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Description

The E2 is a rotary encoder with a molded polycarbonate enclosure, which utilizes either a 5-pin locking or standard connector.This optical incremental encoder is designed to easily mount to and dismount from an existing shaft to provide digital feedback information.

The E2 is easy to add to existing applications and only consists of four main components; base, cover, hub/code wheel and optical encoder module.

The E2 is normally designed for applications of 6 feet or less. For longer cable lengths, adding a PC4 / PC5 differential line driver is recommended.

The base and cover are both constructed of rugged 20% glass filled polycarbonate. 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 use of a centering tool (sold separately). The cover is securely attached to the base with two 4-40 flat head screws to provide a resilient package protecting the internal components.

The internal components consist of a shatterproof mylar disk mounted to a precision machined aluminum hub and an encoder module. The module consists of a highly collimated solid state light source and monolithic phased array sensor, which together provide a system extremely tolerant to mechanical misalignments.

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

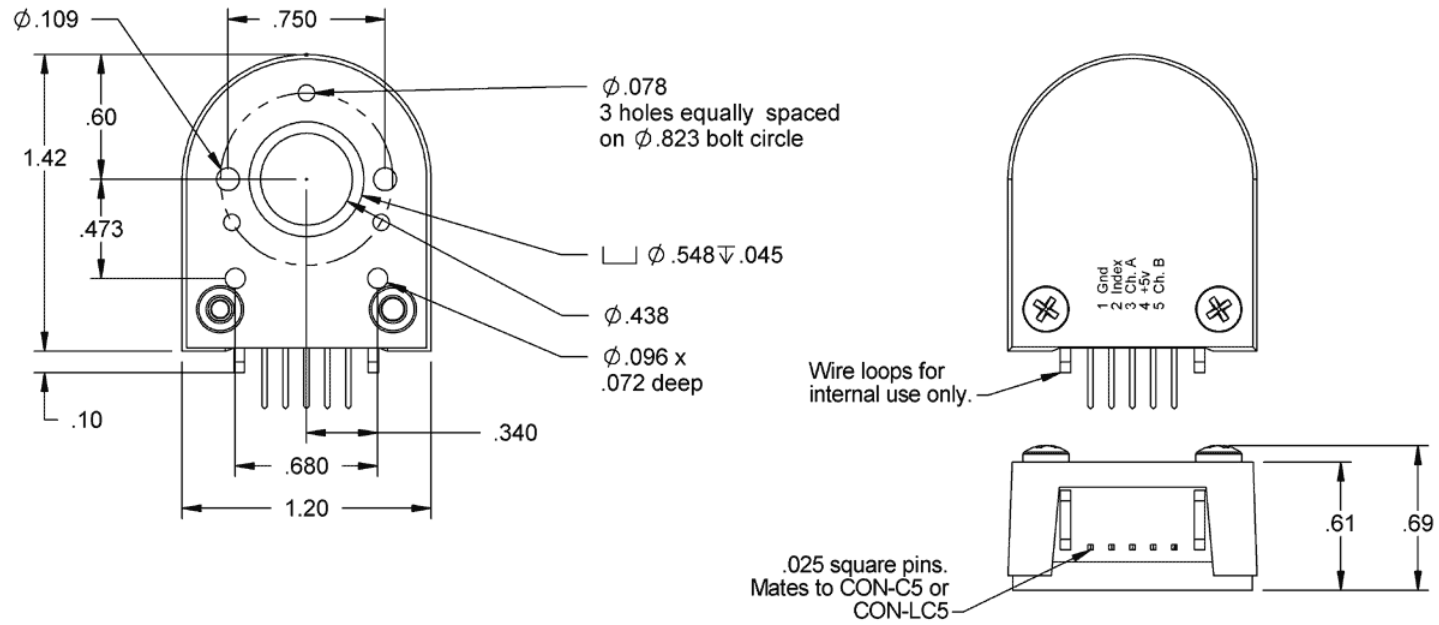
Avago / Agilent Direct Replacements:

US Digital's E2 encoder may now be used as direct replacements for Avago / Agilent's HEDS-5500, HEDS-5505, HEDS-5540, HEDS-5545, HEDS-5600, HEDS-5640, HEDS-5645.

Features

- Quick, simple assembly and disassembly
- Rugged screw-together housing
- Accepts .010" axial shaft play
- Tracks from 0 to 100,000 cycles/sec
- 32 to 1250 cycles per revolution (CPR)
- 128 to 5000 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- -40 to +100C operating temperature
- Mounting compatibility with Agilent HEDS-5500

Mechanical Drawing



Mechanical

Parameter	Dimension	Units
Moment of Inertia	8.0 x 10^-6	oz-in-s²
Hub Set Screw	3-48 or 4-48	in.
Hex Wrench Size	.050	in.
Encoder Base plate Thickness	.135	in.
3 Mounting Screw Size	0-80	in.
2 Mounting Screw Size	2-56 or 4-40	in.
3 Screw Bolt Circle Diameter	.823 +/-.005	in.
2 Screw Bolt Circle Diameter	.750 +/-.005	in.
Required Shaft Length	.445 to .570*	in.
With **E**-option	.445 to .795*	in.
With **H**-option	>.445*	in.

* Add .125" to the required shaft length when using **R**-option.

Absolute Maximum Ratings

Parameter	Max.	Units
Vibration (5 to 2kHz)	20	g
Shaft Axial Play	0.01	in.
Shaft Eccentricity Plus Radial Play	0.004	in.

Parameter	Max.	Units
Acceleration	250,000	rad/sec²

- Note that radial play translates directly to position inaccuracy.

Phase Relationship

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

Torque Specifications

Parameter	Torque
Hub Set Screw to Shaft	2-3 in.-lbs.
Cover (4-40 screws through cover into base)	2-3 in.-lbs.
Base to Mounting Surface	4-6 in.-lbs.
Base to Mounting Adapter Plate	4-6 in.-lbs.
Adapter Plate to Mounting Surface (4-40 screws)	4-6 in.-lbs.

Disk Optics

Be sure to keep different diameters, resolutions and options separated. The resolution of the optoelectronic modules and the code wheels must match. Index and non-index parts cannot be mixed since the optical patterns are different. An identifier is stamped on each optoelectronic module.

For Agilent Modules (HEDS):
The 2-channel (non-index) version can be identified by a 9100 or 9200. The 3-channel (index) version can be identified by a 9140. One letter specifies the resolution as shown in the table below.

For US Digital Modules (EM1):
Only available in 3-channel (index) version and are identified by a 1 for 1" disk. The second number indentifies the resolution as shown in the table below (*in italics*).

Disk	Standard	Index
32	-	*1-32*
50	S	S
96	C	C
100	C	C
110	C	-
120	C	-
192	E	E

Disk	Standard	Index
200	E	E
250	F	F
256	F	F
360	G	G
400	H	H
500	A	A
512	I	I
540	I	-
720	-	*1-720*
900	-	*1-900*
1000	B	*1-1000*
1016	J	-
1024	J	*1-1024*
1250	-	*1-1250*

Pin-Out

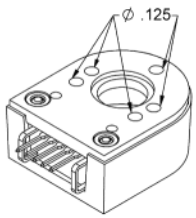
Pin	Description
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

Options

Index

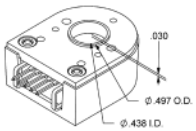
Provides a single pulse per revolution.

3-option



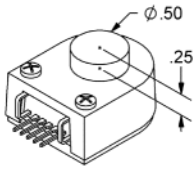
3-option makes all five of these hole diameters .125". If desired, the two .096" diameter recesses will mate with matching aligning pins. The .438" diameter center hole can also mate with a motor boss.

A-option



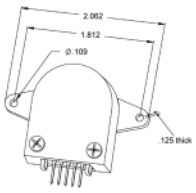
A-option adds a .497" diameter alignment shoulder designed to slip into a .500" diameter recess in the mounting surface centered around the shaft.

E-option

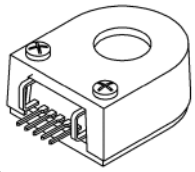


The **E**-option provides a cylindrical extension to the cover allowing for longer shafts of up to .795".

G-option



This option includes molded ears on the base which enable it to be mounted to a 1.812" diameter bolt circle. The mounting holes are designed to fit 4-40 screws. Because the ears are molded to the base this does not increase the thickness of the encoder and does not add to the required shaft length. This option will work with shaft lengths of .445" to .570".



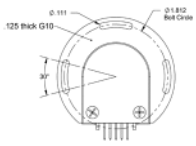
H-option

The **H**-option adds a hole to the cover for the shaft to pass through.

Shafts <.375", a .375" diameter hole is supplied.

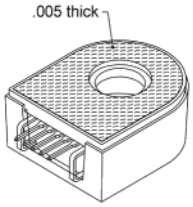
Shafts >=.375", a .500" diameter hole is supplied.

R-option



This adapter is an 1/8" thick fiberglass adapter which is pre-mounted to the base of the encoder. It allows the **E2** to be rotated 15 ° while operating for index orientation. Use three 4-40 x 1/4" screws (sold separately). When installing the hub, rotate the index to the approximate position. After assembly, with the 3 screws loose, rotate while operating to the desired index location and tighten. Note that this adds 1/8" to the required shaft length.

T-option



When mounting holes are not available, a pre-applied transfer adhesive (with peel-off backing) is available for "stick-on" mounting. Use the centering tool (sold separately) to slide the base into position. **T**-option specifies transfer adhesive on the standard mounting base. A centering tool is highly recommended when using transfer adhesive.

Instructions: To use transfer ahesive, peel off paper backing and slip tool into center hole of base and slide both down shaft as one piece. Press to form a good bond, then slip tool off and continue with standard mounting instructions.

Accessories

For complete information on included accessories see the Packaging Options below.

Centering Tools (May need to order separately, only included with PKG3-packaging option).

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.
- When using the **T**-option transfer adhesive.

Instructions: When mounting encoder base, slide centering tool down shaft until it slips into centering hole of encoder base. Tighten mounting screws, then remove centering tool.

Hex Tools (May need to order separately, see below for more information).

Part #: HEXD-050 (only included with default or PKG1-packaging options).

Description: Hex driver, .050" flat-to-flat for 3-48 or 4-48 set screws.

Part #: HEXW-050 (only included with PKG2 or PKG3-packaging options)

Description: Hex wrench, .050" flat-to-flat for 3-48 or 4-48 set screws.

Spacer Tools (Do not need to order separately, included with ALL packaging options)

Part #: SPACER-96

Description: For shafts <=.315".

Part #: SPACER-4192

Description: For shaft sizes 3/8 IN. or 10MM.

Screws For base mounting only, screws for mounting the housing to the base are already included).

Part #: SCREW-080-250-PH

Description: Pan Head, Cross Drive 0-80 UNF x 1/4"

Quantity Required for Mounting: 3 per encoder

Part #: SCREW-256-250-PH

Description: Pan Head, Cross Drive 2-56 UNC x 1/4"

Quantity Required for Mounting: 2 per encoder

Part #: SCREW-440-250-PH

Description: Pan Head, Cross Drive 4-40 UNC x 1/4"

Quantity Required for Mounting: 2 per encoder

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 and HEDS product pages.

	Supply Current	Output voltage low	Output voltage high	
Resolution	Typ / Max	Max	Min	Based on

	Supply Current	Output voltage low	Output voltage high	
50,96, 100, 110, 120, 192, 200, 250, 256, 360, 400, 500, 512, 540 CPR, non-index	17 / 40 mA	0.4 volts @ 3.2mA	2.4 volts @ -200uA	Low-res HEDS
1000, 1016, 1024 CPR, non-index	57 / 85 mA	0.5 volts @ 8mA	2.4 volts @ -40uA	High-res HEDS
32 CPR, with index	27 / 30 mA	0.5 volts @ 8mA	2.0 volts @ -8mA	EM1
50,96, 100, 192, 200, 250, 256, 360, 400, 500, 512 CPR, with index	57 / 85 mA	0.5 volts @ 8mA	2.4 volts @ -40uA	High-res HEDS
720, 900, 1000, 1024, 1250 CPR, with index	55 / 57 mA	0.5 volts @ 8mA	2.0 volts @ -8mA	EM1

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Ordering Information

E2 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

CPR	Bore	Index	Cover	Base	Packaging
32	079 = *2mm*	N =*No Index*	D =*Default*	D =*Default*	B =*Encoder components packaged in bulk. One spacer tool and one hex driver per 100 encoders*
50	118 = *3mm*	I =*Index (3rd channel)*	E =*Cover Extension*	3 =*Base Mounting Holes become .125"*	1 =*Each encoder packaged individually. One spacer tool and one hex driver per 100 encoders.*
96	125 = *1/8"*		H =*Hole in Cover*	A =*Adds self-aligning shoulder to base*	2 =*Each encoder packaged individually with one spacer tool and one hex wrench per encoder.*
100	156 = *5/32"*			G =*Adds 1.812 mounting "ears" to base*	3 =*Each encoder packaged individually with one spacer tool, one hex wrench, and one centering tool per encoder.*
110	157 = *4mm*			R =*Adds 3-slot adapter to bottom of base*	
120	188 = *3/16"*			T =*Transfer Adhesive*	
192	197 = *5mm*				
200	236 = *6mm*				
250	250 = *1/4"*				
256	313 = *5/16"*				
360	315 = *8mm*				
400	375 = *3/8"*				
500	394 = *10mm*				
512					
540					
720					
900					
1000					
1016					
1024					
1250					

Rules

- Index must be something other than I when CPR is 110, 120 or 1016
- Index must be equal to I when CPR is 32, 540, 720, 1024 or 1250

Notes

- US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.

Pricing

Quantity	Price

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1	$46.95
10	$39.17
50	$32.39
100	$28.15

- Add $7.00 per unit for **Base** of Adds 3-slot adapter to bottom of base
- Add $6.00 per unit for **Base** of Transfer Adhesive
- Add $3.00 per unit for **Packaging** of Each encoder packaged individually. One spacer tool and one hex driver per 100 encoders.
- Add $4.00 per unit for **Packaging** of Each encoder packaged individually with one spacer tool and one hex wrench per encoder.
- Add $7.00 per unit for **Packaging** of Each encoder packaged individually with one spacer tool, one hex wrench, and one centering tool per encoder.
- Add 21% per unit for **Index** of I or **CPR** greater than or equal to 1000.