E6 Features

- Kit Version for mounting on a motor or other shaft
- Supports 22 shaft sizes (2 to 25 mm and 1/8 in. to 1 in.)
- For NEMA 23 to NEMA 34 and larger motors
- 21 Resolutions from 64 to 10,000 CPR (256 to 40,000 PPR)
- Optional Index channel, Differential and High-Voltage Outputs
- Choice of 2 base styles and 2 cover options
- Secure latching connector/cable (sold separately)

E6 Product Description

US Digital's E6 motor encoder mounts directly to a motor or other rotating shaft. This optical encoder features a rugged, glass-filled polymer housing and is designed for easy installation and removal.

RoHS COMPLIANT

The E6 rotary encoder contains a precision-machined aluminum hub with a specially patterned Mylar disk. This disk, in combination with our proprietary optical encoder module, creates a system that is highly tolerant to mechanical misalignment.

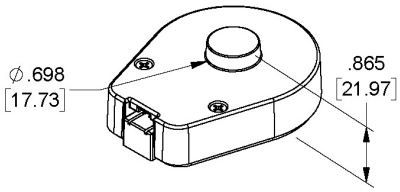
The E6 is a versatile motor encoder with two base configurations and three cover styles, which allows it to fit a wide range of applications. This optical rotary encoder also has five available outputs—single-ended, single-ended High-Voltage, differential, and Avago single-ended and differential. This incremental encoder is designed for use with a secure latching connector—connector/cable sold separately.

Mechanical Drawings

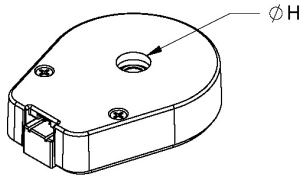
E6 Optical Kit Encoder (Base & Cover Options, 5-Pin Version Shown)

RELEASE DATE: 10/31/2025

E-OPTION COVER
(EXTENSION FOR SHAFT
LENGTHS UP TO .750 [19.05])

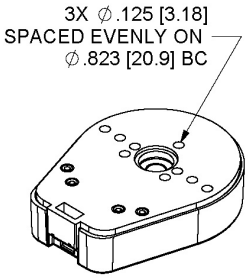


H-OPTION COVER
(COVER HOLE FOR SHAFT
LENGTHS OVER .750 [19.05])

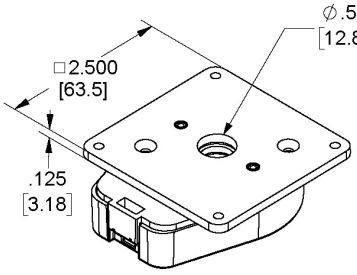


H=.438 [11.13] FOR BORE SIZES ≤ ∅.394 [10]
H=1.047 [26.59] FOR BORE SIZES > ∅.394 [10]

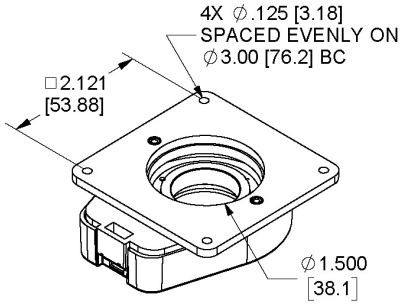
3-OPTION BASE
(LARGER MOUNTING HOLES)



M-OPTION BASE
(MOUNTING PLATE)
REQUIRES MINIMUM .570 [14.48] SHAFT LENGTH



FOR BORES ≤ ∅.394 [10]



FOR BORES > ∅.394 [10]

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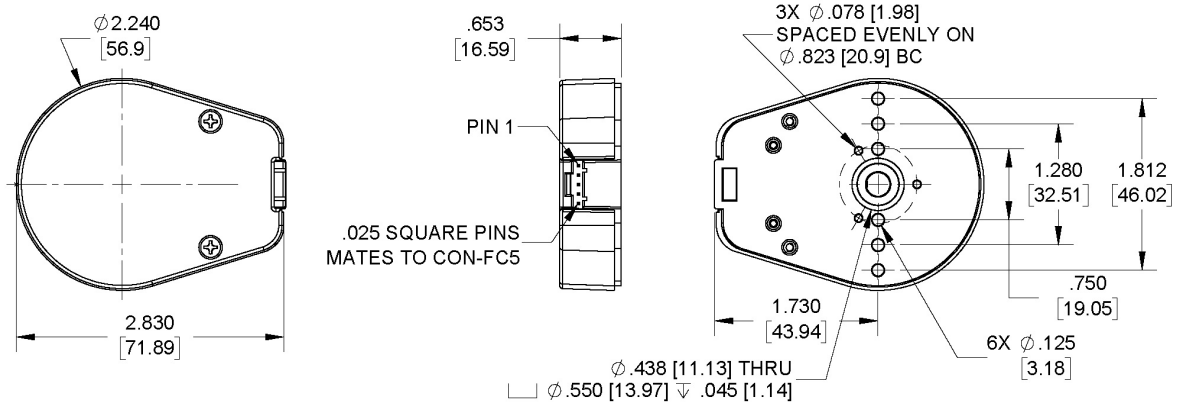
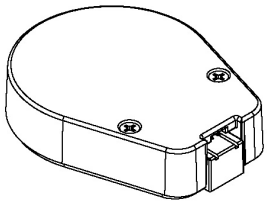
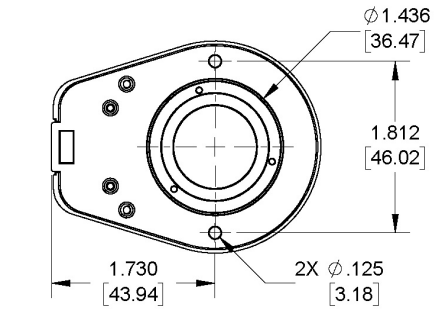
UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY

E6 Optical Kit Encoder, 5-Pin Version (Default)

RELEASE DATE: 10/31/2025







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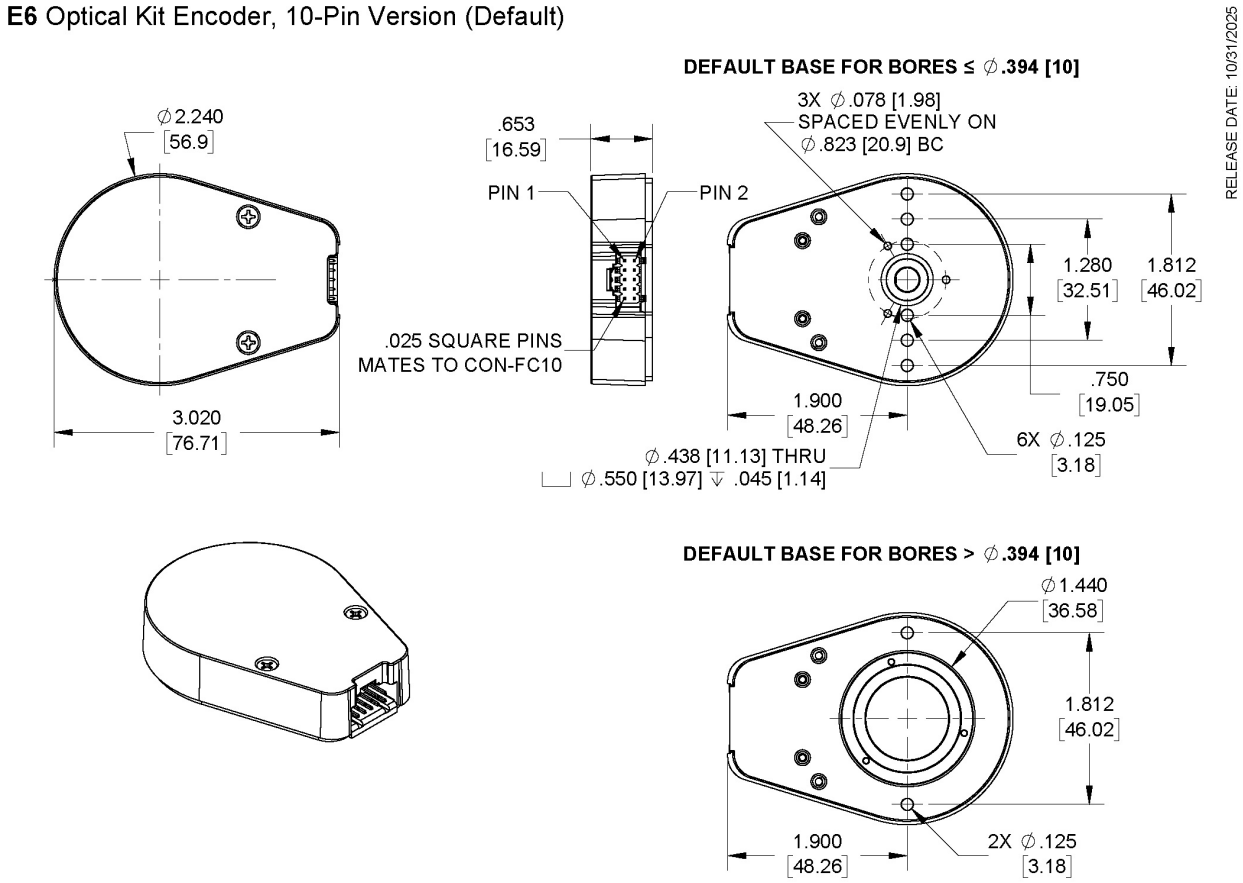


Specifications

ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature (CPR < 3600)	-40 to 100	C
Operating Temperature (CPR ≥ 3600)	-25 to 100	C
Electrostatic Discharge Single-ended (-A, -S version), IEC 61000-4-2 Differential (-D, -L version), Human Body Model High-Voltage, Open-collector (H, C option), IEC 61000-4-2	 ± 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 ≤ 2500: Max. RPM (1) Max. A/B Frequency e.x. CPR=2500, Max. RPM=7200 e.x. CPR=100, Max. RPM=60000	 minimum value of ((18 x 10^6) / CPR) and (60000) 300	 RPM kHz
For CPR = 3600, 4000, 4096, 5000: Max. RPM (1) Max. A/B Frequency	 (21.6 x 10^6) / CPR 360	 RPM kHz
For CPR = 7200, 8000, 8192, 10000: Max. RPM (1) Max. A/B Frequency	 (43.2 x 10^6) / CPR 720	 RPM kHz
Typical Product Weight Single-Ended (S option) Differential (D, L option) High-Voltage, Open-Collector (H, C option)	 1.55 1.83 1.83	 oz.
Codewheel Moment of Inertia	8.9 x 10^-5 for bore < 12mm 4.0 x 10^-4 for bore ≥ 12 mm	oz-in-s²
Hub Set Screw	#3-48 or #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 (2)	0.823 ± 0.005	in.
2 Screw Bolt Circle Diameter	0.750 ± 0.005	in.
Required Shaft Length (3) With E-option (2) With H-option	0.445 to 0.570 0.445 to 0.750 > 0.445	in.
Index Alignment to Hub Set Screw	180 Typical	degrees

(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) Only for shaft diameters < 0.472".

(3) Add 0.125" to all required shaft lengths when using M-option.

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
Module Mounting Screw	3.5-4	in-lbs

PHASE RELATIONSHIP

SINGLE-ENDED (S) / DIFFERENTIAL (D) / HIGH-VOLTAGE (H) / OPEN-COLLECTOR (C) OPTION:

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

BROADCOM / AVAGO COMPATIBLE PIN-OUT (A, L) OPTION:

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

SINGLE-ENDED OPTION

- S option provides 5V TTL compatible outputs
- 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/components/modules/em1/)* and EM2 *(https://www.usdigital.com/products/encoders/incremental/components/modules/em2/)* product pages

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27 54 72	33 62 85	mA mA mA	CPR < 1000, no load CPR ≥ 1000 and < 3600, no load CPR ≥ 3600, no load
Low-level Output		 0.05 0.25	0.5 0.5	V mA mA mA	I_{OL} = 8mA max., CPR < 3600 I_{OL} = 5mA max., CPR ≥ 3600 no load, CPR < 3600 no load, CPR ≥ 3600
High-level Output	2.0 2.0	 4.8 3.5		V V V V	I_{OH} = -8mA max., CPR < 3600 I_{OH} = -5mA max., CPR ≥ 3600 no load, CPR < 3600 no load, CPR ≥ 3600
Output Current Per Channel	-8 -5		8 5	mA mA	CPR < 3600 CPR ≥ 3600
Output Rise Time		110 50		nS nS	CPR < 3600 CPR ≥ 3600
Output Fall Time		35 50		nS nS	CPR < 3600 CPR ≥ 3600

DIFFERENTIAL OPTION

- D Option provides differential line driver output
- 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/components/modules/em1/)* and EM2 *(https://www.usdigital.com/products/encoders/incremental/components/modules/em2/)* product pages

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		29 56 74	36 65 88	mA mA mA	CPR < 1000, no load CPR ≥ 1000 and < 3600, no load CPR ≥ 3600, no load

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Low-level Output		0.2	0.4	V	I_{OL} = 20mA max.
High-level Output	2.4	3.4		V	I_{OH} = -20mA max.
Differential Output Rise/Fall Time			15	nS	

HIGH-VOLTAGE OPTION

- H option uses a higher supply voltage and provides both single-ended and open-collector outputs
- Single-ended outputs are 5V TTL compatible (same as S option). See Pin-out.
- Specifications apply over the entire operating temperature range
- For complete details, see the EM1 *(https://www.usdigital.com/products/encoders/incremental/components/modules/em1/)* or EM2 *(https://www.usdigital.com/products/encoders/incremental/components/modules/em2/)* product pages

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Voltage	7.5		30.0	V	
Supply Current, 24V power		8 16 22	10 19 25	mA mA mA	CPR < 500, no load CPR ≥ 500 and < 2000, no load CPR ≥ 2000, no load
Open Collector "On" Resistance		2		ohms	
Open Collector Sink Current			200	mA	
Output Low Voltage			0.4	V	200 mA sink current
Open Collector Pullup Voltage			50	V	

PIN-OUTS

5-PIN SINGLE-ENDED S OPTION (1)		10-PIN DIFFERENTIAL D OPTION (2)		10-PIN DIFFERENTIAL L OPTION (2)(3)		10-PIN SINGLE-ENDED A-OPTION (2)(3)		10-PIN HIGH-VOLTAGE H OPTION (2)	
Pin	**Description**	**Pin**	**Description**	**Pin**	**Description**	**Pin**	**Description**	**Pin**	**Description**
1	Ground	1	Ground	1	No connection	1	A channel	1	Ground
2	Index	2	Ground	2	+5VDC power	2	+5VDC power	2	Ground
3	A channel	3	Index-	3	Ground	3	Ground	3	Index- (open collector)
4	+5VDC power	4	Index+	4	No connection	4	No connection	4	Index+ (single-ended)
5	B channel	5	A- channel	5	A- channel	5	No connection	5	A- channel (open collector)
		6	A+ channel	6	A+ channel	6	Ground	6	A+ channel (single-ended)
		7	+5VDC power	7	B- channel	7	+5VDC power	7	7.5-30V power
		8	+5VDC power	8	B+ channel	8	B+ channel	8	7.5-30V power
		9	B- channel	9	Index-	9	+5VDC power	9	B- channel (open collector)
		10	B+ channel	10	Index+	10	Index	10	B+ channel (single-ended)

(1) 5-pin single-ended mating connector is CON-FC5 *(https://www.usdigital.com/products/accessories/connectors/con-fc5/)*.
(2) 10-pin differential mating connector is CON-FC10 *(https://www.usdigital.com/products/accessories/connectors/con-fc10/)*.
(3) Broadcom / Avago compatible version.

ACCESSORIES

1. Centering Tool

Part #: CTOOL - (Shaft Diameter)
This reusable tool centers the shaft within the encoder base during assembly. It is required for the proper functioning of the encoder.

2. Hex Tool

Part #: HEXD-050
Hex driver, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Included with **-B** or **-1** packaging options for order quantities of 10 or more.

Part #: HEXW-050

Hex wrench, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Included with **-B** or **-1** packaging options for order quantities of 9 or less. Included with **-3** packaging option for all order quantities.

3. Spacer Tool

This reusable tool sets the proper spacing between the disk and sensor during assembly. It is required for the proper functioning of the encoder.

Part #: SPACER-E6S
Description: For shaft sizes < 0.472"

Part #: SPACER-E6L
Description: For shaft sizes 12mm to 1"

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-348-125-SS
Description: Socket Head Set Screw, 3-48 UNC x 1/8"
Use: Hub/Disk Mounting for 12mm - 1" Bore
Quantity Required: 2
Screws are 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-440-500-PH
Description: Pan Head, Phillips #4-40 UNC x 1/2"
Use: Module Mounting
Quantity Required: 2
Screws are included

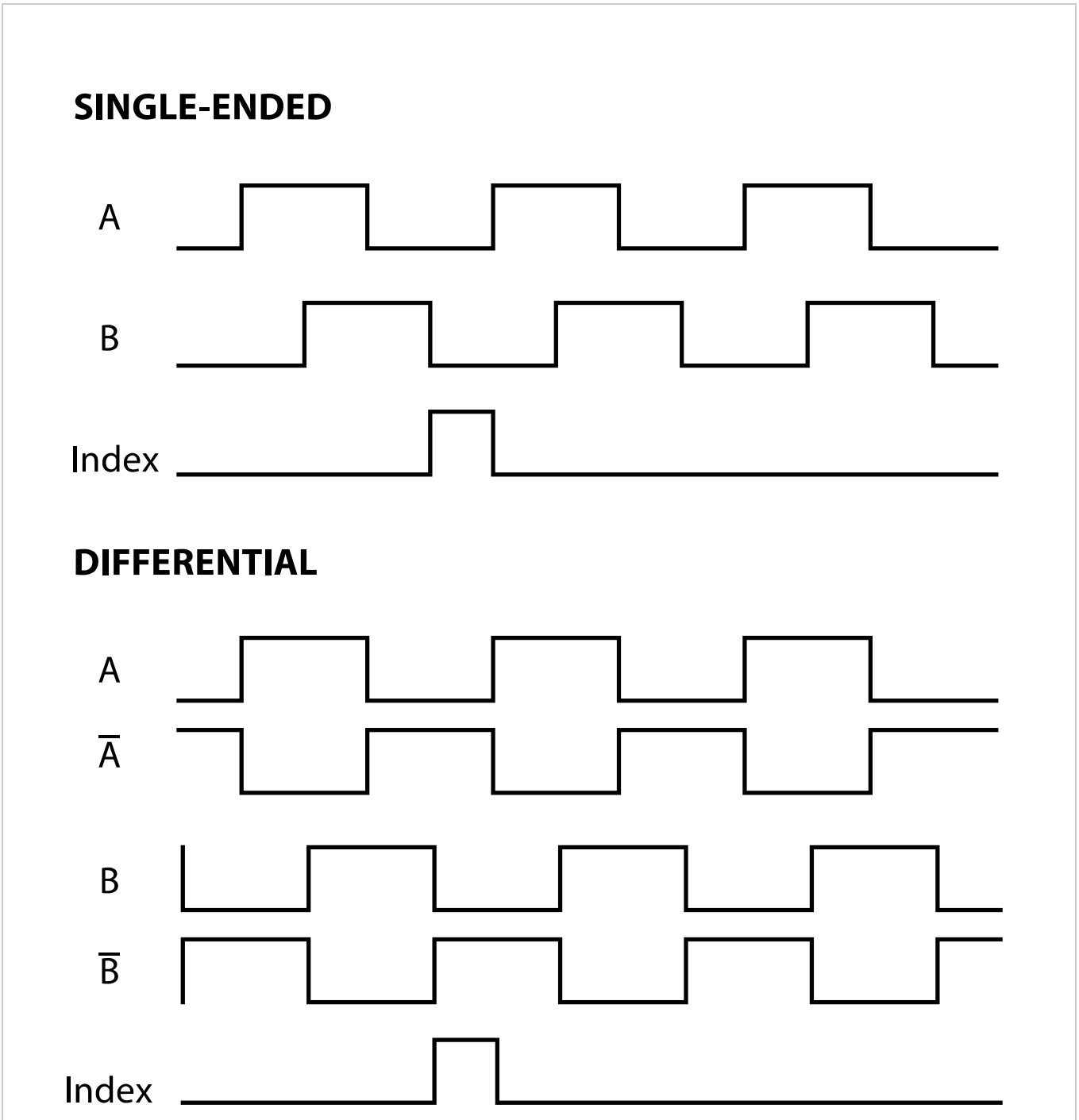
Part #: SCREW-440-625-FH
Description: Flat Head, Phillips 4-40 UNC x 5/8"
Use: Cover Mounting
Quantity Required: 2
Screws are included

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

- Cables and connectors are not included and must be ordered separately.
- 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.

Configuration Options

E6	-	CPR (Cycles Per Revolution)	-	Bore Size	-	Index	-	Output	-	Cover	-	Base	-	Packaging
		64 100 200 400 500 512 800 1000 1024 1800 2000 2048 2500 3600 4000 4096 5000 7200 8000 8192 10000		079 (*2.0mm*) 118 (*3.0mm*) 125 (*1/8"*) 156 (*5/32"*) 157 (*4.0mm*) 188 (*3/16"*) 197 (*5.0mm*) 236 (*6.0mm*) 250 (*1/4"*) 313 (*5/16"*) 315 (*8.0mm*) 375 (*3/8"*) 394 (*10.0mm*) 472 (*12.0mm*) 500 (*1/2"*) 551 (*14.0mm*) 625 (*5/8" Bore*) 750 (*3/4" Bore*) 787 (*20.0mm*) 875 (*7/8"*) 984 (*25.0mm*) 1000 (*1"*)		IE (*Index*) NE (*Non-Index*)		S (*Single-Ended*) H (*Single-Ended High-Voltage*) D (*Differential*) L (*Avago 10-pin Differential*) A (*Avago 10-pin Single-Ended*)		D (*Default*) E (*Extended*) H (*Through-Hole*)		D (*Default*) 3 (*1/8" Mounting Holes*) M (*3" Diameter Bolt Circle*)		Bulk (B) - Includes one centering, hex and spacer tool per order, plus an extra set per 100 encoders. Individual (1) - Includes one centering, hex, and spacer tool per order, plus an extra set per 100 encoders. Individual (3) - Includes one centering, hex, and spacer tool with each encoder.

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the E6 product page *(https://www.usdigital.com/products/E6)* for pricing and additional information.