E2 Features

- Quick, simple assembly, and disassembly
- Rugged screw-together housing
- Accepts .010 in. axial shaft play
- 32 to 5,000 cycles per revolution (CPR)
- 128 to 20,000 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- Mounting compatibility with HEDS-5500

E2 Product Description

The E2 is a rotary encoder with a rugged glass-filled polymer enclosure, which utilizes either a 5-pin locking or standard connector. The internal components consist of a mylar disk mounted to a precision machined aluminum hub and an encoder module. The module contains a highly collimated solid-state light source and monolithic phased array sensor, which together provide a system extremely tolerant to mechanical misalignments.

The E2 is normally designed for applications of 10 feet or less. For applications requiring longer cable lengths, we recommend adding a PC4 *(https://www.usdigital.com/pc4/)* / PC5 *(https://www.usdigital.com/pc5/)* differential line driver or check out our E5 *(https://www.usdigital.com/products/encoders/incremental/kit/e5/)* which has an optional differential output.

Attachment of the base to a surface may be accomplished by utilizing one of several machine screw bolt circle options. Positioning of the base to the centerline of a shaft is ensured by the use of our centering tool. The cover is securely attached to the base with two 4-40 pan head screws to provide a resilient package protecting the internal components.

Connection to the E2 product is made through either a 5-pin locking or standard connector. The mating connectors are available from US Digital with several cable options and lengths.

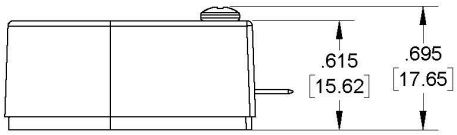
BROADCOM/AVAGO REPLACEMENTS:

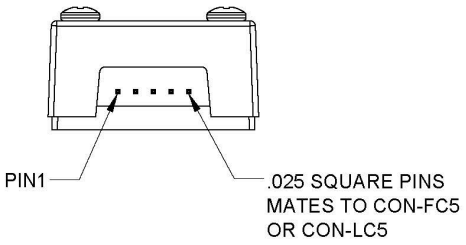
US Digital's E2 encoder may be used as direct replacements *(https://www.usdigital.com/support/resources/reference/compatibility-guides/avago-heds-5xxx-encoder-us-digital-e2-compatibility-guide/)* for Avago HEDM-5500, HEDM-5600, *(https://www.usdigital.com/support/resources/reference/compatibility-guides/avago-hedm-5x0x-encoder-us-digital-e2-compatibility-guide/)* HEDS-5500, HEDS-5600 *(https://www.usdigital.com/support/resources/reference/compatibility-guides/avago-heds-5xxx-encoder-us-digital-e2-compatibility-guide/)*.

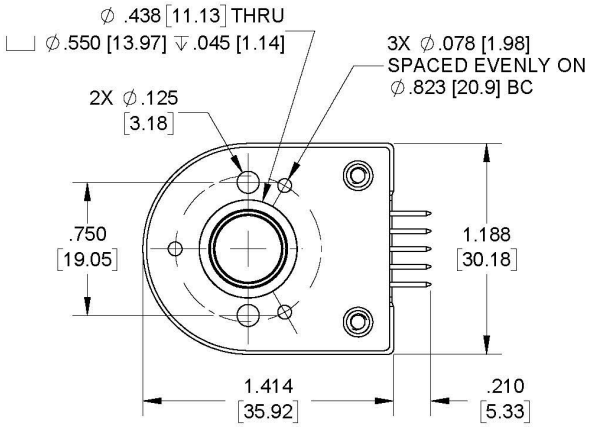
Mechanical Drawings

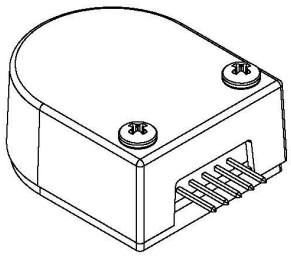
E2 Optical Kit Encoder (Default)

RELEASE DATE: 7/8/2019



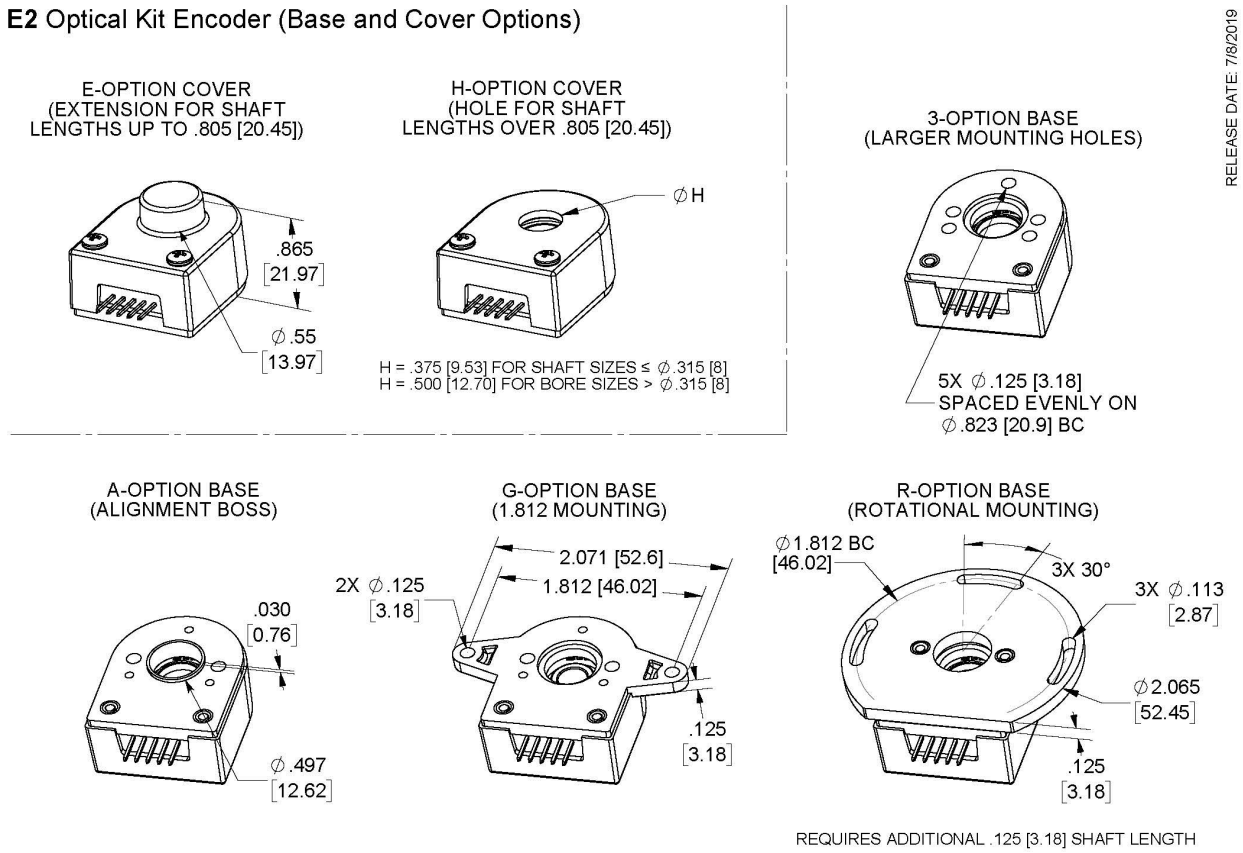






US DIGITAL
1400 NE 136th Avenue
Vancouver, Washington 98684, USA
info@usdigital.com
www.usdigital.com
Local: 360.260.2468
Toll-free: 800.736.0194

UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY



Specifications

ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature, CPR < 2000	-40 to 100	C
Operating Temperature, CPR ≥ 2000	-25 to 100	C
Electrostatic Discharge, IEC 61000-4-2	± 4	kV
Vibration (10Hz to 2kHz, sinusoidal)	20	G
Shock (6 milliseconds, half-sine)	75	G

MECHANICAL

PARAMETER	VALUE	UNITS
Max. Shaft Axial Play	±0.010	in.
Max. Shaft Runout	0.004 T.I.R.	in.
Max. Acceleration	250000	rad/sec²
For CPR ≤ 1250: Max. RPM (1) Max. A/B Frequency e.x. CPR=1250, Max. RPM=14400 e.x. CPR=100, Max. RPM=60000	 minimum value of ((18 x 10^6) / CPR) and (60000) 300	 RPM kHz
For CPR = 2000, 2048, 2500: Max. RPM (1) Max. A/B Frequency	 minimum value of ((21.6 x 10^6) / CPR) and (60000) 360	 RPM kHz
For CPR = 4000, 4096, 5000: Max. RPM (1) Max. A/B Frequency	 minimum value of ((43.2 x 10^6) / CPR) and (60000) 720	 RPM kHz
Typical Product Weight	0.56	oz.
Codewheel Moment of Inertia	8.0 x 10^-6	oz-in-s²
Hub Set Screw	#4-48	
Hex Wrench Size	0.050	in.
Encoder Base plate Thickness	0.135	in.
3 Mounting Screw Size	#0-80	
2 Mounting Screw Size	#2-56 or #4-40	
3 Screw Bolt Circle Diameter	0.823 ± 0.005	in.
2 Screw Bolt Circle Diameter	0.750 ± 0.005	in.
Required Shaft Length (2)(3) With E-option (3) With H-option	0.445 to 0.575 0.445 to 0.805 > 0.445	in. in. in.
Index Alignment to Hub Set Screw	180 Typical	degrees
Technical Bulletin TB1001 - Shaft and Bore Tolerances		Download *(https://www.usdigital.com/media/yyvb4qsy/tb_1001.pdf)*

(1) 60000 RPM is the maximum rpm due to mechanical considerations. The maximum rpm due to the module's maximum frequency response is dependent upon the module's resolution (CPR).

(2) Add 0.125" to the required shaft length when using R-option.

(3) Including Axial play.

TORQUE SPECIFICATIONS

PARAMETER	VALUE	TORQUE
Hub Set Screw	2-3	in-lbs
Cover Screw	2-4	in-lbs
Base Mounting Screw (#0-80)	1-2	in-lbs
Base Mounting Screw (#2-56)	2-3	in-lbs
Base Mounting Screw (#4-40)	4-6	in-lbs
Adapter Plate Mounting Surface (#2-56 screws)	2-3	in-lbs
Adapter Plate Mounting Surface (#4-40 screws)	4-6	in-lbs

PHASE RELATIONSHIP

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation viewed from the cover side of the encoder.

ELECTRICAL

- Specifications apply over the entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25°C.
- For complete details, see the EM1 *(https://www.usdigital.com/products/encoders/incremental/modules/em1/)* or EM2 *(https://www.usdigital.com/products/encoders/incremental/modules/em2/)* product pages.

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPR < 500, no load
		54	62	mA	CPR ≥ 500 and < 2000, no load
		72	85	mA	CPR ≥ 2000, no load
Low-level Output			0.5	V	I_{OL} = 8mA max., CPR < 2000
			0.5	V	I_{OL} = 5mA max., CPR ≥ 2000
		0.25		V	no load, CPR ≥ 2000
High-level Output	2.0			V	I_{OH} = -8mA max. and CPR < 2000
	2.0			V	I_{OH} = -5mA max. and CPR ≥ 2000
		4.8		V	no load and CPR < 2000
		3.5		V	no load and CPR ≥ 2000
Output Current Per Channel	-8		8	mA	CPR < 2000
	-5		5	mA	CPR ≥ 2000
Output Rise Time		110		nS	CPR < 2000
		50		nS	CPR ≥ 2000, ± 5mA load
Output Fall Time		100		nS	CPR < 2000
		50		nS	CPR ≥ 2000, ± 5mA load

PIN-OUT

PIN	DESCRIPTION
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

Note: 5-pin single-ended mating connector is CON-C5 *(https://www.usdigital.com/products/accessories/connectors/con-c5/)* or CON-LC5 *(https://www.usdigital.com/products/accessories/connectors/con-lc5/)*

ACCESSORIES

1. Centering Tool

Part #: CTOOL - (Shaft Diameter)
Description: This reusable tool provides a simple method for accurately centering the **E2** base onto the shaft, promoting hub to base

concentricity and thus accuracy.

It is recommended for the following situations:

- When using mounting screws smaller than #4-40.
- When the position of the mounting holes is in question.
- When using the 3-hole mounting pattern.

2. Hex Tool

Depending on the order packaging option, either a hex driver or hex wrench is included.

Part #: HEXD-050 (only included with **-B** or **-1** packaging options)
Description: Hex driver, 0.050" flat-to-flat for #4-48 set screws.

3. Spacer Tool

A spacer tool is included for all packaging options.

Part #: SPACER-E2

4. Screws

Part #: SCREW-080-250-PH
Description: Pan Head, Philips #0-80 UNF x 1/4"
Use: Base Mounting
Quantity Required: 3
Screws are not included

Part #: SCREW-256-250-PH
Description: Pan Head, Philips #2-56 UNC x 1/4"
Use: Base Mounting
Quantity Required: 2
Screws are not included

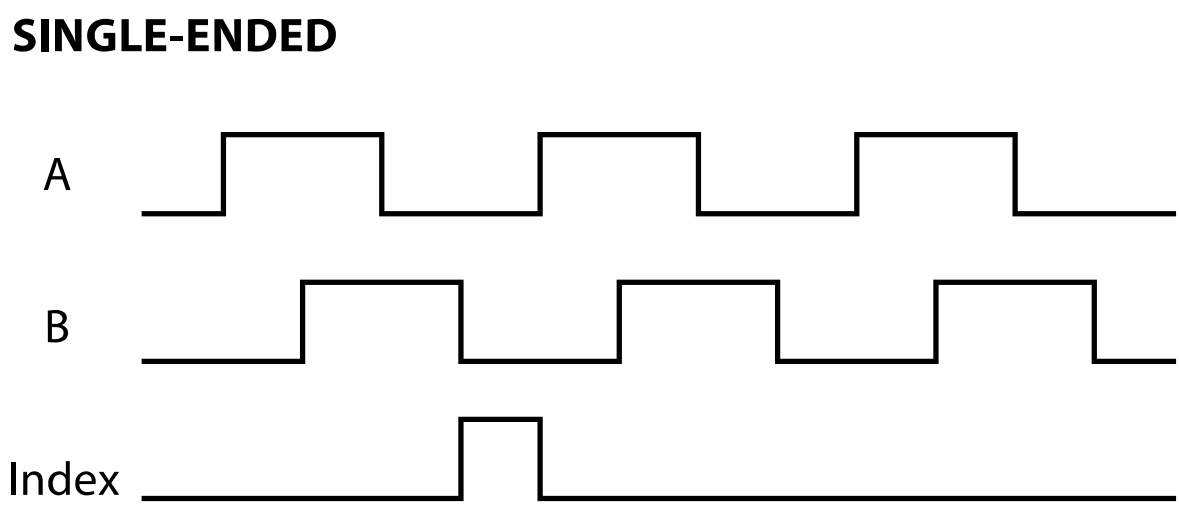
Part #: SCREW-440-250-PH
Description: Pan Head, Philips #4-40 UNC x 1/4"
Use: Base Mounting
Quantity Required: 2
Screws are not included

Part #: SCREW-440-625-PH
Description: Pan Head, Phillips 4-40 UNC x 5/8"
Use: Cover Mounting
Quantity Required: 2
Screws are included

Part #: SCREW-448-063-SS
Description: Socket Head Set Screw, 4-48 UNC x 1/16"
Use: Hub/Disk Mounting for 5/16" - 10mm Bore
Quantity Required: 1
Screw is included

Part #: SCREW-448-125-SS
Description: Socket Head Set Screw, 4-48 UNC x 1/8"
Use: Hub/Disk Mounting for 2mm - 1/4" Bore
Quantity Required: 1
Screw is included

OUTPUT WAVEFORMS



Notes

- US Digital® warrants its products against defects in materials and workmanship for two years. See complete warranty *(https://www.usdigital.com/company/warranty)* for details.
- Cables and connectors are not included and must be ordered separately.

Configuration Options

E2	-	CPR (Cycles Per Revolution)	-	Bore Size	-	Index	-	Cover	-	Base	-	Packaging
		32		079 (*2.0mm*)		IE (*Index*)		D (*Default*)		D (*Default*)		B (*Encoders packaged in bulk. Every order includes one centering tool, hex tool and spacer tool. An additional set of tools is included for each 100 encoders ordered.*)
		50		118 (*3.0mm*)		NE (*Non-Index*)		E (*Extended*)		3 (*1/8" Mounting Holes*)		1 (*Encoders packaged individually. Every order includes one centering tool, hex tool and spacer tool. An additional set of tools is included for each 100 encoders ordered.*)
		96		125 (*1/8"*)				H (*Through-Hole*)		A (*Aligning Shoulder*)		3 (*Encoders packaged individually. Every order includes one centering tool, hex tool and spacer tool per encoder.*)
		100		156 (*5/32"*)						G (*1.812" Diameter Bolt Circle*)		
		120		157 (*4.0mm*)						R (*1.812" Diameter Bolt Circle, 3 Slot Rotational Mounting*)		
		192		188 (*3/16"*)								
		200		197 (*5.0mm*)								
		250		236 (*6.0mm*)								
		256		250 (*1/4"*)								
		360		276 (*7.0mm*)								
		400		313 (*5/16"*)								
		500		315 (*8.0mm*)								
		512		375 (*3/8"*)								
		540		394 (*10.0mm*)								
		720										
		800										
		900										
		1000										
		1024										
		1250										
		2000										
		2048										
		2500										
		4000										
		4096										
		5000										

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the E2 product page *(https://www.usdigital.com/products/E2)* for pricing and additional information.