Linx 5900 & 7900

How To Install and Set Up the 5900 & 7900 Printer

LINX

THINKING ALONG YOUR LINES

How To Install and Set Up the 5900 & 7900 Printer

Contents

1 Installation

1.1 Introduction

This document describes how to install and set up the 5900 and 7900 printers. You can use these instructions to move the printer to a new location or make changes to the production line setup.

If you are not sure about any procedure, contact your local Linx distributor, who will be pleased to advise you or send a trained Linx-approved service engineer.

1.2 Health and Safety

Make sure that you read and understand the Health and Safety information in the 'Safety' section of the *Linx 5900 & 7900 Quick Start Guide*.

1.3 Equipment information

This equipment has been tested and found to comply with the limits for a Class A digital device, 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 instruction manual, 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.

1.4 Tools required

There are no special tools required to install the printer.

1.5 Where to install the printer

Install the printer in an area with good ventilation. Install the printer on a strong base, near a power supply that does not have electrical interference.

Make sure that:

- The vents at the base of the printer are not blocked.
- Air can flow freely around the bottom of the printer.
- There is a minimum clearance of 150 mm at the rear of the printer to allow some space for the printhead conduit to bend.

Figure 1 shows the layout of the rear panel of the Linx 5900 and 7900 printers.

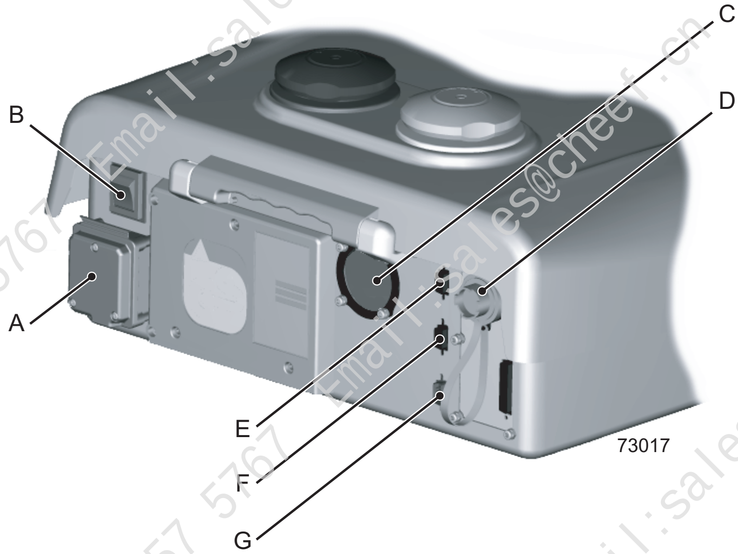

Figure 1. Linx 5900/7900 printer rear panel

Figure 1 shows the following items:

A	External power connection
B	Mains power supply switch
C	Printhead conduit entry/exit
D	External alarm connection
E	Primary trigger/shaft encoder
F	Secondary trigger/shaft encoder
G	RS232 interface

1.6 Connect to a power source

The Linx 5900 and 7900 printers uses a single-phase, 50/60 Hz AC supply of 100 V (maximum current 3 A) to 230 V (maximum current 1 A). Any AC voltage within this range provides acceptable power.

NOTE: Before you turn on the printer, make sure that the information shown on the label on the rear panel matches your power source.

Make sure that the Mains Power Supply Switch (item B in Figure 1) is in the Off (**O**) position before you connect the printer to the power supply.

The mains cable has a socket on one end, which connects to the printer. A local plug is fitted to the other end of the cable.

One of two types of cable is supplied. The cables have the same specification but the colours of the wires are different. The wire colours in the cable are as follows.

WIRE COLOUR		CONNECTION
Green-Yellow	Green	Earth/Ground
Blue	White	Neutral
Brown	Black	Live

Figure 2. Wire colours

WARNING: THIS PRINTER MUST BE EARTHED/GROUNDED.

WARNING: THE PRINTER MUST BE ELECTRICALLY WIRED ONLY BY A QUALIFIED AND COMPETENT ELECTRICIAN. LINX CANNOT ACCEPT RESPONSIBILITY FOR ANY INJURY TO PERSONNEL OR DAMAGE TO MACHINERY CAUSED BY INCORRECT OR FAULTY WIRING.

1.7 Fit the printhead to the production line

You can set the printhead at any angle. Use a Linx printhead bracket to hold the printhead correctly and prevent vibration—a number of bracket types are available.

The distance between the end of the printhead and the product is the '*throw distance*'. To make sure that the print quality is good, set the throw distance to the recommended distance shown in the table below.

Printhead	Recommended distance
Midi	6 mm for a 25 Linear Speed message type, 12 mm for all other message types
Ultima	12 mm
Midi *plus*	12 mm
Ultima *plus*	12 mm
Mini	The first digit in the name of the message type is the throw distance in millimetres. For example '4T...' indicates 4 mm. For the 5900, only 4 mm and 8 mm throw distances are available. The 7900 printer also has a 12 mm throw distance available.
Micro (7900 only)	4 mm

Figure 3. Recommended throw distances

1.7.1 Printhead conduit

The printer, conduit, and printhead are supplied as a unit. Follow these guidelines for the conduit:

- Do not bend the conduit at a sharp angle. The minimum radius for the conduit is 75 mm for static operation and 150 mm for dynamic applications (traversing).
- Make sure that the conduit has enough support.
- Make sure that you have access to the printhead for maintenance.
- Make sure that when the machinery guards are closed, the guards do not damage the conduit.
- Make sure that the conduit does not touch any sharp edges.
- For dynamic applications (traversing), Linx recommends that you use a 4-metre conduit. Leave a loop in the conduit to absorb the movement as shown below.

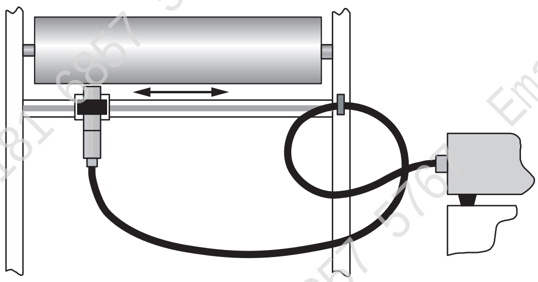

Figure 4. Printhead conduit with loop

2 Product sensor setup

The Linx 5900 and 7900 printers can use a product sensor to detect the presence of the product. Normally, the message is printed when the printer receives a trigger signal from the product sensor.

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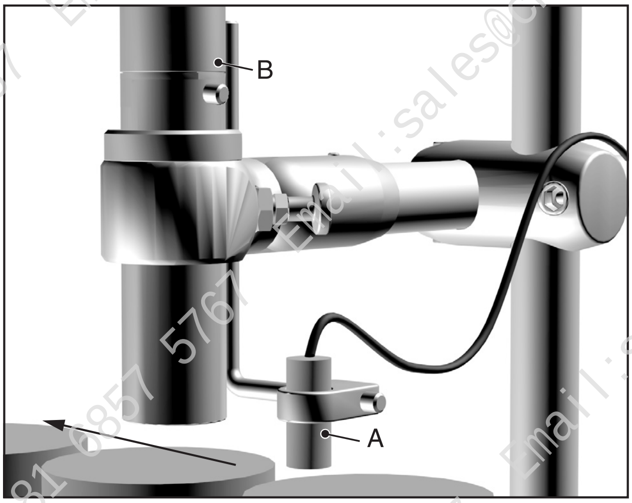

Figure 5. Product sensor setup

Normally, the product passes the product sensor first, then the printhead. The distance between the printhead and the product sensor must be less than the distance between the products.

Figure 5 shows the product sensor (A) and the printhead (B). The arrow shows the direction of movement of the product along the production line.

The **Print Delay** parameter controls the distance between the product sensor and the printed message. For information on how to adjust the **Print Delay**, see the *Linx 5900 & 7900 Quick Start Guide*.

The following product sensor types are available from Linx:

- Fibre optic control unit, 5 m D-type
- Retro-reflective light beam, 5 m D-type
- Inductive switch, 5 m D-type
- Reflection light beam scanner, 5 m D-type
- Background suppression sensor, 5 m D-type
- Colour registration mark scanner, 5 m D-type

2.1 Product Sensor connection

You must use a 9-pin, D-type connector to connect the product sensor to the printer. The following table describes the function of each pin.

Function	Connection
+ 24 V	Pin 1
0 V	Pin 2
Secondary Trigger	Pin 4
Primary Trigger	Pin 6

Figure 6. Product sensor pin connections

Connect the screen of the product sensor cable to the shell of the connector. The connector shell must connect to the printer chassis. Do *not* connect the screen to 0 volts.

To maintain the IP65 rating of the 7900 printer, the connector of the product sensor must have an IP65 rating. Linx product sensors have a D-type connector that has an IP67 rating.

CAUTION: Use only Linx-approved accessories. The EMC performance of the printer can change if you use other product sensors and cables.

3 Line speed detection setup

Linx recommends that you use a shaft encoder or dual trigger to detect the line speed on production lines where the speed can change. If your system has a fixed line speed, you can go to the next section.

The shaft encoder generates a pulse for a fixed distance of product movement. The pulses enable the printer to print at a constant width if the line speed changes.

For information about setting the line speed, see *How To Change the System Setup*.

Normally the shaft encoder is attached to a drive shaft on the production line. Install the shaft encoder in the best position to follow the movement of the products.

Linx offers the following range of shaft encoders for line speed detection:

- 2500 pulses per revolution (p.p.r.)
- 5000 p.p.r.
- 10000 p.p.r.

Each shaft encoder has a 5-metre cable fitted with a 9-pin D-type connector.

To measure the line speed, you can connect the shaft encoder to a drive shaft on the line, or to an encoder wheel. Linx provides the following range of encoder wheels:

- 500 mm circumference
- 333 mm circumference
- 304.8 mm (1 foot) circumference
- 200 mm circumference
- 60 mm circumference

3.1 Shaft encoder connection

You must use a 9-pin, D-type connector to connect the shaft encoder to the printer. The following table describes the function of each pin.

Function	Connection pin
+ 24 V	Pin 1
0 V	Pin 2
+ 5 V	Pin 3
Single-ended input	Pin 8

Figure 7. Shaft encoder pin connections

Connect the screen of the shaft encoder cable to the shell of the connector. The connector shell must connect to the printer chassis. Do *not* connect the screen to 0 volts.

To maintain the IP65 rating of the 7900 printer, the connector of the shaft encoder must have an IP65 rating. Linx shaft encoders have a D-type connector that has an IP67 rating.

CAUTION: Use only Linx-approved accessories. The EMC performance of the printer can change if you use other shaft encoders and cables.

3.1.1 Select the shaft encoder, encoder wheel, and Print Width

If you use a shaft encoder, you *must* perform the following calculations to calculate the number of pulses per millimetre and the drop pitch. The calculations require a series of steps as shown below:

1. Define the Required Raster Pitch.
2. Select the shaft encoder, the encoder wheel, and the Pitch Factor to get a raster pitch that approximately equals the correct pitch.
3. Make sure that the calculated performance is acceptable (message length and print speed).
4. Use the Pitch Factor to calculate the number of encoder pulses per millimetre. Enter this value into the **Speed** page (**Line Setup** > **Speed**).

   Calculate the raster pitch and use this value for the **Print Width** parameter (**Print Settings** > **Print Width**).
5. Check the print samples for performance.

If you do not follow these calculation steps, your messages are not printed at the required size. The spaces between the rasters are too small or too large.

3.1.2 Example calculation

The calculation below uses the following example:

- The message is a 16 Linear Quality Message Type.
- The printer has an Ultima 62 µm printhead, which requires 132 rasters for this message.
- The Print area is 50 mm long.

Step 1: Define the required Raster Pitch

To get the best print quality a 1:1 aspect ratio is needed—the vertical pitch (drop spacing) must equal the horizontal pitch. This drop pitch is the '*Ideal Raster Pitch*'. The Ideal Raster Pitch depends on the printhead type and the message type.

The effect of raster pitch is shown in Figure 8.

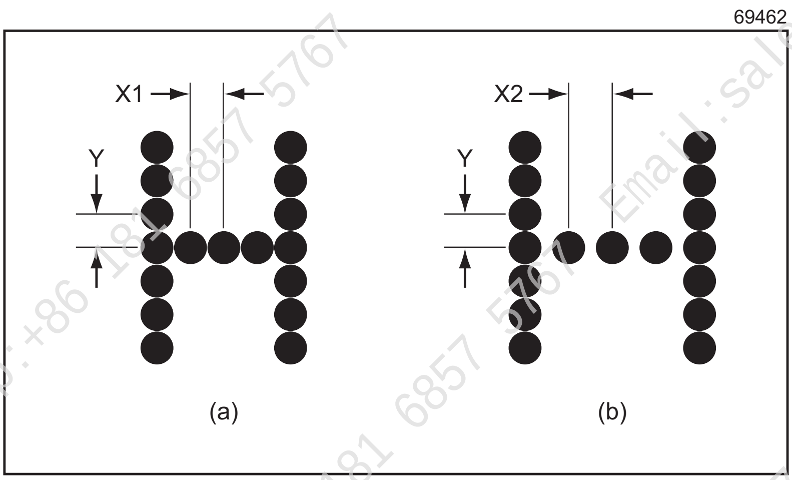

Figure 8. Raster Pitch

In Figure 8 (a) the letter 'H' is printed at the Ideal Raster Pitch—the horizontal spacing (X1) is equal to the vertical spacing (Y). In Figure 8 (b), the raster pitch is larger than the Ideal Raster Pitch—the horizontal spacing (X2) is larger than the vertical spacing (Y).

The section 'Ideal Raster Pitch tables' on page 18 contains tables that show the following parameters for each combination of printhead and message type:

- **Character matrices** (character width)
- **Ideal Raster Pitch** (mm)
- **Maximum raster rate** (kHz)
- **Maximum line speed** for the ideal raster pitch

If the raster pitch in your application does not equal the Ideal Raster Pitch, you can adjust the **Print Height** setting to make the aspect ratio 1:1.

NOTE: Not all message types listed in the Ideal Raster Pitch tables are available on the 5900 printer.

To calculate the required Raster Pitch

Use the formula:

$$\textit{Required Raster Pitch (mm)} = \frac{\textit{Printed Length (mm)}}{\textit{Number of Rasters in Message}}$$

where:

Printed length = the length of the printed message on the product. This length must not be greater than the length of the area that is left clear for printing.

Number of Rasters in Message: Where all the characters in the font have the same width, this value = Number of characters x Character width (rasters). If the characters have different widths, you can use the Cursor Position value in the **Message Editor** page to measure the printed length.

In this example, the length of the area that is available for the message is 50 mm and the message contains 132 rasters. The calculation is as follows:

$$\textit{Required Raster Pitch (mm)} = \frac{\textit{50 mm}}{\textit{132}} = \textit{0.378 mm}$$

If the pitch is greater than this value, the message does not fit into the 50 mm print area.

The ideal raster pitch for the 16 Linear Quality Message Type and Ultima 62 µm is 0.353 mm (see the table on page 20). In this example, the space between the drops, in the horizontal direction, is greater than the ideal raster pitch. This difference causes small spaces between the drops.

NOTE: Before you purchase any components, consider other products that you plan to put on the same line. Repeat the raster pitch calculations for other products as necessary.

Step 2: Select the encoder, encoder wheel, and pitch factor

Each combination of encoder and encoder drive (gears or wheels) gives a different 'encoder pitch'. The encoder pitch is the distance that the product moves for each encoder output pulse. The encoder pitch and the pitch factor (a whole number) are multiplied together to give the actual raster pitch. This value must be as close as possible to the required raster pitch.

The table below gives the encoder pitch for standard Linx encoders and wheels.

To calculate the encoder pitch for other gearing or drives, use the following:

$$\textit{Encoder Pitch} = \frac{\textit{Encoder wheel circumference}}{\textit{Encoder pulses per revolution}}$$

where:

Encoder wheel circumference = the distance that the product moves for one rotation of the encoder. This value depends on the application. For example, the wheel circumference can be 3.14 x roller diameter, or 3.14 x star-wheel diameter.

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	Wheel Circumference/Encoder Pitch (mm)					
Encoder p.p.r.	**Your Application**	**500 mm**	**333 mm**	**304.8 mm**	**200 mm**	**50 mm**
2500		0.200	0.133	0.121	0.080	0.020
5000		0.100	0.066	0.060	0.040	0.010
10000		0.050	0.033	0.030	0.020	0.005

Figure 9. Encoder Pitch for standard Linx encoders and wheels

The encoder pitch is multiplied by a whole number (or pitch factor) to give the actual raster pitch. Select an encoder and gearing to make the actual raster pitch close to the required raster pitch.

Actual Raster Pitch (mm) = Encoder Pitch (mm) x Pitch Factor

where the Pitch Factor is a whole number.

Select a combination of an encoder and gearing, calculate the encoder pitch, then multiply this value by whole numbers to get the actual raster pitch. Repeat this process until you get a value that is close to the required raster pitch.

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	Encoder/Gearing	**Encoder Pitch x**	**Pitch Factor =**	**Actual Raster Pitch**
Try 1				
Try 2				
Try 3				

Figure 10. Calculate the Pitch Factor

For each encoder pitch that you try, use the following formula to find the starting point for the pitch factor calculation:

$$\text{Pitch Factor*} = \frac{\text{Required Pitch (mm)}}{\text{Encoder Pitch (mm)}}$$

* This value is calculated to the nearest whole number.

In this example, the required raster pitch is 0.378 mm. You can use a standard Linx encoder and wheel to try to match this value.

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	Encoder/Gearing	Encoder Pitch x	Pitch Factor =	Actual Raster Pitch
Try 1	2500 p.p.r./200 mm	0.080 mm	4	0.32 mm
				Too Low
Try 2	2500 p.p.r./200 mm	0.080 mm	5	0.40 mm
				Too High
Try 3	5000 p.p.r./200 mm	0.040 mm	9	0.36 mm

Figure 11. Calculate the Pitch Factor: example

The actual raster pitch in Try 3 is acceptable because the value is close to the required raster pitch. Also the required raster pitch is the maximum. You can use a 5000 p.p.r. encoder and a 200-millimetre wheel. The pitch factor is 9.

You can see that when the encoder p.p.r. is greater, the actual raster pitch is closer to the required pitch. If the encoder p.p.r. is greater, you can adjust the required pitch, but the encoder cost is higher and the maximum print speed can decrease.

Step 3: Check the calculated print performance

If there is any difference between the required raster pitch and the actual raster pitch, the print performance can decrease. You must also consider the maximum frequency of the encoder signal.

For this step, you must perform the following steps:

1. Calculate the length of the printed message:

   Number of Rasters (step 1) x Actual Raster Pitch (step 2)

2. Calculate the maximum print speed for the message type

   Actual Raster Pitch (step 2) x Raster Rate (kHz)*

   * The raster rate depends on the printhead type and the message type—see the table on page 20.

   To make sure that the print quality is acceptable, the maximum print speed must be greater than the line speed. If necessary, select a message type that has a higher raster rate.

3. Calculate the maximum encoder speed:

   Encoder Pitch (Figure 9) x Maximum Signal Frequency (kHz)

   NOTE: The maximum signal frequency for Linx standard encoders is 80 kHz.

4. Compare the maximum line speed with the maximum encoder speed.

   If the maximum line speed is not less than the maximum encoder speed, repeat the selection process.

The following table shows the maximum encoder speeds for standard Linx encoders and wheels.

68546

Encoder p.p.r.	Maximum Encoder Speeds (m/s)				
	500 mm	333 mm	304.8 mm	200 mm	50 mm
2500	16.00	10.66	9.68	6.40	1.60
5000	8.00	5.33	4.80	3.20	.80
10000	4.00	2.66	2.40	1.60	.40

Figure 12. Maximum encoder speeds for standard Linx encoders and wheels

In this example, the actual raster pitch is 0.36 mm (step 2) and the number of rasters is 132 (step 1).

Printed Message Length (mm) = *132 x 0.36 (mm)*

= *47.52 (mm)*

This result shows that the message fits into the target area of 50 mm.

For a 16 Linear Quality message type and an Ultima 62 μm printhead, the raster rate is 1.74 kHz (see the table on page 20).

Maximum Print Speed (m/s) = *0.36 x 1.74 (kHz)*

= ***0.626 m/s***

The encoder/gearing that was selected has an encoder pitch of 0.040 mm (step 2), and a maximum encoder frequency of 80 kHz.

Maximum Line Speed (m/s) = *0.040 (mm) x 80 (kHz)*

= ***3.2 m/s***

This calculation shows that in this example the maximum print speed is not decreased by the maximum encoder frequency.

Step 4: Enter the calculated values

1 **Select the shaft encoder.**

Go to the **Speed** page (**Line Setup** > **Speed**).

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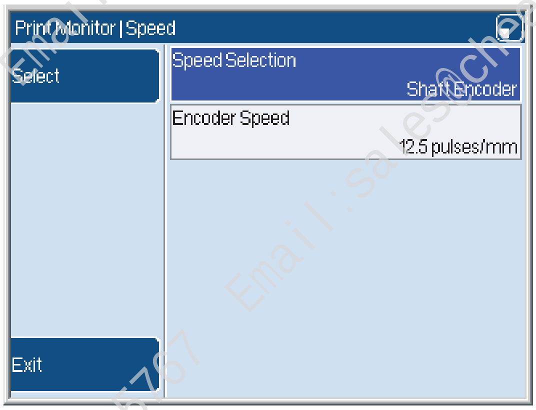

Figure 13. Speed page

Make sure that the **Speed Selection** parameter is set to ‘Shaft Encoder’ as shown.

2 **Enter the Pulses/mm value.**

At the **Speed** page (see Figure 13), enter the calculated Pulses/mm value into the **Encoder Speed** parameter.

The Pulses/mm value is the number of pulses of the encoder output signal for every millimetre of the product movement.

The following table shows the pulses per mm values for the combinations of Linx standard encoders and encoder wheels.

68550

	Encoder Pulses per mm for Wheel Circumferences				
Shaft Encoder p.p.r.	**500 mm**	**333 mm**	**304.8 mm**	**200 mm**	**50 mm**
2500	5.0	7.5	8.2	12.5	50.0
5000	10.0	15.0	16.4	25.0	100.0
10000	20.0	30.0	32.8	50.0	200.0

Figure 14. Encoder pulses/mm for Linx standard encoders and wheels

3 **Enter the Actual Raster Pitch (calculated from step 2).**

At the **Print Monitor** page, press the **Print Setting** key to display the **Print Settings** page.

Select the **Print Width** option and enter the calculated Actual Raster Pitch value.

The printer adjusts the value to the next lowest raster pitch given by a pitch factor, which is a whole number. To make sure that the corrected value is accepted, and prevent any rounding errors, enter the following raster pitch:

Selected Encoder Pitch x *(Pitch Factor + 0.5)*

The value required for this example is as follows:

$$0.040 \times (9 + 0.5) = \mathbf{0.38}$$

The printer changes the value to 0.36 when you press the **OK** key.

Step 5: Check the print performance

Create a message that uses the character size and the message type that you used in the calculations.

Make a sample of the print for different line speeds to confirm that the settings are correct. The line speeds must include the maximum line speed that you plan to use.

3.1.3 Summary

1. Calculate:

$$\textit{Required Raster Pitch} = \frac{\textit{Printed Length}}{\textit{Number of Rasters in Message}}$$

2. Refer to the tables in the section 'Ideal Raster Pitch tables' to get the Ideal Raster Pitch for your printhead and message type.
3. Calculate:

$$\textit{Encoder Pitch} = \frac{\textit{Encoder wheel circumference}}{\textit{Encoder pulses per revolution}}$$

4. Calculate:

$$\textit{Pitch Factor}^{*} = \frac{\textit{Required Raster Pitch}}{\textit{Encoder Pitch}}$$

* This value is calculated to the nearest whole number.

5. Calculate:

$$\textit{Actual Raster Pitch} = \textit{Encoder Pitch} \times \textit{Pitch Factor}$$

6. Calculate:

$$\textit{Printed Message Length} = \textit{Number of Rasters} \times \textit{Actual Raster Pitch}$$

Make sure that the Printed Message Length is less than the Printed Length in step 1.

7. Calculate the Maximum Print Speed for this message type:

$$\textit{Maximum Print Speed} = \textit{Actual Raster Pitch} \times \textit{Raster Rate}$$

8. Calculate:

$$\textit{Maximum Encoder Speed} = \textit{Encoder Pitch} \times \textit{Maximum Encoder Frequency}$$

(Maximum Encoder Frequency is 80 kHz for Linx standard encoders.)

9. Make sure that the Maximum Line Speed (step 7) is less than the Maximum Encoder Speed (step 8).
10. Make sure that the line speed is never greater than either the Maximum Print Speed or the Maximum Encoder Speed.
11. At the **Speed** page, enter the **Encoder Speed** value (pulses/mm) for the encoder and wheel combination.
12. At the **Print Settings** page, set the **Print Width** parameter to the value that you calculated for the Actual Raster Pitch (step 5).
13. Check the print performance.

3.2 Ideal Raster Pitch tables

NOTE: The rasters available depend upon the printer type (5900 or 7900) and the software configuration.

3.2.1 Midi and MidiEC printheads

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MIDI PRINTHEAD				
Message Type	**Character matrices (no. of lines x H x W)**	**Ideal raster pitch (mm)**	**Maximum raster rate (kHz)**	**Maximum line speed at ideal raster pitch (m/s)**
5 Linear Flexible	1Lx5x5	0.423	6.66	2.60
5 Linear Quality	1Lx5x5	0.353	8.00	2.56
5 Linear Wide	1Lx5x5	0.550	13.33	6.28
7 Linear Flexible	1Lx7x5	0.423	5.00	1.99
7 Linear Quality	1Lx7x5	0.353	5.71	1.88
7 Linear Wide	1Lx7x5	0.550	10.00	4.88
8 Linear Flexible	1Lx8x5	0.423	4.22	1.69
8 Linear Quality	1Lx8x5	0.353	4.70	1.56
8 Linear Wide	1Lx8x5	0.469	8.00	3.75
9 Linear Flexible	1Lx9x7	0.423	3.64	1.47
9 Linear Quality	1Lx9x7	0.353	4.44	1.48
16 Linear Flexible	1Lx16x10 2Lx7x5	0.423	1.29	0.53
16 Linear Quality	1Lx16x10 2Lx7x5	0.353	1.54	0.53
16 Linear Speed	1lx16x10 2Lx7x5	0.353	2.10	0.72
18 Linear Flexible	1Lx18x10 2Lx8x5	0.423	1.07	0.44
18 Linear Quality	1Lx18x10 2Lx8x5	0.353	1.27	0.44
18 Linear Speed	1Lx18x10 2Lx8x5	0.353	1.57	0.54
21 Linear Flexible	1Lx21x12 2L mixed	0.423	1.05	0.43
21 Linear Quality	1Lx21x12 2L mixed	0.353	1.16	0.40
25 Linear Quality	1Lx25x16 3Lx7x5	0.353	0.82	0.28
25 Linear Speed	1Lx25x16 3Lx7x5	0.353	1.11	0.38
34 Linear Quality	1Lx34x24 2Lx16x10 4Lx7x5	0.353	0.53	0.18
2x7 Stitched Speed	2Lx7x5	0.353	4.00	1.34
2x8 Stitched Speed	2Lx8x5	0.353	3.48	1.17
3x7 Stitched Quality	3Lx7x5	0.353	2.42	0.70
3x7 Stitched Speed	3Lx7x5	0.353	2.42	0.83
3x7 Stitched Wide	3Lx7x5	0.423	2.96	1.25
3x8 Stitched Speed	3Lx8x5	0.353	2.11	0.72
4x7 Stitched Quality	4Lx7x5	0.423	1.18	0.50

Figure 15. Midi printhead: Ideal Raster Pitch and Raster Rate

NOTE: The MidiEC printhead can print a maximum of three lines of text or graphics. The four line options shown in Figure 15 are not available.

3.2.2 Ultima printhead

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ULTIMA PRINTHEAD				
Message Type	Character matrices (no. of lines x H x W)	Ideal raster pitch (mm)	Maximum raster rate (kHz)	Maximum line speed at ideal raster pitch (m/s)
5 Linear Flexible	1Lx5x5	0.423	7.27	2.82
5 Linear Quality	1Lx5x5	0.353	8.89	2.82
5 Linear Speed	1Lx5x5	0.353	11.43	3.53
5 Linear Wide	1Lx5x5	0.469	13.33	6.25
7 Linear Flexible	1Lx7x5	0.423	5.00	1.99
7 Linear Quality	1Lx7x5	0.353	6.15	2.01
7 Linear Speed	1Lx7x5	0.353	10.00	3.53
7 Linear Wide	1Lx7x5	0.469	10.00	4.69
8 Linear Flexible	1Lx8x5	0.423	4.44	1.69
8 Linear Quality	1Lx8x5	0.353	5.33	1.76
8 Linear Speed	1Lx8x5	0.353	7.27	2.35
8 Linear Wide	1Lx8x5	0.469	8.89	4.16
9 Linear Flexible	1Lx9x7	0.423	3.64	1.47
9 Linear Quality	1Lx9x7	0.353	4.71	1.56
16 Linear Flexible	1Lx16x10 2Lx7x5	0.423	1.54	0.63
16 Linear Quality	1Lx16x10 2Lx7x5	0.353	1.74	0.56
16 Linear Speed	1Lx16x10 2Lx7x5	0.400	2.11	0.82
16 Linear Wide	1Lx16x10 2Lx7x5	0.469	3.20	1.44
18 Linear Quality	1Lx18x10 2Lx8x5	0.353	1.45	0.50
18 Linear Speed	1Lx18x10 2Lx8x5	0.400	1.82	0.71
21 Linear Quality	1Lx21x12 2L mixed	0.353	1.16	0.40
21 Linear Speed	1Lx21x12 2L mixed	0.353	1.38	0.47
25 Linear Quality	1Lx25x16 3Lx7x5	0.353	1.11	0.38
25 Linear Speed	1Lx25x16 3Lx7x5	0.353	1.45	0.51
2x5 Stitched Quality	2Lx5x5	0.353	5.33	1.88
2x7 Stitched Quality	2Lx7x5	0.353	3.81	1.34
2x7 Stitched Speed	2Lx7x5	0.353	5.71	2.01
2x7 Stitched Wide	2Lx7x5	0.424	5.71	2.42
2x8 Stitched Quality	2Lx8x5	0.353	3.33	1.17
2x8 Stitched Speed	2Lx8x5	0.353	5.00	1.76
3x7 Stitched Quality	3Lx7x5	0.353	2.05	0.70
3x7 Stitched Speed	3Lx7x5	0.353	2.96	1.00

Figure 16. Ultima printhead: Ideal Raster Pitch and Raster Rate

3.2.3 Midi *plus* printhead

68589

MIDI *plus* PRINTHEAD				
Message Type	**Character matrices (no. of lines x H x W)**	**Ideal raster pitch (mm)**	**Maximum raster rate (kHz)**	**Maximum line speed at ideal raster pitch (m/s)**
5 Linear Quality	1Lx5x5	0.428	5.33	2.10
7 Linear Quality	1Lx7x5	0.428	4.00	1.61
9 Linear Quality	1Lx9x7	0.428	2.46	1.01
16 Linear Quality	1Lx16x10 2Lx7x5	0.428	0.98	0.41
25 Linear Quality	1Lx25x16 3Lx7x5	0.428	0.68	0.28
34 Linear Quality	1Lx34x24 2Lx16x10 4Lx7x5	0.428	0.37	0.15

Figure 17. Midi *plus* printhead: Ideal Raster Pitch and Raster Rate

3.2.4 Ultima *plus* printhead

68590

ULTIMA *plus* PRINTHEAD				
Message Type	**Character matrices (no. of lines x H x W)**	**Ideal raster pitch (mm)**	**Maximum raster rate (kHz)**	**Maximum line speed at ideal raster pitch (m/s)**
5 Linear Quality	1Lx5x5	0.428	6.40	2.73
5 Linear Speed	1Lx5x5	0.428	10.66	4.56
5 Linear Wide	1Lx5x5	0.569	12.80	7.28
7 Linear Quality	1Lx7x5	0.428	3.76	1.61
7 Linear Speed	1Lx7x5	0.428	8.00	3.42
7 Linear Wide	1Lx7x5	0.569	9.14	5.20
9 Linear Quality	1Lx9x7	0.428	3.55	1.52
16 Linear Quality	1Lx16x10	0.428	1.28	0.54
16 Linear Speed	1lx16x10	0.428	1.82	0.78
16 Linear Wide	1lx16x10	0.560	1.88	1.05
21 Linear Quality	1Lx21x12	0.428	1.08	0.46
21 Linear Speed	1Lx21x12	0.428	1.36	0.58
25 Linear Quality	1Lx25x16	0.428	0.87	0.37
2x5 Stitched Quality	2Lx5x5	0.428	4.26	1.82
2x5 Stitched Speed	2Lx5x5	0.428	6.40	2.73
2x7 Stitched Quality	2Lx7x5	0.428	3.20	1.36
2x7 Stitched Speed	2Lx7x5	0.428	4.57	1.95
2x7 Stitched Wide	2Lx7x5	0.510	4.57	2.33
3x7 Stitched Quality	3Lx7x5	0.428	1.60	0.68
3x7 Stitched Speed	3Lx7x5	0.428	2.37	1.01

Figure 18. Ultima *plus* Printhead: Ideal Raster Pitch and Raster Rate

3.2.5 Mini printhead

MINI PRINTHEAD				
Message Type	Character matrices (no. of lines x H x W)	Ideal raster pitch (mm)	Maximum raster rate (kHz)	Maximum line speed at ideal raster pitch (m/s)
4T 1x 5 Quality 2.27 m/s	1Lx5x5	0.285	8.00	2.28
4T 1x 5 Speed 2.73 m/s	1Lx5x5	0.285	9.60	2.73
4T 1x 5 Speed 4.55 m/s	1Lx5x5	0.285	16.00	4.56
4T 1x 5 WIDE 6.83 m/s	1Lx5x5	0.428	16.00	6.84
4T 1x 6 Quality 2.27 m/s	1Lx6x5	0.285	8.00	2.28
4T 1x 6 Speed 3.41 m/s	1Lx6x5	0.285	12.00	3.42
4T 1x 7 Quality 1.95 m/s	1Lx7x5	0.285	6.85	1.95
4T 1x 7 Speed 2.27 m/s	1Lx7x5	0.285	8.00	2.28
4T 1x 7 Speed 3.03 m/s	1Lx7x5	0.285	10.66	3.04
4T 1x 7 Speed 3.41 m/s	1Lx7x5	0.285	12.00	3.42
4T 1x 7 WIDE 5.12 m/s	1Lx7x5	0.428	12.00	5.13
4T 1x 8 Quality 1.70 m/s	1Lx8x5	0.285	6.00	1.71
4T 1x 8 Speed 2.10 m/s	1Lx8x5	0.285	7.38	2.10
4T 1x 9 Quality 1.51 m/s	1Lx9x7	0.285	5.33	1.52
4T 1x 9 Speed 1.95 m/s	1Lx9x7	0.285	6.85	1.95
4T 1x12 Quality 1.13 m/s	1Lx12x8	0.285	4.00	1.14
4T 1x12 Speed 1.30 m/s	1Lx12x8	0.285	4.57	1.30
4T 1x12 Speed 1.50 m/s	1Lx12x8	0.314	4.80	1.50
4T 1x16 Quality 0.85 m/s	1Lx16x10	0.285	3.00	0.85
4T 2x 5 Quality 1.43 m/s	2L5x5	0.285	5.05	1.44
4T 2x 5 Speed 1.95 m/s	2L5x5	0.285	6.85	1.95
4T 2x 5 Speed 2.27 m/s	2L5x5	0.285	8.00	2.28
4T 2x 5 WIDE 2.56 m/s	2L5x5	0.428	6.00	2.56
4T 2x 5 WIDE 2.93 m/s	2L5x5	0.428	6.85	2.93
4T 2x 6 Quality 1.18 m/s	2L6x5	0.285	4.17	1.19
4T 2x 6 Speed 1.60 m/s	2L6x5	0.285	5.64	1.60
4T 2x 7 Quality 0.78 m/s	2L7x5	0.285	2.74	0.78
4T 2x 7 Speed 0.97 m/s	2L7x5	0.285	3.42	0.97
4T 2x 7 Speed 1.30 m/s	2L7x5	0.285	4.57	1.30

Figure 19. Mini Printhead: Ideal Raster Pitch and Raster Rate

MINI PRINTHEAD				
Message Type	**Character matrices (no. of lines x H x W)**	**Ideal raster pitch (mm)**	**Maximum raster rate (kHz)**	**Maximum line speed at ideal raster pitch (m/s)**
8T 1x 5 Quality 1.82 m/s	1Lx5x5	0.285	6.4	1.82
8T 1x 5 Speed 2.73 m/s	1Lx5x5	0.285	9.6	2.73
8T 1x 5 WIDE 6.83 m/s	1Lx5x5	0.428	16.0	6.84
8T 1x 6 Speed 2.27 m/s	1Lx6x5	0.285	8.0	2.28
8T 1x 7 Quality 1.30 m/s	1Lx7x5	0.285	4.57	1.30
8T 1x 7 Speed 1.95 m/s	1Lx7x5	0.285	6.85	1.95
8T 1x 7 WIDE 5.12 m/s	1Lx7x5	0.428	12.0	5.13
8T 1x 8 Quality 1.13 m/s	1Lx8x5	0.285	4.0	1.14
8T 1x 8 Speed 1.70 m/s	1Lx8x5	0.285	6.0	1.71
8T 1x 9 Quality 1.01 m/s	1Lx9x7	0.285	3.55	1.01
8T 1x 9 Speed 1.51 m/s	1Lx9x7	0.285	5.33	1.52
8T 1x12 Quality 1.13 m/s	1Lx12x8	0.285	4.0	1.14
8T 1x16 Quality 0.85 m/s	1Lx16x10	0.285	3.0	0.85
8T 2x 5 Quality 1.82 m/s	2Lx5x5	0.285	6.4	1.82
8T 2x 6 Quality 1.51 m/s	2Lx6x5	0.285	5.33	1.52
8T 2x 6 WIDE 2.15 m/s	2Lx6x5	0.428	5.05	2.16
8T 2x 7 Quality 1.24 m/s	2Lx7x5	0.285	4.36	1.24
12T 2x 7 WIDE 1.95 m/s	2Lx7x5	0.428	4.57	1.95
12T 2x 7 WIDE 2.27 m/s	2Lx7x5	0.428	5.33	2.28

Figure 19. Mini Printhead: Ideal Raster Pitch and Raster Rate (Continued)

3.2.6 Micro printhead (7900 only)

MK 7 MICRO PRINTHEAD				
Message Type	**Character matrices (no. of lines x H x W)**	**Ideal raster pitch (mm)**	**Maximum raster rate (kHz)**	**Maximum line speed at ideal raster pitch (m/s)**
4T 1x 5 Quality 1.82m/s	1Lx5x5	0.228	8.00	1.82
4T 1x 5 Wide 4.10m/s	1Lx5x5	0.342	12.00	4.10
4T 1x 7 Quality 1.30m/s	1Lx7x5	0.228	5.71	1.30
4T 1x 7 Wide 2.93m/s	1Lx7x5	0.342	8.57	2.93
4T 1x 7 Wide 5.47m/s	1Lx7x5	0.456	12.00	5.47
4T 1x 7 Wide 8.41m/s	1Lx7x5	0.912	9.23	8.42
4T 1x 8 Quality 1.13m/s	1Lx8x5	0.228	5.00	1.14
4T 1x 8 Wide 2.56m/s	1Lx8x5	0.342	7.50	2.57
4T 1x 8 Wide 3.41m/s	1Lx8x5	0.456	7.50	3.42
4T 1x 8 Wide 6.07m/s	1Lx8x5	0.456	13.33	6.08
4T 1x 9 Quality 1.01m/s	1Lx9x7	0.228	4.44	1.01
4T 1x 9 Wide 2.27m/s	1Lx9x7	0.342	6.67	2.28
4T 1x 9 Wide 3.03m/s	1Lx9x7	0.456	6.67	3.04
4T 1x 9 Wide 5.47m/s	1Lx9x7	0.456	12.00	5.47
4T 1x12 Quality 0.59m/s	1Lx12x8	0.228	2.61	0.59
4T 1x12 Speed 0.68m/s	1Lx12x8	0.228	3.00	0.68
4T 1x16 Quality 0.50m/s	1Lx15x10	0.228	2.22	0.51
4T 1x24 Quality 0.29m/s	1Lx23x16	0.228	1.28	0.29
4T 1x24 Quality 0.29m/s	1Lx25x16	0.228	1.28	0.29
4T 1x32 Quality 0.19m/s	1Lx32x24	0.228	0.85	0.19
4T 2x 5 Quality 0.91m/s	2Lx5x5	0.228	4.00	0.91
4T 2x 5 Wide 1.36m/s	2Lx5x5	0.342	4.00	1.37
4T 2x 5 Wide 2.05m/s	2Lx5x5	0.342	6.00	2.05
4T 2x 5 Wide 2.73m/s	2Lx5x5	0.456	6.00	2.74
4T 2x 7 Speed 0.65m/s	2Lx7x5	0.228	2.86	0.65
4T 2x 7 Speed 0.97m/s	2Lx7x5	0.228	4.29	0.98
4T 2x 7 Wide 0.97m/s	2Lx7x5	0.342	2.86	0.98
4T 2x 7 Wide 1.46m/s	2Lx7x5	0.342	4.29	1.47
4T 2x 7 Wide 1.95m/s	2Lx7x5	0.456	4.29	1.95

Figure 20. Micro Printhead: Ideal Raster Pitch and Raster Rate