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 6 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 110 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

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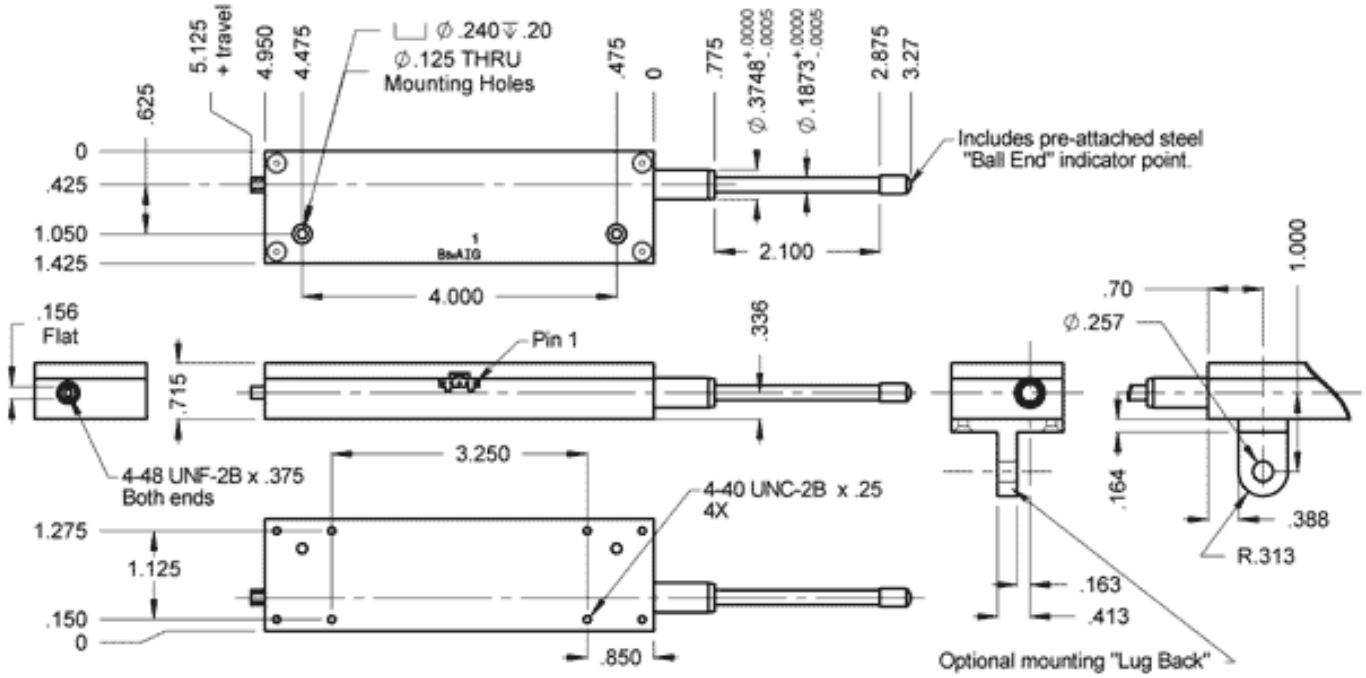
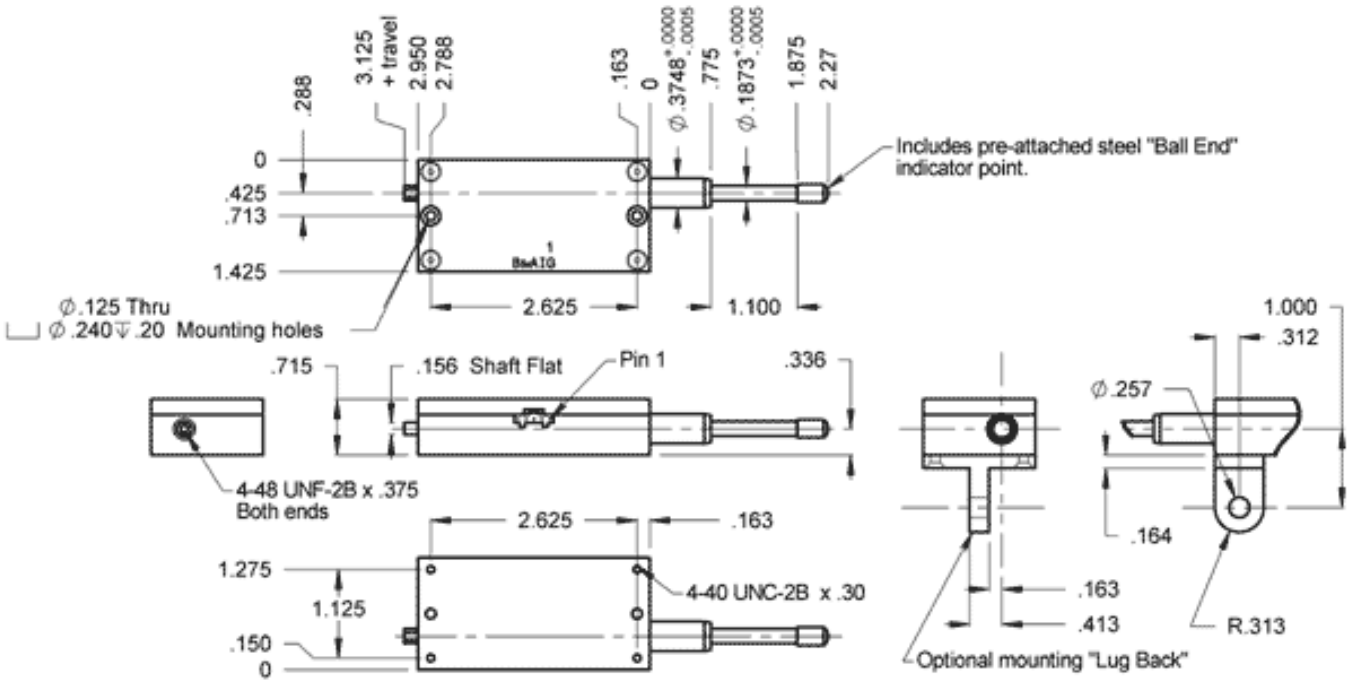
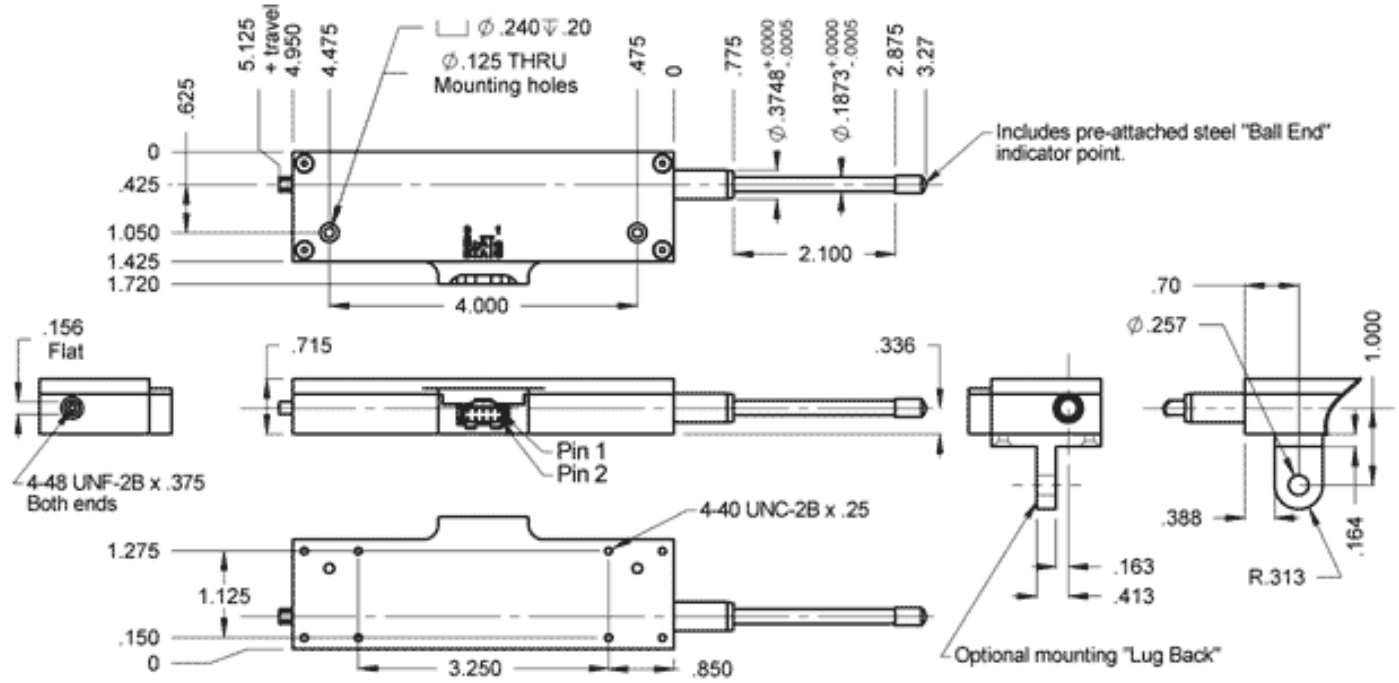
Single-ended Interface (PES) 2



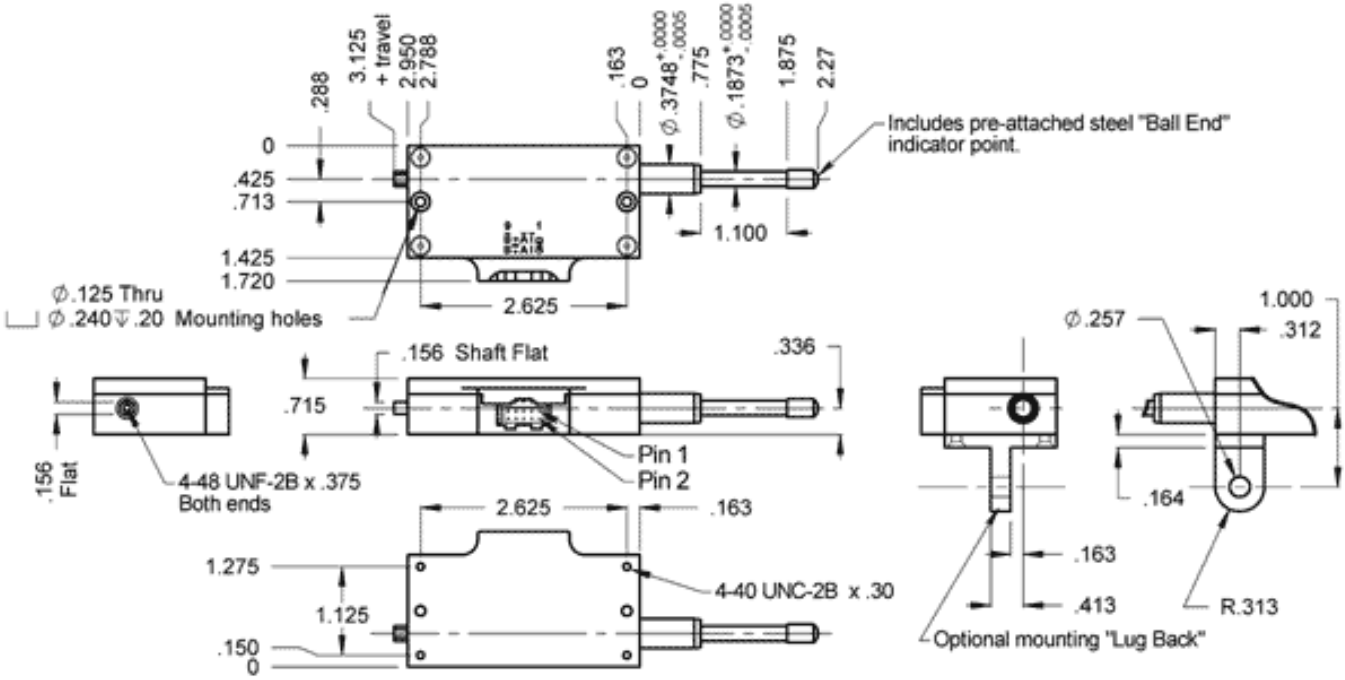
Single-ended Interface (PES) 1



Differential Interface (PED) 2



Differential Interface (PED) 1



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.

Absolute Maximum Ratings

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.

Environmental

The **PE** performs best over a 0 C to 50 C temperature zone 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" / C
2" Product Temperature Coefficient	-0.000075" / C

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

Phase Relationship

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

Single-ended Output

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0 V and 25 C.
- For complete details see the EM1 and HEDS product pages.

	Supply Current	Output voltage low	Output voltage high	
Resolution	Typ / Max	Max	Min	Based on
All CPI's with index	27 / 30 mA	0.5 V @ 8 mA	2.0 V @ -8 mA	EM1

Differential Output

Specification	Min.	Typ.	Max.	Units	Notes
Supply	4.5	5.0	5.5	V	
Current Consumption	-	56	59	mA	No load
Output Voltage					
Sourcing to +5 V	2.4	3.4	-	V	@ -20 mA
Sinking to Ground	-	0.2	0.4	V	@ 20 mA

For complete details see the EM1 / HEDS page.

Accessories

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

For body through hole mounting:

Part #: SCREW-440-1000-PH

Description:#4-40 x 1"

Quantity Required for Mounting:2 per encoder

Pin-outs

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

Pin	Description
7	+5VDC power
8	+5VDC power
9	B- channel
10	B+ channel

Ordering Information

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

CPI	Stroke	Index	Output	Housing
120	1 =*1"*	N =*No Index*	S =*Single-ended*	D =*Default*
125	2 =*2"*	I =*Index (3rd Channel)*	D =*Differential*	L =*Lug Back*
127				
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.

Pricing

Quantity	Price
1	$178.00
10	$159.71
50	$143.73
100	$129.36

- Add 25% per unit for **CPI** of 500
- Add 20% per unit for **Stroke** of 2"
- Add 5% per unit for **Index** of Index (3rd Channel)
- Add 7% per unit for **Output** of Differential
- Add $20.00 per unit for **Housing** of Lug Back