



RFID Inlay Placement/Power Guidelines

www.zebra.com/transponders

Zebra RP4T

Model Number: P4D-UXXX0000-00

Revision Date: 3-Apr-14

This document defines the optimal encode position for RFID inlays when used with Zebra Printer/Encoders. These guidelines are provided for two purposes.

- To define the optimal inlay position (x), minimum inlay pitch (y), and encoder power setting for RFID media **without use of the program position command**. Media converted to these guidelines require **no RFID calibration step**, and no extra media movement for RFID encoding. This is the optimal method to print and encode RFID media.
- For media converted to a compatible inlay pitch (y), but different inlay position (x), these guidelines should be used to determine the required inlay program position. Program position is set by parameter "p" of the ^RS command. This can be useful for encoding directly to wet inlays, or for using media converted to a different inlay position.

Three critical dimensions define transponder placement and pitch, as shown in the schematic to the right and explained below.

Parameter	Name	Definition	Explanation
a (mm)	Inlay Center	Left liner edge to inlay center Viewed from facestock side, feed direction down	RF coupling with the inlay can change horizontally across the width of the label. This dimension is relative to the inlay <i>antenna center</i> , which is not always the same as the chip location. "a" is typically defined with a $\pm 3\text{mm}$ tolerance.
x (mm)	Inlay Position	Label Start to inlay antenna leading edge	This dimension ensures proper RF coupling with the inlay in the current label. It is relative to the inlay <i>antenna leading edge</i> . This is also the optimal distance from the printline to inlay antenna during encoding. "x" is generally given with a $\pm 3\text{mm}$ tolerance.
y (mm)	Inlay Pitch	Distance from inlay antenna leading edge to inlay antenna leading edge.	If Inlays are spaced too close together, coupling to multiple inlays can sometimes occur. This dimension ensures coupling with only the inlay in the current label. "y" defines the <i>minimum pitch</i> required to avoid multiple coupling.

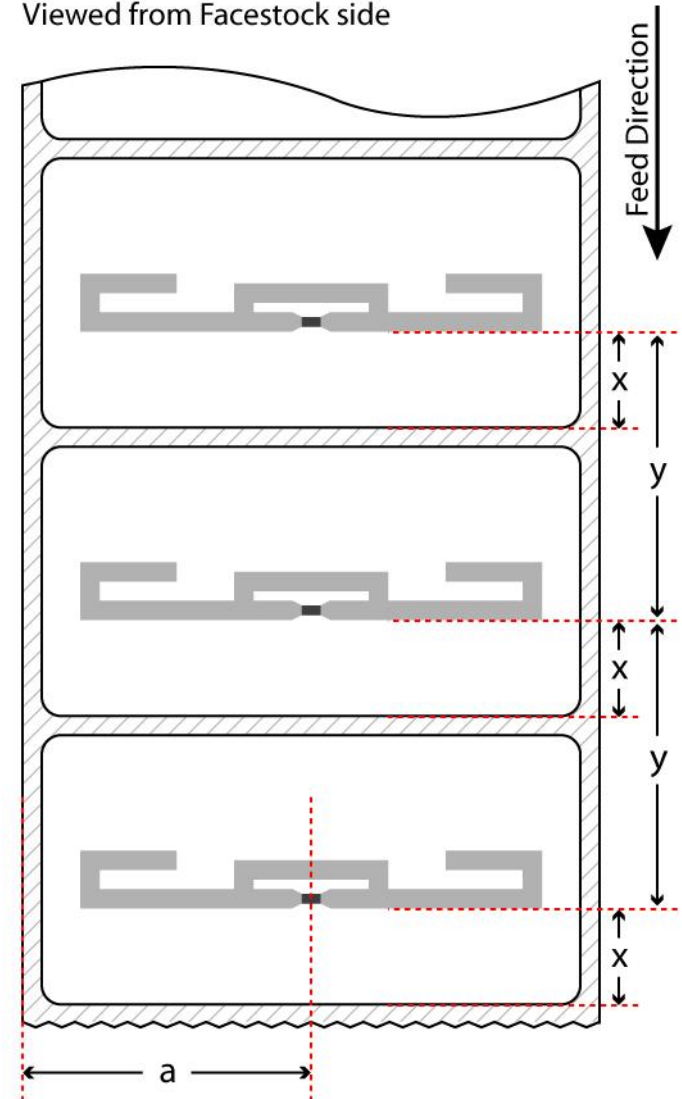
Example 1: Determine the optimal converting position for an Avery AD-223 Inlay in a 4"x2" label with 1/8" gap for the R110Xi UHF to be used in Region 0. The guideline specifies a=51mm, x=34mm, y 51mm. Since the label + gap length, 2.125", is greater than "y", inlay pitch is compatible with the guideline. The leading edge of the inlay antenna should be placed 34mm from the "Label Start". In this case, "Label Start" is the leading edge of the label.

Example 2: Determine the program position for a Raflatrac Short Dipole #3001490 converted to a=50mm, x=2mm, y=20mm for the RZ400 UHF to be used in Region 0. The guideline specifies a=51mm, x=13mm, y 20mm. In this case, "a" and "y" are compatible with the guideline, but "x" is not. To encode the inlay, the label needs to move *backward* into the printer by a distance of: 13mm - 2mm = 11mm. This can be accomplished by setting parameter "p" of the ^RS command to "B11". Program position capabilities vary by printer model and firmware version. See the Zebra RFID Programming Guide and firmware release notes for more information.

Note:

- Guidelines are only valid for the specified printer model and region.
- Many inlays look similar, but behave very differently. Guidelines are only valid for the specific inlay listed.
- Inlay orientation is critical. Images are shown as viewed through the media facestock, with feed direction down.
- For media compliant to the guidelines below, do not run the printer RFID calibrate procedure.
- "Label Start" is defined by one of three different methods: 1) The leading edge of a label, 2) The leading edge of a black mark, or 3) The leading edge of a notch (See printer specifications for mark and notch requirements).
- Because "y" is defined as a minimum distance, for some inlays "y" can actually be smaller than "x". In this case, a program position is required to run the media at the minimum pitch.
- Inlay pitch, "y", is not always equal to the label length + 1/8" gap. In some cases, labels are converted with a larger gap, to accommodate the minimum pitch requirement.
- Guidelines are established using the latest printer firmware. See www.zebra.com for firmware updates.












Viewed from Facestock side














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Date	Manufacturer	Part #	Orientation (Size not to scale)	Region 0 (US/Canada/Mexico)					Region 1 (Europe)							
				Inlay			Position (mm)			Power		Position (mm)			Power	
				a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write			
6/1/12	Alien	ALN-9629		Label Width/2	18	32	14	22	rfid@zebra.com							
12/29/10	Alien	ALN-9630		Label Width/2	18	16	16	20	Label Width/2	18	16	16	20			
12/29/10	Alien	ALN-9630		Label Width/2	18	16	16	20	Label Width/2	18	16	16	20			
12/17/09	Alien	ALN-9634		Label Width/2	1	54	15	15	2	54	15	23	23			
3/31/09	Alien	ALN-9640		Label Width/2	10	16	10	16	Label Width/2	10	16	10	16			
3/31/09	Alien	ALN-9640		Label Width/2	17	16	10	16	Label Width/2	17	16	10	16			
8/25/09	Alien	ALN-9654		Label Width/2	15	25	12	12	Label Width/2	15	25	12	12			
12/17/09	Alien	ALN-9662		Label Width/2	4	25	12	20	Label Width/2	4	25	19	23			
3/12/10	Alien	ALN-9662		Label Width/2	13	25	12	20	Label Width/2	15	25	19	20			
4/3/14	Alien	ALN-9710		Label Width/2	8	25	10	20	rfid@zebra.com							


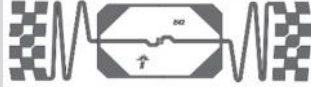


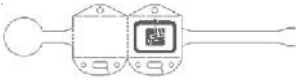


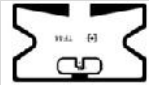
Date	Manufacturer	Part #	Inlay Orientation (Size not to scale)	Region 0 (US/Canada/Mexico)			Region 1 (Europe)						
				Position (mm)			Power		Position (mm)			Power	
				a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write
4/3/14	Alien	ALN-9720		Label Width/2	5	25	17	21	rfid@zebra.com				
7/30/12	Alien	ALN-9730		Label Width/2	9	17	13	21	rfid@zebra.com				
7/30/12	Alien	ALN-9740		Label Width/2	11	17	9	18	rfid@zebra.com				
7/30/12	Alien	ALN-9762		Label Width/2	5	25	12	20	rfid@zebra.com				
4/6/09	Avery	AD-223		Label Width/2	18	16	10	12	Label Width/2	18	16	12	15
4/6/09	Avery	AD-223		Label Width/2	8	16	10	14	Label Width/2	5	16	16	20
9/30/09	Avery	AD-224		Label Width/2	18	16	12	15	Label Width/2	18	16	18	21
9/30/09	Avery	AD-224		Label Width/2	8	16	15	15	Label Width/2	8	16	18	21
11/2/12	Avery	AD-227		Label Width/2	19	16	10	12	rfid@zebra.com				
10/27/09	Avery	AD-230		Label Width/2	19	22	12	12	Label Width/2	19	22	12	18
3/14/11	Avery	AD-231		Label Width/2	9	19	12	12	rfid@zebra.com				

Date	Manufacturer	Part #	Inlay Orientation (Size not to scale)	Region 0 (US/Canada/Mexico)			Region 1 (Europe)						
				Position (mm)			Power		Position (mm)			Power	
				a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write
3/14/11	Avery	AD-231		Label Width/2	4	19	12	12	rfid@zebra.com				
1/20/11	Avery	AD-232		Label Width/2	16	23	13	20	rfid@zebra.com				
1/20/11	Avery	AD-232		Label Width/2	5	23	12	20	rfid@zebra.com				
10/31/12	Avery	AD-233D		Label Width/2	6	22	11	11	rfid@zebra.com				
10/31/12	Avery	AD-233S		Label Width/2	6	22	11	11	rfid@zebra.com				
2/15/11	Avery	AD-240		Label Width/2	15	16	15	15	rfid@zebra.com				
2/15/11	Avery	AD-240		Label Width/2	15	16	5	5	rfid@zebra.com				
6/15/12	Avery	AD-317iL		Label Width/2	6	38	15	21	rfid@zebra.com				
1/17/14	Avery	AD-318m5		Label Width/2	16	28	15	16	rfid@zebra.com				
7/11/12	Avery	AD-380WiL		Label Width/2	4	38	9	20	rfid@zebra.com				
11/30/09	Avery	AD-805		Label Width/2	15	25	12	15	Label Width/2	15	25	16	18

Date	Manufacturer	Part #	Inlay Orientation (Size not to scale)	Region 0 (US/Canada/Mexico)			Region 1 (Europe)						
				Position (mm)			Power		Position (mm)			Power	
				a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write
8/19/09	Avery	AD-814		Label Width/2	6	38	21	21	rfid@zebra.com				
3/29/11	Avery	AD-815		Label Width/2	7	19	12	19	Label Width/2	7	19	18	19
3/31/09	Avery	AD-824		Label Width/2	3	63	24	24	rfid@zebra.com				
8/19/09	Avery	AD-826		Label Width/2	3	63	21	21	Label Width/2	0	63	15	15
2/15/11	Avery	AD-828		Label Width/2	4	45	16	18	rfid@zebra.com				
8/9/10	Avery	AD-843		Label Width/2	7	44	9	9	Label Width/2	7	44	9	9
1/30/13	Checkpoint	Champion M5		Label Width/2	4	28	15	16	rfid@zebra.com				
6/11/12	Checkpoint	Champion II		Label Width/2	3	32	12	14	rfid@zebra.com				
7/20/10	Checkpoint	MV-Champion 74X23		Label Width/2	5	30	20	20	Label Width/2	5	30	20	20
1/30/13	Checkpoint	Wind Apparel M5		Label Width/2	4	40	11	16	rfid@zebra.com				
1/30/13	Checkpoint	Wind Sporting M5		Label Width/2	4	40	17	17	rfid@zebra.com				

Date	Manufacturer	Part #	Inlay Orientation (Size not to scale)	Region 0 (US/Canada/Mexico)					Region 1 (Europe)				
				Position (mm)			Power		Position (mm)			Power	
				a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write
3/14/11	Invengo	XC-TF8029-C06		Label Width/2	4	25	16	18	rfid@zebra.com				
3/14/11	Invengo	XC-TF8032-C08		Label Width/2	4	25	20	20	rfid@zebra.com				
3/31/09	SMARTRAC	ShortDipole M3		Label Width/2	16	20	10	10	Label Width/2	16	20	15	15
8/19/09	SMARTRAC	3001274 Web NXP		Label Width/2	0	50	15	15	rfid@zebra.com				
8/19/09	SMARTRAC	3001274 Web NXP		Label Width/2	4	40	15	15	rfid@zebra.com				
3/31/09	SMARTRAC	3001557 Satellite M3		Label Width/2	3	30	12	15	rfid@zebra.com				
3/31/09	SMARTRAC	3001557 Satellite M3		Label Width/2	14	30	10	10	rfid@zebra.com				
8/19/09	SMARTRAC	3001674 Paperclip		Label Width/2	10	20	18	20	rfid@zebra.com				
10/5/09	SMARTRAC	3001690 M3 Button		Label Width/2	6	20	15	15	rfid@zebra.com				
8/19/09	SMARTRAC	3001698 Trap		Label Width/2	7	32	18	18	rfid@zebra.com				
3/4/10	SMARTRAC	3001871 M3 Belt		Label Width/2	17	20	12	12	Label Width/2	17	20	15	15

Date	Manufacturer	Part #	Inlay Orientation (Size not to scale)	Region 0 (US/Canada/Mexico)					Region 1 (Europe)				
				Position (mm)			Power		Position (mm)			Power	
				a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write
3/4/10	SMARTRAC	3001871 M3 Belt		Label Width/2	5	20	15	15	Label Width/2	5	20	18	18
4/20/10	SMARTRAC	3001876 M4 Dogbone		Label Width/2	10	30	10	10	Label Width/2	10	30	14	13
9/7/10	SMARTRAC	3001885 M4 SD		Label Width/2	16	20	10	10	rfid@zebra.com				
9/7/10	SMARTRAC	3001885 M4 SD		Label Width/2	9	20	10	10	rfid@zebra.com				
1/4/13	SMARTRAC	3001971 M4E		Label Width/2	3	32	15	19	rfid@zebra.com				
11/15/12	SMARTRAC	3001998 M5 SD		Label Width/2	7	20	11	13	rfid@zebra.com				
11/9/10	SMARTRAC	3002011 M4 Frog 3D		Label Width/2	6	54	15	18	rfid@zebra.com				
1/7/13	SMARTRAC	3002024 WebLite M5		Label Width/2	4	20	15	16	rfid@zebra.com				
4/3/12	SMARTRAC	3002173 Trap M5		Label Width/2	3	32	20	2	Label Width/2	3	32	20	2
2/17/12	SMARTRAC	Belt M5		Label Width/2	19	20	10	10	rfid@zebra.com				
2/17/12	SMARTRAC	Belt M5		Label Width/2	4	20	10	10	rfid@zebra.com				

				Region 0 (US/Canada/Mexico)					Region 1 (Europe)				
Inlay				Position (mm)			Power		Position (mm)			Power	
Date	Manufacturer	Part #	Orientation (Size not to scale)	a (±3)	x (±3)	y (≥)	Read	Write	a (±3)	x (±3)	y (≥)	Read	Write
4/20/10	SMARTRAC	Dogbone M3		Label Width/2	11	30	10	10	Label Width/2	11	30	10	10
9/7/10	SMARTRAC	E42 Monza4		Label Width/2	9	25	10	10	rfid@zebra.com				
3/31/09	SMARTRAC	ShortDipole M3		Label Width/2	9	20	10	10	Label Width/2	10	20	15	15
2/7/14	Smartrac	Web M5		Label Width/2	8	40	15	15	Label Width/2	8	40	15	15
1/23/13	TAGEOS	EOS-100 H4		Label Width/2	6	30	17	19	rfid@zebra.com				
4/8/13	TAGEOS	EOS-300		Label Width/2	17	39	18	18	rfid@zebra.com				
12/17/12	TAGEOS	EOS-500		Label Width/2	15	30	12	13					
3/1/13	Trace-Tech	TF44		rfid@zebra.com					Label Width/2	7	34	12	12