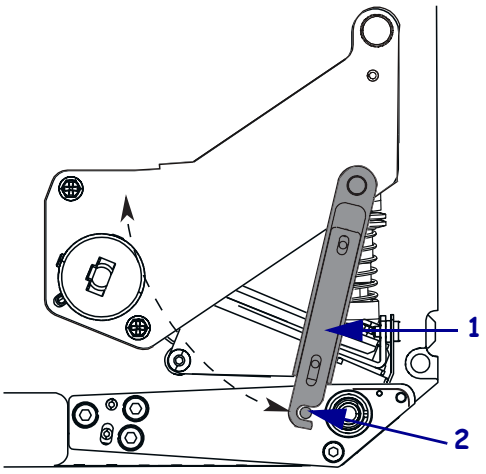
5. See Figure 32. Open the printhead assembly by unlatching the printhead latch from the locking pin.

Figure 32 • Opening the Printhead Assembly

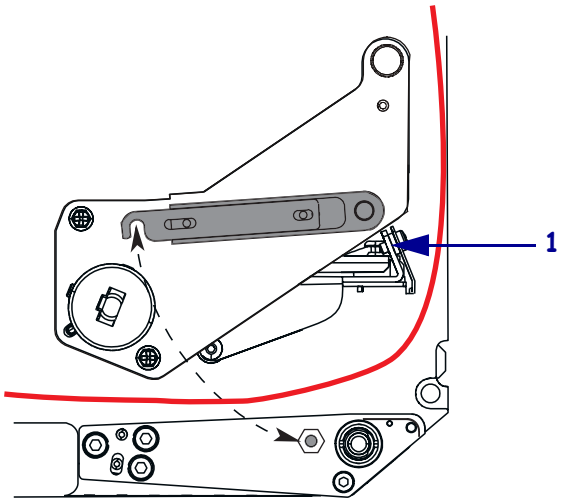


1	Printhead latch
2	Locking pin

6. See Figure 33. Thread the ribbon under the printhead assembly and then up toward the upper dancer assembly.

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

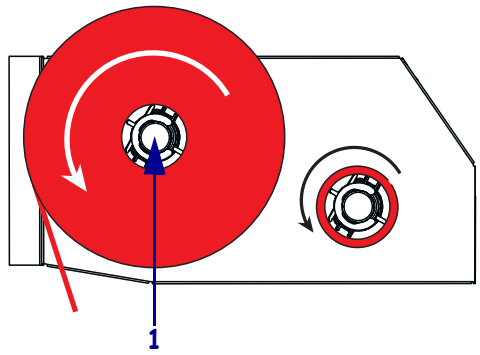
Figure 33 • Threading Ribbon under the Printhead Assembly



1	Printhead assembly

7. See Figure 30 on page 40. On the upper dancer assembly, squeeze the opening tabs to pivot open the dancer arm.
8. See Figure 30 on page 40. Carefully thread the ribbon through the upper dancer assembly, and then slowly release the dancer arm.
9. See Figure 34. 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.
10. See Figure 34. 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 34 • Loading Ribbon on the Ribbon Take-Up Spindle



1	Ribbon take-up spindle with empty ribbon core

11. See Figure 32 on page 41. Close the printhead assembly by pivoting the printhead latch onto the locking pin.
12. 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 34 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 34 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.

Print a Configuration Label

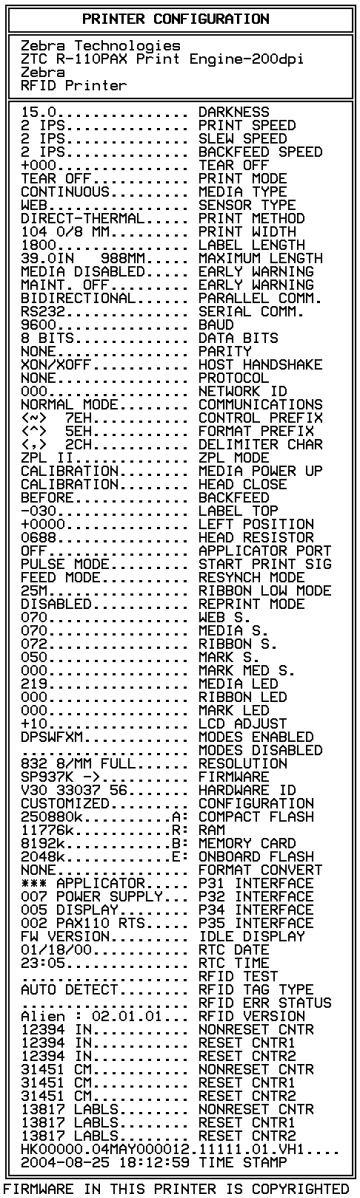
When you have loaded the media and ribbon (if necessary), print a configuration label as a record of your print engine's current settings. Keep the label to use when troubleshooting printing problems.

To print a configuration label, complete these steps:

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

   A configuration label prints (Figure 35).

Figure 35 • Configuration Label



```
PRINTER CONFIGURATION

Zebra Technologies
ZTC R-110PAX Print Engine-200dpi
Zebra
RFID Printer

15.0............... DARKNESS
2 IPS.............. PRINT SPEED
2 IPS.............. SLEW SPEED
2 IPS.............. BACKFEED SPEED
+000............... TEAR OFF
TEAR OFF........... PRINT MODE
CONTINUOUS......... MEDIA TYPE
WEB................ SENSOR TYPE
DIRECT-THERMAL..... PRINT METHOD
104 0/8 MM......... PRINT WIDTH
1800............... LABEL LENGTH
39.0IN   988MM..... MAXIMUM LENGTH
MEDIA DISABLED..... EARLY WARNING
MAINT. OFF......... EARLY WARNING
BIDIRECTIONAL...... PARALLEL COMM.
RS232.............. SERIAL COMM.
9600............... BAUD
8 BITS............. DATA BITS
NONE............... PARITY
XON/XOFF........... HOST HANDSHAKE
NONE............... PROTOCOL
000................ NETWORK ID
NORMAL MODE........ COMMUNICATIONS
<~>  7EH........... CONTROL PREFIX
<^>  5EH........... FORMAT PREFIX
<,>  2CH........... DELIMITER CHAR
ZPL II............. ZPL MODE
CALIBRATION........ MEDIA POWER UP
CALIBRATION........ HEAD CLOSE
BEFORE............. BACKFEED
-030............... LABEL TOP
+0000.............. LEFT POSITION
0688............... HEAD RESISTOR
OFF................ APPLICATOR PORT
PULSE MODE......... START PRINT SIG
FEED MODE.......... RESYNCH MODE
25M................ RIBBON LOW MODE
DISABLED........... REPRINT MODE
070................ WEB S.
070................ MEDIA S.
072................ RIBBON S.
050................ MARK S.
000................ MARK MED S.
219................ MEDIA LED
000................ RIBBON LED
000................ MARK LED
+10................ LCD ADJUST
DPSWFXM............ MODES ENABLED
.................. MODES DISABLED
832 8/MM FULL...... RESOLUTION
SP937K ->.......... FIRMWARE
V30 33037 56....... HARDWARE ID
CUSTOMIZED......... CONFIGURATION
250880k.........A: COMPACT FLASH
11776k..........R: RAM
8192k...........B: MEMORY CARD
2048k...........E: ONBOARD FLASH
NONE............... FORMAT CONVERT
*** APPLICATOR.... P31 INTERFACE
007 POWER SUPPLY... P32 INTERFACE
005 DISPLAY........ P34 INTERFACE
002 PAX110 RTS..... P35 INTERFACE
FW VERSION......... IDLE DISPLAY
01/18/00........... RTC DATE
23:05.............. RTC TIME
.................. RFID TEST
AUTO DETECT........ RFID TAG TYPE
.................. RFID ERR STATUS
Alien : 02.01.01... RFID VERSION
12394 IN........... NONRESET CNTR
12394 IN........... RESET CNTR1
12394 IN........... RESET CNTR2
31451 CM........... NONRESET CNTR
31451 CM........... RESET CNTR1
31451 CM........... RESET CNTR2
13817 LABLS........ NONRESET CNTR
13817 LABLS........ RESET CNTR1
13817 LABLS........ RESET CNTR2
HK00000.04MAY000012.11111.01.VH1....
2004-08-25 18:12:59 TIME STAMP

FIRMWARE IN THIS PRINTER IS COPYRIGHTED
```

Print a Network Configuration Label

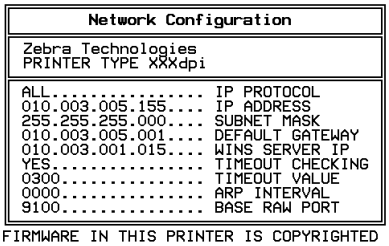
If you are using a print server, you can print a network configuration label after the print engine is connected to the network.

To print a network configuration label, complete these steps:

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

   A network configuration label prints (Figure 36).

Figure 36 • Network Configuration Label



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 66) • 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 66). • 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 66 or *Select Head Close Option* on page 66).
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 66 or *Select Head Close Option* on page 66).

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 61 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 62 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 122 for information about black mark requirements.

Transmissive Media Sensor

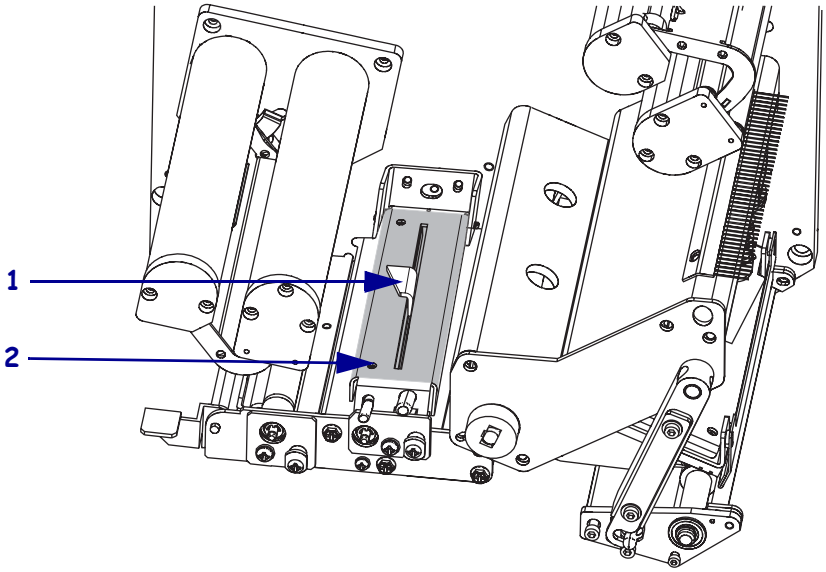
The transmissive media sensor finds “start of label” indicators, such as notches or holes in the media or interlabel gaps. This sensor consists of a light source (positioned below the media) and a light sensor (positioned above the media).

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



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 *PAUSE Self Test* on page 112 and *FEED Self Test* on page 113.

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.

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.

Table 5 • Save Options When Leaving Setup Mode

LCD	Description
LOAD LAST SAVE	Loads values from the last permanent save.
DEFAULT NET	Restores the wired 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.

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.

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 6 • Print Engine Parameters (Sheet 1 of 18)

Parameter	Action/Explanation
	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 113 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
	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
	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

Table 6 • Print Engine Parameters (Sheet 2 of 18)

Parameter	Action/Explanation
BACKFEED SPEED 2 IPS +	**Adjust Backfeed Speed** If backfeed is on, adjusts the speed at which the label backs up before printing (given in inches per second). • 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 (Sheet 3 of 18)

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 **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 (Sheet 4 of 18)

Parameter	Action/Explanation
MAXIMUM LENGTH -39.0 IN 988 MM	**Set Maximum Label Length** Maximum length is used in conjunction with the calibration procedure. The value of this setting is the maximum label length that is used during the media portion of the calibration process. Only a few labels are required to set media sensors. The interlabel gap is considered part of the label length and must be taken into consideration. Always set a value that is at least 1 in. (25.4 mm) longer than the length of the label you are using. For example, if the label length is 5 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). 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. • 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.
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.**

Table 6 • Print Engine Parameters (Sheet 5 of 18)

Parameter	Action/Explanation
EARLY WARNING MAINT. OFF	**Set Early Warning for Maintenance** When this parameter is enabled, the print engine provides warnings when the printhead needs to be cleaned. **Note •** 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.**
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, optional EPROM, 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.

Table 6 • Print Engine Parameters (Sheet 6 of 18)

Parameter	Action/Explanation
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.
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.

Table 6 • Print Engine Parameters (Sheet 7 of 18)

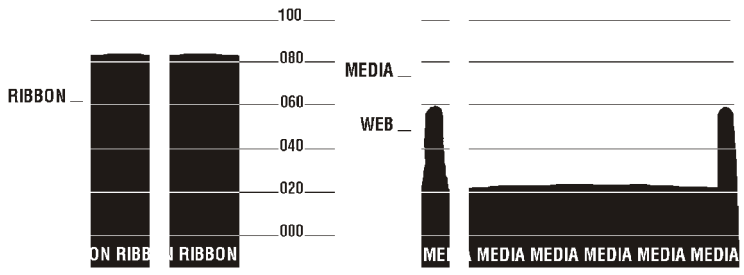
Parameter	Action/Explanation
INIT FLASH MEM YES	**Initialize Flash Memory** **Caution •** Perform this operation only when it is necessary to erase all previously stored information from Flash memory. **1.** Press the right oval to select **YES**. (If you are prompted to enter the password, see *Changing 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.
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 38 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 62 to adjust sensor sensitivity. **Figure 38 • Media Sensor Profile** 

Table 6 • Print Engine Parameters (Sheet 8 of 18)

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 (Sheet 9 of 18)

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 (Sheet 10 of 18)

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 116. 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 (Sheet 11 of 18)

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 (Sheet 12 of 18)

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 (Sheet 13 of 18)

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 (Sheet 14 of 18)

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. **Note** • Set this value as suggested by the applicator manufacturer. • **Off:** The applicator port is off. • **Mode 1:** Asserts the **~END_PRINT** signal low while the print engine is moving the label forward. • **Mode 2:** Asserts the **~END_PRINT** signal high while the print engine is moving the label forward. • **Mode 3:** Asserts the **~END_PRINT** signal low for 20 milliseconds when a label has been completed and positioned. Not asserted during continuous printing modes. • **Mode 4:** Asserts the **~END_PRINT** signal high for 20 milliseconds when a label has been completed and positioned. Not asserted during continuous printing modes. • 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 (Sheet 15 of 18)

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 66). • 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 (Sheet 16 of 18)

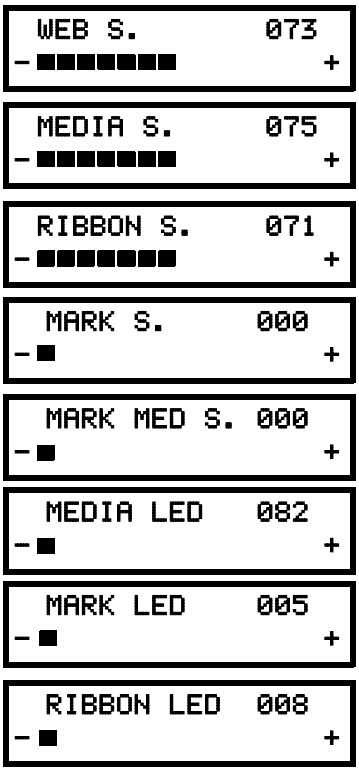
Parameter	Action/Explanation
	Set Reprint Mode When the Reprint feature is enabled, the reprint input signal (Pin 6) on the applicator port is functional. When the input signal is asserted, the last label printed is printed again. (This includes non-printing labels.) When the Reprint feature is disabled, 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
	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.
	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 (Sheet 17 of 18)

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.
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.

Table 6 • Print Engine Parameters (Sheet 18 of 18)

Parameter	Action/Explanation
RFID TEST QUICK SLOW	**Perform RFID Test** In both versions of this test, the print engine attempts to read and write to a transponder. In the slow test, the print engine also checks the reader version number. If the print engine fails the test, the front panel displays an error message. **1.** Place an RFID tag over the reader (no movement occurs with the test). **2.** Press SELECT to select the parameter. **3.** Press MINUS (–) to select **QUICK**. OR Press PLUS (+) to select **SLOW**. **4.** If necessary, press PLUS (+) to select **CONTINUE**. **5.** Press SELECT to deselect the parameter.
RFID ERR STATUS	**Show RFID Error Status** If an error condition exists, a message may be displayed here.
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® Print Server LCD Displays

The menu options shown in Table 7 display only if you have the ZebraNet PrintServer II installed.

Table 7 • Print Server LCD Displays

Parameter	Action/Explanation
IP PROTOCOL[1]	**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 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
IP ADDRESS[1]	**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[1]	**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.
DEFAULT GATEWAY[1]	**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.

1 These parameters appear after the system recognizes the existence of a ZebraNet print server. 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.

Notes • _____

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5

RFID Guidelines

This chapter provides an overview of how RFID works and the ZPL commands used to create RFID labels.

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Overview

The R110*PAX*3 “smart” label printer-encoders serve as dynamic tools for both printing and encoding RFID labels, tickets, and tags. The print engine encodes information on ultra-thin UHF RFID transponders 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.

Functionality of an encoded “smart” label 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 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 a “smart” 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 “smart” label and the print engine is established when the transponder lines up with the print engine’s antenna. The optimal transponder 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 print engine may print with low quality. Design your printed label around the location of the chip in the type of approved “smart” label that you select. For the list of approved transponders and related placement specifications, go to http://www.rfid.zebra.com.

Important • It is important to use transponders that have been specifically approved for use in this RFID print engine. 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 print engine. For the list of approved transponders, go to http://www.rfid.zebra.com.

ZPL II Commands for RFID

Printing and encoding (writing) of "smart" labels is handled through the use of Zebra Programming Language (ZPL). Each transponder has memory that can be read from through ZPL commands, and most transponders have memory that can be written to. The print engine divides the ZPL commands that it receives into two categories: RFID and non-RFID (such as the printing commands for bar codes or human-readable text).

ZPL commands also provide for exception handling, such as setting the number of read/write retries before declaring a transponder defective. For example, if an RFID transponder fails to program correctly or cannot be detected, the print engine ejects it and prints the word "VOID" across the label. This process continues for the number of RFID tags specified by the `^RS` command using the same data and format.

The following pages provide the ZPL II commands that can be used for RFID applications.

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

^HV

Host Verification

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

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 the ^RT command. *Accepted values:* 0 to 9999 *Default value:* 0
n = maximum number of bytes to be returned	*Accepted values:* 1 to 256 *Default value:* 64
h = header	Header (in ASCII characters) to be returned with the data. *Acceptable values:* 0 to 3072 characters *Default value:* none

^RS

RFID Setup

Important • Use care when using this command in combination with ^RT (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.

Description The ^RS command sets up various RFID parameters, including label position, error handling, and number of retries.

Format ^RSt,p,v,n,e,s,r

The following table identifies the parameters for this format.

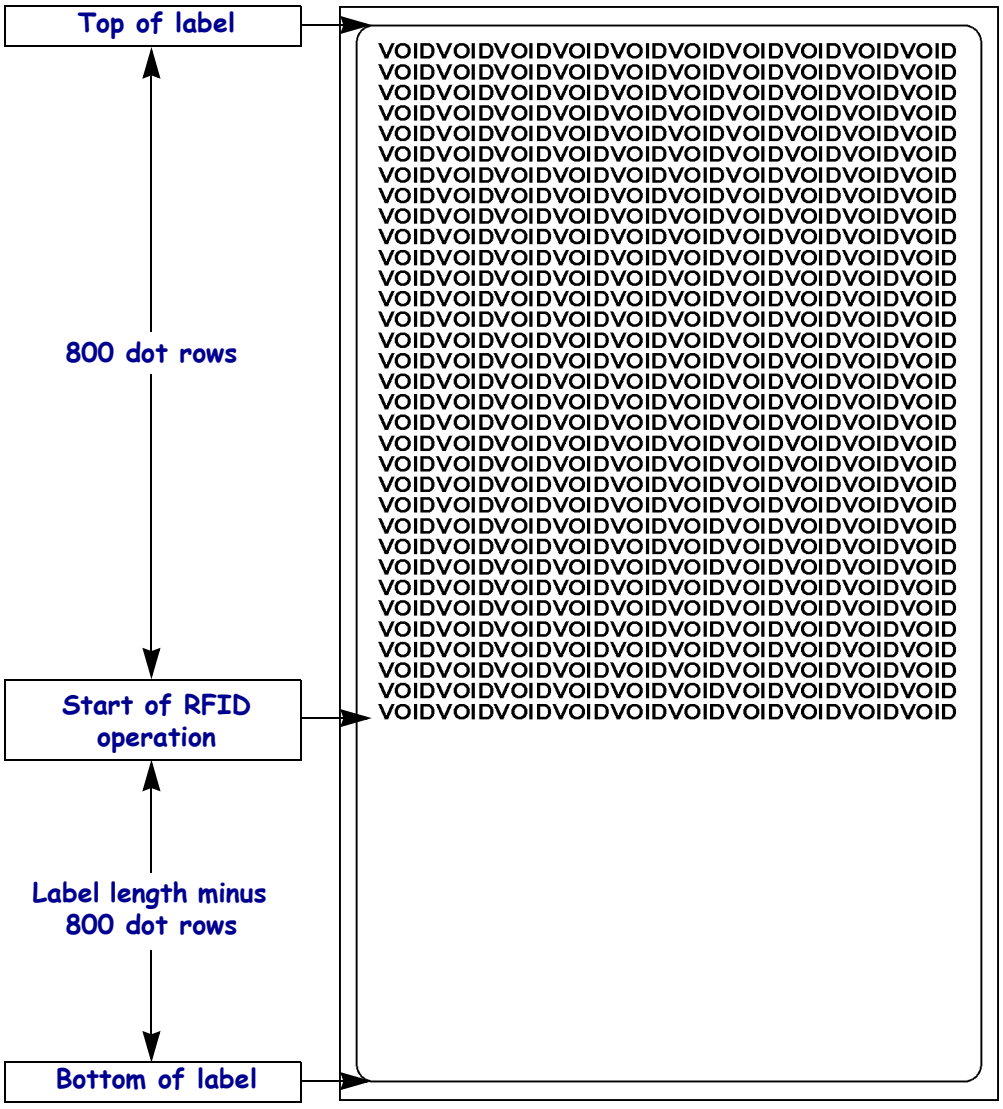
Parameters	Details
t = tag type	*Accepted values:* • 1 = Auto detect (automatically determine the tag type by querying the tag) *Default value:* 1
p = read/write position of the transponder	Sets the read/write position of the transponder in the vertical (Y axis) in dot rows from the top of the label. Set to 0 (no movement) if the transponder is already in the effective area without moving the media. *Accepted values:* 0 to label length *Default value:* label length minus 8 dot rows
v = length of void printout	Sets the length of the void printout in vertical (Y axis) dot rows. *Default value:* label length *Accepted values:* 0 to label length
n = number of labels	The number of labels that will be attempted in case of read/encode failure. *Default value:* 3 *Accepted values:* 1 to 10 (number of labels)
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.

Parameters	Details
s = signals on applicator	When the value for parameter p (read/write position of the transponder) is nonzero, this paramters 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 print engine will resume printing only after the second start print command is received. *Accepted values:* • S (single) signal • D (double) signal *Default value:* S
r = RFID pre-read disable	To optimize throughput, the RFID tag is pre-read to ensure that a transponder is present before trying to write to it. This function can be disabled. *Accepted values:* • N (use RFID pre-read) • Y (disable RFID pre-read) *Default value:* N

Example 1 • This example sets the print engine 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 print engine will try to print two labels, then will pause the print engine if printing and encoding fail.

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

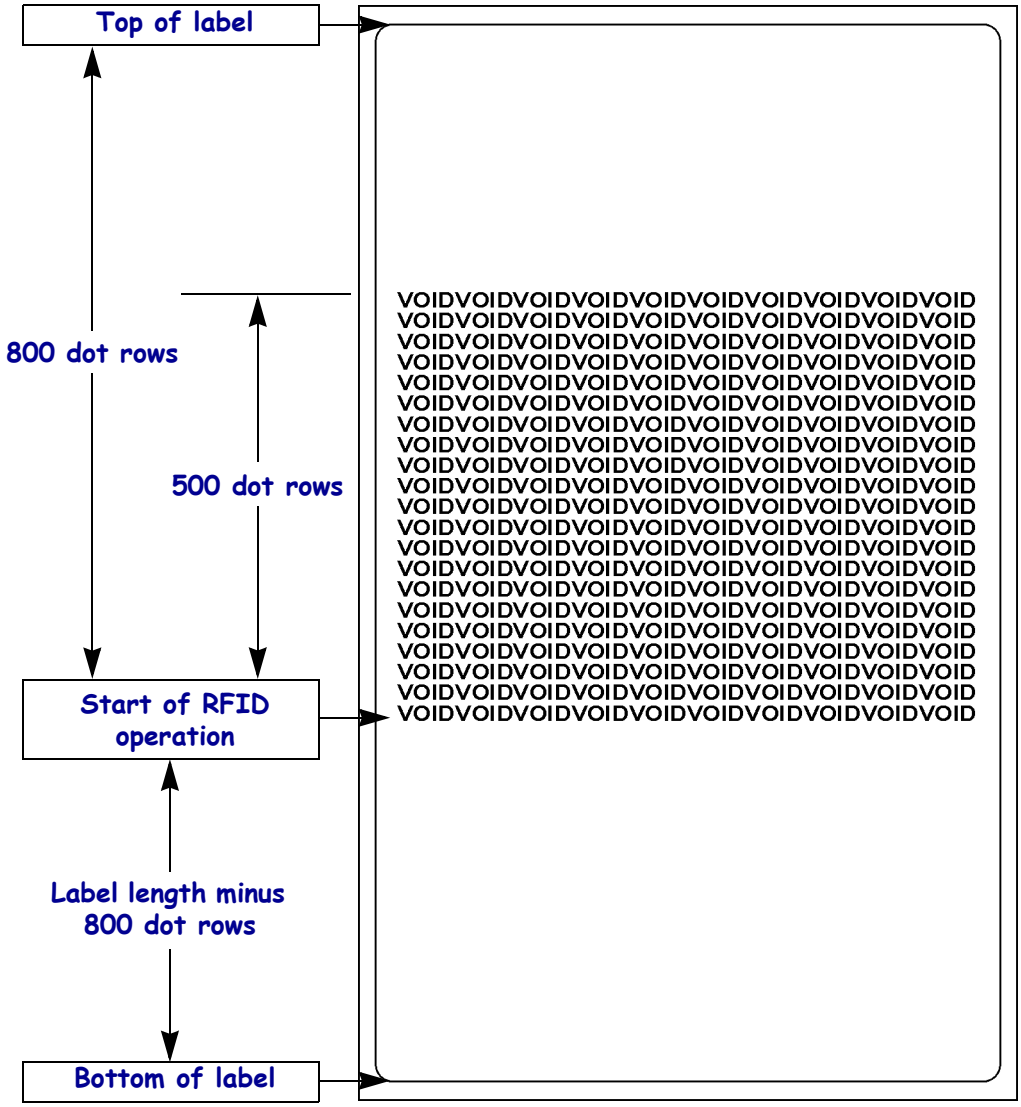
The following illustration shows the resulting voided label. Note where the void starts. The media has been moved 800 dot rows from the top of the label (label length minus 800 dot rows from the bottom (leading edge) of a label) to bring the transponder into the effective area to read/write a tag. If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



Example 2 • This example sets the print engine 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 print engine 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 Tag

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

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 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 give you block 6 and block 7 information. *Default value:* 1
f = format	*Accepted values:* • 0 (ASCII) • 1 (Hexadecimal) *Default value:* 0
r = number of retries	The number of times that the command will be tried on the same tag. *Accepted values:* 0 to 10 *Default value:* 0
m = motion	*Accepted values:* • 0 (Feed label after reading.) • 1 (No Feed after reading. Other ZPL may cause a feed.) *Default value:* 0
s = special mode*	For EPC Class 1 (Alien reader) only. Not applicable for EPC class 0. *Default value:* 0 (Do not read if mismatched checksum.) *Accepted values:* 1 (Read even if mismatched checksum.)

* Not applicable for R110*PAX*3.

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 print engine will retry the command on the same tag five times, if necessary.

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

^WT

Write Tag

Note • 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 data will be truncated.

Description The `^WT` command allows you to program the current RFID tag.

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

The following table identifies the parameters for this format.

Parameters	Details
`b` = block number*	*Accepted values:* • 0 (ID data/EPC) • 1 (User data) *Default value:* 0
`r` = number of retries	The number of times that the command will be tried on the same tag. *Accepted values:* 0 to 10 *Default value:* 0
`m` = motion	*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
`f` = data format	*Accepted values:* • 0 (ASCII) • 1 (Hexadecimal) *Default value:* 0
`v` = verify valid data*	*Default value:* Y *Accepted values:* • N (Do not verify) • Y (Verify valid data [Hex A5A5 in the first two bytes] before writing)

* Not applicable for R110PAX.

Example • This sample encodes data “RFIDRFID”. The print engine will try writing the same tag up to five times, if necessary.

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

Sample of RFID Programming

ZPL II is Zebra's label design language. ZPL II lets you create a wide variety of labels from the simple to the very complex, including text, bar codes, and graphics.

This section is not intended as an introduction to ZPL II. If you are a new ZPL II user, order the *ZPL II Programming Guide* (part number 46530L) or go to http://support.zebra.com to download the guide.

For your programming, do the following:

1. Set up the print engine, and then turn the power On (**I**).
2. Use any word processor or text editor capable of creating ASCII-only files (for example, use Microsoft® Word and save as a .txt file) and type in the label format exactly as shown in the sample label format shown in Table 8.
3. Save the file in a directory for future use. Use the ".zpl" extension.
4. Copy the file to the print engine.

   From the DOS command window, use the "COPY" command to send a file to the print engine. For example, if your file name is **format1.zpl** then type,
   `COPY FORMAT 1.ZPL XXXX`
   where `XXXX` is the port to which your print engine is connected (such as LPT1).
5. Compare your results with those shown. 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. If nothing prints, refer to
   - *Before You Begin* on page 14
   - *Print Engine Operation* on page 31
   - *Print Engine Configuration* on page 51
   - *Troubleshooting* on page 99

   to make sure that your system is set up correctly.

Table 8 • Sample ZPL Code and Results

Line Number	Type This Label Format	Resulting Printout
1	^XA	**123456789ABCDEF*** Zebra
2	^RS,0^FS	
3	^WT^FDZebra^FS	
4	^FO100,100^A0n,60^FN0^FS	
5	^FO100,200^A0n,40^FN1^FS	
6	^RT0^FS	
7	^RT1,,,1^FS	
8	^XZ	

Line 1 Indicates start of label format.
Line 2 Indicates no movement for media.
Line 3 Writes the data “Zebra” to the tag.
Line 4 Print field number ‘0’ at location 100,100.^FN0 is replaced by what we read on line 6.
Line 5 Print field number ‘1’ at location 100,200. ^FN1 is replaced by what we read on line 7.
Line 6 Read Tag into field number 0 in ASCII format (default).
Line 7 Read Tag into field number 1 in hexadecimal format.
Line 8 End of label format.

* This value will be the actual transponder ID.

6

Routine Maintenance

This chapter provides routine cleaning and maintenance procedures.

Contents

Cleaning Schedule 90
Clean Exterior 90
Clean Interior 91
  Clean the Sensors 91
  Clean the Printhead and Platen Roller 93
Toggle Positioning 95
Printhead Pressure Adjustment 96
Power Fuse Replacement 97

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 9. 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 9 • 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

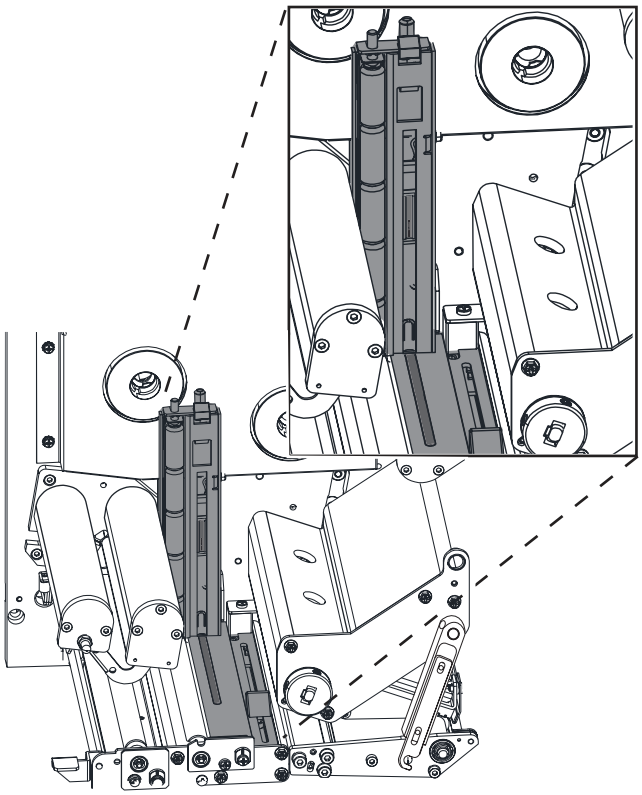
Remove any accumulated dirt and lint from the interior of the print engine using a soft bristle brush and/or vacuum cleaner. This area should be inspected every time a new ribbon is loaded.

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:

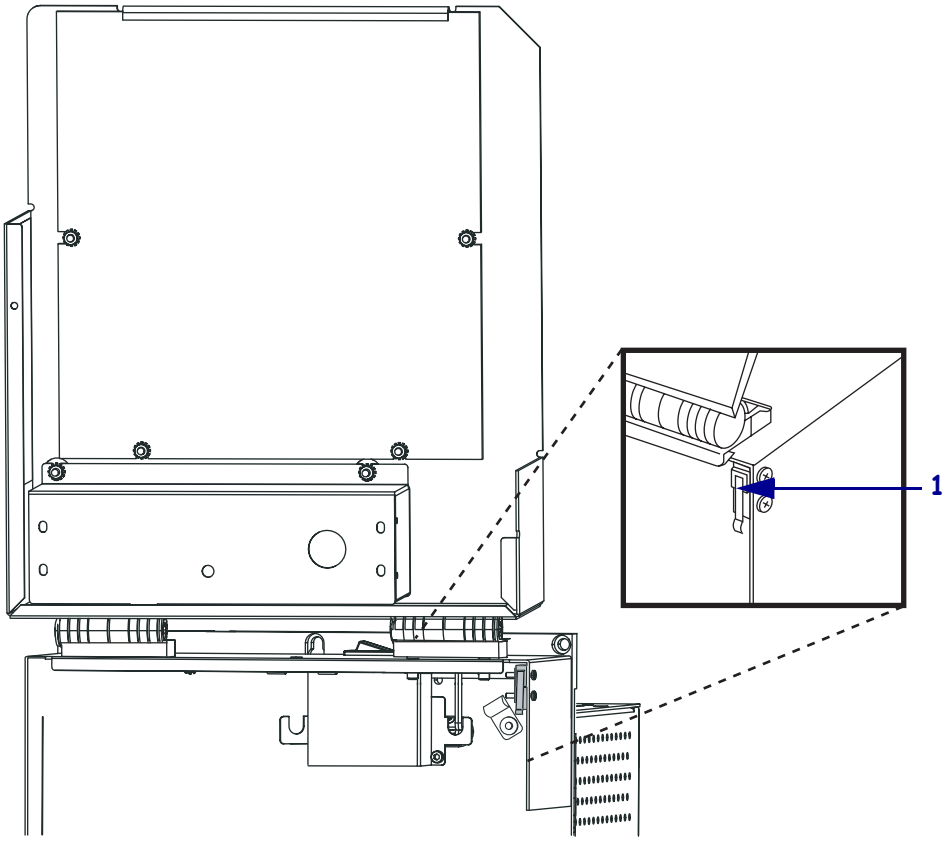
- See Figure 39 for the media sensors.
- See Figure 40 on page 92 for the door-open sensor.
- See Figure 41 on page 92 for the ribbon sensor and ribbon sensor reflector.

Figure 39 • Media Sensor Locations



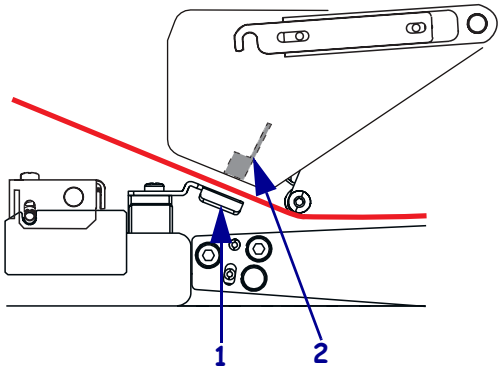
1	Upper transmissive media sensor
2	Reflective media sensor
3	Lower transmissive media sensor

Figure 40 • Door-Open Sensor Location



1	Door-open sensor

Figure 41 • Ribbon Sensor Location



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 9 on page 90. Clean the printhead more often if you see inconsistent print quality, such as voids or light print. Clean the platen roller if you see media movement problems.

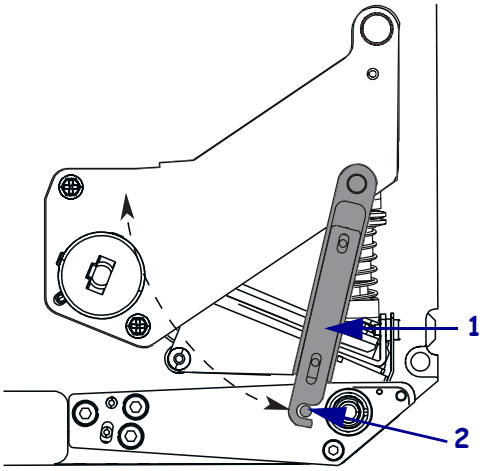
To clean the printhead and platen roller, complete these steps:

Caution • 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 42. Open the printhead assembly by unlatching the printhead latch from the locking pin.

Figure 42 • Opening the Printhead Assembly

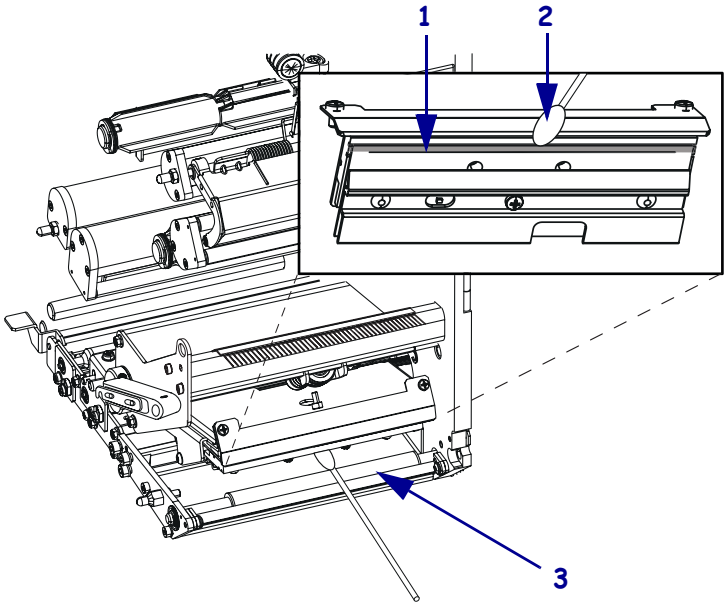


1	Printhead latch
2	Locking pin

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

4. See Figure 43. 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 43 • Printhead and Platen Roller Cleaning



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.

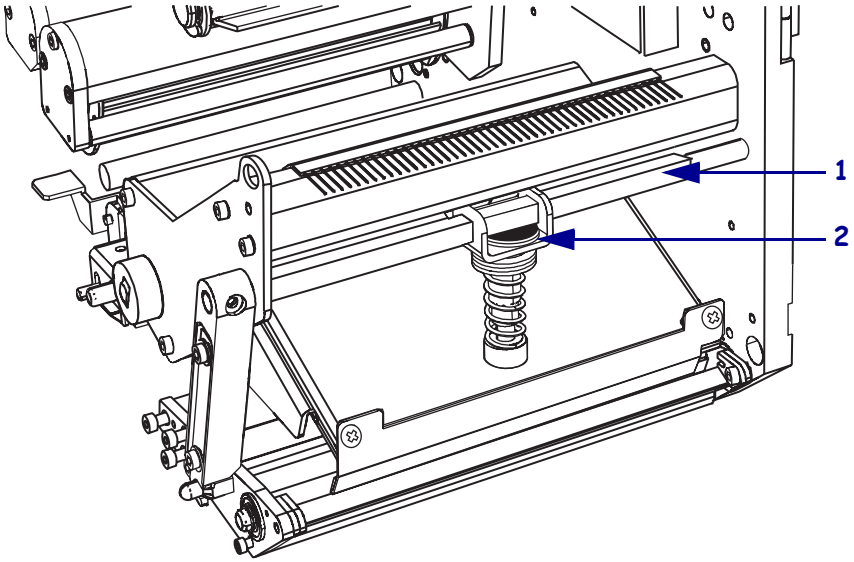
Toggle Positioning

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 44. 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 44 • Toggle Positioning



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 95.

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

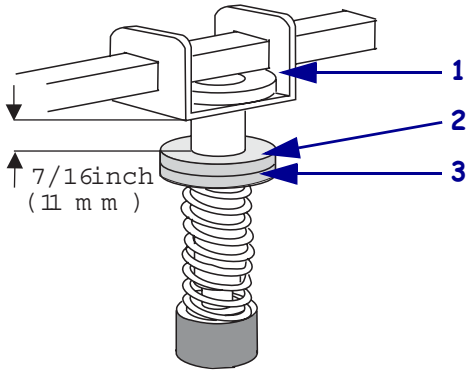
- if there is noticeable bleed or swelling in the printed image (too much pressure)
- if there are voids (too little pressure)
- if the darkness setting (burn duration) is set properly, but printing is too light (too little pressure)

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 45. 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 112 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 45 • Printhead Pressure Adjustment



1	Yoke
2	Locking nut
3	Adjusting nut

Power Fuse Replacement

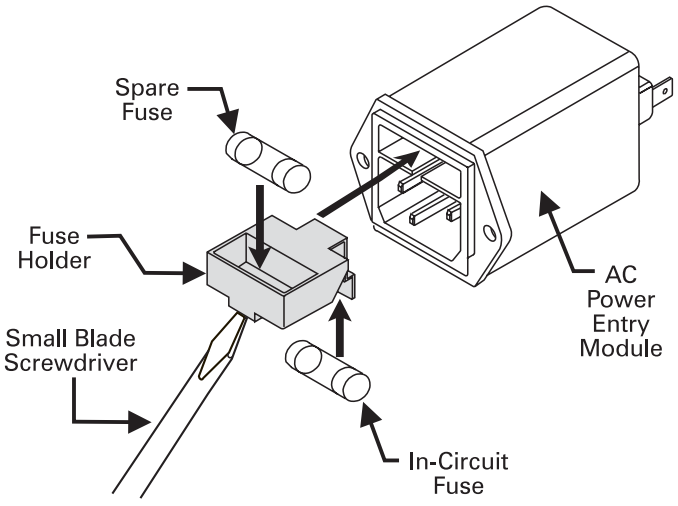
The print engine uses a metric-style fuse (5 × 20 mm IEC) rated for 5 Amps at 250 Volts that bears the certification mark of a known international safety organization (see Figure 12 on page 23). The power entry module comes with two approved fuses in the fuse holder: one is in-circuit and the other is a spare.

To replace a fuse, complete these steps:

1. See Figure 46. 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 99.

Figure 46 • 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.

Contents

Troubleshooting Checklists 100
LCD Error Messages 101
Memory Errors 103
Print Quality Problems 104
Communications Problems 107
Miscellaneous Print Engine Problems 108
Print Engine Diagnostics 110
- Power-On Self Test 110
- Additional Print Engine Self Tests 110
- Communications Diagnostics Test 116

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 101 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 62.
- ❑ Are you experiencing problems with print quality? If yes, see *Print Quality Problems* on page 104.
- ❑ Are you experiencing communications problems? If yes, see *Communications Problems* on page 107.

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 48.
- ❑ Does the printhead need to be adjusted? See *Printhead Pressure Adjustment* on page 96 for more information.
- ❑ Do the sensors need to be calibrated? See *Calibrate Media and Ribbon Sensor Sensitivity* on page 62 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 110. 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 10 for LCD errors, the possible causes, and the recommended solutions.

Table 10 • 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 62.
	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 62.
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 10 • 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 11 indicate that the print engine does not have enough memory to perform the function shown on the second line of the LCD.

Table 11 • 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.** With PAUSE on, 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. **2.** With PAUSE on, press CANCEL. The print engine skips the current label formatting process and goes to the next label. **3.** Turn the print engine OFF (**O**) and then ON (**I**) to clear the print engine's memory. **4.** 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 12 identifies problems with print quality, the possible causes, and the recommended solutions.

Table 12 • 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 93. **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 12 • 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 96.
	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 95 and *Printhead Pressure Adjustment* on page 96.
		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 96.
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 12 • 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 93.
	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 67.
	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 93.
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 62.
	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 13 identifies problems with communications, the possible causes, and the recommended solutions.

Table 13 • 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 63.
		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 64.
		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 65 and *Set Delimiter Character* on page 65 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 14 identifies miscellaneous problems with the print engine, the possible causes, and the recommended solutions.

Table 14 • 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 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 62.
	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 are 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 62.

Table 14 • Miscellaneous Print Engine Problems (Continued)

Problem	Possible Cause	Recommended Solution
The 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 62.
All lights on, but nothing displays on the LCD, and the print engine locks up.	Internal electronic or firmware failure.	Call a service technician.
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. 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 and then ON.
- If print engine is in applicator mode and the liner is being taken up by the applicator, the operator must manually remove the labels as they become available.

CANCEL Self Test

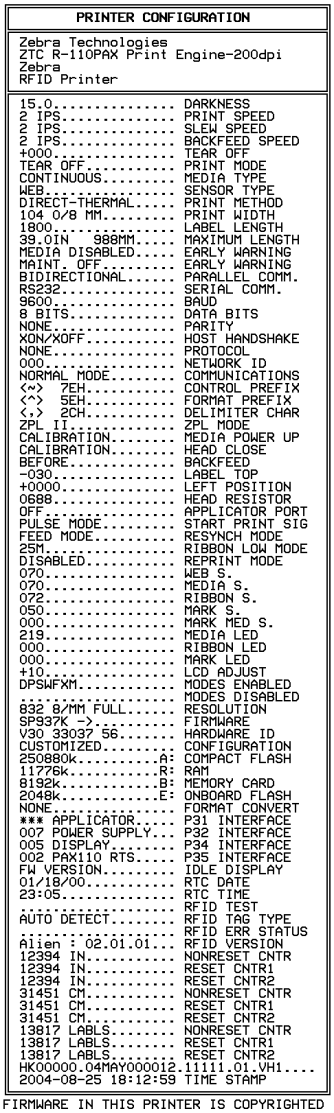
The CANCEL self test prints a configuration label, which tells you the settings for the print engine stored in configuration (EEPROM) memory (Figure 47). The settings may be changed either temporarily (for specific label formats or ribbon and label stock) or permanently (by saving the new parameters in EEPROM memory). New parameters are saved whenever a print engine calibration procedure is performed. Refer to *Front Panel LCD* on page 55 for further details on changing parameters.

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 47).

Figure 47 • Configuration Label



```
PRINTER CONFIGURATION

Zebra Technologies
ZTC R-110PAX Print Engine-200dpi
Zebra
RFID Printer

15.0............... DARKNESS
2 IPS.............. PRINT SPEED
2 IPS.............. SLEW SPEED
2 IPS.............. BACKFEED SPEED
+000............... TEAR OFF
TEAR OFF........... PRINT MODE
CONTINUOUS......... MEDIA TYPE
WEB................ SENSOR TYPE
DIRECT-THERMAL..... PRINT METHOD
104 0/8 MM......... PRINT WIDTH
1800............... LABEL LENGTH
39.0IN   988MM..... MAXIMUM LENGTH
MEDIA DISABLED..... EARLY WARNING
MAINT. OFF......... EARLY WARNING
BIDIRECTIONAL...... PARALLEL COMM.
RS232.............. SERIAL COMM.
9600............... BAUD
8 BITS............. DATA BITS
NONE............... PARITY
XON/XOFF........... HOST HANDSHAKE
NONE............... PROTOCOL
000................ NETWORK ID
NORMAL MODE........ COMMUNICATIONS
<~>  7EH........... CONTROL PREFIX
<^>  5EH........... FORMAT PREFIX
<,>  2CH........... DELIMITER CHAR
ZPL II............. ZPL MODE
CALIBRATION........ MEDIA POWER UP
CALIBRATION........ HEAD CLOSE
BEFORE............. BACKFEED
-030............... LABEL TOP
+0000.............. LEFT POSITION
0688............... HEAD RESISTOR
OFF................ APPLICATOR PORT
PULSE MODE......... START PRINT SIG
FEED MODE.......... RESYNCH MODE
25M................ RIBBON LOW MODE
DISABLED........... REPRINT MODE
070................ WEB S.
070................ MEDIA S.
072................ RIBBON S.
050................ MARK S.
000................ MARK MED S.
219................ MEDIA LED
000................ RIBBON LED
000................ MARK LED
+10................ LCD ADJUST
DPSWFXM............ MODES ENABLED
................... MODES DISABLED
832 8/MM FULL...... RESOLUTION
SP937K ->.......... FIRMWARE
V30 33037 56....... HARDWARE ID
CUSTOMIZED......... CONFIGURATION
250880k.........A: COMPACT FLASH
11776k..........R: RAM
8192k...........B: MEMORY CARD
2048k...........E: ONBOARD FLASH
NONE............... FORMAT CONVERT
*** APPLICATOR..... P31 INTERFACE
007 POWER SUPPLY... P32 INTERFACE
005 DISPLAY........ P34 INTERFACE
002 PAX110 RTS..... P35 INTERFACE
FW VERSION......... IDLE DISPLAY
01/18/00........... RTC DATE
23:05.............. RTC TIME
................... RFID TEST
AUTO DETECT........ RFID TAG TYPE
................... RFID ERR STATUS
Alien : 02.01.01... RFID VERSION
12394 IN........... NONRESET CNTR
12394 IN........... RESET CNTR1
12394 IN........... RESET CNTR2
31451 CM........... NONRESET CNTR
31451 CM........... RESET CNTR1
31451 CM........... RESET CNTR2
13817 LABLS........ NONRESET CNTR
13817 LABLS........ RESET CNTR1
13817 LABLS........ RESET CNTR2
HK00000.04MAY000012.11111.01.VH1....
2004-08-25 18:12:59 TIME STAMP

FIRMWARE IN THIS PRINTER IS COPYRIGHTED
```

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 48 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 48 shows a sample of the labels.

Figure 48 • 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

During this print quality test, seven labels are printed at the 2 ips and seven at the 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 49) at various speeds and at darkness settings higher and lower than the darkness value shown on the configuration label.

Figure 49 • 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 Key and PAUSE Key

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

Table 15 • 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 15 • Control of Print Engine Parameters

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 (option EPROMS)
Firmware	Fixed (code EPROMS)
Configuration	Configuration
B:Memory	Fixed (option card)
J12 Interface	Fixed

Table 15 • Control of Print Engine Parameters

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

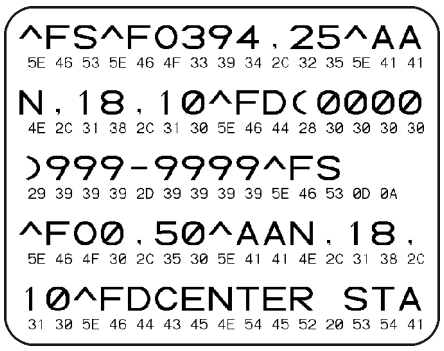
Communications Diagnostics Test

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 64. Figure 50 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 50 • 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	32° F to 105° F (0° C to 41° 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

Agency Approvals

- Binational UL 60950 3rd edition/CSA CAN/CSA-C22.2 No. 60950-00 3rd edition
- 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

- 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) with IEEE 1284-compliant software protocol (standard)
- Serial: high-speed RS-232C DB9 pin (standard)
- Applicator interface with female DB-15 connector

Memory

- 10.0 MB RAM (standard)
- 2.0 MB Flash (standard)
- 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 bit-map fonts, label templates, and formats
- Object copying between memory areas (RAM and PC memory card)
- Adjustable print cache
- Data compression
- Automatic memory allocation for "format while printing"
- Status messages to host upon request
- Format inversion (white on black)
- Mirror image printing
- Four-position field rotation (normal — 0°, 90°, 180°, and 270°)
- Slew command
- Programmable label quantities with print and pause control
- Automatic serialization of fields
- User-programmable password

Bar Codes

Bar code modulus "X" dimensions
Picket fence (non-rotated) orientation:

- 203 dpi = 0.0049 in. mil to 0.049 in.

Ladder (rotated) orientation:

- 203 dpi = 0.0049 in. mil to 0.049 in.

Linear bar codes
Code 11, Code 39, Code 93, Code 128 with subsets A/B C and UCC Case Codes, ISBT-128, UPC-A, UPC-E, EAN-8, EAN-13, UPC and EAN 2 or 5 digit extensions, Plessey, Postnet, Standard 2 of 5, Industrial 2 of 5, Interleaved 2 of 5, LOGMARS, MSI, and Codabar

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, and 3:1

Printing Specifications

Resolution	203 dots per inch (8 dots per mm)	
Dot size	0.0049 in. x 0.0049 in. (0.125 mm x 0.125 mm)	
First dot location (from inside media edge)	0.093 in. (2.4 mm)	
Maximum print width	4.1 in. (104 mm)	
Maximum print length (with full width media)	Non-continuous (4 MB Memory)	39 in. (990 mm)
	Non-continuous (12 MB Memory)	39 in. (990 mm)
	Continuous (4 MB Memory)	149 in. (3785 mm)
	Continuous (12 MB Memory)	546 in. (13,868 mm)
Programmable constant print 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)	

Media Specifications

Media width (label and liner)	Minimum	Non-RFID	0.63 in. (16 mm)
		RFID “smart” labels	Minimum label widths for RFID “smart” labels varies for each transponder type.
	Maximum		4.5 in. (114 mm)
Label length	Minimum	Non-RFID, applicator mode	0.5 in. (12.7 mm) with backfeed on 0.25 in. (6 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)	0.37 in. (9.5 mm) minimum
		Position	One of the following: • within 0.04 in. (1 mm) of the inside edge and <0.8 in (20 mm) from leading edge of media • centered within 0.23 in. to 2.25 in. (5.8 to 57 mm) from the media inner edge
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 • _____

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B

Data Ports

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

Contents

Parallel Port 126
Serial Port 127
Serial Pin Configuration 128
RS-232 Interface Connections 129
Applicator Interface Connector 132
Applicator Interface Connector Pin Configuration 132
Jumper Configurations for +5 V I/O Applicator Interface Board 134

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

Table 16 • 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 17 shows the pin configuration and function of the rear panel serial data connector on the print engine.

Table 17 • 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

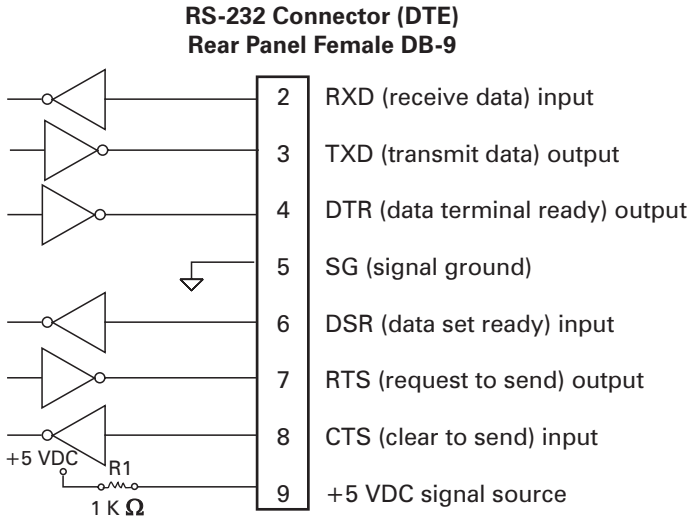
Direct Connection to a Computer

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

Figure 51 • 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.

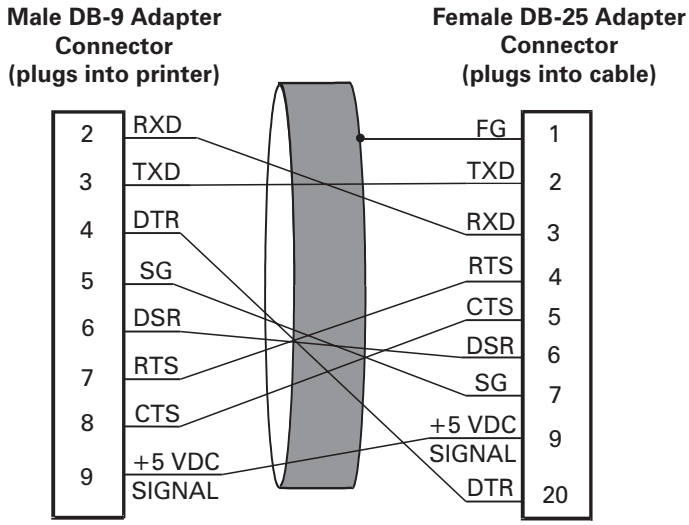
Caution • To enable this capability, a qualified service technician must install a jumper on the print engine's main logic board on JP1, pins 2 and 3.

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

Figure 52 • DB-9 to DB-25 Connections

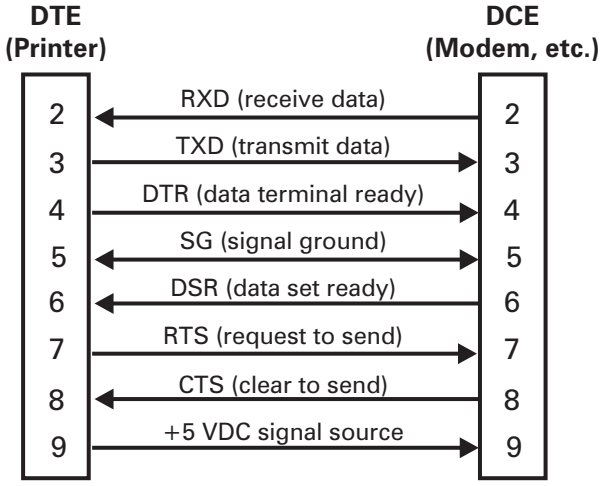


NOTE: Pin 1 of DB-9 connector is unused and unterminated.

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 53 shows the connections required for this cable.

Figure 53 • 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 applicator. An optional DB-15 to DB-9 adapter cable (Zebra part number 49609) is available to accommodate existing DB-9 interfaces.

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 18 lists the pin configurations and functions of the applicator interface connector for both +5 V and 24–28 V operation.

Table 18 • 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 19 on page 134 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 54 on page 135 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 19 on page 134 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.

Table 18 • Applicator Interface Connector Pin Configuration (Continued)

Pin No.	Signal Name	Signal Type	Description
5	PAUSE	Input	To toggle the current pause state, this input must be asserted LOW for 200 milliseconds, or until the SERVICE REQUIRED output (pin 10) changes state.
6	REPRINT	Input	If the Reprint feature is enabled, this input must be asserted LOW to cause the print engine to reprint the last label. See *Set Reprint Mode* on page 70 for more information. If the Reprint feature is disabled, this input is ignored.
7	+28 V (Fused at 500 mA. See Figure 54 on page 135 for fuse location.) **Caution** • Replace the fuse only with one of the same type and rating.	Power	Interface Power Supply – supplies power to external sensors as required.
8	POWER GROUND (+28 V Return)	Ground	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 69 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.

Table 18 • Applicator Interface Connector Pin Configuration (Continued)

Pin No.	Signal Name	Signal Type	Description
12	MEDIA OUT	Output	Asserted LOW while there is no media in the print engine.
13	RIBBON OUT	Output	Asserted LOW while there is no ribbon in the print engine.
14	DATA READY	Output	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 19 shows the pin and jumper configurations for pins 1 and 2 in +5 V I/O operation.

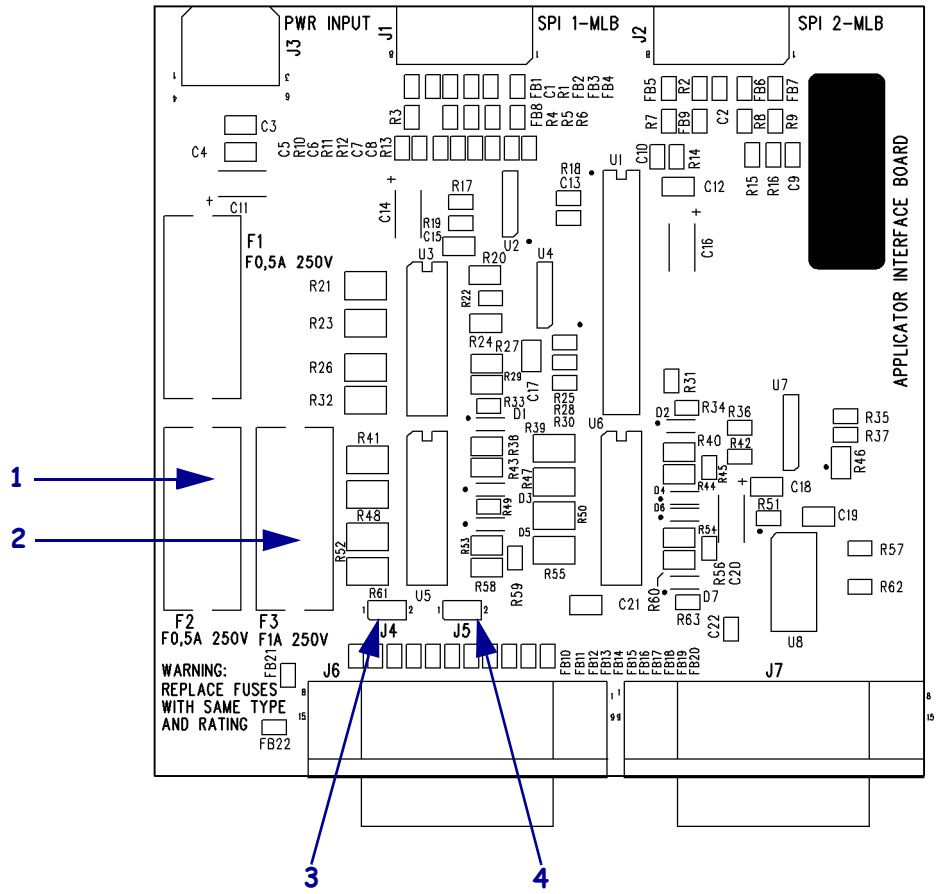
Jumpers J4 and J5 are used together to produce isolated or non-isolated modes of operation for applicator input and output control signals. J4 configures the +5 V source for the optoisolator circuits, and J5 configures the ground. For proper operation, when J4 is installed, J5 must be installed, and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

Table 19 • 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 54 illustrates the location of the fuses and the location of jumpers J4 and J5 for the +5 V I/O applicator interface board.

Figure 54 • Applicator Interface Board



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

Notes • _____

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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.

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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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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

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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.

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Notes •

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Notes •

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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