PE Linear Probe Encoder

Description

The **PE** series linear plunger-style optical encoder has a machined aluminum enclosure. The **PE** provides either single-ended or differential quadrature encoder output in a convenient mechanical package. Various CPI (counts per inch) ranging from 120 CPI to 500 CPI are available. Using x4 quadrature counting, the available resolutions range from 0.0005" to 0.0021". Note that 127 CPI gives a resolution of 50 micrometers.

The **PE** features smooth linear bearings for repeatable measurements and an internal spring to return the plunger to its fully extended position. Standard linear measurement ranges are from 1 to 2 inches. The precision plunger has #4-48 threads on both ends to accept industry standard contact points. The **PE** may be mounted four different ways: the #4-40 clearance body through holes, the #4-40 tapped blind holes, the standard 3/8" diameter mounting stem, or the lug back option.

The single-ended output interface is normally designed for applications of 10 feet or less. For longer cable lengths, the differential output interface is recommended.

The internal encoder module incorporates a lensed LED light source and a monolithic photodetector array. The monolithic photodetector has signal shaping electronics which produces a two channel quadrature with optional index bounceless TTL output. When Index is specified, the default location is in the middle of the linear probe's range of travel with a location tolerance of ±0.050".

For differential versions: the internal differential line driver (26C31) can source and sink 20mA at TTL levels. The recommended receiver is industry standard 26C32. Maximum noise immunity is achieved when the differential receiver is terminated with a 150 Ω resistor in series with a .0047 µF capacitor placed across each differential pair. The capacitor simply conserves power; otherwise power consumption would increase by approximately 20 mA per pair, or 40 mA for 2 pairs.

A secure connection to the **PE** encoder is made through a 5-pin (single-ended versions) or 10-pin (differential versions) polarized connector (sold separately). The mating connectors are available from US Digital with several cable options and lengths.

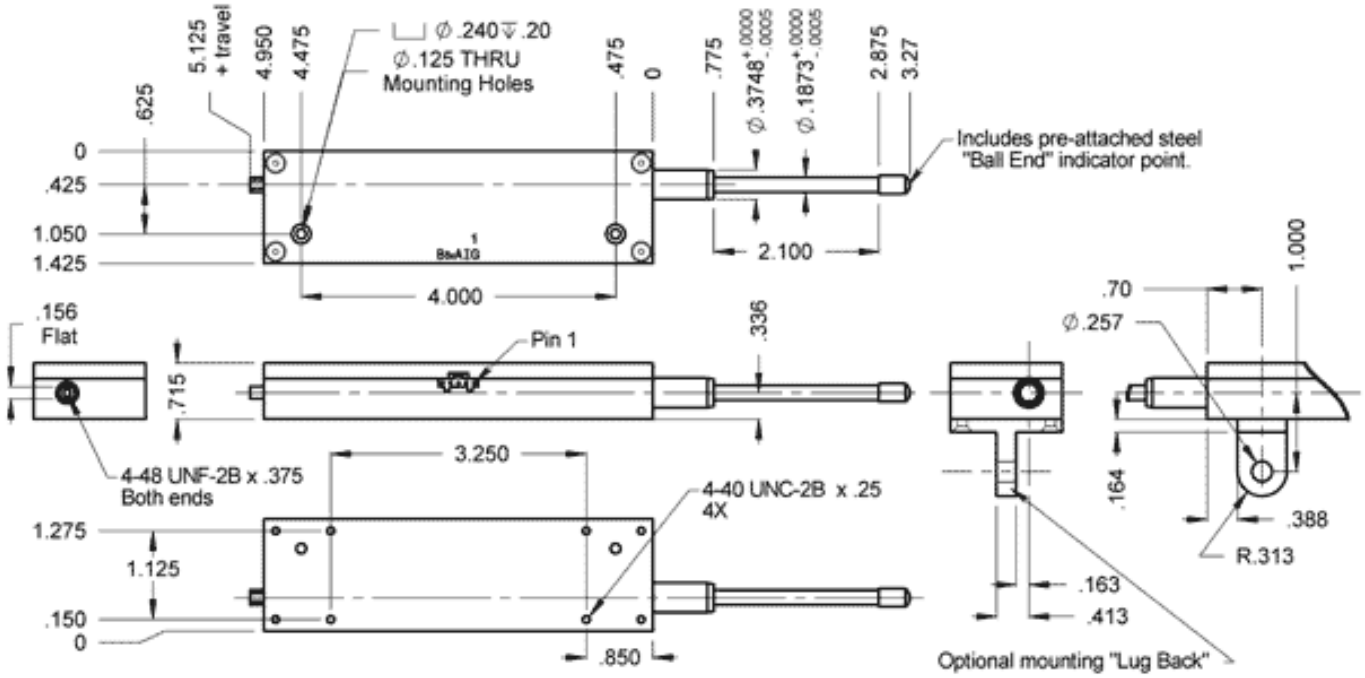
Features

- Standard 3/8" diameter mounting stem
- Compact design
- Linear ranges from 1" to 2"
- 120 CPI to 500 CPI
- 0.0005" to 0.0021" resolution
- Finger-latching connector
- A and B quadrature digital output
- Optional 3rd channel (index)
- TTL compatible outputs
- Interfaces with all US Digital support products

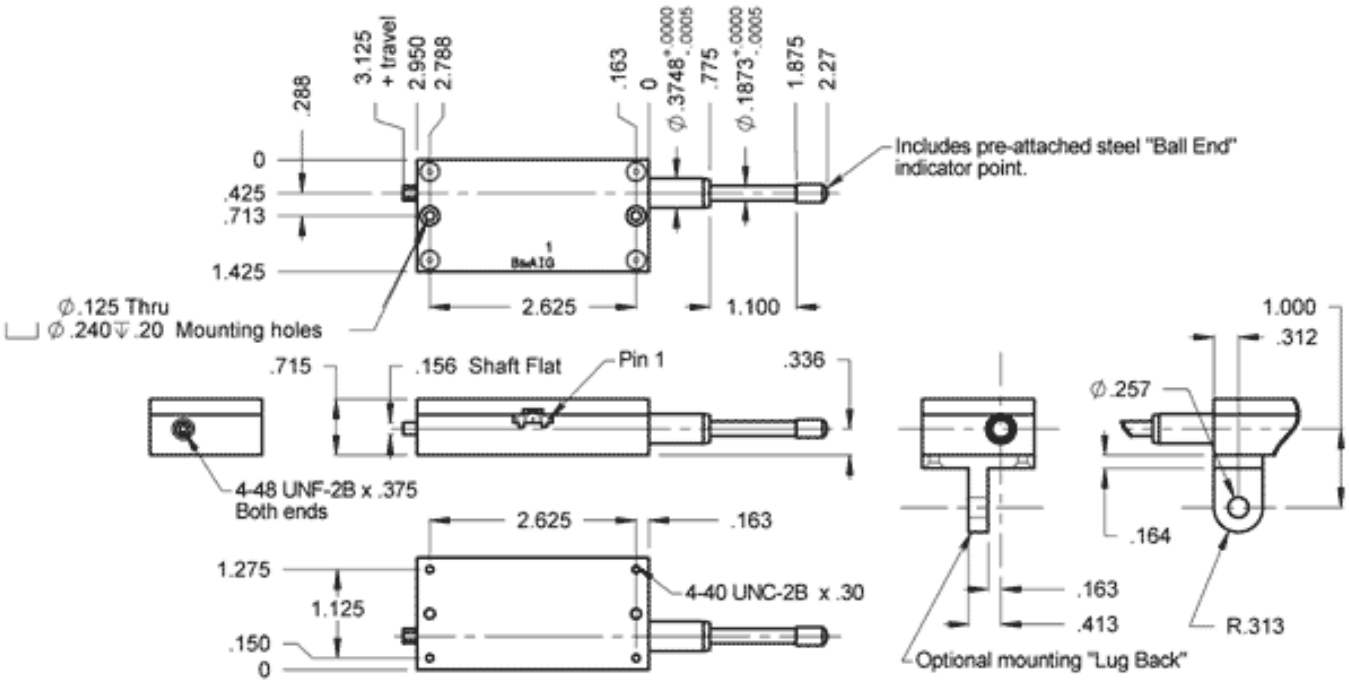
1400 NE 136th Avenue
Vancouver, Washington 98684, USA
info@usdigital.com
www.usdigital.com
Local: 360.260.2468
Toll-free: 800.736.0194

Rev. 130226062901

Single-ended Interface (PES) 2

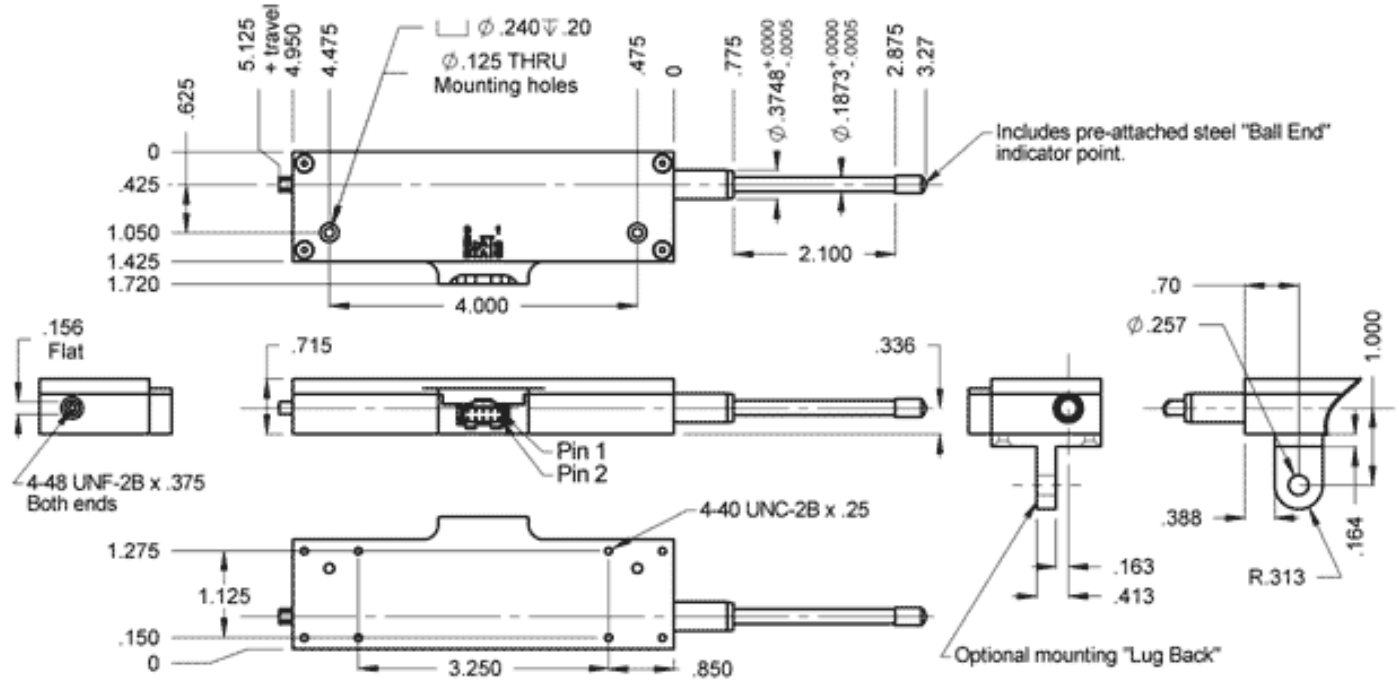


Single-ended Interface (PES) 1

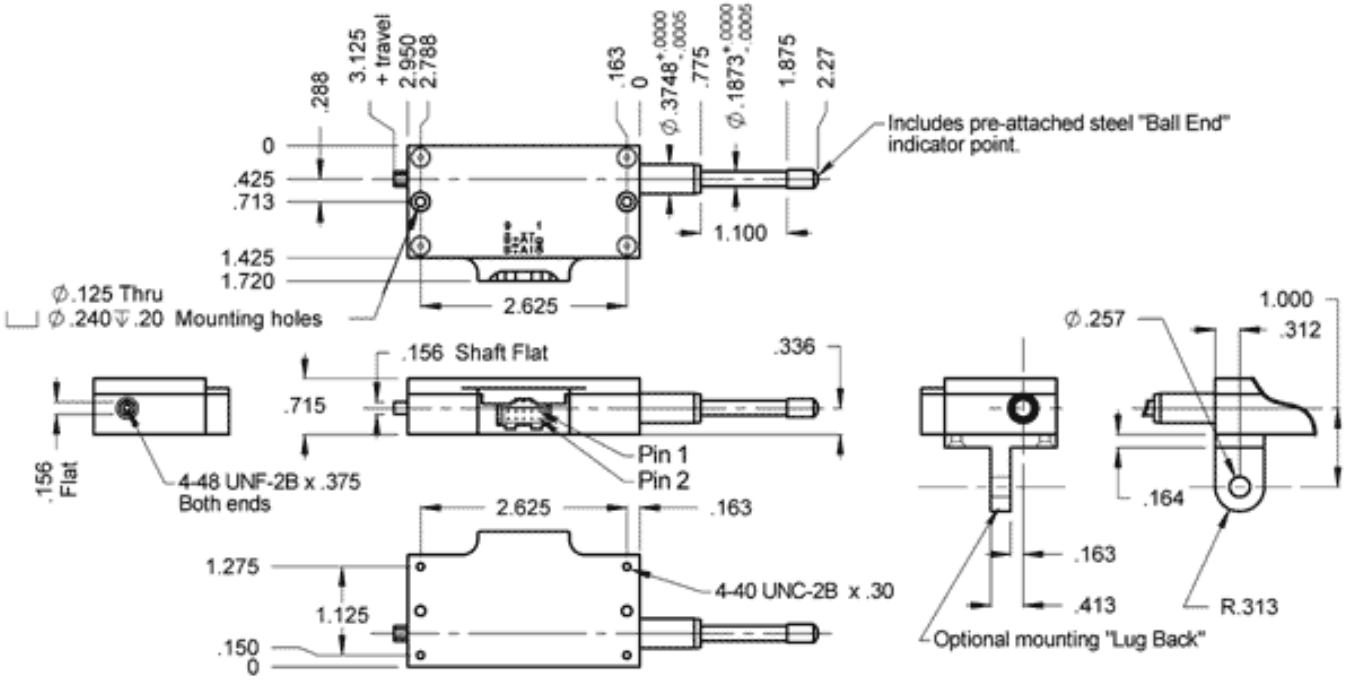


RoHS COMPLIANT

Differential Interface (PED) 2



Differential Interface (PED) 1



US DIGITAL
1400 NE 136th Avenue
Vancouver, Washington 98684, USA
info@usdigital.com
www.usdigital.com
Local: 360.260.2468
Toll-free: 800.736.0194

Environmental

The **PE** performs best over a 0 C to 50 C temperature range due to a fairly linear temperature coefficient. They will however, operate at temperatures above 50C, but the thermal temperature coefficient becomes non linear at elevated temperatures. The negative temperature coefficient indicates the actual measured distance will decrease slightly with temperature increase.

Parameter	Specification
Operating Temperature	0 C to 50 C
1" Product Temperature Coefficient	-0.000036 in/C
2" Product Temperature Coefficient	-0.000075 in/C

Mechanical

Parameter	Dimension	Units
Plunger Force (1" version)	3 to 6 typical	oz.
Plunger Force (2" version)	3 to 9 typical	oz.
Travel (1" version)	1.050 min.	in.
Travel (2" version)	2.050 min.	in.
Side Load	1	lb.

- When Index is specified, the default location is in the middle of the linear probe's range of travel with a location tolerance of ±0.050".

Phase Relationship

A leads B for inward plunger motion, and B leads A for outward plunger motion (*see the EM1 page*).

Tracking Speed

The maximum tracking speed of the encoder can be calculated as follows:

Maximum tracking speed (in. / sec.) = 100000/CPI. Where CPI is the counts-per-inch of the encoder.

The tracking speed for several common CPI's are shown in the table below.

Parameter	Max.	Units
Tracking Speed, 125 CPI	800	in/sec
Tracking Speed, 127 CPI	787	in/sec
Tracking Speed, 250 CPI	400	in/sec
Tracking Speed, 500 CPI	200	in/sec
Vibration (5 Hz to 2000 Hz)	20	G

Resolutions

The position resolution in inches using x4 quadrature counting (count every transition of the A and B outputs) can be calculated as follows:

Resolution = 1/(4*CPI) where CPI is the counts-per-inch of the encoder. Several common values are shown in the table below.

CPI	Resolution
125	0.002 in.
127	50.0 ?m
250	0.0010 in.
500	0.0005 in.

Single-ended Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25 ° C.
- For complete details, see the EM1 product page.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPI < 300, no load
		55	62	mA	CPI ≥ 300, no load
Low-level Output			0.5	V	I_{OL} = 8mA max.
High-level Output	2.0			V	I_{OH} = -8mA max.
	4.2	4.8		V	no load
Output Current Per Channel	-8		8	mA	
Output Rise Time		110		nS	
Output Fall Time		35		nS	

Differential Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25 ° C.
- For complete details, see the EM1 product page.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		29	36	mA	CPI < 300, no load
		57	65	mA	CPI ≥ 300, no load
Low-level Output		0.2	0.4	V	I_{OL} = 20mA max.

US DIGITAL
1400 NE 136th Avenue
Vancouver, Washington 98684, USA
info@usdigital.com
www.usdigital.com
Local: 360.260.2468
Toll-free: 800.736.0194

Parameter	Min.	Typ.	Max.	Units	Conditions
High-level Output	2.4	3.4		V	I_{OH} = -20mA max.
Differential Output Rise/Fall Time			15	nS	

Pin-out

5-pin Single-ended:

Pin	Description
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

10-pin Differential:

Pin	Description
1	Ground
2	Ground
3	Index-
4	Index+
5	A- channel
6	A+ channel
7	+5VDC power
8	+5VDC power
9	B- channel
10	B+ channel

Accessories

1. For tapped blind hole mounting:

Part #: SCREW-440-250-PH
Description:#4-40 x 1/4"
Quantity Required for Mounting: 4 per encoder

Part #: SCREW-440-375-PH
Description:#4-40 x 3/8"
Quantity Required for Mounting: 4 per encoder

Part #: SCREW-440-500-PH

Description:#4-40 x 1/2"
Quantity Required for Mounting: 4 per encoder

Part #: SCREW-440-625-PH
Description: #4-40 x 5/8"
Quantity Required for Mounting: 4 per encoder

2. For body through hole mounting:

Part #: SCREW-440-1000-PH
Description:#4-40 x 1"
Quantity Required for Mounting:2 per encoder

Product Change Notifications

Title	Date	Description	Download
EM1 LED Die - PCN 1016	2/7/2013	As part of US Digital's continual assurance of supply strategy, we have qualified additional sources for our LED die used in our EM1 encoder module, which in turn impacts all of the following products: EM1, E2, E3, E5, E6, H1, H15, H3, H5, H6, HB5M, HB6M, HD25, PE, S1, S2, S5, S6, T5 and T6 The device specification will remain the same, i.e. there will be no change to form, fit or function of the product(s) as specified by US Digital. The appropriate quality and reliability testing has been performed on representative products to ensure normal parametric distribution, consistent with US Digital's quality and reliability standards.	Download

US DIGITAL
1400 NE 136th Avenue
Vancouver, Washington 98684, USA
info@usdigital.com
www.usdigital.com
Local: 360.260.2468
Toll-free: 800.736.0194

RoHS COMPLIANT

Ordering Information

PE - [ ] - [ ] - [ ] - [ ] - [ ]

CPI	Stroke	Index	Output	Housing
125 =	1 =*1"*	NE =*No Index, EM1 Compatible*	S =*Single-ended*	D =*Default*
127 =	2 =*2"*	IE =*Index, EM1 Compatible*	D =*Differential*	L =*Lug Back*
150 =				
180 =				
200 =				
250 =				
300 =				
360 =				
500 =				

Notes

- Cables and connectors are not included and must be ordered separately.
- For ordering information please see the Compatible Cables / Connectors section above.
- US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.

Base Pricing

Quantity	Price
1	$255.00
10	$228.80

For volume discounts, please contact us at sales@usdigital.com or 800.736.0194.

- Add 25% per unit for **CPI** of
- Add 20% per unit for **Stroke** of 2"
- Add 5% per unit for **Index** of Index, EM1 Compatible
- Add 7% per unit for **Output** of Differential
- Add $20.00 per unit for **Housing** of Lug Back

US DIGITAL
1400 NE 136th Avenue
Vancouver, Washington 98684, USA
info@usdigital.com
www.usdigital.com
Local: 360.260.2468
Toll-free: 800.736.0194