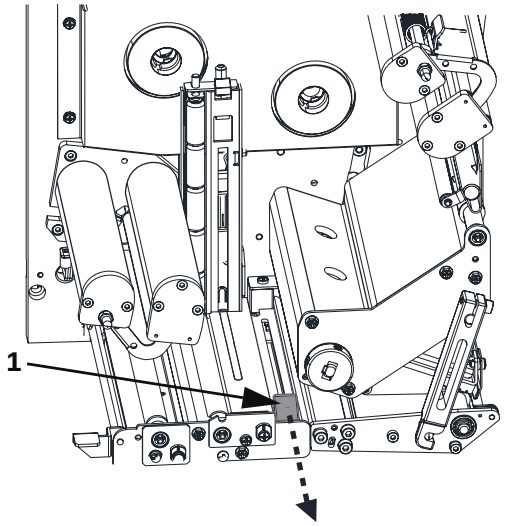
Figure 20 • Opening the Pinch Roller



1	Pinch roller assembly
2	Pinch roller release button

4. See Figure 21. Slide the outer media guide all the way out.

Figure 21 • Sliding the Outer Media Guide

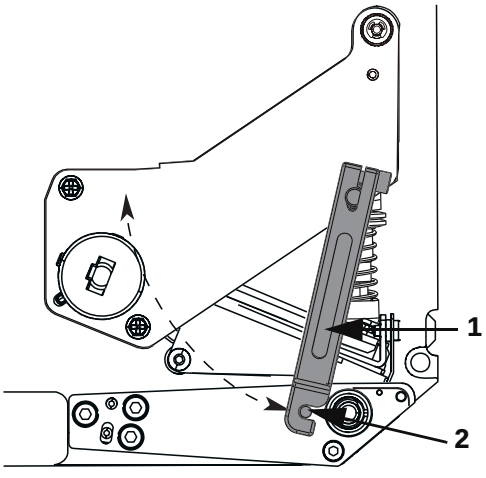


1	Outer media guide

5. See Figure 22. Open the printhead assembly by unlatching the printhead latch from the locking pin.

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

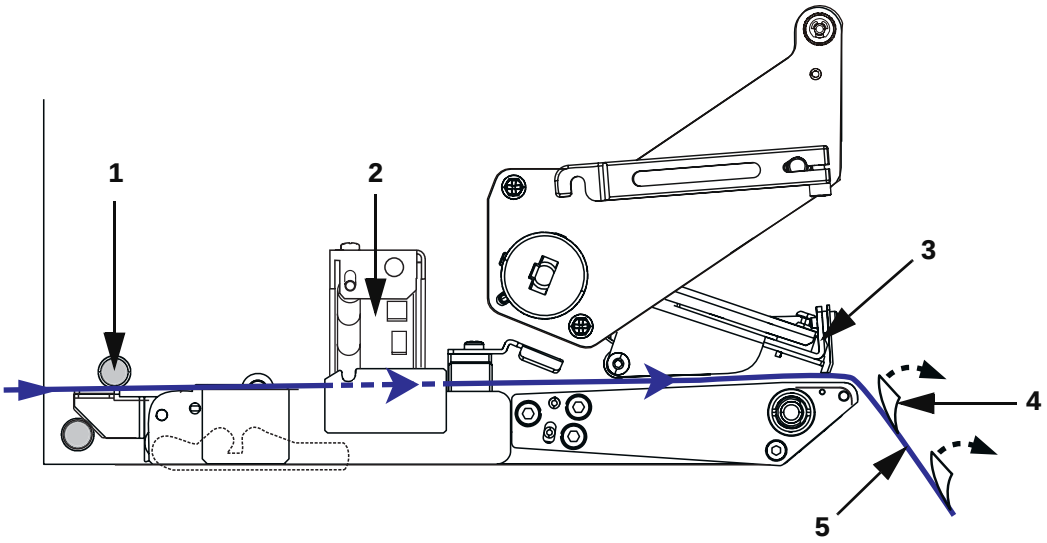
Figure 22 • Opening the Printhead Assembly



1	Printhead latch
2	Locking pin

6. See Figure 23. Thread the media under the upper guide post, below the pinch roller assembly, and under the printhead assembly.
7. See Figure 23. Extend approximately 30 in. (75 cm) of media past the peel bar. Remove and discard the labels from this exposed media.

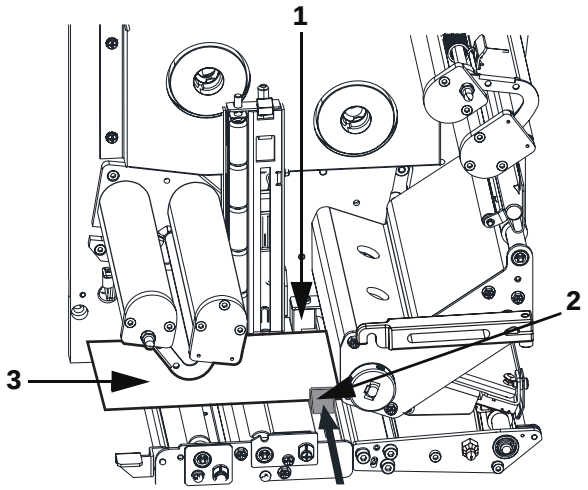
Figure 23 • Threading the Media



1	Upper guide post
2	Pinch roller assembly
3	Printhead assembly
4	Label
5	Liner

8. See Figure 24. Position the media so that it is aligned with and just touching the inner media guide.
9. See Figure 24. Position the outer media guide so that it just touches the outer edge of the media.

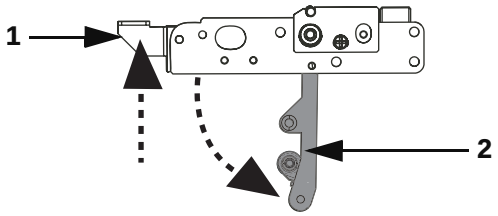
Figure 24 • Adjusting the Outer Media Guide



1	Inner media guide
2	Outer media guide
3	Media

10. See Figure 20 on page 33. Press down on the pinch roller assembly until it locks closed.
11. See Figure 22 on page 34. Close the printhead assembly by rotating the printhead latch until it latches onto the locking pin.
12. See Figure 25. Raise the peel roller latch so that the peel roller assembly pivots down.

Figure 25 • Releasing the Peel Roller Assembly

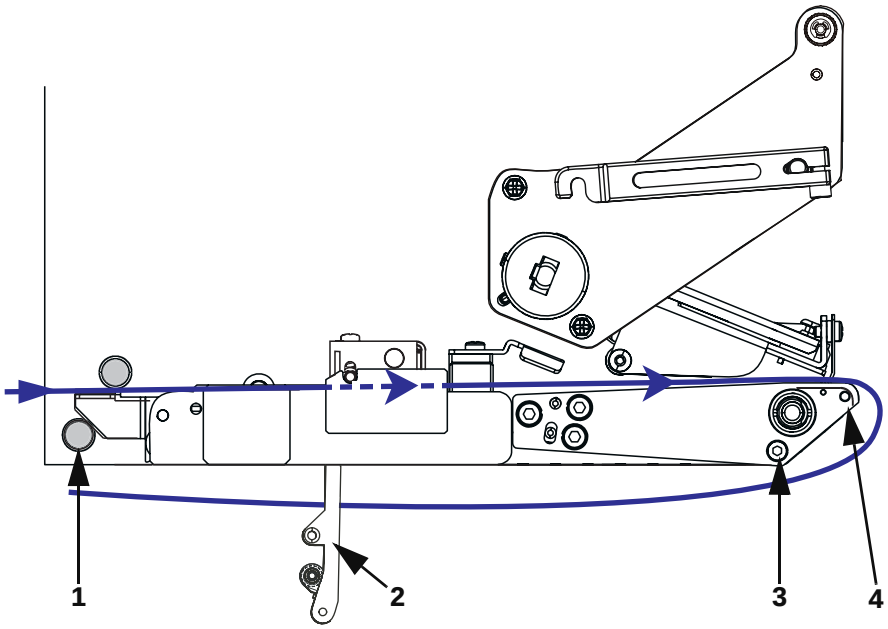


1	Peel roller latch
2	Peel roller assembly

13. See Figure 26. Thread the media liner around the peel bar, under the media liner roller, and through the peel roller assembly.

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.

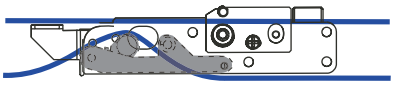
Figure 26 • Threading the Liner



1	Lower guide post
2	Peel bar
3	Media liner roller
4	Peel roller assembly

14. See Figure 27. Rotate the peel roller assembly up until it locks into the closed position.

Figure 27 • Closed Peel Roller Assembly



15. See Figure 26. Thread the media liner past the lower guide post and around the take-up spindle of the applicator (refer to the applicator's user guide).

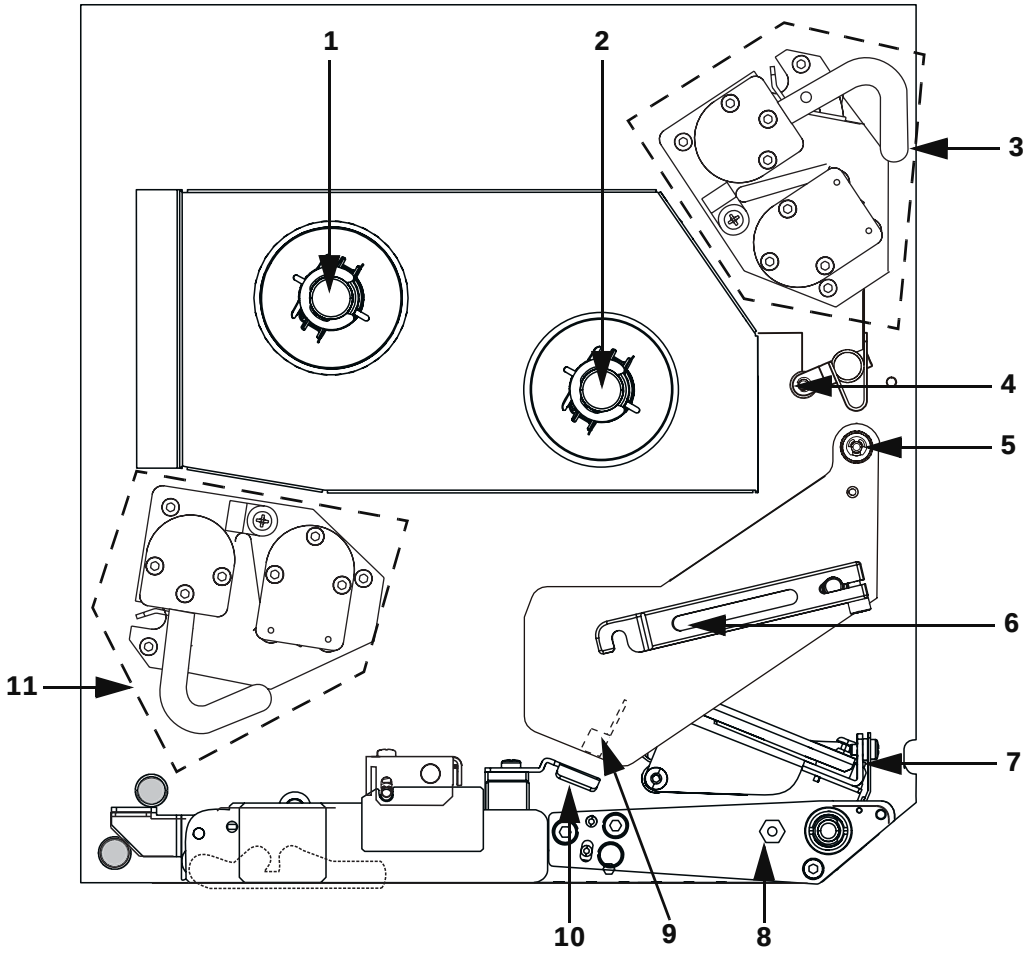
16. Close the media door.

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 28 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 29 on page 39 shows the print engine with ribbon loaded.

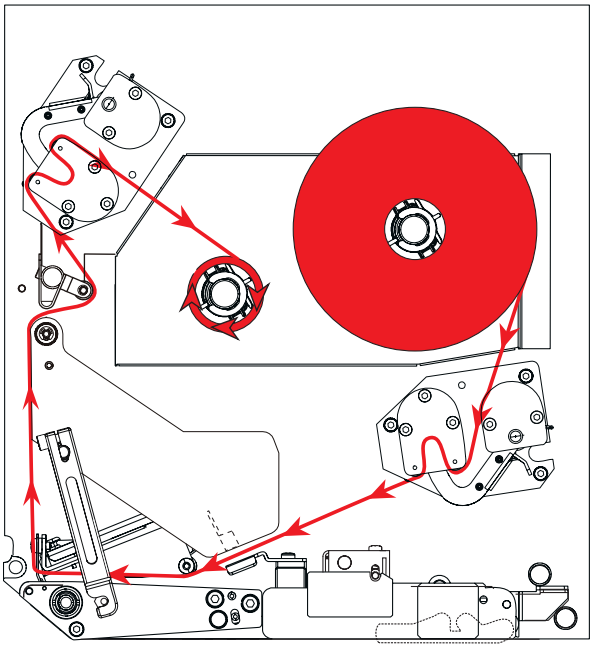
Figure 28 • Components for Ribbon Loading



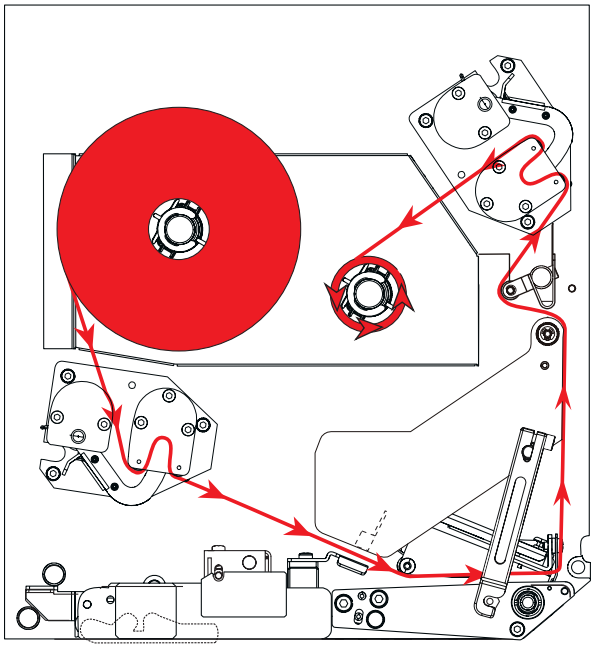
1	Ribbon supply spindle	**7**	Printhead assembly
2	Ribbon take-up spindle	**8**	Locking pin
3	Upper dancer assembly	**9**	Ribbon sensor
4	Idler roller	**10**	Ribbon sensor reflector
5	Auxiliary roller	**11**	Lower dancer assembly
6	Printhead latch		

Figure 29 • Loaded Ribbon

Left - Hand



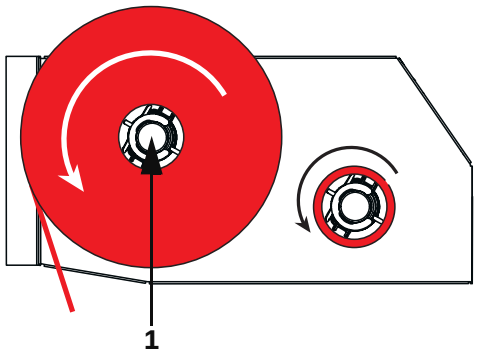
Right - Hand



To load ribbon, complete these steps:

1. See Figure 30. Place a full ribbon roll onto the ribbon supply spindle so the ribbon rotates as shown, and then push the roll toward the print engine frame until it is fully seated.

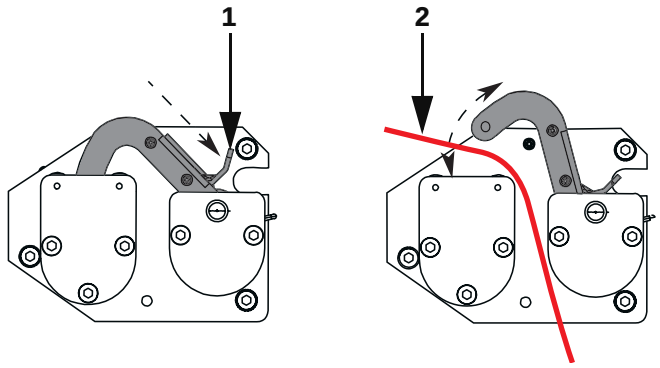
Figure 30 • Placing Ribbon on the Ribbon Supply Spindle



1	Ribbon supply spindle with media

2. See Figure 31. On the lower dancer assembly, squeeze the opening tabs to pivot open the dancer arm.
3. See Figure 31. Carefully thread the ribbon through the lower dancer assembly, and then slowly release the dancer arm.

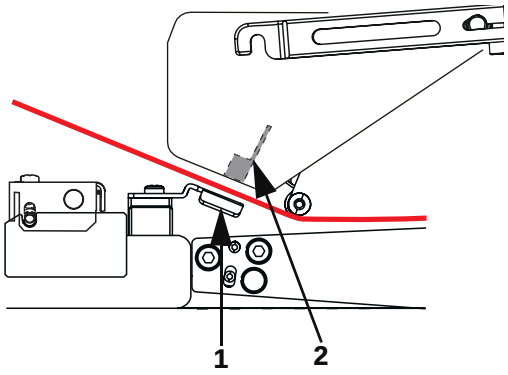
Figure 31 • Opening a Dancer Assembly



1	Opening tabs
2	Ribbon

4. See Figure 32. Thread the ribbon between the ribbon sensor and the ribbon sensor reflector.

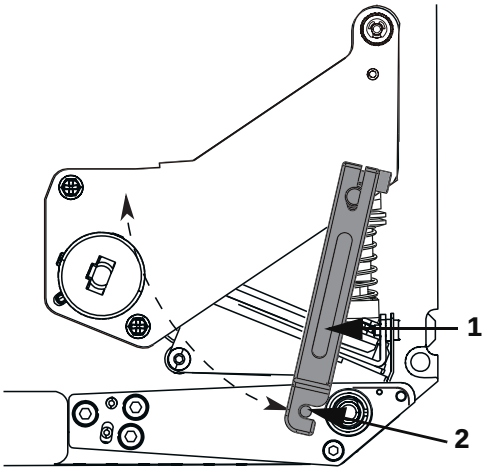
Figure 32 • Ribbon Sensor



1	Ribbon sensor reflector
2	Ribbon sensor

5. See Figure 33. Open the printhead assembly by unlatching the printhead latch from the locking pin.

Figure 33 • Opening the Printhead Assembly

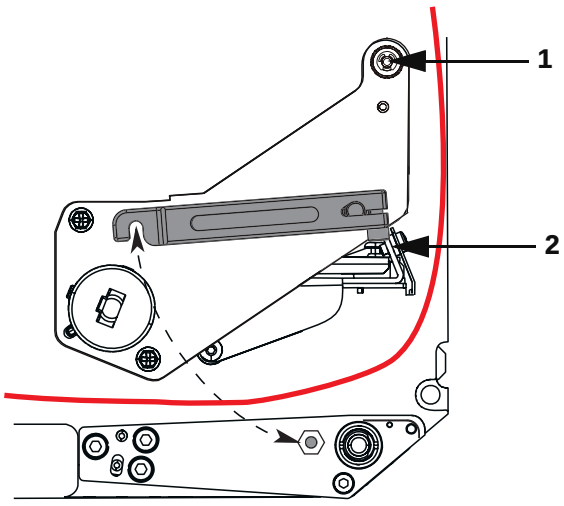


1	Printhead latch
2	Locking pin

6. See Figure 34. Thread the ribbon under the printhead assembly and then up toward the auxiliary roller.

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

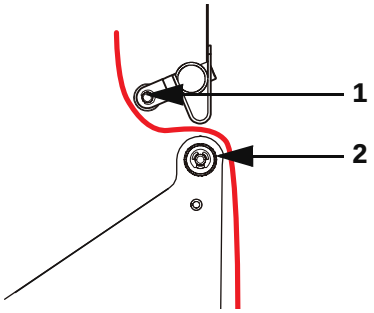
Figure 34 • Threading Ribbon under the Printhead Assembly



1	Auxiliary roller
2	Printhead assembly

7. See . Thread the ribbon over the auxiliary roller, around the idler roller, and then up toward the upper dancer assembly.

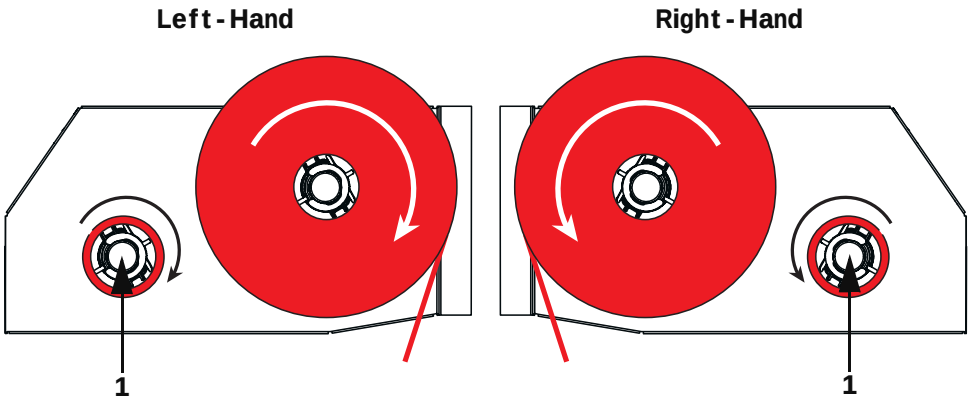
Figure 35 • Threading Ribbon around Rollers



1	Idler roller
2	Auxiliary roller

8. See Figure 31 on page 40. On the upper dancer assembly, squeeze the opening tabs to pivot open the dancer arm.
9. See Figure 31 on page 40. Carefully thread the ribbon through the upper dancer assembly, and then slowly release the dancer arm.
10. See Figure 36. Install an empty ribbon core onto the ribbon take-up spindle, and push the core toward the print engine frame until it is fully seated.
11. See Figure 36. 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.

Figure 36 • Loading Ribbon on the Ribbon Take-Up Spindle



1	Ribbon take-up spindle with empty ribbon core

12. See Figure 33 on page 41. Close the printhead assembly by pivoting the printhead latch onto the locking pin.
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 38.
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.** See Figure 36 on page 42. Install 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 38. **f.** See Figure 36 on page 42. 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.

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 4 shows the different methods for calibration.

Table 4 • 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 67) • 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 67). • 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 front 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 67 or *Select Head Close Option* on page 67).
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 67 or *Select Head Close Option* on page 67).

Table 4 • Types of Calibration

Type of Calibration	Description	When/How It Occurs
Sensor Profile Calibration	The print engine auto-calibrates and prints a media sensor profile.	Select the **SENSOR PROFILE** option on the front panel. See *Print Sensor Profile* on page 62 for instructions.
Media and Ribbon Sensor Sensitivity Calibration	One of the most common adjustments to print engine settings. The print engine resets the sensitivity of the sensors to detect correctly 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 front panel. See *Calibrate Media and Ribbon Sensor Sensitivity* on page 63 for instructions.

Adjust Media Sensors

This section describes how to adjust the media sensors.

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 154 for information about black mark requirements.

Transmissive Media Sensor

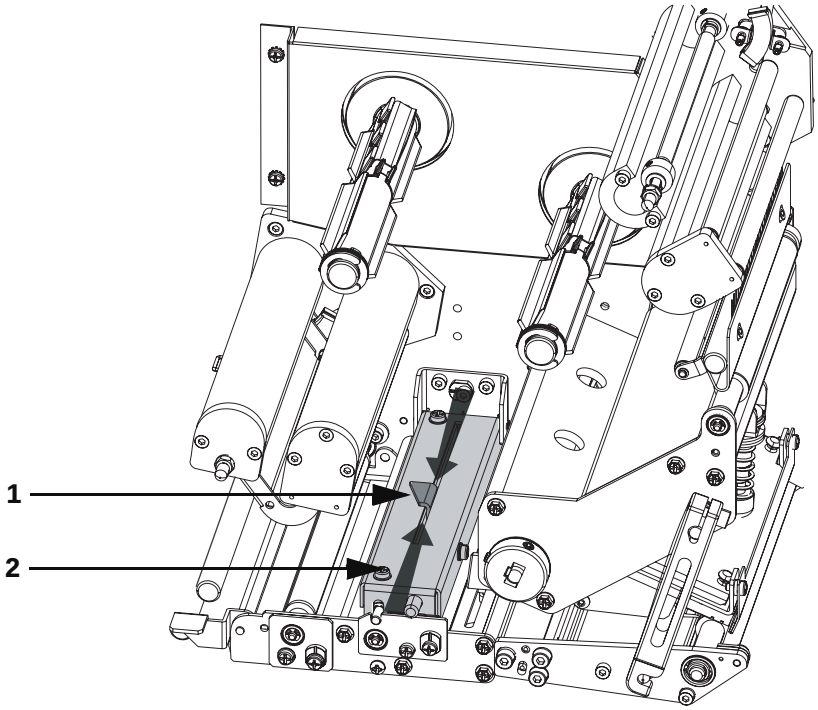
The transmissive media sensor finds “start of label” indicators, such as notches or holes in the media or interlabel gaps. This sensor consists of a light source (positioned below the media) and a light sensor (positioned above the media).

To position the sensor, complete these steps:

1. Refer to Figure 37. How does the current media indicate the start of labels?

If the media...	Then...
Has notches or holes between labels	Slide the sensor position indicator along the pinch roller assembly so the point of the indicator aligns with the notch or hole in the media.
Uses interlabel gaps	Position the sensor position indicator approximately at the center of the media width.

Figure 37 • Media Sensor Adjustment (Right-Hand Unit Shown)



1	Sensor position indicator
2	Pinch roller assembly

Notes • _____

4

Print Engine Configuration

This chapter describes the front panel parameters that are used to configure the print engine for operation.

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Overview

After you have installed the media and ribbon and the Power-On Self Test (POST) is complete, the front panel displays **PRINTER READY**. You may now set print engine parameters for your application using the front 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 146.

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, you can change the print engine's parameters in these additional ways:

- with ZebraLink™ WebView (ZebraNet® 10/100 PrintServer or ZebraNet Wireless Print Server required). For information, see the appropriate print server user guide.
- with the SetWLAN configuration utility (ZebraNet Wireless Print Server required). For information, see the *ZebraNet Wireless Print Server User Guide*.

Enter Setup Mode

To enter Setup Mode, complete these steps:

1. Press SETUP/EXIT to enter Setup mode.
2. Press either NEXT or PREVIOUS to scroll through the parameters.

Exit Setup Mode

To leave Setup mode, complete these steps:

1. Press SETUP/EXIT.
   The LCD displays **SAVE CHANGES**.
2. Press the left or right oval to display the save options (Table 5).

Table 5 • Save Options When Leaving Setup Mode

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. **Note** • 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.

Print a Configuration Label

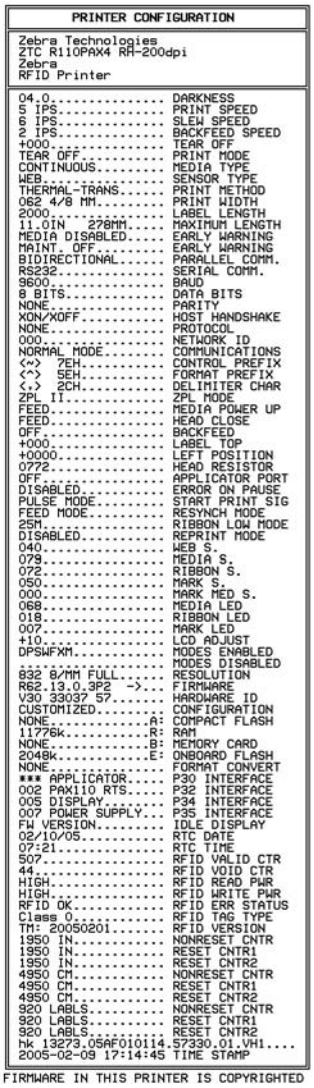
A configuration label lists the print engine settings that are stored in configuration memory. After you load the media and ribbon (if necessary), print a configuration label as a record of your print engine's current settings. Keep the label to use when troubleshooting printing problems.

To print a configuration label, complete these steps:

1. On the front 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 38).

Figure 38 • Configuration Label



```
PRINTER CONFIGURATION

Zebra Technologies
ZTC R110PAX4 RH-200dpi
Zebra
RFID Printer

04.0............... DARKNESS
5 IPS.............. PRINT SPEED
6 IPS.............. SLEW SPEED
2 IPS.............. BACKFEED SPEED
+000............... TEAR OFF
TEAR OFF........... PRINT MODE
CONTINUOUS......... MEDIA TYPE
WEB................ SENSOR TYPE
THERMAL-TRANS...... PRINT METHOD
062 4/8 MM......... PRINT WIDTH
2000............... LABEL LENGTH
11.0IN  278MM...... 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
FEED............... MEDIA POWER UP
FEED............... HEAD CLOSE
OFF................ BACKFEED
+000............... LABEL TOP
+0000.............. LEFT POSITION
0772............... HEAD RESISTOR
OFF................ APPLICATOR PORT
DISABLED........... ERROR ON PAUSE
PULSE MODE......... START PRINT SIG
FEED MODE.......... RESYNCH MODE
25M................ RIBBON LOW MODE
DISABLED........... REPRINT MODE
040................ WEB S.
079................ MEDIA S.
072................ RIBBON S.
050................ MARK S.
000................ MARK MED S.
068................ MEDIA LED
018................ RIBBON LED
007................ MARK LED
+10................ LCD ADJUST
DPSWFXM............ MODES ENABLED
.................... MODES DISABLED
832 8/MM FULL...... RESOLUTION
R62.13.0.3P2  ->... FIRMWARE
V30 33037 57....... 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
002 PAX110 RTS..... P32 INTERFACE
005 DISPLAY........ P34 INTERFACE
007 POWER SUPPLY... P35 INTERFACE
FW VERSION......... IDLE DISPLAY
02/10/05........... RTC DATE
07:21.............. RTC TIME
507................ RFID VALID CTR
44................. RFID VOID CTR
HIGH............... RFID READ PWR
HIGH............... RFID WRITE PWR
RFID OK............ RFID ERR STATUS
Class 0............ RFID TAG TYPE
TM: 20050201....... RFID VERSION
1950 IN............ NONRESET CNTR
1950 IN............ RESET CNTR1
1950 IN............ RESET CNTR2
4950 CM............ NONRESET CNTR
4950 CM............ RESET CNTR1
4950 CM............ RESET CNTR2
920 LABLS.......... NONRESET CNTR
920 LABLS.......... RESET CNTR1
920 LABLS.......... RESET CNTR2
hk 13273.05AF010114.57330.01.VH1....
2005-02-09 17:14:45 TIME STAMP

FIRMWARE IN THIS PRINTER IS COPYRIGHTED
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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 front 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 39). 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 39 • Network Configuration Label (With a Wireless Print Server Installed)

```
Network Configuration

Zebra Technologies
PRINTER MODEL XXXdpi
USER-DEFINED TEXT

NO.................. WIRED PS CHECK?
Printer............. LOAD LAN FROM?

Wired
ALL................. IP PROTOCOL
000.000.000.000.... IP ADDRESS
000.000.000.000.... SUBNET MASK
000.000.000.000.... DEFAULT GATEWAY
000.000.000.000.... WINS SERVER IP
YES................. TIMEOUT CHECKING
0300................ TIMEOUT VALUE
0000................ ARP INTERVAL
9100................ BASE RAW PORT

Wireless*
ALL................. IP PROTOCOL
010.003.015.089.... IP ADDRESS
255.255.255.000.... SUBNET MASK
010.003.015.001.... DEFAULT GATEWAY
010.003.001.015.... WINS SERVER IP
YES................. TIMEOUT CHECKING
0300................ TIMEOUT VALUE
0000................ ARP INTERVAL
9100................ BASE RAW PORT
YES................. CARD INSERTED
015FH............... CARD MFG ID
000AH............... CARD PRODUCT ID
000e83df3bc7........ MAC ADDRESS
YES................. DRIVER INSTALLED
INFRASTRUCTURE...... OPERATING MODE
wh-CTC-PRD.......... 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................ AUTH. TYPE
OFF................. LEAP MODE
128-bit............. ENCRYPTION MODE
1................... ENCRYPT. INDEX
020................. POOR SIGNAL
LONG................ PREAMBLE
YES................. ASSOCIATED

FIRMWARE IN THIS PRINTER IS COPYRIGHTED
```

Changing 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 ^KP (Define Password) ZPL II instruction or through ZebraLink™ WebView (ZebraNet® PrintServer II, 10/100 Print Server, 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/ZPL II command. To re-enable the password-protection feature, send the ZPL/ZPL II command ^KPx, where x can be any number from 1 to 9999.

Front Panel LCD

Use the LCD display on the front panel to adjust print engine settings. Table 6 shows parameters in the order in which they are displayed when you press NEXT after entering Setup mode. Throughout this process, 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 (*) is shown in the upper left corner of the display to indicate that the value is different from the one currently active in the print engine. Table 7 on page 74 shows the additional parameters that appear when a wired or wireless print server is installed in the print engine. Table 8 on page 76 shows the parameters that appear when an RFID reader is installed.

Table 6 • Print Engine Parameters (Page 1 of 19)

Parameter	Action/Explanation
DARKNESS +4.0 - ■■■■ +	**Adjust Print Darkness** Darkness (burn duration) settings depend on a variety of factors, including ribbon type, media, and the condition of the printhead. You may adjust the darkness for consistent high-quality printing. If printing is too light or if there are voids in printed areas, you should increase the darkness. If printing is too dark or if there is spreading or bleeding of printed areas, you should decrease the darkness. Darkness settings also may be changed by the driver or software settings. The *FEED Self Test* on page 145 can be used to determine the best darkness setting. Because the darkness setting takes effect immediately, you can see the results on labels that are currently 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. • Press the right oval to increase darkness. • Press the left oval to decrease darkness. **Default:** +4.0 **Range:** 00.0 to +30.0
PRINT SPEED 2 IPS +	**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. • Press the right oval to increase the value. • Press the left oval to decrease the value. **Default:** 2 IPS **Range:** 2 to 12 IPS for 203 dpi, 2 to 8 IPS for 300 dpi

Table 6 • Print Engine Parameters (Page 2 of 19)

Parameter	Action/Explanation
SLEW SPEED 6 IPS +	**Adjust Slew Speed** Adjusts the speed for feeding a blank label (given in inches per second). • Press the right oval to increase the value. • Press the left oval to decrease the value. **Default:** 6 IPS **Range:** 1 to 12 IPS
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). • Press the right oval to increase the value. • Press the left oval to decrease the value. **Default:** 2 IPS **Range:** 1 to 12 IPS
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. Positive numbers move the media out and negative numbers move the media in. Each press of an oval adjusts the tear-off position by four dot rows. • Press the right oval to increase the value. • Press the left oval to decrease the value. **Default:** +0 **Range:** –120 to +120
PRINT MODE -APPLICATOR +	**Select Print Mode** Print mode settings tell the print engine the method of media delivery that you wish to use. • Press either oval to display other choices. **Default:** APPLICATOR **Selections:** TEAR-OFF, REWIND, APPLICATOR
MEDIA TYPE -NON-CONTINUOUS+	**Set Media Type** This parameter tells the print engine the type of media that you are using. 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). • Press either oval to display other choices. **Default:** NON-CONTINUOUS **Selections:** CONTINUOUS, NON-CONTINUOUS

Table 6 • Print Engine Parameters (Page 3 of 19)

Parameter	Action/Explanation
SENSOR TYPE -WEB +	**Set the Sensor Type** This parameter tells the print engine whether you are using media with a web (gap/space between labels, notch, or hole) to indicate the separations between labels or if you are using media with a black mark printed on the back. If your media does not have black marks for registration on the back, leave your print engine at the default (WEB). • Press either oval to display other choices. **Default:** WEB **Selections:** WEB, MARK
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). • Press either oval to display other choices. **Default:** THERMAL TRANSFER **Selections:** THERMAL TRANSFER, DIRECT THERMAL **Note •** Selecting direct thermal when using thermal transfer media and ribbon creates a print engine error condition, but printing continues.
PRINT WIDTH - 104 0/8 MM +	**Set Print Width** Determines the printable area across the width of the label given the resolution of the print engine. To change 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). **Default:** 104 MM for 203 dpi print engines; 105 8/12 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.

Table 6 • Print Engine Parameters (Page 4 of 19)

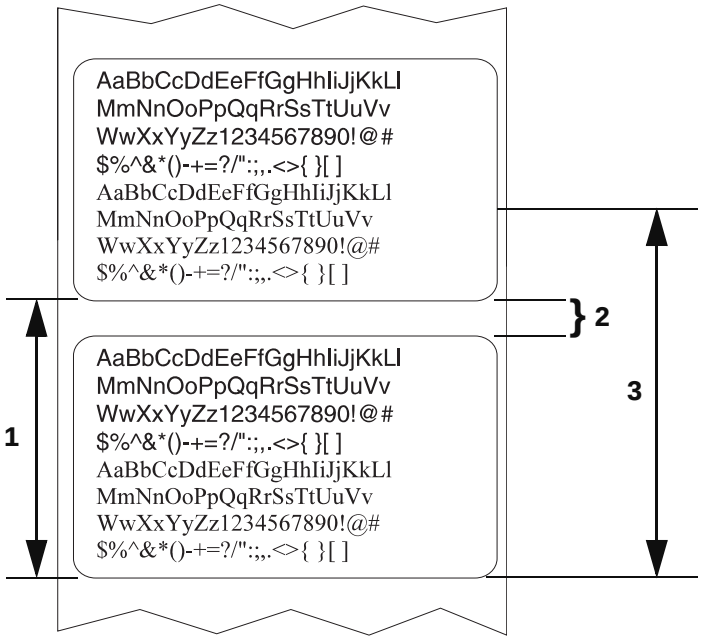
Parameter	Action/Explanation
MAXIMUM LENGTH -39.0 IN 988 MM	**Set Maximum Label Length** This parameter is used during the media portion of the calibration process. Always set maximum label length to a value that is at least 1.0 in. (25.4 mm) greater than the actual label length (Figure 40). If the value 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). • Press the right oval to increase the value. • Press the left oval to decrease the value. **Default:** 39.0 inches (988 mm). **Range:** Values are adjustable in one-inch (25.4 mm) increments. **Figure 40 • Label Length**  1 — Label length (including interlabel gap) 2 — Interlabel gap 3 — Set maximum label length to approximately this value

Table 6 • Print Engine Parameters (Page 5 of 19)

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. Also, the print engine does not make any adjustments when power is turned off and on. • Press the right or left oval to display other choices. **Default:** MEDIA DISABLED **Selections:** MEDIA DISABLED, MEDIA ENABLED To change the Early Warning settings: **1.** When the LCD displays **EARLY WARNING**, press the right or left oval until the desired setting is listed on the LCD. (If you are prompted for a password, enter your password using the instructions in *Changing Password-Protected Parameters* on page 54.) When the print engine detects that less than 15% of the labels remain, **WARNING MEDIA LOW** appears on the LCD. If the alert function has been enabled, an alert is also sent. When the printhead is opened and then closed after a media warning has been received, the LCD prompts with **MEDIA REPLACED?**. Press the right oval to select **YES** to clear the warning and reset the label counter. **2.** When setting the Early Warning for maintenance, the LCD prompts **HEAD CLEAN?**. **3.** Press the right oval to select **YES.**
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 •** Update the number of labels per roll when beginning use of the Early Warning System. Also, the print engine does not make any adjustments when power is turned off and on. • Press the right or left oval to display other choices. **Default:** MAINTENANCE DISABLED **Selections:** MAINTENANCE DISABLED, MAINTENANCE ENABLED To change the Early Warning settings: **1.** When the LCD displays **EARLY WARNING**, press the right or left oval until the desired setting is listed on the LCD. (If you are prompted for a password, enter your password using the instructions in *Changing Password-Protected Parameters* on page 54.) When setting the Early Warning for maintenance, the LCD prompts **HEAD CLEAN?**. **2.** Press the right oval to select **YES.**

Table 6 • Print Engine Parameters (Page 6 of 19)

Parameter	Action/Explanation
LIST FONTS PRINT	**List Fonts** • Press the right oval to print 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.
LIST BAR CODES PRINT	**List Bar Codes** • Press the right oval to print 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 CompactFlash cards.
LIST IMAGES PRINT	**List Images** • Press the right oval to print a label that lists the available images stored in the print engine's RAM, Flash memory, optional memory card, PCMCIA cards, or CompactFlash cards.
LIST FORMATS PRINT	**List Formats** • Press the right oval to print a label that lists the available formats stored in the print engine's RAM, Flash memory, or optional memory card.
LIST SETUP PRINT	**List Setup** • Press the right oval to print a configuration label, which lists the current print engine configuration.
LIST NETWORK PRINT	**List Network Settings** This selection is used to print a network configuration label, which lists the settings for any print server that is installed. • Press the right oval to print a network configuration label.
LIST ALL PRINT	**List All** • Press the right oval to print labels that list the available fonts, bar codes, images, formats, and the current print engine and network configurations.

Table 6 • Print Engine Parameters (Page 7 of 19)

Parameter	Action/Explanation
`FORMAT CARD:` `A:  B:`	**Initialize Memory Card** **Caution •** Perform this operation only when it is necessary to erase all previously stored information from the optional PCMCIA card or CompactFlash card. **1.** Press the right oval to select **YES**. (If you are prompted to enter the password, see *Changing Password-Protected Parameters* on page 54. The front panel LCD asks **ARE YOU SURE?**. **2.** Do you wish to continue? • Press the left oval to select **NO** to cancel the request and return to **INITIALIZE 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 front panel displays **PRINTER READY**. If you exit Setup mode while initialization is still in process, the front 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.
`INIT FLASH MEM` `YES`	**Initialize Flash Memory** **Caution •** Perform this operation only when it is necessary to erase all previously stored information from Flash memory. **1.** Press the right oval to select **YES**. (If you are prompted to enter the password, see *Changing Password-Protected Parameters* on page 54. The display shows **INITIALIZE FLASH?** **2.** Press the right oval to select **YES.** The display shows **ARE YOU SURE?**. **3.** 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 front panel displays **PRINTER READY**. If you exit Setup mode while initialization is still in process, the front 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 6 • Print Engine Parameters (Page 8 of 19)

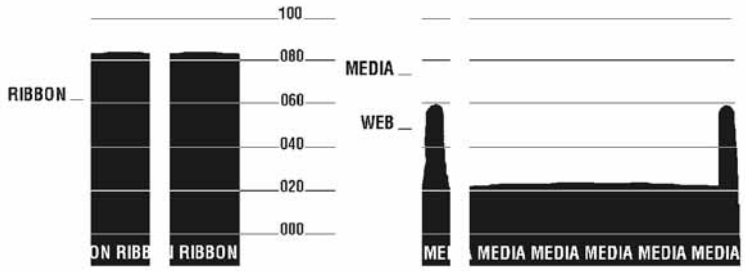
Parameter	Action/Explanation
SENSOR PROFILE PRINT	**Print Sensor Profile** The media sensor profile may be used to troubleshoot registration problems that may be caused when the media sensor detects preprinted areas on the media or experiences difficulty in determining web location. • Press the right oval to start this standard calibration procedure and print a media sensor profile. Figure 41 shows a media sensor profile. If the sensitivity of the media and/or ribbon sensors must be adjusted, use *Calibrate Media and Ribbon Sensor Sensitivity* on page 63 to adjust sensor sensitivity. **Figure 41 • Media Sensor Profile** 

Table 6 • Print Engine Parameters (Page 9 of 19)

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 •** This procedure must be followed 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 procedure. **1.** Press the right oval to start the calibration procedure. The **LOAD BACKING** prompt displays. **2.** Open the printhead. **3.** 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. **4.** Leave the printhead open. **5.** Press the right oval to continue. The **REMOVE RIBBON** prompt displays. **6.** Remove the ribbon (if used). **7.** Close the printhead. **8.** 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. **9.** Open the printhead and pull the media forward until a label is positioned under the media sensor. **10.** Reload the ribbon (if used). **11.** Close the printhead. **12.** 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.
PARALLEL COMM. - BIDIRECTIONAL +	**Set Parallel Communications** Select the communications port that matches the one being used by the host computer. • Press the right or left oval to display other choices. **Default:** BIDIRECTIONAL **Selections:** BIDIRECTIONAL, UNIDIRECTIONAL

Table 6 • Print Engine Parameters (Page 10 of 19)

Parameter	Action/Explanation
SERIAL COMM - RS232 +	**Set Serial Communications** Select the communications port that matches the one being used by the host computer. **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:** RS-232 **Selections:** RS-232, RS-422/485, RS-485 MULTIDROP
BAUD - 9600 +	**Set Baud** 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. • Press the right or left oval to display other choices. **Default:** 9600 **Selections:** 110, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200
DATA BITS - 8 BITS	**Set Data Bits** 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 *ZPL II Programming Guide* for more information. • Press the right or left oval to display other choices. **Default:** 8 BITS **Selections:** 7 BITS, 8 BITS
PARITY - EVEN +	**Set Parity** 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. • Press the right or left oval to display other choices. **Default:** NONE **Selections:** EVEN, ODD, NONE
HOST HANDSHAKE - XON/XOFF +	**Set Host Handshake** 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. • Press the right or left oval to display other choices. **Default:** XON/XOFF **Selections:** XON/XOFF, DTR/DSR, RTS/CTS

Table 6 • Print Engine Parameters (Page 11 of 19)

Parameter	Action/Explanation
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 *ZPL II Programming Guide*. • Press the right or left oval to display other choices. **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** host handshake protocol.
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. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit. **Default:** 000 **Range:** 000 to 999
COMMUNICATIONS - NORMAL MODE +	**Set Communications Mode** The communication diagnostics mode is a troubleshooting tool for checking the interconnection between the print engine and the host computer. When **DIAGNOSTICS** is selected, all data sent from the host computer to the print engine prints as straight ASCII characters, with the hex value below the ASCII text. The print engine prints all characters received, including control codes, like CR (carriage return). A sample printout is shown in *Communications Diagnostics Test* on page 148. Notes on diagnostic printouts are defined as follows: • FE indicates a framing error. • OE indicates an overrun error. • PE indicates a parity error. • NE indicates noise. **1.** Press the right or left oval to toggle between the choices. **2.** For any errors, check that your communication parameters are correct. **3.** Set the print width equal to or less than the label width used for the test. See *Set Print Width* on page 57 for more information. **Default:** NORMAL MODE **Selections:** NORMAL MODE, DIAGNOSTICS

Table 6 • Print Engine Parameters (Page 12 of 19)

Parameter	Action/Explanation
CONTROL PREFIX - <■>7EH +	**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. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit. **Default:** 7E (tilde—displayed as a black square) **Range:** 00 to FF
FORMAT PREFIX - <^>5EH +	**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 *ZPL II Programming Guide Volume 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. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit. **Default:** 5E (caret) **Range:** 00 to FF
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 *ZPL II Programming Guide Volume 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. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit. **Default:** 2C (comma) **Range:** 00 to FF

Table 6 • Print Engine Parameters (Page 13 of 19)

Parameter	Action/Explanation
ZPL MODE - ZPL II +	**Select ZPL Mode** The print engine remains in the selected mode until it is changed by this front panel instruction 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 *ZPL II Programming Guide* for more information on the differences between ZPL and ZPL II. • Press the right or left oval to display other choices. **Default:** ZPL II **Selections:** ZPL II, ZPL
MEDIA POWER UP - CALIBRATION +	**Select Media Power-Up Option** This parameter sets the action of the labels when the print engine is turned on. • Press the right or left oval to display the choices. **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 non-continuous mode, calibrates based on the maximum label length setting (see *Set Maximum Label Length* on page 58). • **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.
HEAD CLOSE - CALIBRATION +	**Select Head Close Option** • Press the right or left oval to display the choices. **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 non-continuous mode, calibrates based on the maximum label length setting (see *Set Maximum Label Length* on page 58). • **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.

Table 6 • Print Engine Parameters (Page 14 of 19)

Parameter	Action/Explanation
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 parameter setting can be superseded by the ~JS instruction when received as part of a label format (refer to *ZPL II Programming Guide Volume I*). • Press the right or left oval to display other choices. **Default:** BEFORE **Selections:** DEFAULT, AFTER, BEFORE, OFF
LABEL TOP +000 -■■■■■■■ +	**Adjust Label Top Position** The label top position adjusts the print position vertically on the label. Positive numbers adjust the label top position further down the label (away from the printhead); negative numbers adjust the position up the label (toward the printhead). The displayed value represents dots. • Press the right oval to increase the value. • Press the left oval to decrease the value. **Default:** +000 **Range:** –120 to +120 dots
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. **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. **Default:** 0000 **Range:** –9999 to +9999 dots

Table 6 • Print Engine Parameters (Page 15 of 19)

Parameter	Action/Explanation
HEAD RESISTOR - 0500 OHMS +	**Set the Head 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 has been 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. **1.** Look on the printhead for the label that shows the resistance value (Ω value). Take note of this value before installing the replacement 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. **Initial Value:** Factory-set to match the printhead shipped with your print engine. **Default Value:** 0500 **Range:** 0500 to 2000
APPLICATOR PORT - OFF +	**Set the Applicator Port** Determines the action of the applicator port. For more information about the applicator signals, see *Applicator Interface Connector* on page 163. **Note •** Set this value as suggested by the applicator manufacturer. • **Off (Mode 0):** 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. • Press the right or left oval to display other choices. **Default:** OFF **Selections:** OFF, MODE 1, MODE 2, MODE 3, MODE 4

Table 6 • Print Engine Parameters (Page 16 of 19)

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. • **Pulse Mode**—Labels print when the signal transitions from HIGH to LOW. • **Level Mode**—Labels print as long as the signal is asserted LOW. **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. • Press the right or left oval to display other choices. **Default:** PULSE MODE **Selections:** PULSE MODE, LEVEL MODE
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. • **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 67). • Press the right or left oval to toggle between choices. **Default:** FEED MODE **Selections:** FEED MODE, ERROR MODE
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 HIGH to provide a **RIBBON LOW** warning. • Press the right or left oval to display other choices. **Default:** 25M **Selections:** OFF, 25M, 50M, 75M, 100M

Table 6 • Print Engine Parameters (Page 17 of 19)

Parameter	Action/Explanation
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 *ZPL II Programming Guide* for additional information. • Press the right or left oval to display other choices. **Default:** DISABLED **Range:** ENABLED, DISABLED
WEB S. 073 - ■■■■■■■ + MEDIA S. 075 - ■■■■■■■ + RIBBON S. 071 - ■■■■■■■ + MARK S. 000 - ■ + MARK MED S. 000 - ■ + MEDIA LED 082 - ■ + MARK LED 005 - ■ + RIBBON LED 008 - ■ +	These parameters are automatically set during the calibration procedure and should be changed only by a qualified service technician. Refer to the *ZPL II Programming Guide* for information on these parameters. • Press NEXT repeatedly to skip these parameters.
LCD ADJUST +10 - ■ +	**Adjust LCD Display** This parameter allows you to adjust the brightness of your LCD if it is difficult to read. • Press the left oval to decrease the value (reduce brightness). • Press the right oval to increase the value (increase brightness). **Default:** 10 **Range:** 00 to 19

Table 6 • Print Engine Parameters (Page 18 of 19)

Parameter	Action/Explanation
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. • Press the right or left oval to display other choices. **Default:** NONE **Selections:** NONE, 150 → 300, 150 → 600, 200 → 600, 300 → 600
RTS TAKEUP ARM XXX	**Set RTS Takeup Dancer Arm Calibration Value** This parameter is used as a diagnostic tool to monitor the voltage supplied to the Ribbon Tensioning System Takeup Dancer Arm. Refer to the *Maintenance Manual* for information.
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 *Maintenance Manual* 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 either oval briefly displays the firmware version of the print engine. • Press the right or left oval to display other choices. **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
RTC DATE - 01/31/01 +	**Set RTC Date** This parameter allows you to set the date following the convention selected in **IDLE DISPLAY**. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to change the value of the digit.

Table 6 • Print Engine Parameters (Page 19 of 19)

Parameter	Action/Explanation
RTC TIME - 14:55 +	**Set RTC Time** This parameter allows you to set the time following the convention selected in **IDLE DISPLAY**. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to change the value of the digit.
LANGUAGE -ENGLISH +	**Select the Display Language** This parameter allows you to change the language displayed on the front panel LCD. • Press the right or left oval to display other choices. **Default:** ENGLISH **Selections:** ENGLISH, SPANISH, FRENCH, GERMAN, ITALIAN, NORWEGIAN, PORTUGUESE, SWEDISH, DANISH, SPANISH 2, DUTCH, FINNISH, JAPAN

ZebraNet® Wired and Wireless Print Server LCD Displays

The menu options shown in Table 7 display only if you have the ZebraNet PrintServer II, or 10/100 PrintServer, or Wireless Print Server installed.

Table 7 • Print Server LCD Displays

Parameter	Action/Explanation
LOAD LAN FROM?[1]	This parameter, which serves the same function as the ^NP ZPL command, specifies whether to use the printer's or the print server's IP settings at bootup. *Accepted Values:* PRINTER, PRINTSERVER *Default Value:* PRINTER
WIRED PS CHECK?[1]	This parameter, which serves the same function as the ^NB ZPL command, tells the printer whether to search for a wired print server at bootup. *Accepted Values:* YES, NO *Default Value:* NO
IP PROTOCOL[2]	**IP Protocol** Allows either the user (permanent) or the server (dynamic) to select the IP address. If a dynamic option is chosen, this selection determines the method(s) by which the print server (wired or wireless) receives the IP address from the server. • Press the right or left oval to display other choices. **Default:** ALL **Selections:** ALL, GLEANING ONLY, RARP, BOOTP, DHCP, DHCP AND BOOTP, PERMANENT **Note •** Use of GLEANING ONLY is not recommended when the Wireless Print Server is installed.
IP ADDRESS[2]	**IP Address** This parameter allows you to select the IP address if PERMANENT was chosen in IP PROTOCOL. (If a dynamic option was chosen, the user cannot select the address.) **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit.
SUBNET MASK[2]	**Subnet Mask** This parameter selects the part of the IP address that is considered to be part of the local network. It can be reached without going through the default gateway. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit.

1 Appears only when the ZebraNet Wireless Print Server is installed.

2 These parameters appear after the system recognizes the existence of a ZebraNet print server (wired or wireless). After the print server is recognized, all zeroes (000.000.000.000) will display until the printer obtains an IP address or defaults to address 192.168.254.254.

3 If a wireless password is set, you must enter the wireless password (not the printer password) to access this parameter.

4 This parameter appears 1) when no wireless card is inserted or 2) when the wireless card is associated to the WLAN and the card supports LEAP.

Table 7 • Print Server LCD Displays (Continued)

Parameter	Action/Explanation
DEFAULT GATEWAY[2]	**Default Gateway** This parameter allows you to select the IP address that the network traffic is routed through if the destination address is not part of the local network. **1.** Press the left oval to move to the next digit position. **2.** Press the right oval to increase the value of the digit.
MAC ADDRESS[1,3]	**MAC Address** This parameter cannot be changed through the front panel.
ESSID[1,3]	**ESSID** This parameter cannot be changed through the front panel.
AUTH. TYPE[1,3]	**Authentication Type** **Default:** OPEN **Selections:** OPEN, SHARED
LEAP MODE[3,4]	An encryption method that is available with some wireless cards. Set the LEAP user name and password through the printer web pages. *Accepted Values:* ON, OFF *Default Value:* OFF
ENCRYPTION MODE[1,3]	**Encryption Mode** **Default:** OFF **Selections:** OFF, 40-BIT, 128-BIT
ENCRYPTION INDEX[1,3]	**Encryption Index** **Default:** 1 **Selections:** 1, 2, 3, 4
RESET NETWORK[2,3]	**Reset Network** This option resets the wireless card and the print server when the wireless option is running. Selecting this option has no effect when the wireless option is not running, when there is no card inserted, or when the wireless password is anything other than the default (zero). **1.** Press the right oval to select **YES**. The LCD prompts **ARE YOU SURE?**. • Press the left oval to select **NO** to cancel the request. • Press the right oval to select **YES** and reset the network.

1 Appears only when the ZebraNet Wireless Print Server is installed.

2 These parameters appear after the system recognizes the existence of a ZebraNet print server (wired or wireless). After the print server is recognized, all zeroes (000.000.000.000) will display until the printer obtains an IP address or defaults to address 192.168.254.254.

3 If a wireless password is set, you must enter the wireless password (not the printer password) to access this parameter.

4 This parameter appears 1) when no wireless card is inserted or 2) when the wireless card is associated to the WLAN and the card supports LEAP.

RFID LCD Displays

The menu options shown in Table 8 display only if you have a Radio Frequency Identification (RFID) reader installed. When you enter Setup mode, press Previous to access these parameters without having to scroll through all of the other parameters.

Table 8 • RFID LCD Displays

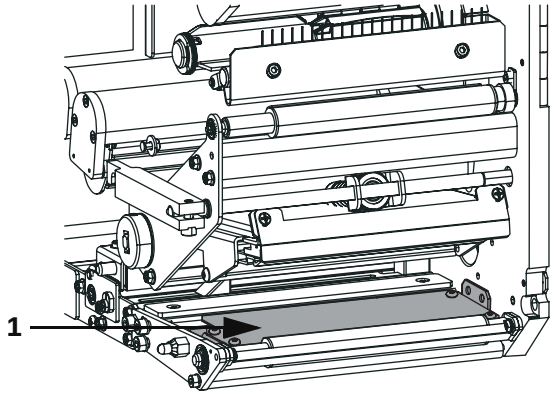
Parameter	Action/Explanation
`RFID TEST` `QUICK  SLOW`	**Perform RFID Test** In both versions of this test, the printer attempts to read and write to a transponder. In the slow test, the printer also checks the reader version number. If the printer fails the test, the front panel displays an error message. No label movement occurs with this test. **1.** Position an RFID label so that the transponder is over the antenna support. **Figure 42 • Antenna Support Location**  **1** Antenna support **2.** Press the left oval to select **`QUICK`**. OR Press the right oval to select **`SLOW`**. **3.** If necessary, press the right arrow to select **`CONTINUE`**.

Table 8 • RFID LCD Displays (Continued)

Parameter	Action/Explanation
RFID TAG CALIB RESTORE RUN	**Calibrate RFID Tag** This option allows you to have the printer determine the optimum programming position for a given label or to bypass this function and use a default position if the media conforms to Zebra's placement requirements. An auto-calibration occurs after this tag calibration to realign the media to its proper rest position and to update the media tracking values in the printer. **1.** Place an RFID label over the reader (no movement occurs with the test). **2.** Press the left oval to select **RESTORE**. OR Press the right oval to select **RUN**. • **RESTORE**—Selecting this option resets the programming position to zero (the printer programs the tag without moving the transponder's position). • **RUN**—This option performs an RFID transponder calibration for a specific RFID label. The printer feeds the RFID label one dot-row at a time while taking readings (via the READ TAG command and the WRITE TAG commands) to profile the RFID transponder. Based on the results, the printer determines the optimum programming position for the label. The calibrated value is used as the programming position for the ^RS command, can be overwritten by the ^RS command, and is saved to nonvolatile memory (the value is saved even if the power is turned off). This calibration takes into account the print mode, backfeed mode, and tear off position. The ^HR ZPL command performs the same calibration and returns a results table to the host.
RFID READ PWR	**View or Change RFID Read Power** This parameter displays the current value for RFID read power. **Selections:** HI, MED, LOW **Default:** HI
RFID WRITE PWR	**View or Change RFID Write Power** This parameter displays the current value for RFID write power. **Selections:** HI, MED, LOW **Default:** HI

Table 8 • RFID LCD Displays (Continued)

Parameter	Action/Explanation
RFID ERR STATUS	**RFID Error Status** If an error condition exists, one of the following messages may be displayed here. • RFID OK • DATA AMOUNT ERR • INVALID OPCODE • OPCODE UNAVAIL • POWER TOO HI • INVALID FREQ • INVALID PARAM • INVALID BITS • TIMEOUT TO LONG • INVALID ADDRESS • INVALID CMD • BAD ERASE PASS • BAD WRITE PASS • FLASH ERROR • NO TAG FOUND • NO PROTOCOL • INVALID PROTOC • LOCK ERROR • NOT IMPLEMENTED • AFE NOT ON • WRITE FAILED • INVALID W/ PROT • INVALID WR DATA • INVALID FREQ • TAG ID FAULT • ID BUFFER FULL • REPEATED ID • RDR COM TIMEOUT • VERIFY FAIL • MULTIPLE TAGS • RDR ERR %04X

Table 8 • RFID LCD Displays (Continued)

Parameter	Action/Explanation
RFID TAG TYPE	**Specify RFID Tag Type** **Selections:** • CLASS 1 64-BIT • CLASS 1 96-BIT • ISO18000 • NONE • CLASS 0 • CLASS 0+ **Default:** CLASS 1 96-BIT
RFID TAG DATA	**Read and Display RFID Tag Data** When this option is selected, the reader attempts to read a tag over the reader, even if the printhead is open. If no tag data can be read, the text **NO DATA** appears on the bottom line of the display. If a tag is present, the data for that tag appears on the bottom line of the display in hexadecimal format. If there is more data than can fit on the bottom line (such as for 96-bit tags), the bottom line will cycle from the first 8 bytes (most significant) to the next 4 bytes (least significant) approximately every 2 seconds. Whatever hexadecimal data that can fit on two screens is displayed and cycled through. For example, if the tag contains the data `0x1122334455667788990011 22`, when this option is selected, the bottom line of the display shows: **1122334455667788** for 2 seconds followed by **99001122** for 2 seconds. The printer cycles through these indefinitely. The printer rereads the tag every cycle, so if the tag changes, data is displayed for the current tag over the antenna.

Notes • _____

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5

RFID Guidelines

This chapter describes how Radio Frequency Identification (RFID) works and provides the commands used to create RFID labels.

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Overview

The R110*PAX*4 RFID label printers/encoders serve as dynamic tools for both printing and encoding RFID labels, tickets, and tags. The printer encodes information on ultra-thin UHF RFID transponders that are embedded in “smart” labels. It then immediately verifies proper encoding and prints bar codes, graphics, and/or text on the label’s surface. For more information about RFID media, see Table 3, *Types of Media* on page 27.

How well that an encoded RFID label functions depends on factors such as where the label is placed on an item as well as on the contents of the item (such as metals or liquids). Contact the supplier of your RFID transponders for assistance with these types of issues.

Transponder Placement

The RFID transponder, which is sometimes called the RFID tag, is usually comprised of an antenna that is bonded to an integrated circuit (IC) chip. The IC chip contains the RF circuit, coders, decoders, and memory. If you hold an RFID label up to the light, you can see the transponder’s antenna embedded within the label, and you can feel a bump in the label where the IC chip is located.

Communication between the RFID label and the printer is established when the label’s transponder lines up with the printer’s antenna. The optimal transponder programming position varies with the transponder size, its configuration, and the type of RFID IC chip used.

Print quality may be affected by printing directly over the transponder. In particular, there is an area on each label immediately around the location of the IC chip where the printer may print with low quality. Design your printed label around the location of the chip in the type of approved RFID label that you select.

Important • It is important to use transponders that have been specifically approved for use in this RFID printer. Failure to do so may result in the inability to read or write to the embedded RFID tags. As new transponders become commercially available, Zebra will evaluate them for compatibility with this printer. To order labels with transponders that are approved for your specific RFID printer, contact your authorized Zebra reseller.

ZPL Commands for RFID Applications

Each RFID label has memory that can be read and most have memory that can be written to through Zebra Programming Language (ZPL) commands. Use ZPL to read and encode (write to) RFID labels just as you would use ZPL to print data on the labels. You can use serialized fields, field variables, and any other ZPL features (such as the command *^HV* on page 98 to return the results to a host computer).

The RFID-specific ZPL commands for this printer are described in *ZPL II Commands for RFID* on page 95. For examples of how you may use the ZPL commands, see *Creating Basic RFID Label Formats* on page 86.

For more information about non-RFID ZPL commands and how to use them, refer to the *ZPL II Programming Guide* (part number 46530L). A copy is available on the R110*PAX*4 User CD (part number 23062-003) and online at http://www.zebra.com/manuals.

Electronic Product Code (EPC)

EPC is a product numbering standard that can be used to identify a variety of items by using RFID technology. The 96-bit EPC code links to an online database, providing a secure way of sharing product-specific information along the supply chain.

As with bar codes, EPC is divided into numbers that identify the manufacturer and product type. However, EPC contains the following additional information:

- **Header**—identifies the length, type, structure, version, and generation of EPC
- **Manager Number**—identifies the company or company entity
- **Object Class**—similar to a stock keeping unit (SKU)
- **Serial Number**—the specific instance of the Object Class being tagged

Additional fields may be used as part of the EPC code to encode and decode information from different numbering systems into human-readable form.

EPC Structure in RFID Labels

In the printer, you can subdivide transponder data into unique fields. You can customize these fields to create “smart” labels that meet your needs or that meet the standards necessary in EPC programming.

The ^RB ZPL command is used to define EPC structure. EPC field data can be delimited with any of the following characters:

```
, ~ ! @ # $ % ^ & * | . < > / \ : ;
```

See *^RB* on page 99 for more information about and examples for defining EPC structure.

XML-Enabled Printing

This printer contains the XML-Enabled Printing option, which offers increased flexibility and interoperability by making it possible to integrate Zebra printers quickly and easily into most Enterprise Resource Planning (ERP) systems and their applications. XML-enabled printers print directly from Oracle Warehouse Management System (WMS), Mobile Supply Chain Applications (MSCA), and many other ERP vendor applications. XML-enabled label formats upload directly to the label printer, and the XML data stream is sent via TCP/IP directly to the appropriate Zebra printer.

For more information about XML-Enabled Printing, refer to the *Zebra XML-Enabled Printer Reference Guide* (part number 13426L-001). A copy is available on the R110*PAX*4 User CD (part number 23062-003) and online at http://www.zebra.com/manuals.

Getting Started with RFID

How you set up your printer for RFID applications is determined in part by the transponder that you select. This section guides you through that selection and the settings that you may need to change on your printer to make RFID reading and encoding possible. When you have completed this section, you will be ready to program your RFID label formats.

Select a Transponder Type Before you purchase RFID labels, determine what type of RFID transponder to use (Table 9). Different transponder types can have different attributes. Some transponders can only be read while others can be read and written to repeatedly. Transponders also have different amounts of available memory, which corresponds to the amount of data that can be encoded in it. Select the combination that best suits your needs.

Table 9 • Characteristics of Different Transponder Types

Transponder Type	Read	Write	Size (in bits)
Class 0	X		96 bits
Class 0+	X	X	96 bit (ID) 104 bit (USER)
Class 1 64 bits	X	X	64 bits
Class 1 96 bits	X	X	96 bits
ISO18000	X	X	Varies

Set Tag Type After you have selected a transponder type and purchased labels, set the transponder (tag) type on the printer. Do this through the front panel menu (see *Specify RFID Tag Type* on page 79) or through the ^RS ZPL command (see *^RS* on page 109).

Set Power Settings Each transponder has specific power setting requirements, which define how much power the printer's antenna will emit to "energize" the transponder in its program field. The tag type that you are using must match the RFID power settings of the printer. If necessary, you can change the power settings through the front panel (see *View or Change RFID Read Power* or *View or Change RFID Write Power* on page 77) or through the ^RW ZPL command (see *^RW* on page 115).

Perform RFID Transponder Calibration If you are using RFID labels that were designed to meet the specifications of this printer, you do not need to perform RFID transponder calibration. The printer will automatically place the labels in the optimal programming position.

However, if you are using RFID labels that were not designed to meet the specifications of this printer, you may need to perform an RFID transponder calibration to determine the optimal programming position for your media. If necessary, you can perform this calibration through the front panel (see *Calibrate RFID Tag* on page 77) or through the ^HR ZPL command (see *^HR* on page 96).

Creating Basic RFID Label Formats

After you have selected a transponder type and set your printer appropriately, use the ZPL samples in this section as a base for programming your own RFID label formats. For specific information about individual ZPL commands, see *ZPL II Commands for RFID* on page 95.

To create an RFID label based on a sample label, complete these steps:

1. Set up the printer, and turn the power On (**I**).
2. Using any word processor or text editor that is capable of creating ASCII-only files (for example, use Microsoft® Word and save as a .txt file), type in the label format exactly as shown in the desired sample.
3. Save the file to your computer.

   When naming the file, use `.zpl` as the extension for the file (for example, you may choose to name a file `format1.zpl`).
4. Copy the file to the printer.

   If you are connected to the printer via the parallel port, from the DOS command window, use the "COPY" command to send a file to the printer. For example, if your file name is **format1.zpl,** type

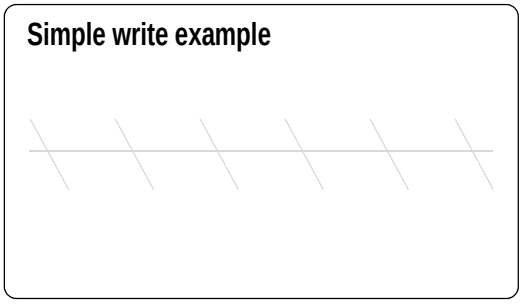
   ```
   COPY FORMAT1.ZPL XXXX
   ```

   where *XXXX* is the port to which your printer is connected (such as LPT1).
5. Compare your label results with those shown in the sample. If your printout does not look like the one shown, confirm that the file you created is identical to the format shown, then repeat the printing procedure.
6. Check the RFID data on your label.
   a. Open the printhead, and place the label above the reader in the printer.
   b. Use the front panel to view the transponder data (see *Read and Display RFID Tag Data* on page 79).
   c. Compare your RFID data with that shown in the sample. If your front panel display does not look like what is shown, confirm that the file you created is identical to the format shown, then repeat the printing procedure.
7. If nothing prints, make sure that your system is set up correctly by referring to the following:
   - *Getting Started* on page 13
   - *Print Engine Operation* on page 31
   - *Print Engine Configuration* on page 49
   - *Troubleshooting* on page 131

RFID Label Format 1—Write a 96-bit Tag in Hexadecimal

Line Number	Type This ZPL Code	Function of ZPL Code
1	^XA	Indicates start of label format.
2	^RS4	Sets tag type to EPC Class 1 96-bit.
3	^FO50,50 ^A0N,65 ^FDSimple write example ^FS	Prints “Simple write example” on the label at location 50,50.
4	^RFW,H ^FD112233445566778899001122 ^FS	W,H = write hex Writes the 12 bytes of data (96 bits) to the tag. The data written is: 112233445566778899001122
5	^XZ	Indicates end of label format.

Resulting Label



Programmed to Transponder

112233445566778899001122

Front Panel Display (toggles between these two)

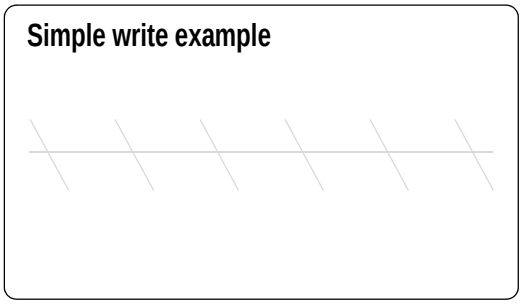
```
RFID TAG DATA
1122334455667788
```

```
RFID TAG DATA
99001122
```

RFID Label Format 2—Write a 64-bit Tag in Hexadecimal

Line Number	Type This ZPL Code	Function of ZPL Code
1	^XA	Indicates start of label format.
2	^RS3	Sets tag type to EPC Class 1 64-bit.
3	^FO50,50 ^A0N,65 ^FDSimple write example ^FS	Prints “Simple write example” on the label at location 50,50.
4	^RFW,H ^FD1122334455667788 ^FS	W,H = write hex Writes the 8 bytes of data (64 bits) to the tag. The data written is: 1122334455667788
5	^XZ	Indicates end of label format.

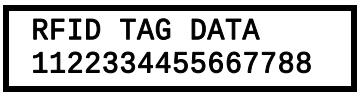
Resulting Label



Programmed to Transponder

1122334455667788

Front Panel Display

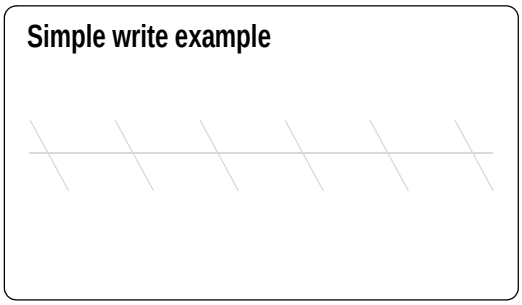


RFID Label Format 3—Write a 96-bit Tag in ASCII

This label format is different in what shows on the front panel. The front panel always displays RFID data in hexadecimal.

Line Number	Type This ZPL Code	Function of ZPL Code
1	^XA	Indicates start of label format.
2	^RS4	Sets tag type to EPC Class 1 96-bit.
3	^FO50,50 ^A0N,65 ^FDSimple write example ^FS	Prints “Simple write example” on the label at location 50,50.
4	^RFW,A ^FD00 rfid data ^FS	W,A = write ASCII Writes the 12 bytes of data (96 bits) to the tag. The data written is: 00 rfid data
5	^XZ	Indicates end of label format.

Resulting Label



Programmed to Transponder

```
00 rfid data
```

Front Panel Display (toggles between these two)

```
RFID TAG DATA
3030207266696420
```

```
RFID TAG DATA
64617461
```

RFID Label Format 4—Read Data from Tag and Print on Label

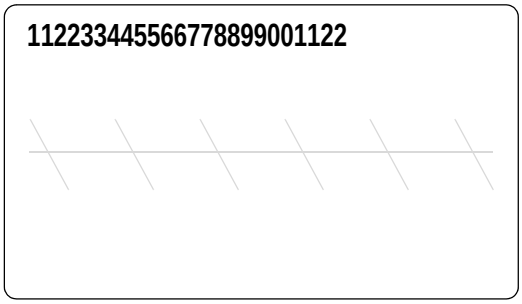
This example assumes that the tag created using *RFID Label Format 1—Write a 96-bit Tag in Hexadecimal* on page 87 is being read.

Line Number	Type This ZPL Code	Function of ZPL Code
1	^XA	Indicates start of label format.
2	^RS4	Sets tag type to EPC Class 1 96-bit.
3	^FO50,50 ^A0N,40 ^FN0 ^FS	^FN0 is a placeholder field variable for the tag data that will be read in the following line. When the label prints, the data read from the tag will be printed at 50,50.
4	^FN0 ^RFR,H ^FS	R,H = read hexadecimal The read results are put into field variable 0 (^FN0). At this point, the printer substitutes previous instances of ^FN0 in the label format with the data from this field. The data read from the tag will be padded with zeroes to the maximum bit size.
5	^XZ	Indicates end of label format.

Read from Transponder

```
112233445566778899001122
```

Resulting Label



Front Panel Display (toggles between these two)

```
RFID TAG DATA
1122334455667788
```

```
RFID TAG DATA
99001122
```

RFID Label Format 5—Write Tag, Read Tag, and Print Data on Label

Line Number	Type This ZPL Code	Function of ZPL Code
1	^XA	Indicates start of label format.
2	^RS4	Sets tag type to EPC Class 1 96-bit.
3	^FO60,60 ^A0N,40 ^FN7 ^FS	When the label prints, the data read from the tag at field variable 7 (^FN7) will be printed at location 60,60.
4	^RFW,A ^FD0data ^FS	W,A = write ASCII Writes “0data” into the block padded with 8 bytes of zeroes to make the data 12 bytes. The data written is: 306461746100000000000000 (“0data” in ASCII)
5	^FN7 ^RFR,A ^FS	R,A = read ASCII Reads the tag data into field variable 7 (^FN7). After this occurs, any fields in this label format that have ^FN7 will be replaced with this read data.
6	^XZ	Indicates end of label format.

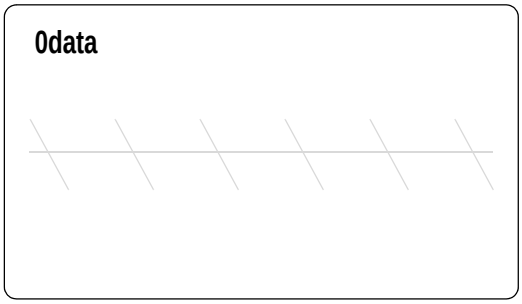
Programmed to Transponder

306461746100000000000000

Read from Transponder

306461746100000000000000

Resulting Label



Front Panel Display (toggles between these two)

```
RFID TAG DATA
3064617461000000
```

```
RFID TAG DATA
00000000
```

RFID Label Format 6—Write Tag, Read Tag, and Return Results to Host

Line Number	Type This ZPL Code	Function of ZPL Code
1	^XA	Indicates start of label format.
2	^RS3	Sets tag type to EPC Class 1 64-bit.
3	^FO50,50 ^A0N,65 ^FN3 ^FS	When the label prints, the data read from the tag at field variable 3 (^FN3) will be printed at location 50,50.
4	^RFW,H ^FD0102030405 ^FS	W,H = write hex Writes 8 bytes of data (64 bits) to the tag with 3 bytes of zeroes as padding. The data written is: 0102030405000000
5	^FN3 ^RFR,H ^FS	R,H = read hexadecimal Reads the tag data into field variable 3 (^FN3). After this occurs, any fields in this label format that have ^FN3 will be replaced with this read data.
6	^HV3	Return the value in ^FN3 to the host computer. Data is sent over whichever communication channel is established with the host (such as parallel, serial, USB, ethernet) In this example, 0102030405000000 would be returned to the host.
7	^XZ	Indicates end of label format.

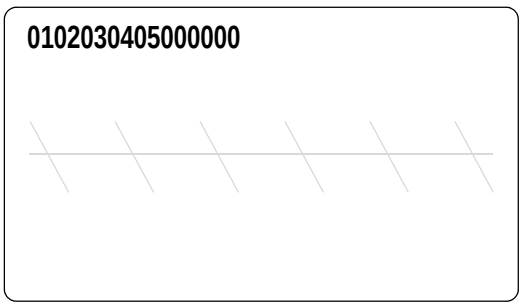
Programmed to Transponder

0102030405000000

Read from Transponder

0102030405000000

Resulting Label



Front Panel Display

```
RFID TAG DATA
0102030405000000
```

Sent to Host Computer

0102030405000000

ZPL II Commands for RFID

This section contains the ZPL commands for RFID-specific applications. For non-RFID ZPL commands, refer to the *ZPL II Programming Guide* (part number 46530L). A copy is available on the R110*PAX*4 User CD (part number 23062-003) and online at http://www.zebra.com/manuals.

In addition to reading or encoding RFID tags, these ZPL commands also provide for RFID exception handling, such as setting the number of read/write retries before declaring a transponder defective (set with ^RT and ^WT) or setting the number of labels that will be attempted if an error occurs (set with ^RS).

For example, if an RFID label fails to program correctly or if the transponder cannot be detected, the printer ejects the label and prints VOID across it. The printer will try to print another label with the same data and format for the number of RFID labels specified by the ^RS command. If the problem persists, the printer follows the error handling instructions specified by the ^RS command: the printer may remove the problematic format from the print queue and proceed with the next format (if one exists in the buffer), or it may place the printer in Pause or Error mode.

Important • If a parameter in the following tables is designated as *not applicable*, any value entered for the parameter will be ignored, but the place holder for the field is required.

^HR

Calibrate RFID Transponder Position

Description This command initiates an RFID transponder calibration for a specific RFID label and returns the results to the host computer. This calibration is used to determine the optimal programming position for RFID media that may not meet the transponder placement specifications for the printer.

Note • You do not need to perform transponder calibration for RFID media that meets the transponder placement specifications for the printer. To order media that is designed for use with your RFID printer, contact your authorized Zebra reseller.

During transponder calibration, the printer feeds the RFID label one-dot row at a time while taking readings (via the READ TAG command and the WRITE TAG commands) to profile the RFID transponder. Based on the results, the printer determines the optimal programming position for the label and returns a results table to the host. The calibrated value is used as the programming position for the ^RS command, can be overwritten by the ^RS command, and is saved to nonvolatile memory (the value is saved even if the power is turned off).

This calibration takes into account the print mode, backfeed mode, and tear off position. The **RUN** option in the **RFID TAG CALIB** front panel parameter performs the same calibration but does not create a results table.

If a label format specifies a value for parameter p (read/write position of the transponder) in the ^RS command, that value will be used for the programming position for all RFID labels until a new position is specified or until the printer is turned Off (**O**) and then back On (**I**).

Format ^HRa,b

The following table identifies the parameters for this format.

Parameters	Details
a = start string	User text to appear before the results table. *Accepted values:* any string less than 65 characters *Default value:* start
b = end string	User text to appear after the results table. *Accepted values:* any string less than 65 characters *Default value:* end

Comments

- Based on the recommended transponder placement position for most RFID labels, the printer's default RFID programming position is the label length minus 1 mm (1/16 in.). To return to the default programming position at any time, use the RESTORE option in the **RFID TAG CALIB** front panel parameter (see *Calibrate RFID Tag* on page 77).

- At the end of calibration, a results table is returned to the host. Each line in the results table appears as:

  Row, Read Result, Write Result

  where

  Row = the dot row where calibration occurred

  Read Result = results of calibration (R = read, " " = unable to read)

  Write Result = results of calibration (W = write, " " = unable to write)

Example • If the following command is sent to the printer:

```
^XA^HR^XZ
```

The printer starts the transponder calibration and returns a results table such as the following:

```
start
position=195
215, ,
214, ,
213, ,
212, ,
211, ,
210, ,W
209,R,
208, ,
207, ,
206, ,W
205,R,
204, ,
203, ,
202, ,W
201,R,W
200,R,W
199,R,W
198,R,W
197,R,W
196,R,W
195,R,W <---****
194,R,W
193,R,W
192,R,W
191,R,W
190,R,W
189,R,
188, ,
187, ,
186, ,
185, ,
.
.
.
end
```

In this example, the optimal programming position is 195. This is identified at the top of the table (`position=195`) and with an the arrow (`<---****`) in the table.

^HV

Host Verification

Description This command is used to return data from specified fields, along with an optional ASCII header, to the host computer. The command can be used with any field that has been assigned a number with the ^RT command or the ^FN and ^RF commands.

Format ^HV#,n,h

The following table identifies the parameters for this format.

Parameters	Details
# = field number specified with another command	The value assigned to this parameter should be the same as the one used in another command. *Accepted values:* 0 to 9999 *Default value:* 0
n = number of bytes to be returned	*Accepted values:* 1 to 256 *Default value:* 64
h = header	Header (in uppercase ASCII characters) to be returned with the data. *Acceptable values:* 0 to 3072 characters *Default value:* no header

^RB

Define EPC Data Structure

Description This command defines the structure of EPC data, which can be read from or written to an RFID transponder.

RFID transponders can have different partitions defined. This command specifies the number of partitions and how many bits are in each partition.

Important • All parameters in this command are persistent and will be used in subsequent formats if not provided. The values are initially set to the default values.

Format `^RBn,p0,p1,p2, ..., p15`

The following table identifies the parameters for this format.

Parameters	Details
`n` = total bit size of the field	*Accepted values:* 1 to *n*, where *n* is the bit size of the tag. *Default value:* 96
`p1 ... p15` = partition sizes	Specify each partition size. These must add up to the total bit size. *Accepted values:* 1 to 64 bit total bit size *Default value:* 1

Example 1 • The following command specifies that there are 96 bits used with three fields. Fields 1, 2, and 3 contain 10, 26, and 60 bits, respectively.

```
^RB96,10,26,60
```

The ZPL code to write to a tag with this format would look like this:

```
^RFW,E^FD1000.67108000.1122921504606846976^FS
```

When writing to the tag, the data will be stored in the tag in the following way:

- Field 1 contains 1000. This value is stored in the first 10 bits
- Field 2 contains 67108000. This value is stored in the next 26 bits.
- Field 3 contains 1122921504606846976. This value is stored in the remaining 60 bits.

Example 2 • The following command specifies that there are 64 bits used with eight 8-bit fields.

```
^RB64,8,8,8,8,8,8,8,8^FS
```

The ZPL code to write to a tag with this format would look like this:

```
^RFW,E^FD1.123.160.200.249.6.1.0^FS
```

When writing to the tag, each set of data is written in its respective 8-bit field.

Example 3 • This example uses the SCTIN-64 standard, which defines 64-bit structure in the following way:

	Header	Filter Value	Company Prefix Index	Item Reference	Serial Number
SGTIN-64	2	3	14	20	25
	10 (binary value)	8 (decimal capacity)	16,383 (decimal capacity)	9 to 1,048,575 (decimal	33,554,431 (decimal capacity)

The ZPL code to write to a tag with this format would look like this:

```
^XA
^RB64,2,3,14,20,25
^RFW,E^FD0,3,12345,544332,22335221^FS
^XZ
```

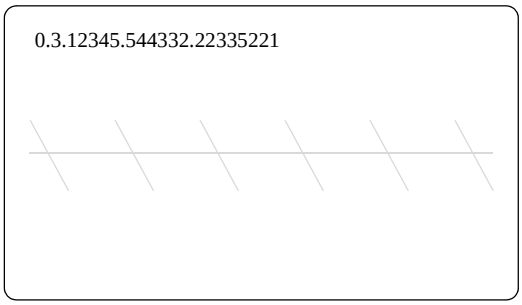
These commands would put

- 0 in the header
- 3 as the filter value
- 12345 as the company prefix
- 544332 as the item reference
- 22335221 as the serial number

To read this EPC data and print the results on the label, you would use the following code:

```
^XA
^RB64,2,3,14,20,25
^FO50,50^A0N,40^FN0^FS
^FN0^RFR,E^FS
^XZ
```

The resulting label would look like this:



^RF

Read or Write RFID Format

Description This command allows you to read or write to an RFID tag.

Note • To read into a field variable, you must have a ^FN command in the

Format ^RFo,t,b,n

The following table identifies the parameters for this format.

Parameters	Details
o = operation	The action to be performed. *Accepted values:* • W = write to the tag • L = write with LOCK (if supported by tag type) • R = read the tag *Default value:* W
t = type	*Accepted values:* • A = ASCII • H = Hexadecimal • E = EPC (ensure proper setup with the ^RB command) *Default value:* H
b = starting block number	*Accepted values:* 0 to *n*, where *n* is the maximum number of blocks for the tag. *Default value:* 0
n = number of blocks to read*	This parameter is valid only for the read operation. *Accepted values:* 1 to *n*, where *n* is the maximum number of blocks for the tag type minus the starting block number. For example, if the tag has 8 blocks (starting with block 0) and you start with block 6, *n* can be 2. This would return block 6 and block 7 information. *Default value:* 1

*Not applicable for *R110PAX4*

Examples •

Write ASCII

This example writes 96-bit data.

```
^XA
^RS4
^RFw,a^FD00 my data^FS
^XZ
```

Write Hex

This example writes 64-bit data.

```
^XA
^RS3
^RFW,H^FD1122334455667788^FS
^XZ
```

Write EPC

This example writes 96-bit data, as specified by the ^RB command.

```
^XA
^RB96,8,3,3,20,24,38
^RFw,e^FD16,3,5,78742,146165,1234567891^FS
^XZ
```

^RM

Enable RFID Motion

Description This command enables or disables RFID motion. By default, labels automatically print at the end of the format. This command allows you to inhibit the label from actually moving when it reaches the program position, which is useful for debugging, setup, and custom applications. This parameter is not persistent (carried over from label to label).

Format ^RMe

The following table identifies the parameters for this format.

Parameters	Details
e = enable	*Accepted values:* Y (Yes, move the label), N (No, do not move the label) *Default value:* Y

^RN

Detect Multiple RFID Tags in Encoding Field

Description This command enables or disables detection of multiple RFID tags in the encoding field. By default, the printer checks for more than one tag in the field before attempting to read or write. If more than one tag is found, the label over the antenna support is voided, and the **RFID ERR STATUS** parameter on the front panel displays **MULTIPLE TAGS**. To speed up printing and encoding by up to 200 ms, the check may be disabled. This parameter is not persistent (carried over from label to label).

Format ^RNe

The following table identifies the parameters for this format.

Parameters	Details
e = enable	*Accepted Values:* Y (Yes, check for multiple tags), N (No, do not check for multiple tags) *Default Value:* Y

~RO

Reset Advanced Counters

Description The ~RO command resets the advanced counters used by the printer to monitor label generation in inches and centimeters, the number of labels printed, and the number of valid and voided RFID labels. Any single error during programming of an RFID tag will result in that label being considered "void" by the counter.

Four resettable counters are available. The values for the counters are displayed on the printer configuration label.

Format ~ROc

This table identifies the parameters for this format:

Parameters	Details
c = counter number	*Accepted Values:* • 1 (counter 1) • 2 (counter 2) • 3 (valid RFID label counter) • 4 (voided RFID label counter) *Default Value:* None. If a value is not specified, the command is ignored.

Example 1 • This example shows how the counter portion of the printer configuration labels looks when counter 1 is reset by sending ~RO1.

Before

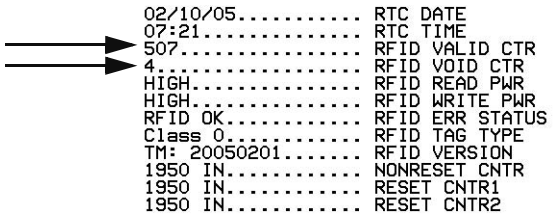
```
296862 IN.......... NONRESET CNTR
296862 IN.......... RESET CNTR1
296862 IN.......... RESET CNTR2
753289 CM.......... NONRESET CNTR
753289 CM.......... RESET CNTR1
753289 CM.......... RESET CNTR2
92928 LABLS........ NONRESET CNTR
92928 LABLS........ RESET CNTR1
92928 LABLS........ RESET CNTR2
```

After

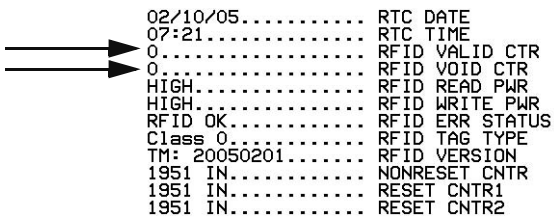
```
296876 IN.......... NONRESET CNTR
0 IN............... RESET CNTR1
296876 IN.......... RESET CNTR2
753323 CM.......... NONRESET CNTR
0 CM............... RESET CNTR1
753323 CM.......... RESET CNTR2
92930 LABLS........ NONRESET CNTR
0 LABLS............ RESET CNTR1
92930 LABLS........ RESET CNTR2
```

Example 2 • This example shows how the counter portion of the printer configuration labels looks when the RFID counters are reset by sending ~R03 and ~R04.

Before



After



^RR

Specify RFID Retries for a Block

Description This command changes the number of times that the printer attempts to read or write to a particular block of a single RFID tag. By default, the printer will attempt six retries. This command is persistent and will be used in subsequent formats if not provided.

Important • This command is not the same as the number of labels to try parameter in the ^RS command.

Format ^RRn

The following table identifies the parameters for this format.

Parameters	Details
n = number of retries	*Accepted values:* 0 to 10 *Default value:* 0

Examples •

Set read block retries to 5

```
^XA
^FN1^RR5^RFR,H^FS
^HV1^FS
^XZ
```

Set write block retries to 2

```
^XA
^RR2^RFW,H^FD1234^FS
^XZ
```

^RS

RFID Setup

Description This command sets up parameters including tag type, read/write position of the transponder, and error handling.

Important • Use care when using this command in combination with ^RT or ^RFR for reading tag data. Problems can occur if the data read from the tag is going to be printed on the label. Any data read from the transponder must be positioned to be printed above the read/write position. Failure to do this will prevent read data from being printed on the label.

Format ^RSt,p,v,n,e,a,c,s

The following table identifies the parameters for this format.

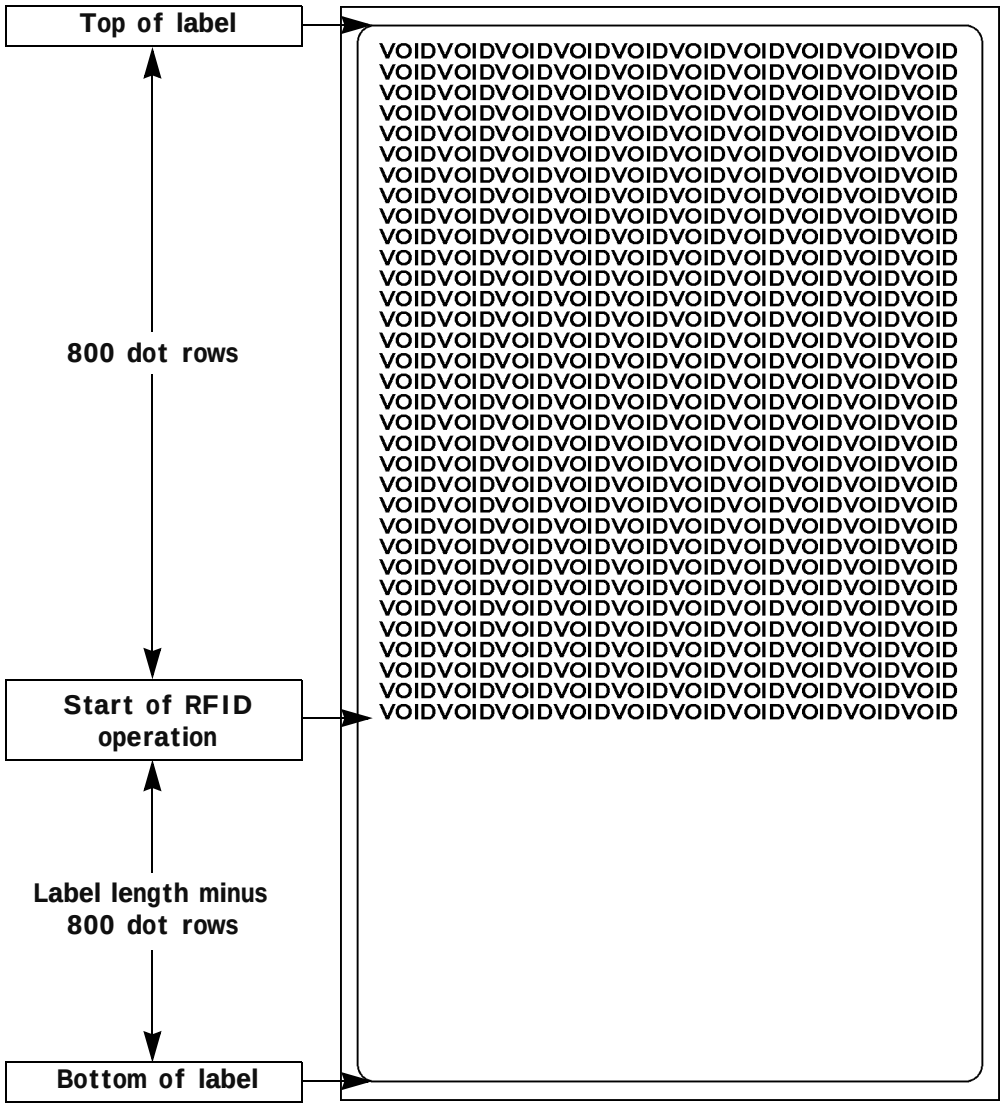
Parameters	Details
t = tag type	*Accepted values:* • 0 = None • 1 = EPC Class 0 • 2 = EPC Class 0 Plus • 3 = EPC Class 1 64-bit • 4 = EPC Class 1 96-bit • 5 = ISO 18000-06B *Default value:* 4
p = read/write position of the transponder	Sets the read/write position of the transponder in the vertical (Y axis) in dot rows from the top of the label. Set to 0 (no movement) if the transponder is already in the effective area without moving the media. **Important •** If a label format specifies a value for this parameter, this value will be used for the programming position for all labels until a new position is specified or until the printer is powered Off (**O**) and then back On (**I**). *Accepted values:* 0 to label length *Default value:* label length minus 1 mm (1/16 in.)
v = length of void printout	Sets the length of the void printout in vertical (Y axis) dot rows. *Accepted values:* 0 to label length *Default value:* label length
n = number of labels	The number of labels that will be attempted in case of read/encode failure. *Accepted values:* 1 to 10 *Default value:* 3

Parameters	Details
e = error handling	If an error persists after the specified number of labels are tried, perform this error handling action. *Accepted values:* • N = No action (print engine drops the label format causing the error and moves to the next queued label) • P = Place print engine in Pause mode (label format stays in the queue until the user cancels) • E = Place print engine in Error mode (label format stays in the queue until the user cancels) *Default value:* N **Note** • You can set the print engine to send an error message to the host as an unsolicited message for each failure. To enable or disable the unsolicited error message, refer to the ^SX and ^SQ ZPL commands. The parameter for the RFID error in these commands is V.
a = signals on applicator	When the value for parameter p (read/write position of the transponder) is nonzero, this parameter changes the number of start and stop print signals required for printing. In Single mode, one start print command is required. In Double mode, two are required, so the printer will resume printing only after the second start print command is received. *Accepted values:* • S (single) signal • D (double) signal *Default value:* S
c = certify tag with a pre-read*	* Not used in this version of the printer. The encoder does this automatically.
s = void print speed	If a label is voided, the speed at which “VOID” will be printed across the label. *Accepted values:* any valid print speed *Default value:* the printer’s maximum print speed

Example 1 • This example sets the printer to move the media to 800 dots from the top of the media [or label length minus 800 from the bottom (leading edge) of the media] and voids the rest of the media in case of an error. The printer will try to print two labels and then will pause if printing and encoding fail.

```
^XA
^RS,800,,2,P^FS
^XZ
```

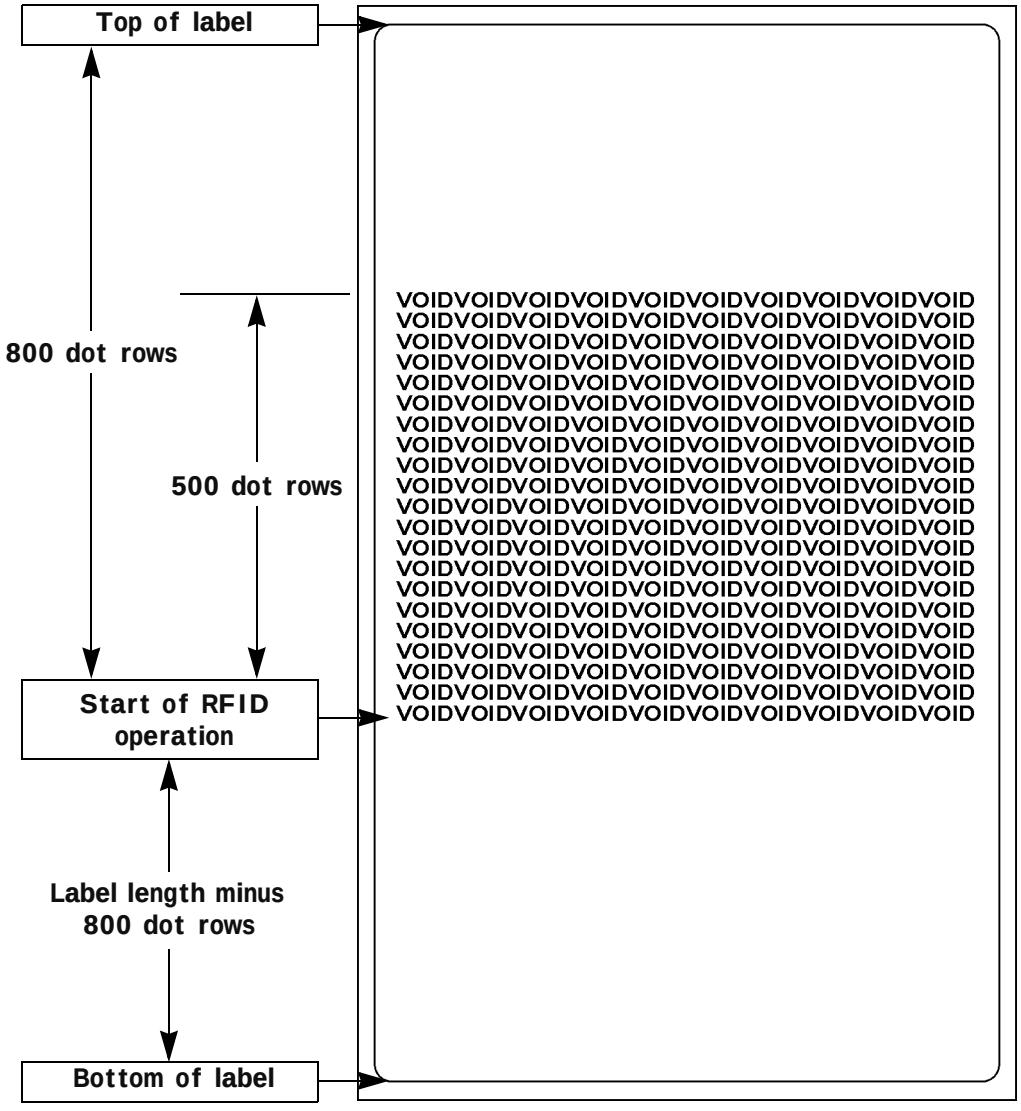
The following illustration shows the resulting voided label. Note where the void starts. The media has been moved 800 dot rows from the top of the label (label length minus 800 dot rows from the bottom (leading edge) of a label) to bring the transponder into the effective area to read/write a tag. If the printer fails the operation, the rest of the media is voided.



Example 2 • This example sets the printer to move the media to 800 dots from the top of the media [or label length - 500 from the bottom (leading edge) of the media] and prints “VOID” 500 dots in vertical length (Y axis) in case of an error.

```
^XA
^RS,800,500,2,P^FS
^XZ
```

The following illustration shows the resulting voided label. Note where the void starts. The media has been moved 800 dot rows from the top of the label [label length minus 800 dot rows from the bottom (leading edge) of a label] to bring the transponder into the effective area to read/write a tag. If the printer fails the operation, an area that is 500 dot rows of the media is voided instead of the entire rest of the media.



^RT

Read RFID Tag

Description This command tells the printer to read the current RFID tag data. The data can be sent back to the host via the ^HV command.

Note • It is recommended that you use the ^RF, ^RM, and ^RR commands rather than the ^RT command. The ^RT command is provided only for backward-compatibility with label formats that were developed for other Zebra RFID printers.

Format ^RT#,b,n,f,r,m,s

The following table identifies the parameters for this format.

Parameters	Details
# = number to be assigned to the field	*Accepted values:* 0 to 9999 *Default value:* 0
b = starting block number	*Accepted values:* 0 to *n*, where *n* is the maximum number of blocks for the tag. *Default value:* 0
n = number of blocks to read*	*Accepted values:* 1 to *n*, where *n* is the maximum number of blocks for the tag type minus the starting block number. For example, if the tag has 8 blocks (starting with block 0) and you start with block 6, *n* can be 2. This would return block 6 and block 7 information. *Default value:* 1
f = format	*Accepted values:* • 0 (ASCII) • 1 (Hexadecimal) *Default value:* 0
r = number of retries	Changes the number of times that the printer attempts to read a particular block of a single RFID tag. (Same retry rules as the ^RR command.) *Accepted values:* 0 to 10 *Default value:* 0
m = motion	Enables or disables RFID motion for the current field. *Accepted values:* • 0 (Feed label after writing.) • 1 (No feed after writing. Other ZPL may cause a feed.) *Default value:* 0

Parameters	Details
`s` = special mode*	For EPC Class 1 (Alien reader) only. Not applicable for EPC class 0. *Default value:* 0 *Accepted values:* • 0 (Do not read if mismatched checksum.) • 1 (Read even if mismatched checksum.)

*Not applicable for *R110PAX4*

Example • This sample reads a tag, prints the data on a label, and sends the string `Tag Data:`*xxxxxxxx* back to the host. The data read will go into the `^FN1` location of the format. The printer will retry the command five times, if necessary.

```
^XA
^FO20,120^A0N,60^FN1^FS
^RT1,,,,5^FS
^HV1,,Tag Data:^FS
^XZ
```

^RW

Set RFID Read and Write Power Levels

Description This command sets the read and write power levels. This function is useful when using different tag types or transponders that require different power levels to obtain the best read and write abilities.

Format `^RWr,w`

This table identifies the parameters for this format:

Parameters	Details
`r` = read power	Sets the power level to match the desired output as calibrated in the factory. *Accepted Values:* H (high), M (medium), or L (low) *Default Value:* H
`w` = write power	Sets the power level to match the desired output as calibrated in the factory. *Accepted Values:* H (high), M (medium), or L (low) *Default Value:* H

^RZ

Set RFID Tag Password

Description This command lets you define the password for the tag during writing.

Important • Only certain tags support this feature, so check to ensure that this command can be used with your particular tag type.

Format ^RZp

The following table identifies the parameters for this format.

Parameters	Details
p = password	*Accepted values:* 00 to FF (hexadecimal) *Default value:* 00

^WT

Write Tag

Description This command allows you to program the current RFID tag.

Note • It is recommended that you use the ^RF, ^RM, ^RR, and ^WV commands rather than the ^WT command. The ^WT command is provided only for backward-compatibility with label formats that were developed for other Zebra RFID printers.

Important • Check the amount of data memory available for the tag that you will be using. If more is sent than the memory can hold, the printer truncates the data.

Format ^WTb,r,m,w,f,v

The following table identifies the parameters for this format.

Parameters	Details
b = block number	This parameter is tag-dependent. For most tags, use block 0. For EPC Class 0 Plus, block 0 is EPC data, and block 1 is user data. *Accepted values:* 0 to *n*, where *n* is the maximum number of blocks for the tag. *Default value:* 0
r = number of retries	Changes the number of times that the printer attempts to write to a particular block of a single RFID tag. (Same function as the ^RR command.) *Accepted values:* 0 to 10 *Default value:* 0
m = motion	Enables or disables RFID motion. (Same function as the ^RM command.) *Accepted values:* • 0 (Feed label after writing.) • 1 (No Feed after writing. Other ZPL may cause a feed.) *Default value:* 0
w = write protect	*Accepted values:* • 0 (Not write protected.) • 1 (Write protect.) *Default value:* 0

Parameters	Details
f = data format	*Accepted values:* • 0 (ASCII) • 1 (Hexadecimal) *Default value:* 0
v = verify valid data	Used only for Alien Class 1 tags, which have preprogrammed data in them. This parameter flags whether the preprogrammed data is verified. (Same function as the ^WV command) *Default value:* N *Accepted values:* • N (Do not verify) • Y (Verify valid data [Hex A5A5 in the first two bytes] before writing)

Example • This sample encodes data “RFIDRFID” and will try writing up to five times, if necessary.

```
^XA
^WT,5^FDRFIDRFID^FS
^XZ
```

^WV

Verify RFID Write Operation

Description If write verify is enabled, this command verifies the RFID write operation to ensure that the tag about to be programmed contains the hex data “A5A5” in the first two bytes. This parameter is not persistent (carried over from label to label).

Important • This command is valid with Class 1 Alien tags only.

Format ^WVe

The following table identifies the parameters for this format.

Parameters	Details
e = enable	*Accepted values:* Y or N *Default value:* N

Notes • _____

6

Routine Maintenance

This chapter provides routine cleaning and maintenance procedures.

Contents

Cleaning Schedule 122
Clean Exterior 122
Clean Interior 123
Clean the Sensors 123
Clean the Printhead and Platen Roller 125
Toggle Positioning 127
Printhead Pressure Adjustment 128
Power Fuse Replacement 129

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 10. 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 10 • 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	
Door-open sensors	Air blow	Monthly and as needed
Tear-off/peel-off bar	Solvent*	
Clear plastic antenna cover	Air blow	

* Use Zebra's Preventative Maintenance kit, part number 47362, or a solution of 90% isopropyl alcohol and 10% deionized water.

Clean 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 Interior

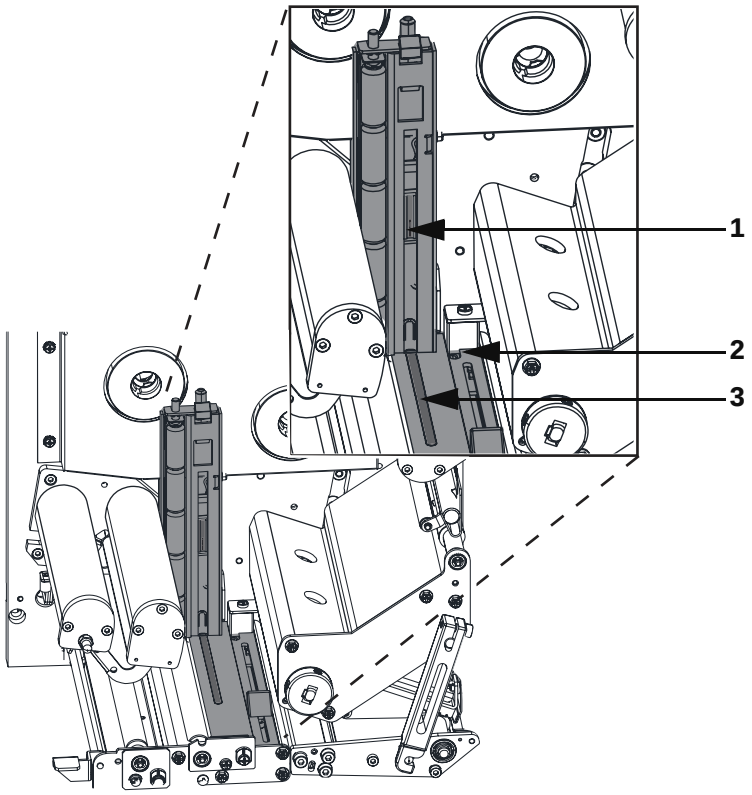
Remove any accumulated dirt and lint from the interior of the print engine using a soft bristle brush and/or vacuum cleaner. This area should be inspected every time a new ribbon is loaded.

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:

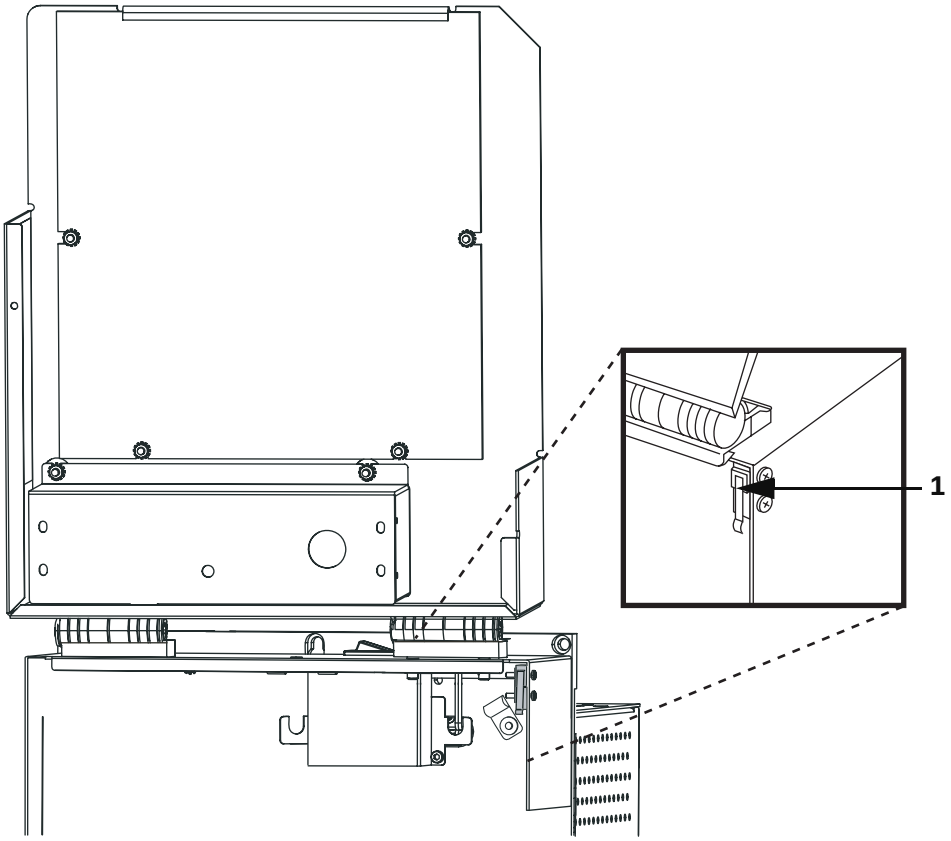
- See Figure 43 for the media sensors.
- See Figure 44 on page 124 for the door-open sensor.
- See Figure 45 on page 124 for the ribbon sensor and ribbon sensor reflector.

Figure 43 • Media Sensor Locations (Right-Hand Unit Shown)



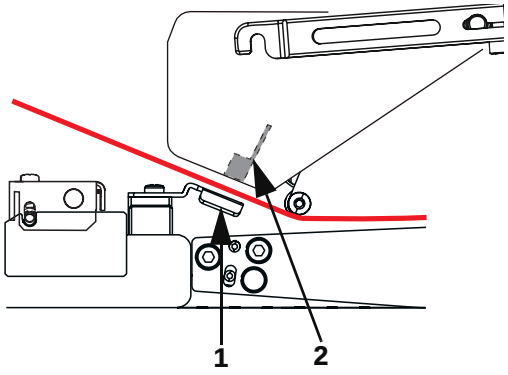
1	Upper transmissive media sensor
2	Reflective media sensor
3	Lower transmissive media sensor

Figure 44 • Door-Open Sensor Location (Right-Hand Unit Shown)



1	Door-open sensor

Figure 45 • 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 10 on page 122. 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.

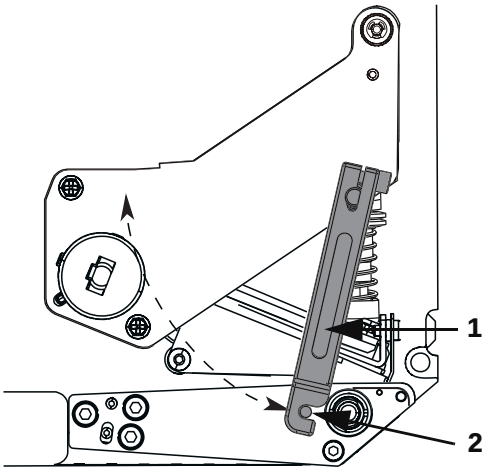
To clean the printhead and platen roller, complete these steps:

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

Electrostatic Discharge 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. See Figure 46. Open the printhead assembly by unlatching the printhead latch from the locking pin.

Figure 46 • Opening the Printhead Assembly

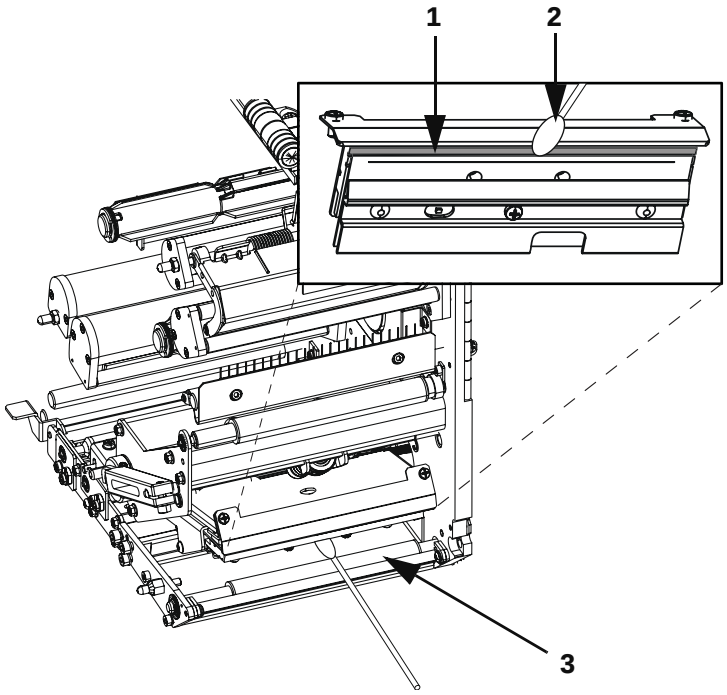


1	Printhead latch
2	Locking pin

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

4. See Figure 47. Using Zebra's 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.

Figure 47 • Printhead and Platen Roller Cleaning (Right-Hand Unit Shown)



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.

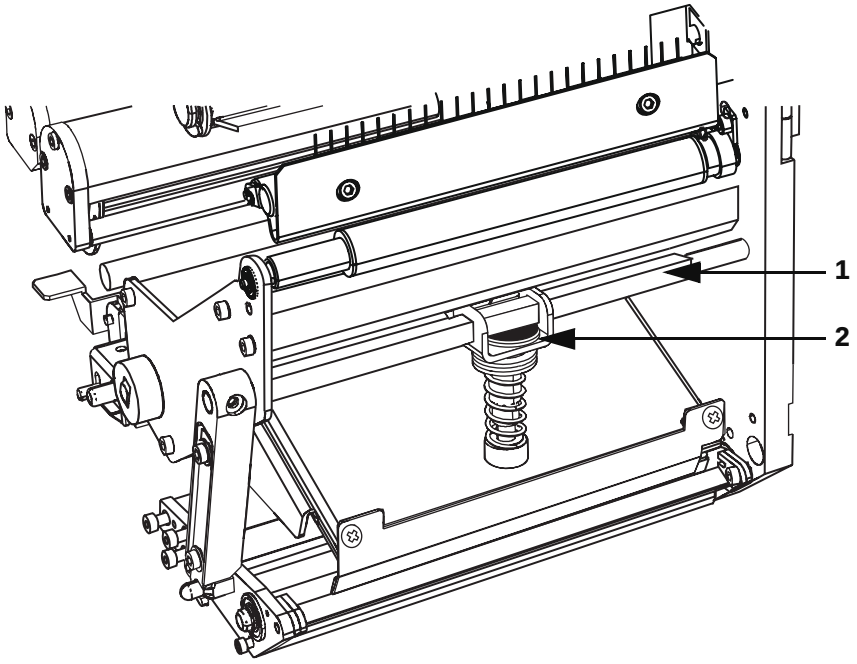
Toggle Positioning

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

To adjust the toggle, complete these steps:

1. See Figure 48. Loosen the position locking nut by rotating it to the left.
2. Slide the toggle to the desired position on the toggle shaft.
3. Finger tighten the position locking nut by rotating it to the right.

Figure 48 • Toggle Positioning (Right-Hand Unit Shown)



1	Toggle shaft
2	Position locking nut

Printhead Pressure Adjustment

Before adjusting the printhead pressure, check that the toggle is positioned correctly. See *Toggle Positioning* on page 127.

You may need to adjust the printhead pressure in the following instances:

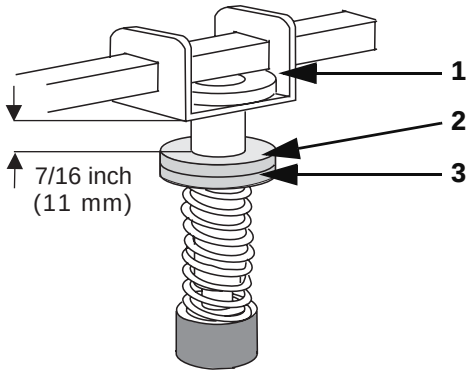
- if there is noticeable bleed or swelling in the printed image (too much pressure)
- if there are voids (too little pressure)
- if the darkness setting (burn duration) is set properly, but printing is too light (too little pressure)

Note • Printhead and drive system (belts and bearings) life can be maximized by using the lowest pressure that produces the desired print quality.

To adjust printhead pressure, complete these steps:

1. See Figure 49. As a starting point for adjustment, set the position of the adjusting nut so that when the locking nut is tightened, it is approximately 7/16 in. (11 mm) from the yoke.
2. Refer to *Adjust Print Darkness* on page 55 to set the darkness value (burn duration) appropriately for your media and ribbon.
3. Refer to *PAUSE Self Test* on page 144 to print test labels.
4. Adjust the position of the adjusting nut until the print quality is acceptable (turning it clockwise increases the spring pressure, and counterclockwise decreases the pressure). Use the lowest pressure that provides the desired print quality.
5. Hold the adjusting nut in position, and tighten the locking nut against it.

Figure 49 • Printhead Pressure Adjustment



1	Yoke
2	Locking nut
3	Adjusting nut

Power Fuse Replacement

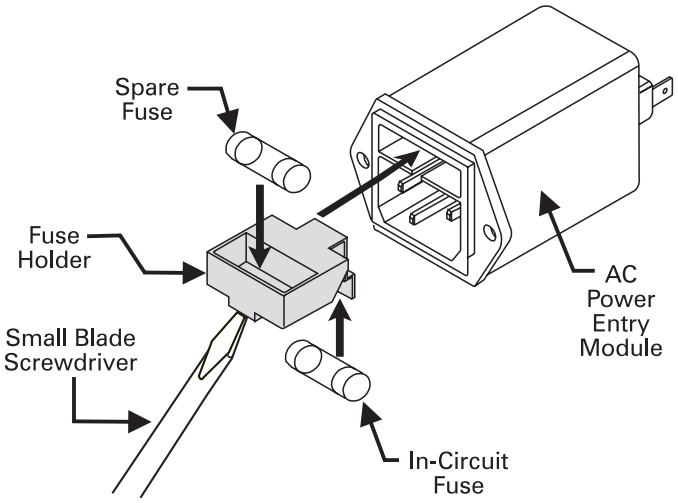
The print engine uses a metric-style fuse (5 × 20 mm IEC) rated for 5 Amps at 250 Volts that bears the certification mark of a known international safety organization (see Figure 13 on page 23). The power entry module comes with two approved fuses in the fuse holder: one is in-circuit and the other is a spare.

To replace a fuse, complete these steps:

1. See Figure 50. Turn off 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 turn the print engine on.

   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. See *Troubleshooting* on page 131.

Figure 50 • Installing a Fuse



Notes • _____

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7 Troubleshooting

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.

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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 133 for more information.
- ❑ Is the CHECK RIBBON light on when ribbon is loaded properly, or are non-continuous labels being treated as continuous labels? If yes, see *Calibrate Media and Ribbon Sensor Sensitivity* on page 63.
- ❑ Are you experiencing problems with print quality? If yes, see *Print Quality Problems* on page 136.
- ❑ Are you experiencing communications problems? If yes, see *Communications Problems* on page 139.

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 27.
- ❑ Review the label- and ribbon-loading illustrations in *Load Media* on page 32 and *Load Ribbon* on page 38.
- ❑ Check the position of the media sensor and move if necessary, as shown in *Adjust Media Sensors* on page 46.
- ❑ Does the printhead need to be adjusted? See *Printhead Pressure Adjustment* on page 128 for more information.
- ❑ Do the sensors need to be calibrated? See *Calibrate Media and Ribbon Sensor Sensitivity* on page 63 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 142. Use the results to help identify the problem.
- ❑ If you are still having problems, see *Support* on page 3 for customer support information.

LCD Error Messages

The LCD displays messages when there is an error. See Table 11 for LCD errors, the possible causes, and the recommended solutions.

Table 11 • LCD Error Messages

LCD Display/ Print Engine Condition	Possible Cause	Recommended Solution

`ERROR CONDITION`
`RIBBON OUT`
Print engine stops; RIBBON light ON, ERROR light flashes.
	In thermal transfer mode, ribbon is not loaded or incorrectly loaded.	Load ribbon correctly. See *Load Ribbon* on page 38.

	In thermal transfer mode, the ribbon sensor is not detecting ribbon that is loaded incorrectly.	**1.** Load ribbon correctly. See *Load Ribbon* on page 38. **2.** Calibrate the sensors. See *Calibrate Media and Ribbon Sensor Sensitivity* on page 63.
	In thermal transfer mode, media is blocking the ribbon sensor.	**1.** Load media correctly. See *Load Media* on page 32. **2.** Calibrate the sensors. See *Calibrate Media and Ribbon Sensor Sensitivity* on page 63.

`WARNING`
`RIBBON IN`
RIBBON light ON, ERROR light flashes.
	Ribbon is loaded, but the print engine is set for direct thermal mode.	Ribbon is not required with direct thermal media. Remove ribbon unless you are using it to protect the printhead. This error message will not affect printing.

`ERROR CONDITION`
`PAPER OUT`
Print engine stops; MEDIA light ON, ERROR light flashes.
	Media is not loaded or is loaded incorrectly.	Load media correctly. See *Load Media* on page 32.

	Misadjusted media sensor.	Check position of the media sensor.
	The print engine is set for non-continuous 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`
Print engine stops and ERROR light flashes.
	The printhead is not fully closed.	Close printhead completely.

	The head open sensor is not working properly.	Call a service technician.

Table 11 • LCD Error Messages (Continued)

LCD Display/ Print Engine Condition	Possible Cause	Recommended Solution
WARNING HEAD TOO HOT Print engine stops and ERROR light flashes.	**Caution** • The printhead may be hot enough to cause severe burns. Allow the printhead to cool. **Electrostatic Discharge Caution** • Observe proper electrostatic safety precautions when handling any static-sensitive components such as circuit boards and printheads.	
	The printhead is over temperature.	Printing automatically resumes when the printhead elements cool to an acceptable operating temperature.
WARNING HEAD COLD Print engine stops and 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. **Electrostatic Discharge Caution** • Observe proper electrostatic safety precautions when handling any static-sensitive components such as circuit boards and printheads.	
	The printhead is under temperature.	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** • You must turn off 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.

Memory Errors

The memory errors in Table 12 indicate that the print engine does not have enough memory to perform the function shown on the second line of the LCD.

Table 12 • 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: **1.** Press PAUSE to place the print engine in Pause mode. **2.** Send a ~HM ZPL command to the print engine to display the amount of free memory. Then do one of the following: • Redesign 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. **3.** In Pause mode, press CANCEL. The print engine skips the current label formatting process and goes to the next label. **4.** Turn the print engine Off (**O**) and then On (**I**) to clear the print engine's memory. **5.** Upgrade the print engine to a larger memory size.
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 13 identifies problems with print quality, the possible causes, and the recommended solutions.

Table 13 • Print Quality Problems

Problem	Possible Cause	Recommended Solution
General print quality issues	You are using an incorrect combination of labels and ribbon for your application.	Consult your authorized Zebra reseller or distributor for information and advice.
	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 ZPL II, the driver, or the software. See *Adjust Print Speed* on page 55.
	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 front panel, the driver, or the software. See *Adjust Print Darkness* on page 55.
	The printhead is dirty.	Clean the printhead according to the instructions in *Clean the Printhead and Platen Roller* on page 125. **Caution** • The printhead may be hot enough to cause severe burns. Allow the printhead to cool. **Electrostatic Discharge Caution** • Observe proper electrostatic safety precautions when handling any static-sensitive components such as circuit boards and printheads.

Table 13 • Print Quality Problems (Continued)

Problem	Possible Cause	Recommended Solution
Wrinkled ribbon	Ribbon fed through the machine incorrectly.	See *Load Ribbon* on page 38.
	Incorrect burn temperature.	Set the darkness to the lowest possible setting for good print quality. See *Adjust Print Darkness* on page 55.
	Incorrect or uneven pressure.	Set the pressure to the minimum needed for good print quality. See *Printhead Pressure Adjustment* on page 128.
	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 and platen roller need to be realigned.	Call a service technician.
Long tracks of missing print on several labels	Wrinkled ribbon.	See wrinkled ribbon causes and solutions in this table.
	Print element damaged.	Call a service technician.
Fine, angular gray lines on blank labels	Wrinkled ribbon.	See wrinkled ribbon causes and solutions in this table.
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 127 and *Printhead Pressure Adjustment* on page 128.
		Call a service technician.
Printing too light or too dark over the entire label	Media or ribbon is not designed for high-speed operation.	Replace supplies with those recommended for high-speed operation.
	Incorrect or uneven printhead pressure.	Set the pressure to the minimum needed. See *Printhead Pressure Adjustment* on page 128.
Smudge marks on labels	Media or ribbon not designed for high-speed operation.	Replace supplies with those recommended for high-speed operation.
Misregistration/skips labels	Media sensor not positioned correctly.	Perform media sensor position adjustment.
	The print engine not calibrated.	Recalibrate the print engine.
	Improper label format.	Use correct label format.

Table 13 • Print Quality Problems (Continued)

Problem	Possible Cause	Recommended Solution
Misregistration and misprint of one to three labels	Media sensor is not positioned correctly.	Place media sensor in proper position.
	The platen roller is dirty.	Clean the platen roller according to the instructions in *Clean the Printhead and Platen Roller* on page 125.
	Media does not meet specifications.	Use media that meets specifications.
Vertical drift in top-of-form position	A plus or minus 4 to 6 dot row (approximately 0.5 mm) vertical drift is acceptable due to different tolerances of mechanical parts and print engine modes.	**1.** Calibrate print engine. **2.** Adjust the label top position setting. See *Adjust Label Top Position* on page 68.
	The print engine is out of calibration.	Recalibrate the print engine.
	The platen roller is dirty.	Clean the platen roller according to the instructions in *Clean the Printhead and Platen Roller* on page 125.
Vertical image or label drift	Print engine using non-continuous labels but configured in continuous mode.	Configure the print engine for non-continuous and run calibration routine, if necessary.
	Incorrectly positioned media sensor.	Ensure the media sensor is properly positioned to read a single/consistent interlabel gap.
	Improperly calibrated media sensor.	See *Calibrate Media and Ribbon Sensor Sensitivity* on page 63.
	The platen roller is dirty.	Clean the platen roller.
	Improper printhead pressure settings (toggles).	Adjust the printhead pressure to ensure proper functionality.
	Improperly loaded ribbon or media.	Verify that the ribbon and media are properly loaded.
	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.

Communications Problems

Table 14 identifies problems with communications, the possible causes, and the recommended solutions.

Table 14 • 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 front panel menu. See *Set Serial Communications* on page 64.
		Make sure you are using the correct communication cable. See *Data Cable Requirements* on page 26 for the requirements.
		Using the front panel controls, check the protocol setting. It should be set to **NONE**. See *Set Protocol* on page 65.
		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 *Data Cable Requirements* on page 26 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 66 and *Set Delimiter Character* on page 66 for the requirements.
	Incorrect data is being sent to the print engine.	Ensure that ZPL II is being used.
		Check the communication settings on the computer. Ensure that they match the print engine settings.
		If the problem continues, check the ZPL II format for changed ^CC, ^CT, and ^CD.

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
Broken or melted ribbon	Darkness setting too high.	**1.** Reduce the darkness setting. **2.** Clean the printhead thoroughly.
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.
Missing LCD 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 power Off (**O**) and then back On (**I**).
	A ZPL command has turned off the ability to change the parameter.	Refer to the *ZPL Programming Guide* or call a service technician.
	A ZPL command has changed the parameter back to the previous setting.	Refer to the *ZPL Programming Guide* or call a service technician.
	If the problem continues, there may be a problem with the main logic board.	Call a service technician.
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 63.
	The print engine is configured for continuous media.	Set the media type to non-continuous media. See *Set Media Type* on page 56.
	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 being treated as continuous labels	The print engine is configured for continuous media.	Set the media type to non-continuous media. See *Set Media Type* on page 56.
	The print engine was not calibrated for the label being used.	Perform the calibration procedure in *Calibrate Media and Ribbon Sensor Sensitivity* on page 63.

Table 15 • Miscellaneous Print Engine Problems (Continued)

Problem	Possible Cause	Recommended Solution
Ribbon light is on even though ribbon is loaded correctly	The print engine was not calibrated for the label being used.	Perform the calibration procedure in *Calibrate Media and Ribbon Sensor Sensitivity* on page 63.
All lights 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 most commonly used are the Power-On and the CANCEL self tests.

Caution • Full width media should be used when performing self tests. If your media is not wide enough, the test labels may print on the platen roller and damage it. To prevent this from happening, check the print width using *Set Print Width* on page 57, and ensure that the width is correct for the media that you are using.

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 front 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, turn On (**I**) the print engine using the power switch on the control panel. 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.

Additional Print Engine Self Tests

These self tests produce sample printouts and provide specific information that helps determine the operating conditions for the print engine.

Each self test is enabled by pressing a specific front panel key or combination of keys while turning the power On (**I**)**.** 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 the print engine power Off (**O**) and then back On (**I**).
- If the 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.

CANCEL Self Test

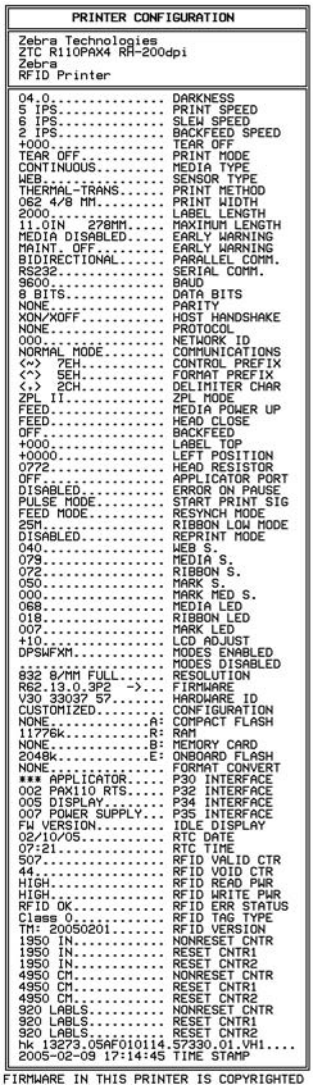
The CANCEL self test prints a configuration label (Figure 51).

To perform the CANCEL Self Test, complete these steps:

1. Turn Off (**O**) the print engine.
2. Press and hold CANCEL while turning the power On (**I**). Hold CANCEL until the first front panel light turns off.

   A print engine configuration label prints (Figure 51).

Figure 51 • Configuration Label



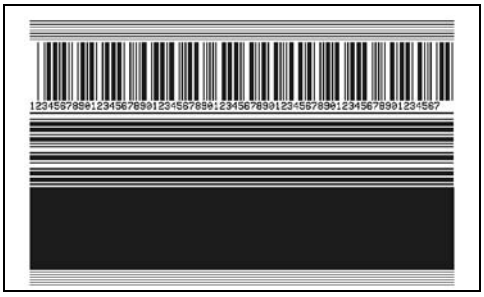
PAUSE Self Test

This self test can be used to provide the test labels required when making adjustments to the print engine's mechanical assemblies. Figure 52 shows a sample printout.

To perform a PAUSE self test, complete these steps:

1. Turn Off (**O**) the print engine.
2. Press and hold PAUSE while turning the power On (**I**). Hold PAUSE until the DATA light turns off.
   - The initial self test prints 15 labels at the print engine's slowest speed, and then automatically pauses the print engine. Each time PAUSE is pressed, an additional 15 labels print. Figure 52 shows a sample of the labels.

Figure 52 • PAUSE Test Label



   - While the print engine is paused, pressing CANCEL alters the self test. Each time PAUSE is pressed, 15 labels print at 6 in. (152 mm) per second.
   - While the print engine is paused, pressing CANCEL again alters the self test a second time. Each time PAUSE is pressed, 50 labels print at the print engine's slowest speed
   - While the print engine is paused, pressing CANCEL again alters the self test a third time. Each time PAUSE is pressed, 50 labels print at 6 in. (152 mm) per second.
   - While the print engine is paused, pressing CANCEL again alters the self test a fourth time. Each time PAUSE is pressed, 15 labels print at the print engine's maximum speed.
   - To exit this self test at any time, press and hold CANCEL.

FEED Self Test

The labels printed during this print quality test depend 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.

Each label is printed at a different darkness setting, starting at three settings below the currently configured value and increasing until it is three settings darker than the configured value. The relative darkness and speed are printed on each label. The bar codes on these labels can be ANSI-graded to check print quality.

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 the power On (**I**). Hold FEED until the DATA light turns off.

   The print engine prints a series of labels (Figure 53) at various speeds and at darkness settings higher and lower than the darkness value shown on the configuration label.

Figure 53 • FEED Test Label

4. Inspect the labels and determine which one has the best print quality for your application. The darkness value printed on that label is added to (plus) or subtracted from (minus) 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.
5. Enter the corresponding darkness and print speed values into the print engine through the front panel.

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. You must also reset the head resistance value and the verifier and applicator port settings 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 the power On (**I**). Hold FEED and PAUSE until the DATA light turns off.

   No labels print at the end of this test.

Table 16 indicates which print engine function controls each of the configuration parameters:

Table 16 • Control of Print Engine Parameters

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

Table 16 • Control of Print Engine Parameters (Continued)

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

Table 16 • Control of Print Engine Parameters (Continued)

Parameter	Controlled By
J11 Interface	Fixed
J10 Interface	Fixed
J9 Interface	Fixed
J8 Interface	Fixed
J7 Interface	Fixed

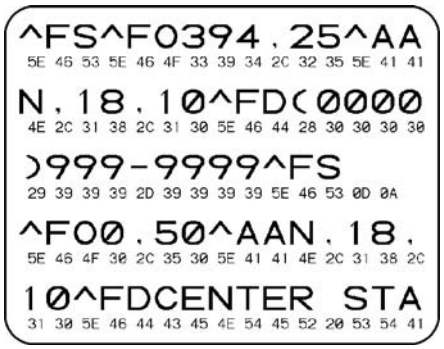
Communications Diagnostics Test

Do not perform the following test until all configuration and calibration parameters have been set. For configuration information, see *Front Panel LCD* on page 55.

This test is controlled from the front panel display. See *Set Communications Mode* on page 65. Figure 54 shows a typical printout from this test. Turn off the power to exit this self test and return to normal operation.

Note • The communications test label prints upside-down.

Figure 54 • Communications Diagnostics Test Label



A

Print Engine Specifications

This appendix provides the features of and specifications for the print engine.

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General Specifications

Physical

For installation information, refer to *Print Engine Installation* on page 16.

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)

Agency Approvals

- IEC 60950-1
- FCC Part 15.107 and 15.109 Class A
- FCC Part 15.247 (UHF applications)
- Canadian ICES-003, Class A
- IC RSS-210

Electrical Specifications

Power Supply	Universal Power Supply with power-factor correcting 90–264 VAC, 48–62 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	• Bi-directional high-speed (36-pin connector) • IEEE 1284-compliant software protocol (standard)
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
Network Connections	• ZebraNet 10/100 PrintServer
Applicator Interface with DC15F Connector	
North America	5V I/O port
Europe	24-28V I/O port

Memory

Standard	• 10.0 MB RAM • 2.0 MB Flash
Flash Options	• Up to 256 MB CompactFlash • 32 MB PC memory card

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”
- Bit image data transfer and printing, mixed text/graphics
- 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
- Portable Data Terminal
- In-spec OCR-A and OCR-B

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.

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

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

Printing Specifications

Specification	R112*PAX4*	R113*PAX4*
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)
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 Continuous (10 MB memory)	 39 in. (990 mm) 150 in. (3810 mm)	 39 in. (990 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 in. (127 mm) 6 in. (152 mm) 7 in. (178 mm) 8 in. (203 mm)

Media Specifications

Media width (label and liner)	Minimum	Non-RFID	0.625 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 mm) with backfeed off
		Non-RFID, tear-off mode	0.5 in. (12.7 mm) with backfeed on 0.25 in. (6 mm) with backfeed off
		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. x 0.12 in. (6 mm x 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)
		Position	Within 0.04 in. (1 mm) of the inside edge and <0.8 in (20 mm) from leading edge of media
Print Line to Peel Bar Distance			0.464 in. (11.8 mm)
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 ±20% during operation.

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	4.2 in. (107 mm)

Notes •

B

Data Ports

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

Contents

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Parallel Port

When communicating via the parallel port, the values selected 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.

A standard 36-pin parallel connector is available on the back of the print engine for connection to the data source.

Table 17 shows the pin configuration and function of a standard computer-to-printer parallel cable.

Table 17 • 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.
19–30	Ground
31	ninit
32	nFault/NDataAvail
33, 34	Not used
35	+5 V through a 1.8 KΩ Resistor
36	NSelectin/1284 active

Serial 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.

Connect the serial data cable to the female DB-9 connector on the back panel of the print engine. Use a DB-9 to DB-25 interface module for all RS-232 connections through a DB-25 cable.

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

Serial Pin Configuration

Table 18 shows the pin configuration and function of the rear panel serial data connector on the print engine.

Table 18 • Serial Connector Pin Configuration

Pin No.	Name	Description
1	—	Not connected
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.

RS-232 Interface Connections

Note • Adapters are available from Zebra Technologies LLC.

- RS-422/RS-485 adapter, Zebra part number 33114M
- RS-232 DB-9 to DB-25 adapter, Zebra part number 33109M

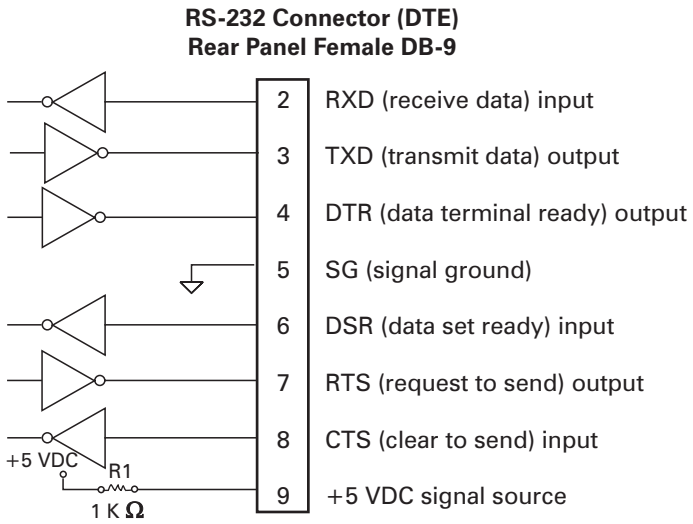
Direct Connection to a Computer

The print engine is configured as Data Terminal Equipment (DTE).

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

Figure 55 shows the internal connections of the print engine's RS-232 connector.

Figure 55 • RS-232 Connections



NOTE: Pin 1 is unused and unterminated.

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

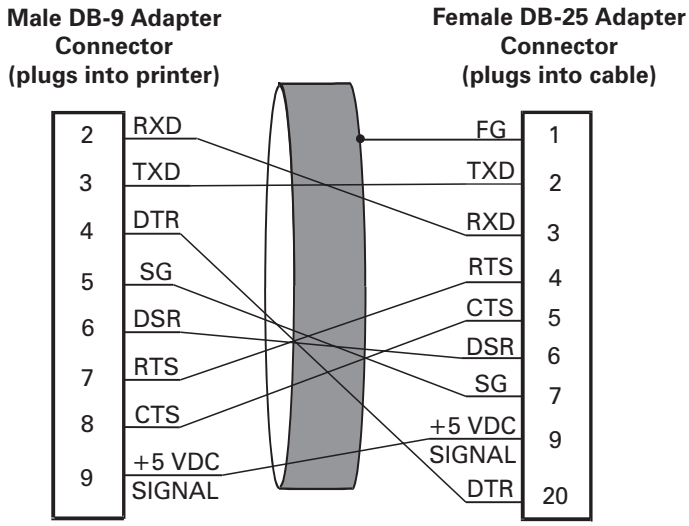
Caution • To enable this capability, a qualified service technician must install a jumper on the print engine's main logic board on JP1, pins 2 and 3.

DB-9 to DB-25 Connections

An interface adapter is required (Zebra part number 33109M) to connect the print engine's DB-9 interface to a DB-25 connector. A generic DB-25 adapter CAN be used, although the +5 VDC signal source would not be passed through the adapter.

Figure 56 shows the connections required for the DB-9 to DB-25 interface.

Figure 56 • DB-9 to DB-25 Connections

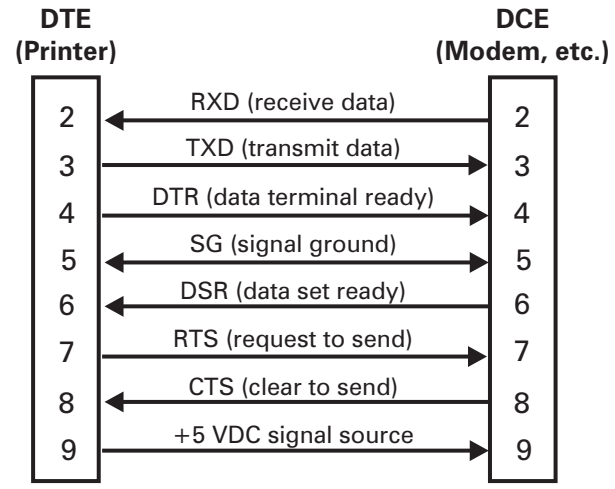


NOTE: Pin 1 of DB-9 connector is unused and unterminated.

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 57 shows the connections required for this cable.

Figure 57 • RS-232 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 the 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 printer and the customer applicator communicate 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 (de-asserted). *Applicator Interface Connector Pin Configuration* on page 168 provides additional information about each pin and signal.

The following examples show how these applicator signals function in each applicator mode during the stages of printing and programming a label. For more information about the applicator modes (which affect the end print signal), see *Set the Applicator Port* on page 69.

Mode 1

Figure 58 • Basic Applicator Signals (Mode 1, good RFID tag)

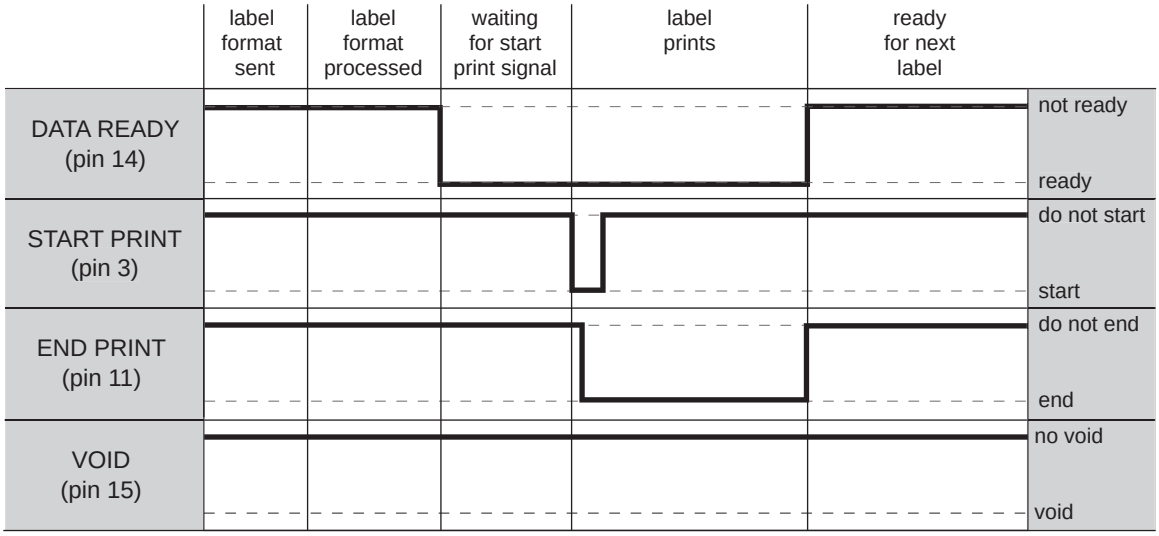
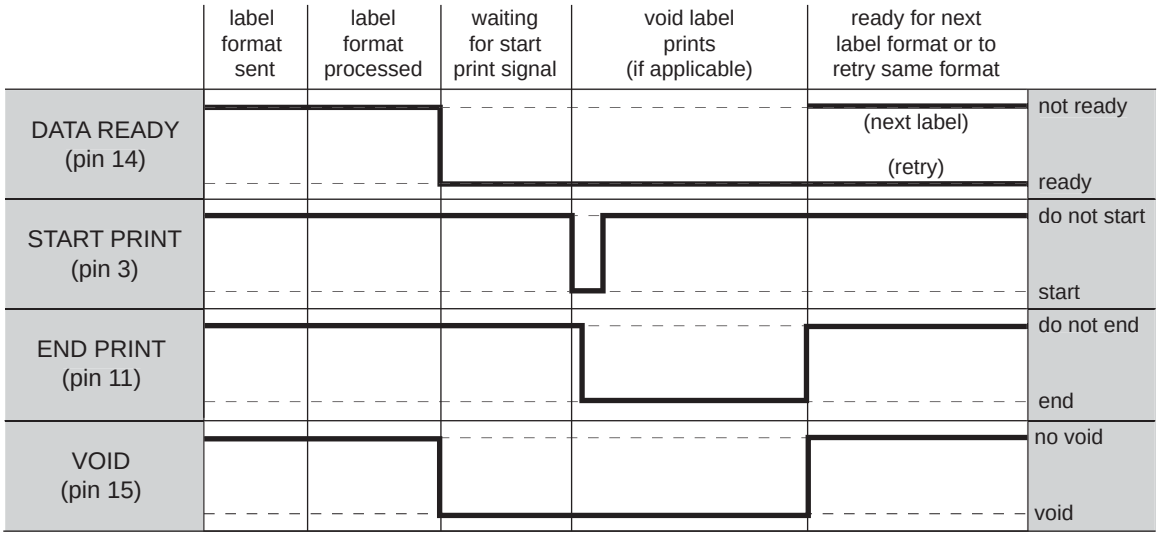


Figure 59 • Basic Applicator Signals (Mode 1, bad RFID tag)



Mode 2

Figure 60 • Basic Applicator Signals (Mode 2, good RFID tag)

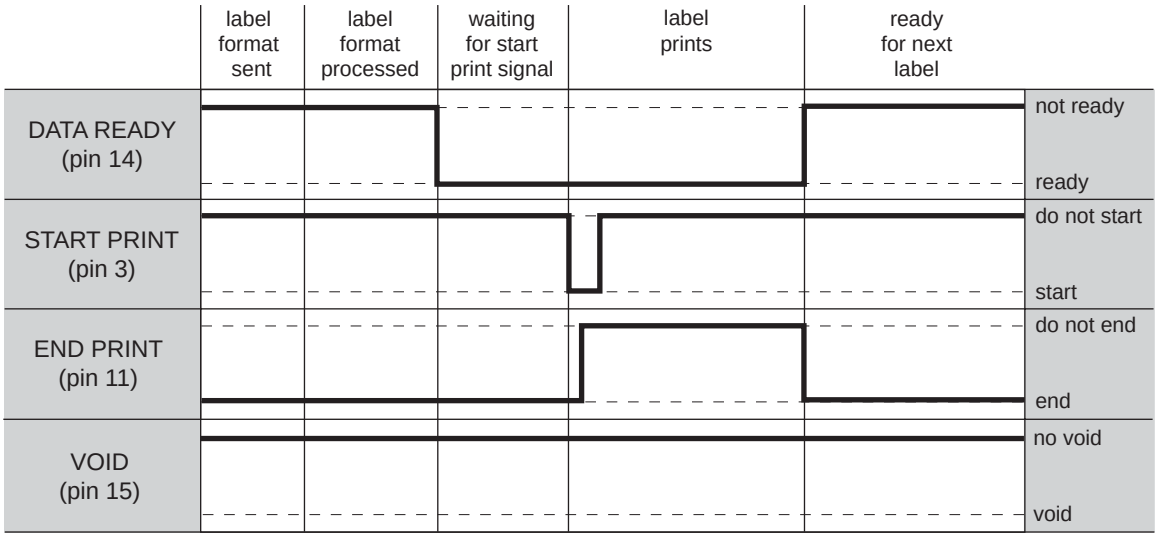
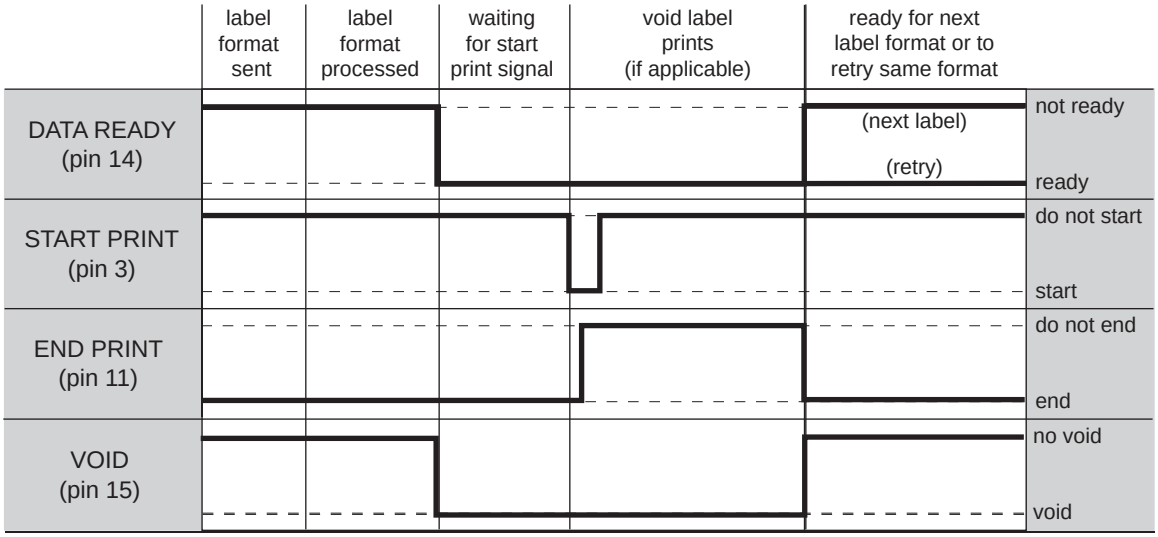


Figure 61 • Basic Applicator Signals (Mode 2, bad RFID tag)



Mode 3

Figure 62 • Basic Applicator Signals (Mode 3, good RFID tag)

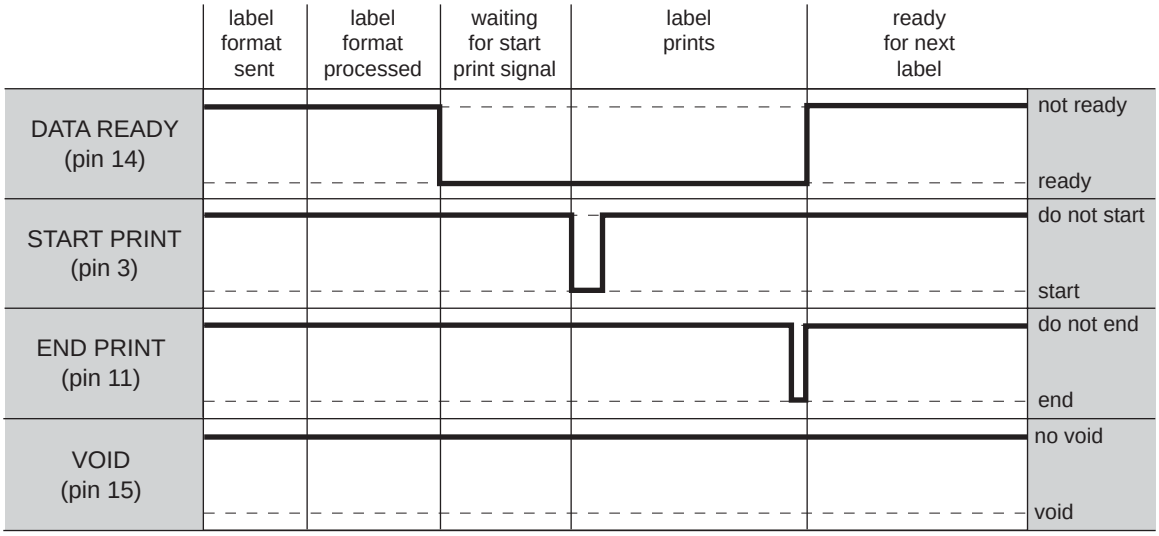
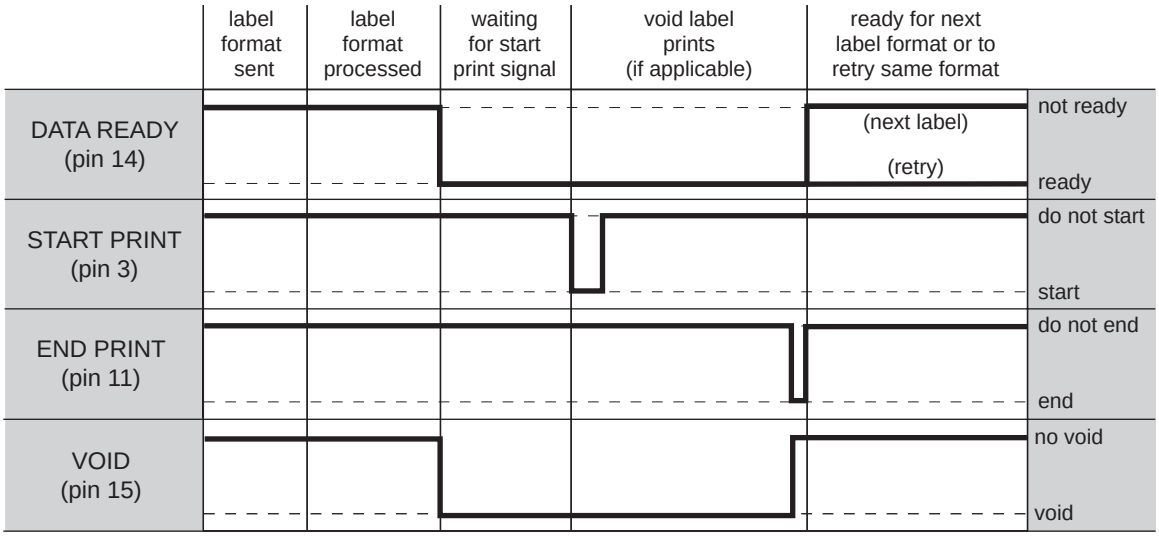


Figure 63 • Basic Applicator Signals (Mode 3, bad RFID tag)



Mode 4

Figure 64 • Basic Applicator Signals (Mode 4, good RFID tag)

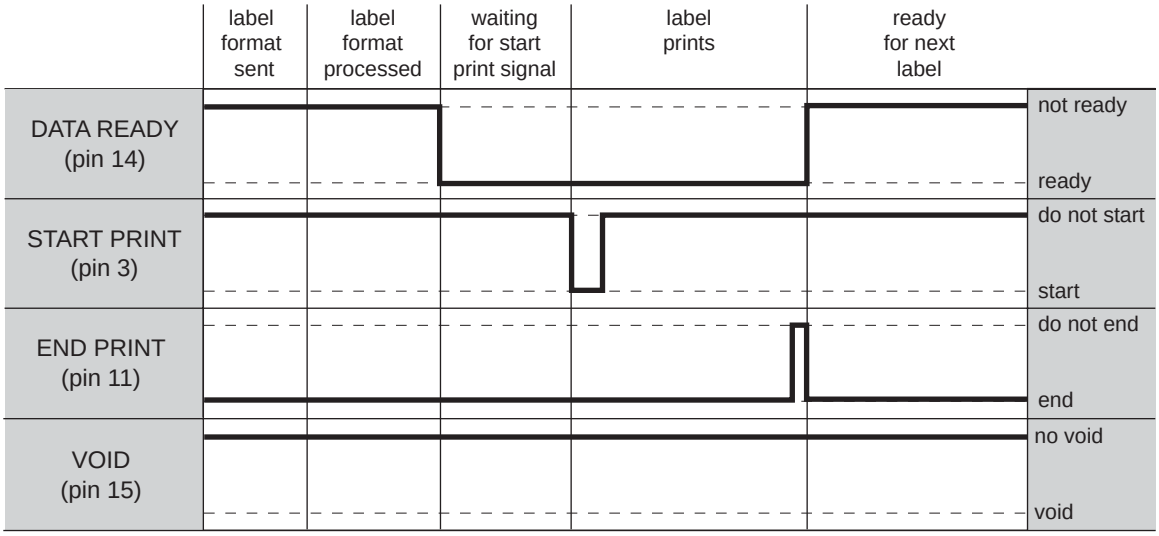
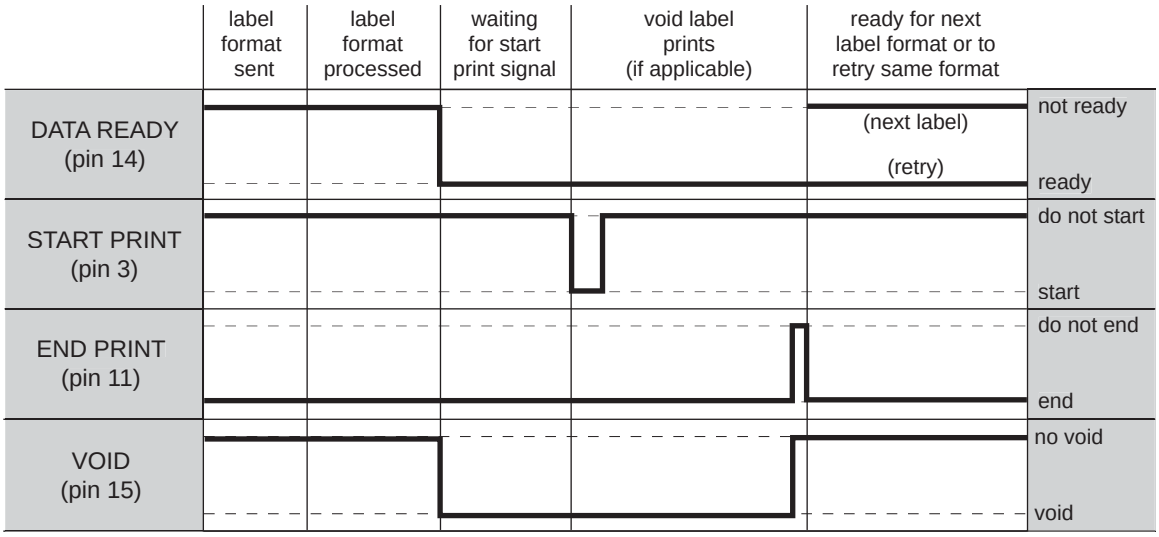


Figure 65 • Basic Applicator Signals (Mode 4, bad RFID tag)



Applicator Interface Connector Pin Configuration

The Applicator Interface Assembly is available in two versions: a +5 V I/O and a +24 V (24–28 V) I/O. Table 19 lists the pin configurations and functions of the applicator interface connector for both +5 V and 24–28 V operation.

Table 19 • Applicator Interface Connector Pin Configuration

Pin No.	Signal Name	Signal Type	Description
1	I/O SIGNAL GROUND	I/O Signal Ground	**+5 V Version** Using jumper J5, this pin can be configured as isolated or non-isolated from the Applicator Interface Circuit Ground. See Table 20 on page 170 for more information. **24–28 V Version** Isolated I/O operation only. No jumpers to configure.
2	+V I/O (Fused at 1 A for +5 V operation. See Figure 66 on page 171 for fuse location.) **Caution •** Replace the fuse only with one of the same type and rating.	Power	**+5 V Version** Using jumper J4, this pin can be configured as isolated or non-isolated from the Applicator Interface Circuit +5 V Supply. See Table 20 on page 170 for more information. **24–28 V Version** Isolated I/O operation only. No jumpers to configure.
3	START PRINT	Input	**Pulse Mode** The label printing process begins on the HIGH to LOW transition of this signal if a format is ready. De-assert this signal HIGH to inhibit printing of a new label. **Level Mode** Assert LOW to enable the print engine to begin printing if a format is ready. The print engine prints new labels as long as the signal is asserted. When de-asserted, the currently printing label is completed and the print engine stops and waits for this input to be reasserted LOW.
4	FEED	Input	When the print engine is in an idle state or has been paused, assert this input LOW to trigger repeated feeding of blank labels. De-assert HIGH to stop feeding blank labels and register to the top of the next label.
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.

Table 19 • Applicator Interface Connector Pin Configuration (Continued)

Pin No.	Signal Name	Signal Type	Description
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 71 for more information. If the Reprint feature is disabled, this input is ignored.
7	+28 V (Fused at 500 mA. See Figure 66 on page 171 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.
8	POWER GROUND (+28 V Return)	Ground	The Interface Power Ground.
9	RIBBON LOW	Output	Asserted HIGH 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 70 for more information. If the Ribbon Low feature is disabled, this output lead is disabled.
10	SERVICE REQUIRED	Output	Asserted LOW if the media cover is open, the printhead is open, the ribbon is out, the media is out, the print engine is paused, or an operational fault occurs. If the applicator Resynch mode is set to Error mode, this signal also asserts LOW for a Resynch error.
11	END PRINT	Output	MODE 0: The applicator port is OFF.
			MODE 1: Asserted LOW only while the print engine is moving the label forward; otherwise de-asserted HIGH.
			MODE 2: Asserted HIGH only while the print engine is moving the label forward; otherwise de-asserted LOW.
			MODE 3: (Default) Asserted LOW for 20 milliseconds when a label has been completed and positioned. Not asserted during continuous printing.
			MODE 4: Asserted HIGH for 20 milliseconds when a label has been completed and positioned. Not asserted during continuous printing.
12	MEDIA OUT	Output	Asserted LOW while there is no media in the print engine.

Table 19 • Applicator Interface Connector Pin Configuration (Continued)

Pin No.	Signal Name	Signal Type	Description
13	RIBBON OUT	Output	Asserted LOW while there is no ribbon in the print engine.
14	DATA READY	Output	Asserted LOW when sufficient data has been received to begin printing the next label. De-asserted HIGH whenever printing stops after the current label, due to either a pause condition or the absence of a label format.
15	VOID	Output	Asserted LOW when the RFID transponder over the antenna is “voided.” De-asserted HIGH when the end print signal is asserted.

Jumper Configurations for +5 V I/O Applicator Interface Board

Table 20 shows the pin and jumper configurations for pins 1 and 2 in +5 V I/O operation.

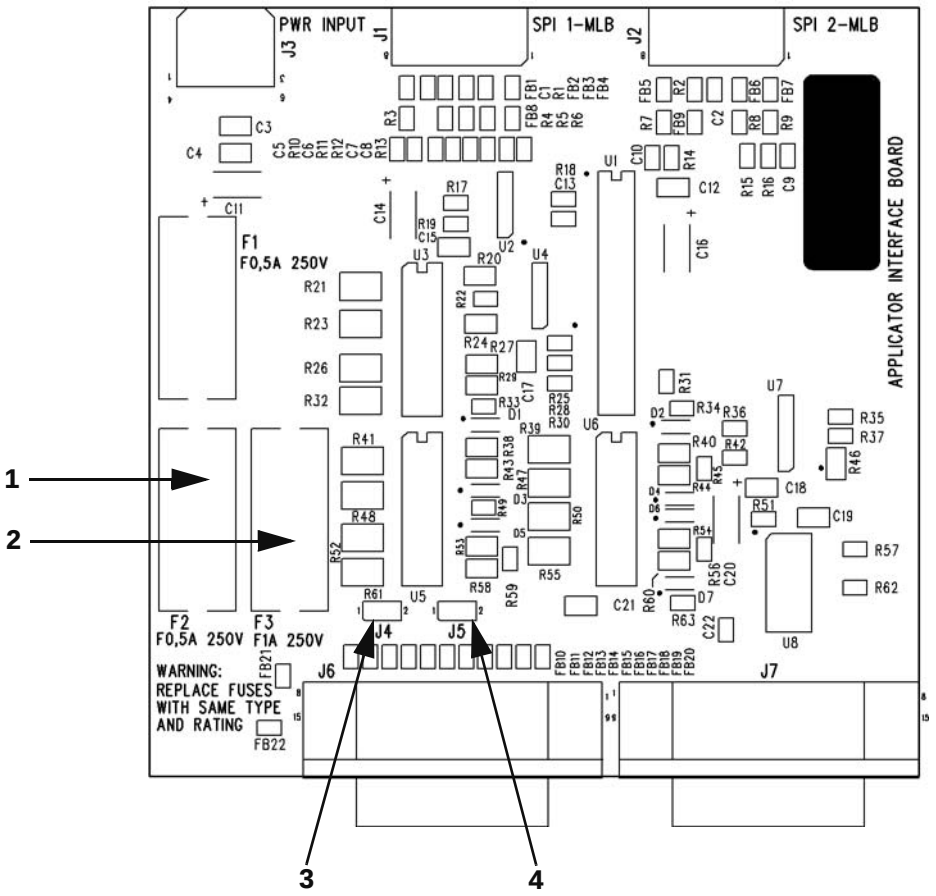
Jumpers J4 and J5 are used together to produce isolated or non-isolated modes of operation for applicator input and output control signals. J4 configures the +5 V source for the optoisolator circuits, and J5 configures the ground. For proper operation, when J4 is installed, J5 must be installed, and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

Table 20 • Pin 1 and Pin 2 Jumper Configurations

Pin No.	Non-Isolated	Isolated
1	**J5 In** I/O ground is connected to the Applicator Interface Circuit Ground.	**J5 Out** I/O ground is disconnected from the Applicator Interface Circuit Ground. Ground for the applicator interface optoisolator circuits is provided externally to this pin.
2	**J4 In** +5 V I/O is connected to the Applicator Interface Circuit +5 V Supply.	**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 is provided externally to this pin.

Figure 66 illustrates the location of the fuses and the location of jumpers J4 and J5 for the +5 V I/O applicator interface board.

Figure 66 • 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

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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

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.

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

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Effective December 30, 2002

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Printers and Related Hardware Products

Proof of purchase or shipment date is required to validate the warranty period. The warranty becomes void if the equipment is modified, improperly installed or used, damaged by accident or neglect, or if any parts are improperly installed or replaced by the user.

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Printers

All printers (excluding printheads) are warranted against defect in material or workmanship for twelve (12) months from the purchase date.

Printheads

Because printhead wear is part of normal operation, the original printhead is covered by a limited warranty as indicated below. Warranty period begins on purchase date.

Printhead	Warranty Period
Bar code label and receipt printer printheads	6 months
Plastic card printer printheads	12 months

To qualify for this warranty, the printhead must be returned to the factory or to an authorized service center. Customers are not required to purchase Genuine Zebra Supplies (media and/or ribbons) for warranty qualification.

However, if it is determined that the use of inappropriate or inferior supplies has caused any defect in the printhead for which a warranty claim is made, the user is responsible for Zebra's labor and material charges required to repair the defect. The warranty becomes void if the printhead is physically worn or damaged; also if it is determined that failure to follow the preventive maintenance schedule listed in the User Guide has caused defect in the thermal printhead for which a warranty claim is made.

Related Hardware Items

Products are warranted to be free of defects in material and workmanship from the date of purchase according to this chart:

Product	Warranty Period
Accessories	1 month
Batteries	3 months
Cables	1 month
Chargers/Power Supplies	1 year
Hardware Keys	1 year
Keyboard Display Units	6 months
Parts	3 months
Pocket Eye®	1 year
Software	1 month
ZebraNet® Print Servers	3 years

Defective product must be returned to Zebra for evaluation. In the event of notification of defect within the warranty period, Zebra will replace the defective item provided there had not been damage resulting from user abuse, modification, improper installation or use, or damage in shipping or by accident or neglect.

Supplies Products

Supplies are warranted to be free from defect in material and workmanship for a period of six (6) months for media and twelve (12) months for ribbon from the date of shipment by Zebra. This is provided the user has complied with storage guidelines, handling, and usage of the supplies in Zebra printers.

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Zebra Technologies Corporation
333 Corporate Woods Parkway
Vernon Hills, IL 60061

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Glossary

Alphanumeric — Indicating letters, numerals, and characters such as punctuation marks.

Backfeed — When the print engine pulls the media and ribbon (if used) backward into the print engine so that the beginning of the label to be printed is properly positioned behind the printhead. Backfeed occurs when operating the print engine in Tear-Off and Applicator modes.

Bar code — A code by which alphanumeric characters can be represented by a series of adjacent stripes of different widths. Many different code schemes exist, such as the universal product code (UPC) or Code 39.

Black mark — A registration mark found on the underside of the print media that acts as a start-of-label indication for the print engine. (See ***continuous media***.)

Calibration (of a print engine) — A process in which the print engine determines some basic information needed to print accurately with a particular media and ribbon combination. To do this, the print engine feeds some media and ribbon (if used) through the print engine and senses whether to use the direct thermal or thermal transfer print method, and (if using non-continuous media) the length of individual labels or tags.

Character set — The set of all letters, numerals, punctuation marks, and other characters that can be expressed by a particular font or bar code.

Check digit — A character added to a bar code symbol that indicates to the scanner that it has read the symbol correctly.

Configuration — The print engine configuration is a group of operating parameters specific to the print engine application. Some parameters are user selectable, while others are dependent on the installed options and mode of operation. Parameters may be switch selectable, front panel programmable or downloaded as ZPL II commands. A configuration label listing all the current print engine parameters may be printed for reference.

Continuous media — Label or tag-stock media that has no notch, gap, or web (media liner only) to separate the labels or tags. The media is one long piece of material.

Core diameter — The inside diameter of the cardboard core at the center of a roll of media or ribbon.

Diagnostics — Information about which print engine functions are not working that is used for troubleshooting print engine problems.

Die-cut media — A type of label stock that has individual labels stuck to a media liner. The labels may be either lined up against each other or separated by a small distance. Typically the material surrounding the labels has been removed. (See ***non-continuous media***.)

Direct thermal — A printing method in which the printhead presses directly against the media. Heating the printhead elements causes a discoloration of the heat-sensitive coating on the media. By selectively heating the printhead elements as the media moves past, an image is printed onto the media. No ribbon is used with this printing method. Contrast this with ***thermal transfer***.

Direct thermal media — Media that is coated with a substance that reacts to the application of direct heat from the printhead to produce an image.

Dynamic RAM — The memory devices used to store the label formats in electronic form while they are being printed. The amount of DRAM memory available in the print engine determines the maximum size and number of label formats that can be printed. This is volatile memory that loses the stored information when power is turned off.

Fanfold media — Media that comes folded in a rectangular stack. Contrast this with ***roll media***.

Firmware — This is the term used to specify the print engine's operating program. This program is downloaded to the print engine from a host computer and stored in FLASH memory. Each time the print engine power is turned on, this operating program starts. This program controls when to feed the media forward or backward and when to print a dot on the label stock.

FLASH memory — FLASH memory is non-volatile and maintains the stored information intact when power is off. This memory area is used to store the print engine's operating program. In addition, this memory can be used to store optional print engine fonts, graphic formats, and complete label formats.

Font — A complete set of alphanumeric characters in one style of type. Examples include CG Times™, CG Triumvirate Bold Condensed™.

Integrated circuit (IC) chip — The part of an RFID transponder that contains the RF circuit, coders, decoders, and memory.

Ips "inches-per-second" — The speed at which the label or tag is printed. Zebra offers print engines that can print from 1 ips to 12 ips.

Label — An adhesive-backed piece of paper, plastic, or other material on which information is printed.

Label backing (label liner) — The material on which labels are affixed during manufacture and which is discarded or recycled by the end-users.

Liquid crystal display — The LCD is a back-lit display that provides the user with either operating status during normal operation or option menus when configuring the print engine to a specific application.

Light emitting diode (LED) — Indicators of specific print engine status conditions. Each LED is either off, on, or blinking depending on the feature being monitored.

Lock-up — This is the term generally used to describe a fault condition that, for apparently no reason, causes the print engine to stop working.

Media — Material onto which data is printed by the print engine. Types of media include: tag-stock, die-cut labels, continuous (with and without media liner), fanfold, and roll.

Media sensor — This sensor is located behind the printhead to detect the presence of media and, for non-continuous media, the position of the web, hole, or notch used to indicate the start of each label.

Non-continuous media — Consumable printing stock that contains an indication of where one label/printed format ends and the next one begins. Examples are die-cut labels, notched tag-stock, and stock with black mark registration marks.

Non-volatile memory — Electronic memory that retains data even when the power to the print engine is turned off.

Notched media — A type of tag stock containing a cutout area that can be sensed as a start-of-label indicator by the print engine. This is typically a heavier, cardboard-like material that is either cut or torn away from the next tag. (See ***non-continuous media***.)

Print speed — The speed at which printing occurs. For thermal transfer print engines, this speed is expressed in terms of ips (inches per second). Zebra offers print engines that can print from 1 ips to 12 ips.

Printhead wear — The degradation of the surface of the printhead and/or the print elements over time. Heat and abrasion can cause printhead wear. Therefore, to maximize the life of the printhead, use the lowest print darkness setting (sometimes called burn temperature or head temperature) and the lowest printhead pressure necessary to produce good print quality. In the thermal transfer printing method, use ribbon that is as wide or wider than the media to protect the printhead from the rough media surface.

Registration — Alignment of printing with respect to the top of a label or tag.

Radio Frequency Identification (RFID) — The technology that allows an item to be identified by a transponder that communicates with a reader via radio waves.

Ribbon — A band of material consisting of a base film coated with wax or resin “ink.” The inked side of the material is pressed by the printhead against the media. The ribbon transfers ink onto the media when heated by the small elements within the printhead. Zebra ribbons have a coating on the back that protects the printhead from wear.

Ribbon wrinkle — A wrinkling of the ribbon caused by improper alignment or improper printhead pressure. This wrinkle can cause voids in the print and/or the used ribbon to rewind unevenly. This condition should be corrected by performing adjustment procedures.

Roll media — Media that comes supplied rolled onto a core (usually cardboard). Contrast this with ***fanfold media***.

“Smart” label — Media that comes with an RFID transponder embedded between the label and the liner.

Supplies — A general term for media and ribbon.

Symbology — The term generally used when referring to a bar code.

Tag — 1) A type of media having no adhesive backing but featuring a hole or notch by which the tag can be hung on something. Tags are usually made of cardboard or other durable material. 2) An RFID transponder.

Tear-off — A mode of operation in which the user tears the label or tag stock away from the remaining media by hand.

Thermal transfer — A printing method in which the printhead presses an ink or resin coated ribbon against the media. H eating the printhead elements causes the ink or resin to transfer onto the media. By selectively heating the printhead elements as the media and ribbon move past, an image is printed onto the media. Contrast this with ***direct thermal***.

Transponder — An RFID component that is usually comprised of an antenna that is bonded to an integrated circuit (IC) chip. The transponder is usually located between the label and liner in “smart” labels.

Void — 1) A space on which printing should have occurred, but did not due to an error condition such as wrinkled ribbon or faulty print elements. A void can cause a printed bar code symbol to be read incorrectly or not at all. 2) An RFID label is “voided” if an error occurs during writing or encoding. The label is ejected, and the word “VOID” is printed across it.

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