

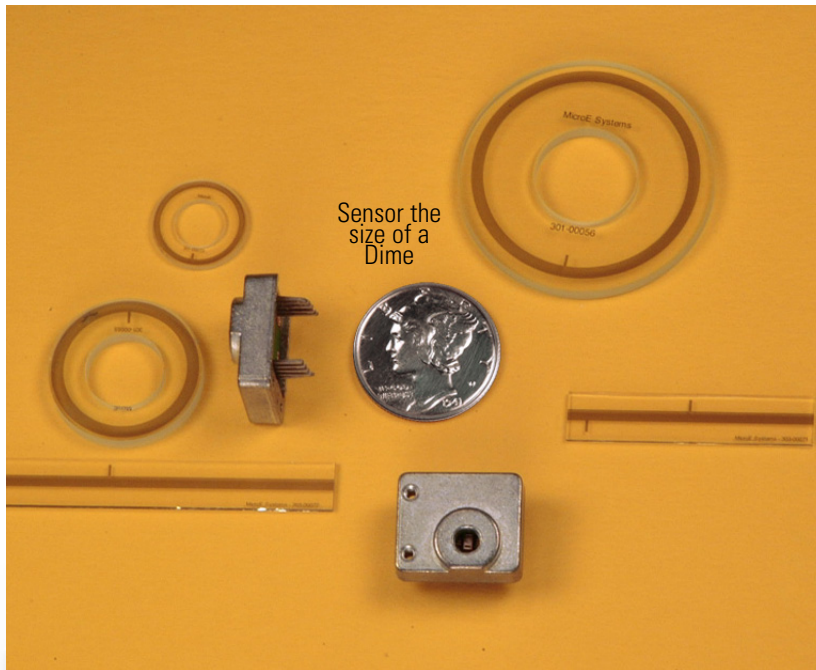
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Mercury™ 1200 PCB-Mount Analog Encoders

For Customer Interpolation- Resolution to 0.078µm

Reflective Linear and Rotary Encoders



Resolution

Determined by Customer Electronics

Linear: 20µm to 0.078µm
Rotary: 2,500 to 4.2M CPR

Accuracy

Linear: ± 1µm available
± 3µm to ± 5µm standard
Rotary: Up to ± 2.1 arc-sec

Output

Analog Sine/Cosine and Index Window

The Mercury 1200 encoder is an analog output system. Designed for PC board mounting, it is available with linear or rotary scales. Mercury's space-saving, integrated configuration gives OEM system designers a breakthrough in performance.

Imagine what you can do with this!

OEMs can now use encoders for closed loop control where it was previously not possible or cost effective. Using your interpolation electronics, engineers can achieve dramatic improvements in system speed, throughput, and reliability, while reducing cost, size and weight. The Mercury 1200 series kit encoders make it all possible. The analog output sensors can mount directly on your printed circuit board within an EMI shielded module. The low Z height of the sensor, only 5.6mm, opens up exciting design possibilities.

OEMs that want to incorporate our interpolation electronics can contact MicroE for chip set or daughterboard solutions.

Standard Features

- Small PCB mount sensor
- Sensor is 5.6mm (H) x 11.9mm (W) x 14.9mm (L) and weighs 1.2g
- Fundamental resolution: Linear 20µm; Rotary 2,500 - 16,384 CPR
Interpolated linear resolution up to 0.078µm;
Rotary resolution 2,500 CPR to 4.2M CPR
- Analog output: sine/cosine and Index window
- Bi-directional Index window signal
- Index mark at the center or end of the glass scale (linear)

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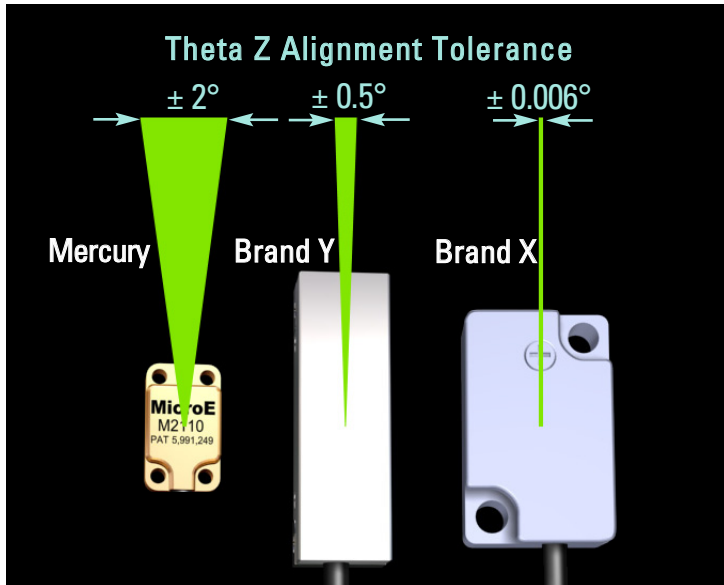
Optional features

- Glass scale length or diameter:
Linear lengths from 5mm to 2m
Rotary diameters from 12mm to 108mm



Broader Alignment Tolerances, Increased Standoff Clearance, Smallest Sensor and More

Why Mercury Encoders Make It Easier To Design High Performance Into Your Equipment



Eliminate the Frustration of Touchy Encoder Alignment

Mercury Solves this Problem for Good

Fussy alignment is no longer a concern. With Mercury's patented PurePrecision™ optics, advanced SmartPrecision™ electronics and LED alignment indicators, you can push the sensor against your reference surface, tighten the screws and you're finished. Try that with brand X or Y.

This performance is possible thanks to relaxed alignment tolerances, particularly in the theta Z axis. Mercury offers a $\pm 2^\circ$ sweet spot— that's a 300% improvement over the best competitive encoder. And that will result in dramatic savings in manufacturing costs.

No other commercially available encoder is easier to align, easier to use, or easier to integrate into your designs.

Alignment Tolerance Comparison**

	Mercury*	Brand X	Brand Y	Mercury vs. Best Competitor
Z Standoff	$\pm 0.15\text{mm}$	$\pm 0.1\text{mm}$	$\pm 0.1\text{mm}$	Mercury is 50% better
Y	$\pm 0.20\text{mm}$ for linear $\pm 0.10\text{mm}$ for rotary $\geq 19\text{mm}$ dia.	$\pm 0.1\text{mm}$	unspecified	Mercury is 100% better
theta X	$\pm 1.0^\circ$	unspecified	$\pm 1.0^\circ$	
theta Y	$\pm 2.0^\circ$	$\pm 0.1^\circ$	$\pm 1.0^\circ$	Mercury is 100% better
theta Z	$\pm 2.0^\circ$	$\pm 0.006^\circ$	$\pm 0.5^\circ$	Mercury is 300% better

*Measured at a constant temperature for one axis at a time with all other axes at their ideal positions.

**Based on published specifications

Mercury Can Reduce System Size and Cost

Mercury's sensor height is 44% shorter than competitive encoders, making it easy to fit into your design. This reduction can also cut total system weight and cost by allowing the use of smaller motors and stages. Safe system operation is also enhanced thanks to Mercury's generous standoff clearance— 200% greater than other encoders. And its standoff tolerance is 50% greater than the best alternative.

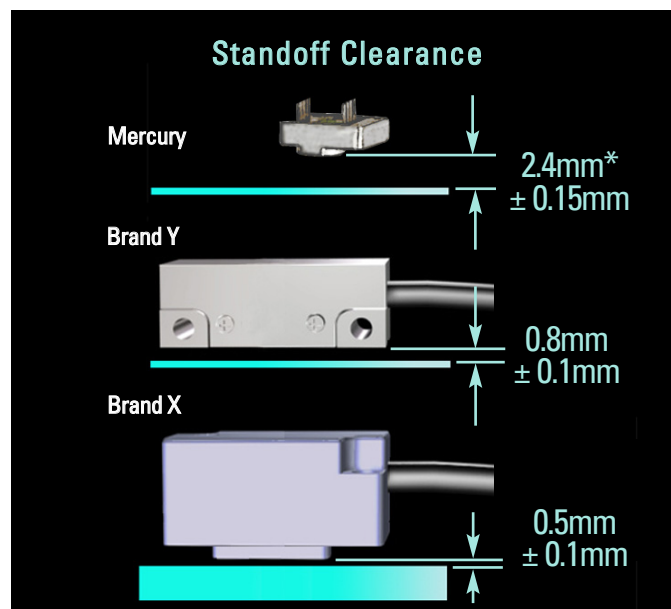
This significantly relaxes mechanical system tolerances, while reducing system costs.

Mechanical Dimension Comparison**

	Mercury	Brand X	Brand Y	Mercury vs. Best Competitor
Sensor Z height	8.4mm	23mm	15mm	44% better
Standoff clearance	2.4mm	0.5mm	0.8mm	200% better
Standoff tolerance	$\pm 0.15\text{mm}$	$\pm 0.1\text{mm}$	$\pm 0.1\text{mm}$	50% better
System height	11.7mm	28.5mm	15.8mm	26% better

**Based on published specifications

Note: Mercury 1200 is even smaller at 5.6mm sensor height



* Dimensions shown illustrate encoder system standoff clearance; see Mercury Encoder Interface Drawings for correct design reference surfaces.

System Specifications

System

Grating Period	20µm		
Signal Period	20µm		
System Resolution	Fundamental resolution: Linear 20µm; Rotary 2,500 - 16,384 CPR Interpolated resolution determined by customer electronics: Linear: 20µm - 0.078µm; rotary: 2,500 to 4.2M CPR		
Linear Accuracy*	Better than ±1µm available; contact MicroE Better than ±3µm up to 130mm, ±5µm from 155mm to 1m, ±5µm per meter from 1m to 2m		
*Maximum peak to peak error over the specified movement when compared to a NIST-traceable laser interferometer standard, used at room temperature and with MicroE interpolation electronics.			
Rotary Accuracy*	Scale O.D.	Microradians	Arc-Seconds
	12.00mm	±100	±21
	19.05mm	±63	±13
	31.75mm	±38	±7.8
	57.15mm	±19	±3.9
	107.95mm	±10	±2.1

*Based on ideal scale mounting concentricity

Sensor Size

W:	12.70mm	0.500"
L:	15.24mm	0.600"
H:	5.59mm	0.220"

Operating and Electrical Specifications

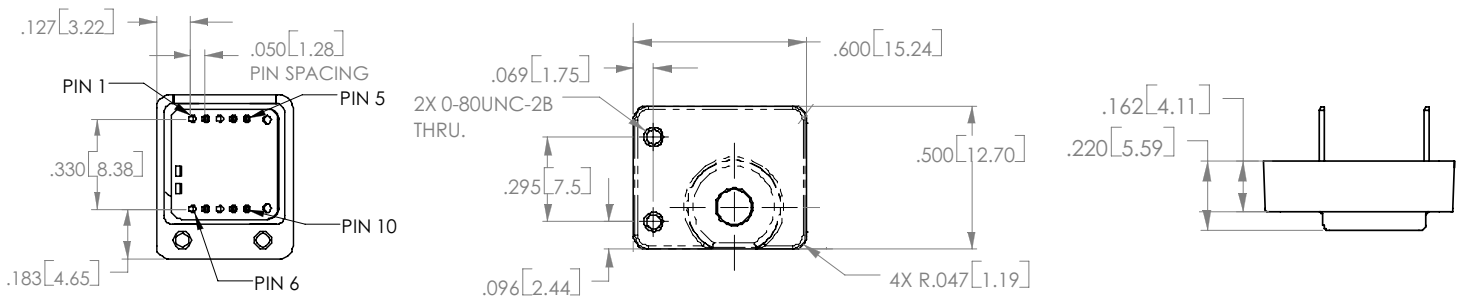
Power Supply	5VDC ±5% @ 33mA
Temperature	
Operating:	0 to 70°C
Storage:	-20 to 70°C
Humidity:	10 - 90% RH non-condensing
Shock:	1500G 0.5ms half sine
Sensor Weight:	2.6g (Sensor without cable)

Maximum Speed

	Scale Length/Diameter	Maximum Speed*
Linear	All Lengths	7200mm/s
Rotary	0.75"	8640 RPM
	1.25"	5273 RPM
	2.25"	2637 RPM
	4.25"	1318 RPM

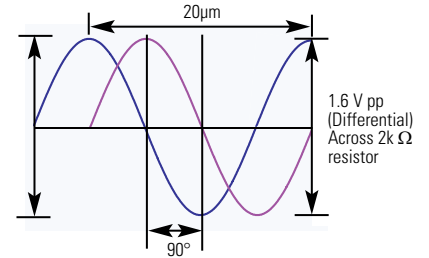
*Assumes customer electronics have adequate bandwidth

Mechanical Information - Sensor



All Specifications are subject to change. All data is accurate to the best of our knowledge. MicroE Systems is not responsible for errors.

Analog Output Pins 1,2,3 and 4

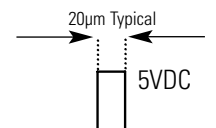


Mercury 1200 Outputs

10-pin interface

PIN	FUNCTION
1	Sine +
2	Sine -
3	Cosine +
4	Cosine -
5	+ 5 V DC
6	Reserved - Do Not Connect
7	Reserved - Do Not Connect
8	Index Window -
9	Index Window +
10	Ground

Index Window Pin 9



Scale Specifications

Standard and Customized Scales

MicroE Systems offers a wide array of chrome on glass scales for the highest accuracy and best thermal stability. Easy to install, standard linear and rotary scales meet most application requirements. Customized linear, rotary, and rotary segment scales are available where needed. All scales include an optical index. Mercury's glass scales save time by eliminating motion system calibrations or linearity corrections required by other encoders, and provide better thermal stability than metal tape scales.

Options include:

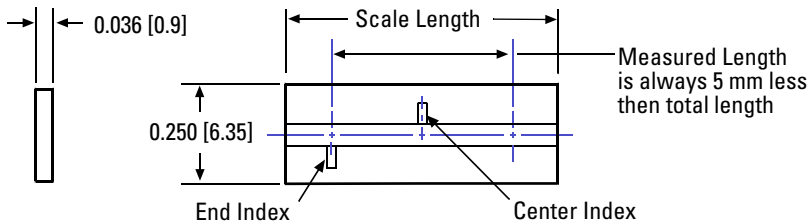
- *Standard linear*: 18mm - 2m
- *Standard rotary*: 12mm - 107.95mm diameter, with or without hubs
- *Custom linear**: special lengths, widths, thickness, index mark locations and special low CTE materials
- *Custom rotary**: special ID's, OD's (up to 304.8mm), index mark outside the main track and special low CTE materials
- *Mounting of hubs for rotary scales*: MicroE Systems can mount and align standard, custom, or customer-supplied hubs
- *Rotary segments**: any angle range; wide range of radius values

*Custom scales or rotary segments are available in OEM quantities. Contact your local MicroE Systems sales office.

Standard Short Linear Scales

130mm and Shorter

Key: inches[mm]



Specifications

Accuracy	±3µm standard ±1µm available
Material	Soda lime glass
Typical CTE	8ppm/°C
Index	Center or End

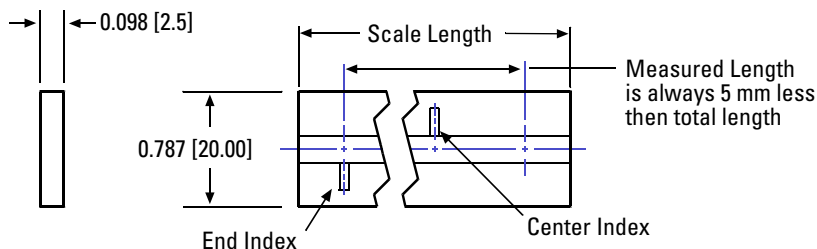
Model	L18	L30	L55	L80	L105	L130
Scale Length	0.709 [18]	1.181 [30]	2.165 [55]	3.150 [80]	4.134 [105]	5.118 [130]
Measured Length	0.512 [13]	0.984 [25]	1.969 [50]	2.953 [75]	3.937 [100]	4.921 [125]

Custom scales available

Standard Long Linear Scales

155mm and Longer

Key: inches[mm]



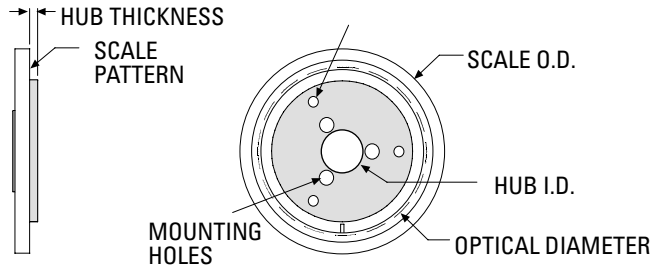
Specifications

Accuracy	±5 µm <1m ±5 µm/m >1m
Material	Soda lime glass
Typical CTE	8ppm/°C
Index	Center or End

Model	L155	L225	L325	L425	L525	L1025	L2025
Scale length	6.102 [155]	8.858 [225]	12.795 [325]	16.732 [425]	20.669 [525]	40.354 [1025]	79.724 [2025]
Measured length	5.906 [150]	8.661 [220]	12.598 [320]	16.535 [420]	20.472 [520]	40.157 [1020]	79.528 [2020]

Custom scales available

Standard Rotary Scales



Specifications

Material	Soda lime glass
Typical CTE	8ppm/°C

Key: inches[mm]

Model No.	Scale Outer Diameter	Scale Inner Diameter	Optical Diameter	Hub Inner Diameter +.0005/-0.0000	Hub Thickness	Fundamental CPR
R1206	0.472 [12.00]	0.250 [6.35]	0.413 [10.50]	0.1253 [3.18]	0.040 [1.02]	1650
R1910	0.750 [19.05]	0.375 [9.52]	0.627 [15.92]	0.1253 [3.183]	0.040 [1.02]	2500
R3213	1.250 [31.75]	0.500 [12.70]	1.027 [26.08]	0.2503 [6.358]	0.050 [1.27]	4096
R5725	2.250 [57.15]	1.000 [25.40]	2.053 [52.15]	0.5003 [12.708]	0.060 [1.52]	8192
R10851	4.250 [107.95]	2.000 [50.80]	4.106 [104.30]	1.0003 [25.408]	0.080 [2.03]	16384

Custom scales available

How to Order Mercury 1200 Encoder Systems

To specify your Mercury encoder with the desired scale, consult the chart below to create the correct part number for your order. Call MicroE Systems' Rapid Customer Response team for more information [508] 903-5000.

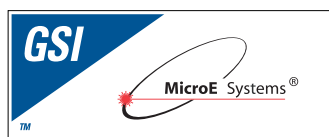
Example (linear): M1200-L55-C1 (Rotary): M1200-R3213-HB

<u>M1200</u>	–	<u>Scale Model</u>	–	<u>Scale Mounting</u>
M1200		Lxxx or Rxxxx		For Linear Scales: T = Tape Mounting C1 = 3 scale clamps* C2 = 10 scale clamps**
				Hubs for Rotary Scales: NH = No hub HE = for R1206 HA = for R1910 HB = for R3213 HC = for R5725 HD = for R10851

* 3 clamps come standard with linear scales up to 130mm

** 10 clamps come standard with linear scales 155mm or longer

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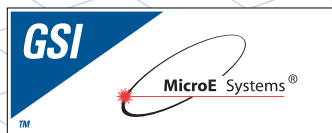
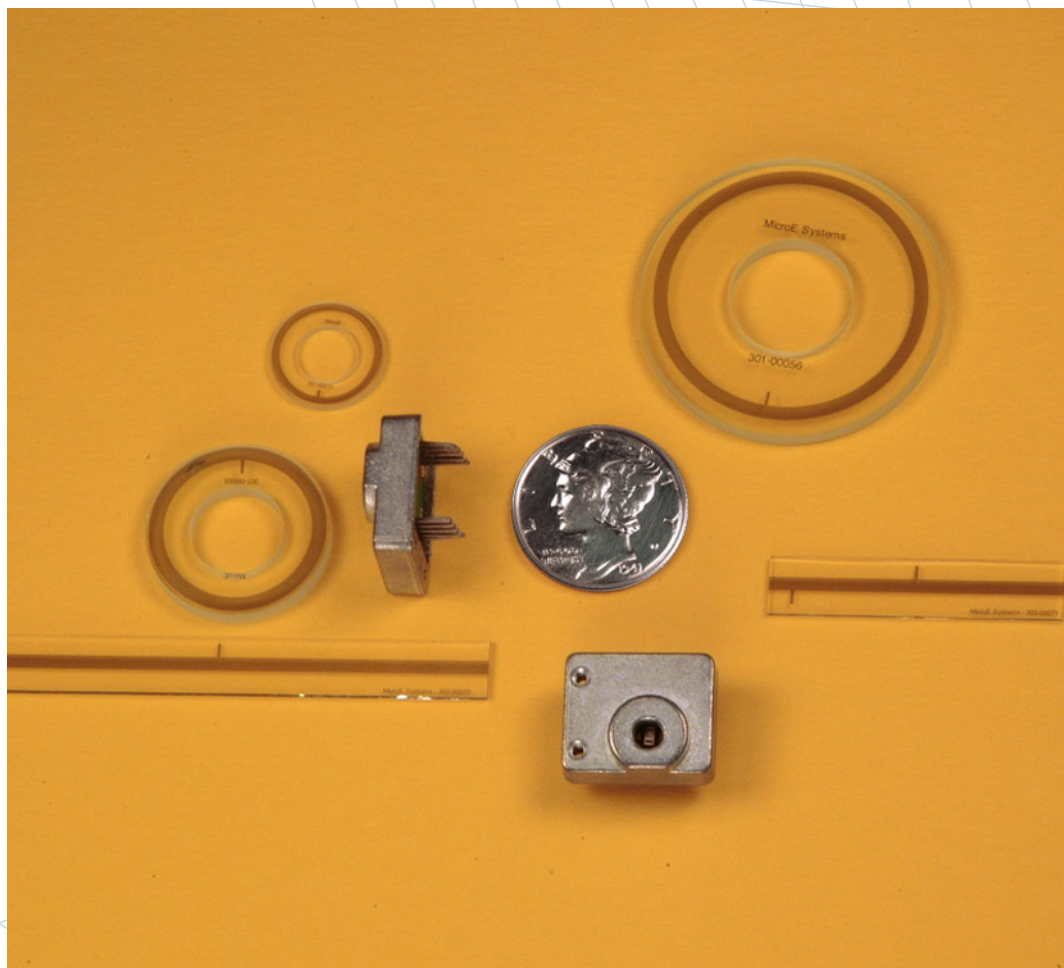


Mercury™ 1200 and 1500P

M1200-Analog Output Encoder Systems

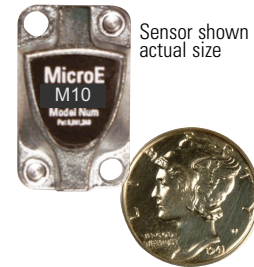
M1500P-Digital Output Encoder Systems

*Installation Manual
and Reference Guide*



Introduction

MicroE Systems was founded to advance encoder technology to a level never before achieved. Our objective was to design encoder systems that would be small enough to fit into densely packed OEM equipment designs, affordable enough for cost-sensitive applications and easy enough to enable installation, setup and alignment by assemblers with little training. We are pleased to say that all of these goals have been realized with the introduction of the Mercury family of encoders.



Precautions



- 1 Follow standard ESD precautions. Turn power off before connecting the sensor. Do not touch the electrical pins without static protection such as a grounded wrist strap.
- 2 Do not touch the glass scale unless you are wearing talc-free gloves or finger cots. Please read this installation manual for full instructions.

LASER SAFETY INFORMATION: Mercury & ChipEncoder

This product is sold solely for use as a component (or replacement) in an electronic product; therefore it is not required to, and does not comply with, 21 CFR 1040.10 and 1040.11 which pertain to complete laser products. The manufacturer of the complete system-level electronic product is responsible for complying with 21 CFR 1040.10 and 1040.11 and for providing the user with all necessary safety warnings and information.

MicroE encoders contain an infrared laser diode or diodes. Emitted invisible laser radiation levels have been measured to be within the CDRH Class 1 range, which is not considered hazardous; however, to minimize exposure to the diverging beam, the encoder sensor should be installed in its operational configuration in close proximity to the encoder scale before power is applied.



- Invisible laser radiation; wavelength: 850 nm
- Max power 2.4 mW CW (4.8 mW CW for Mercury II™)
- CAUTION – The use of optical instruments with this product will increase eye hazard. DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (MICROSCOPES, EYE LOUPES OR MAGNIFIERS).
- All maintenance procedures such as cleaning must be performed with the MicroE encoder turned off.
- Do not insert any reflective surface into the beam path when the encoder is powered.
- Do not attempt to service the MicroE encoder.

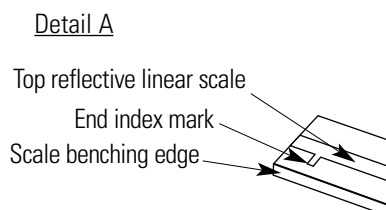
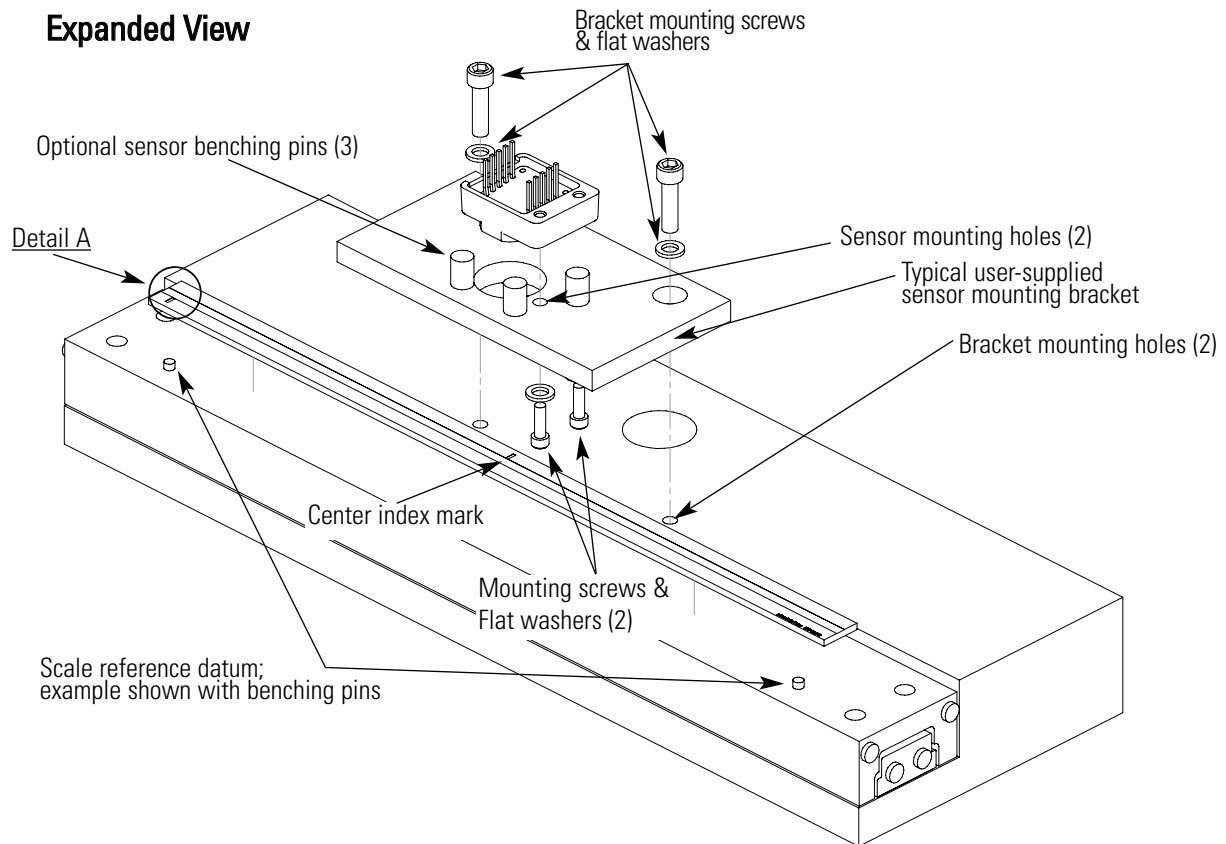
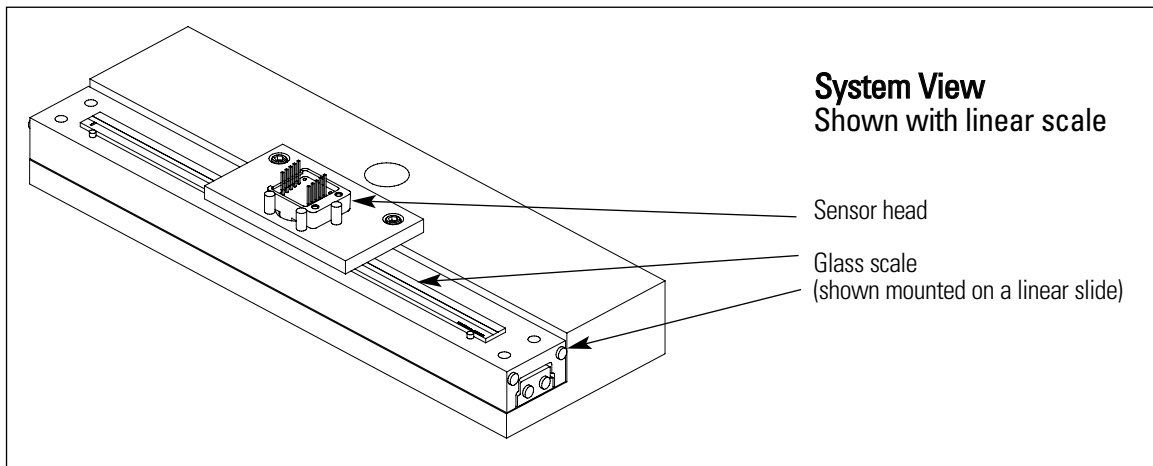
Patents

Covered by the following patents: US 5,991,249; EP 895,239; JP 3,025,237; US 6,897,435; and EP 1,451,933. Additional patents and patents pending may apply.

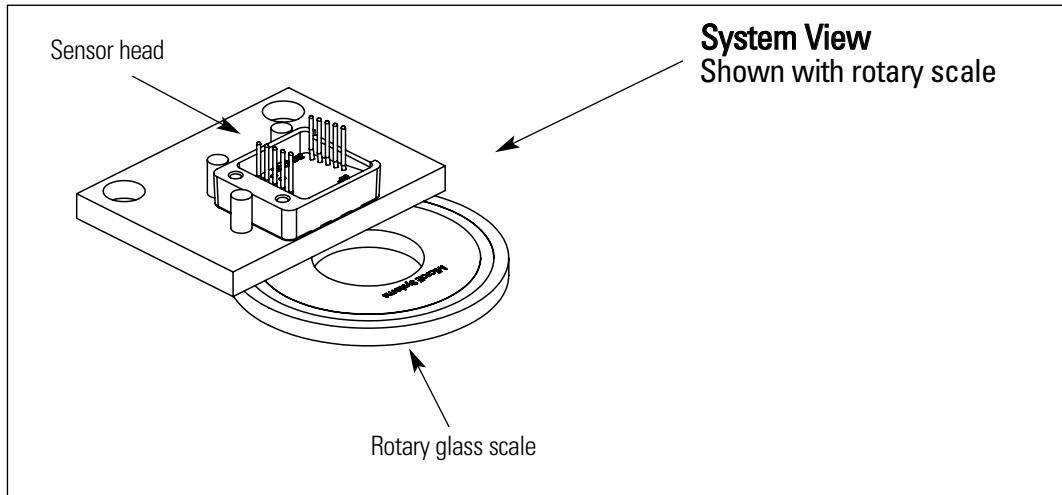
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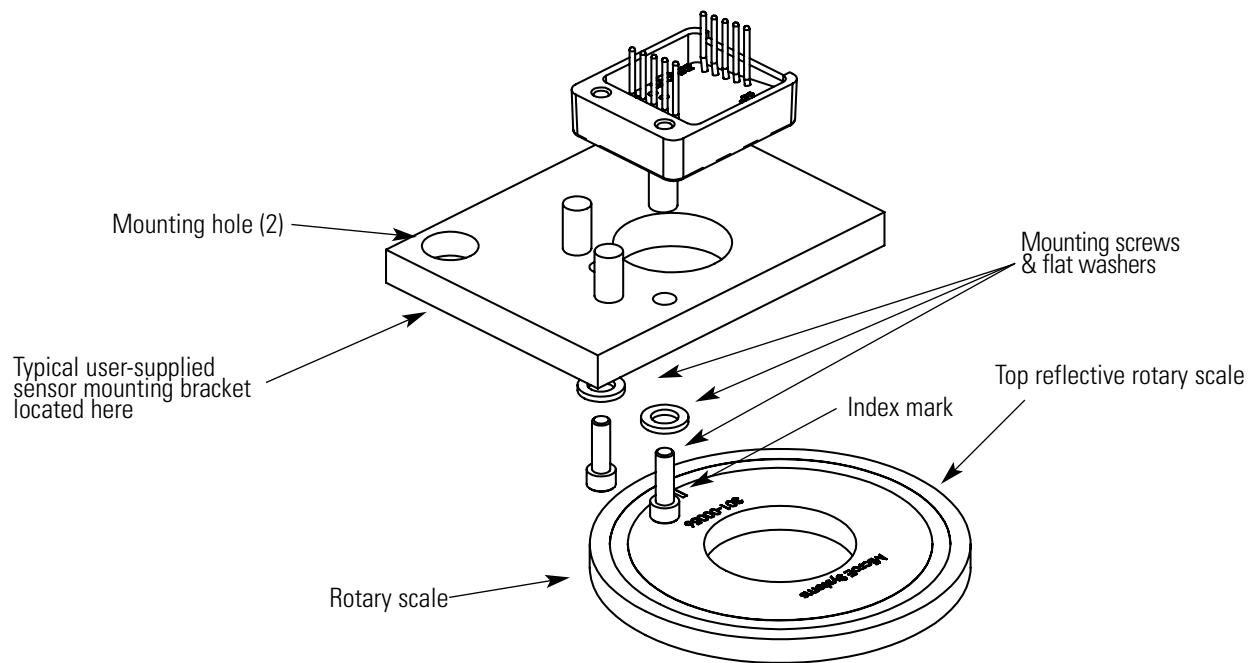
Mercury 1200 and 1500P Encoder Systems with Linear scale



Mercury 1200 and 1500P Encoder Systems with Rotary scale



Expanded View



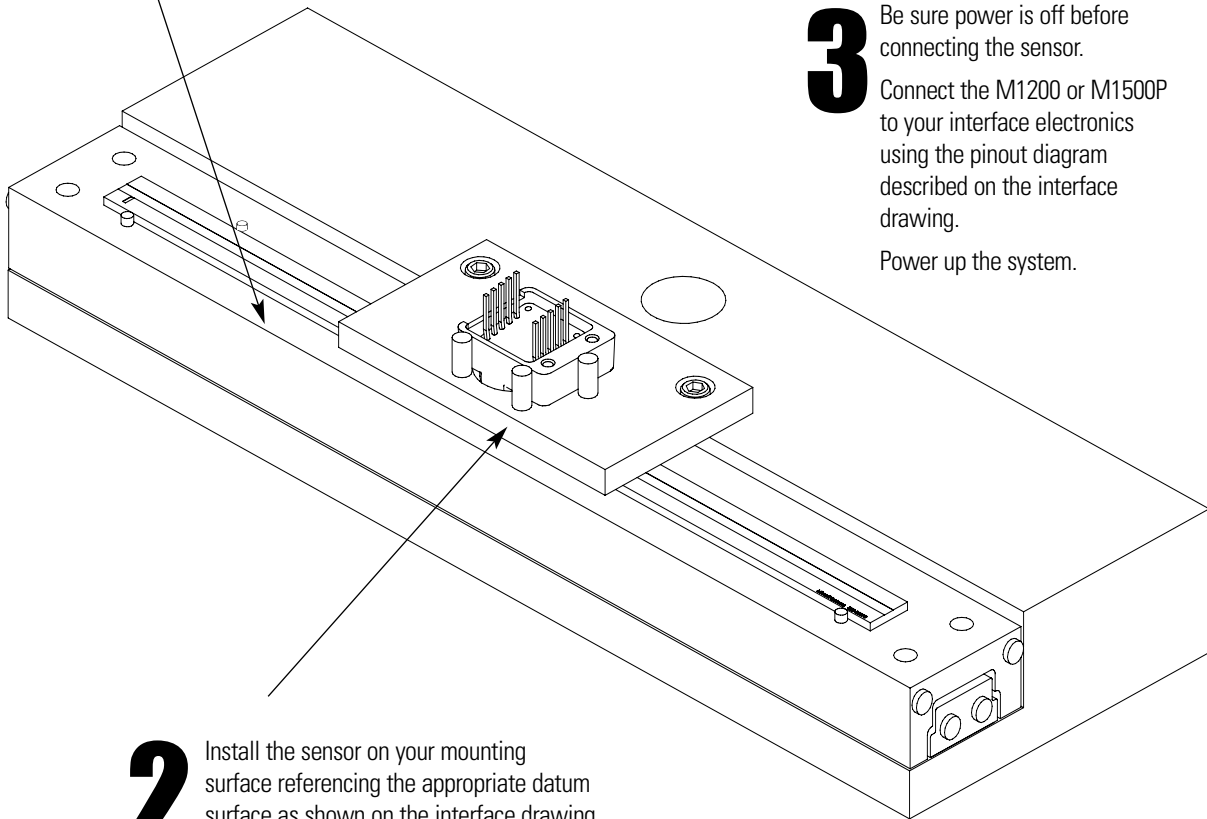
Installation Instructions

Linear Encoders

1 Attach the scale to the base slide. Reference the preferred datum on the interface drawing for either end or center index orientation.

Depending on the mounting method, attach the scale to the slide with adhesive. Refer to pg. 8 for details.

Be sure the grating surface of the scale faces the sensor. There is to be no contact between these surfaces or damage may result.



3 Be sure power is off before connecting the sensor. Connect the M1200 or M1500P to your interface electronics using the pinout diagram described on the interface drawing.

Power up the system.

2 Install the sensor on your mounting surface referencing the appropriate datum surface as shown on the interface drawing.

A) Benching pins to locate the sensor may be used if the system mechanical tolerances are adequate.

B) Tighten the sensor mounting screws and leave the mounting bracket screws loose to allow sensor head alignment.

Installation Instructions

Linear Encoders

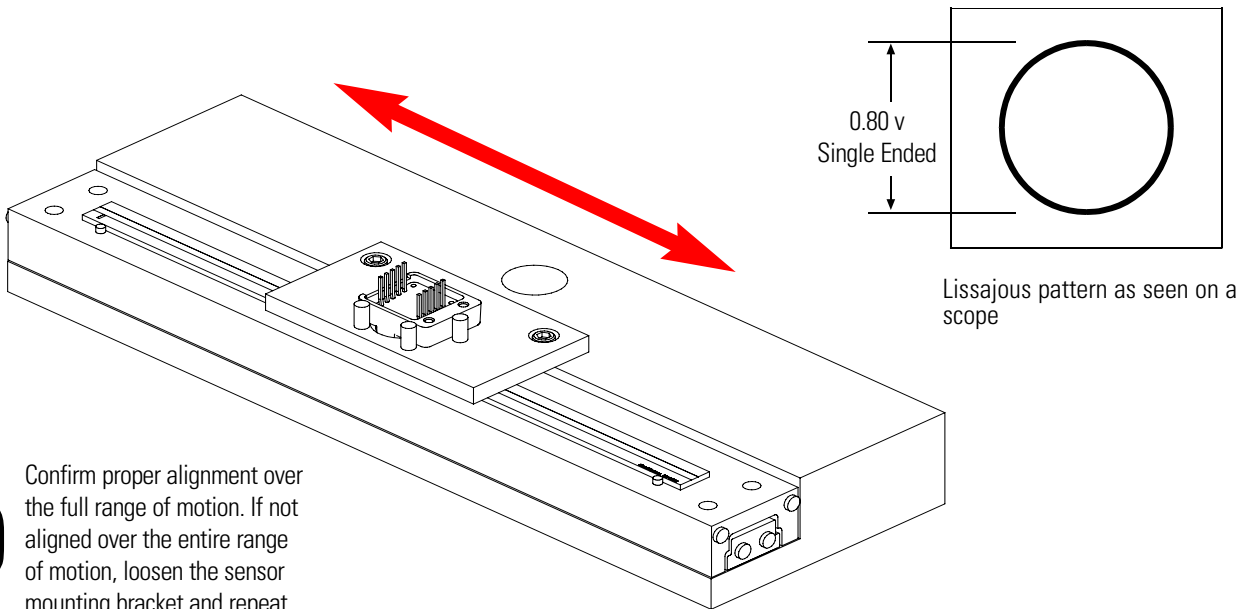
4 MAIN TRACK ALIGNMENT

If benching dimensions cannot be provided, proper sensor alignment may require minor adjustments to the sensor head position with respect to the scale. This can be performed by maximizing the sine/cosine signals from the M1200 or M1500P.

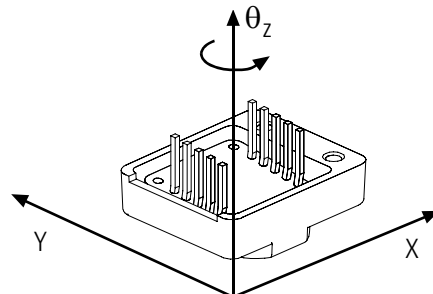
Using an oscilloscope in the X/Y mode, monitor the sine/cosine signals (refer to the interface drawing for pinouts) while moving the sensor head. Align the sensor until 0.80 volts peak-to-peak +/- 20% is obtained. Tighten the mounting bracket screws.

INDEX TRACK ALIGNMENT

The M1200 or M1500P must be aligned for both the main and index tracks. When properly aligned, the sensor will produce an index window as the sensor head passes over the index mark. The index window is roughly one fringe wide (20 μ m). To verify proper index track alignment, use a digital oscilloscope triggered on the index window. Refer to the interface drawing for the index window pinout.



5 Confirm proper alignment over the full range of motion. If not aligned over the entire range of motion, loosen the sensor mounting bracket and repeat step 4.

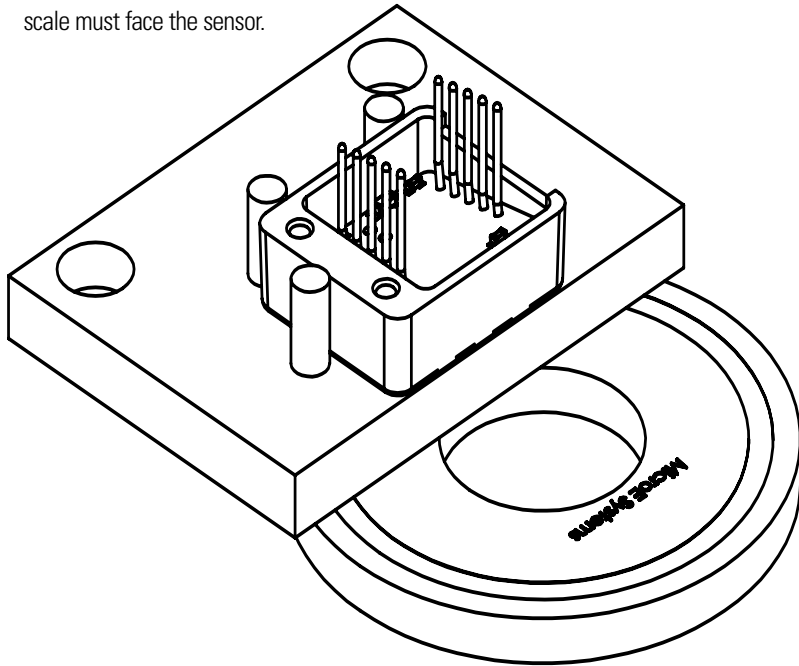


To align the sensor head, move it in the Y or θ_z directions.

Installation Instructions

Rotary Encoders

- 1** Attach your hub/scale assembly to the rotary device. Refer to the interface drawing. The reflective surface of the scale must face the sensor.



- 2** Install the sensor on your mounting surface referencing the appropriate datum surface as shown on the interface drawing.
 - A) Benching pins to locate the sensor may be used if the system mechanical tolerances are adequate.
 - B) Tighten the sensor mounting screws and leave the mounting bracket screws loose to allow sensor head alignment.

- 3** Be sure power is off before connecting the sensor.
 - A) Connect the M1200 or M1500P to your interface electronics using the pinout diagram described on the interface drawing.Power up the system.

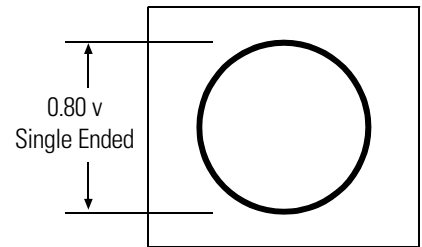
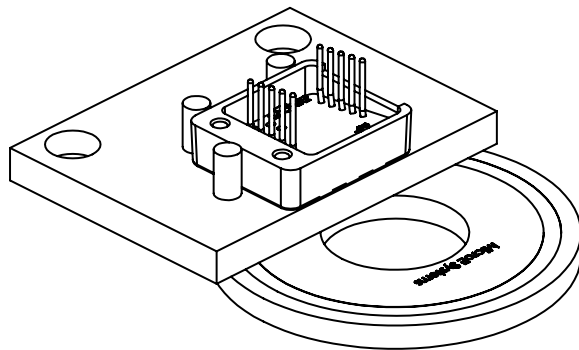
4 MAIN TRACK ALIGNMENT

If benching dimensions cannot be provided, proper sensor alignment may require minor adjustments to the sensor head position with respect to the scale. This can be performed by maximizing the sin/cosine signals from the M1200 or M1500P.

Using an oscilloscope in the X/Y mode, monitor the sin/cosine signals (refer to the interface drawing for pinouts) while moving the sensor head. Slowly move the sensor head by allowing it to slide on the mounting surface until 0.80 volts peak-to-peak +/- 20% is obtained. Tighten the mounting bracket screws.

INDEX TRACK ALIGNMENT

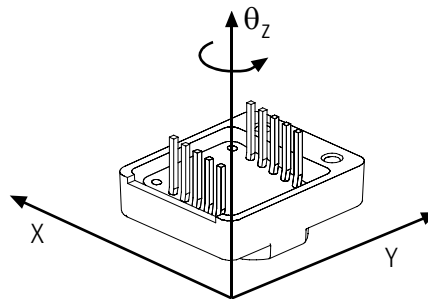
The M1200 or M1500P must be aligned for both the main and index tracks. When properly aligned, the sensor will produce an index window as the sensor head passes over the index mark. The index window is roughly one fringe wide (20µm). To verify proper index track alignment, use a digital oscilloscope triggered on the index window. Refer to the interface drawing for the pinout.



Lissajous pattern as seen on a scope



5 Confirm proper alignment over the full range of motion. If not aligned over the entire range of motion, loosen the sensor mounting screws and repeat step 4.



To align the sensor head, move it in the X, Y or θ_z directions.

Reference Section

Installation of Linear Scales

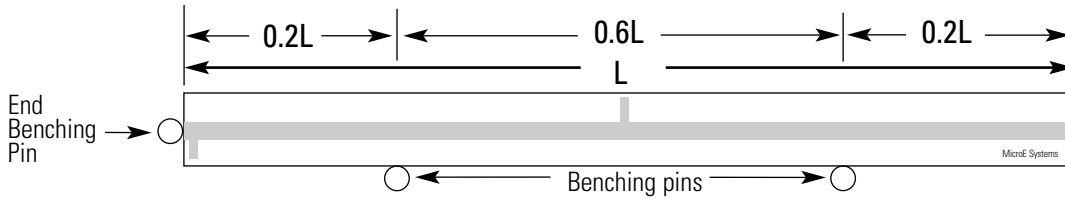
Positioning the Scale

Note: Before beginning mounting procedure, use talc-free gloves or finger cots to handle the scales.

"Benching" the scale to the system means aligning the scale by means of benching pins. Pin locations are described on the appropriate interface drawing. Two benching pins are recommended on the long side of the scale and one at the end as shown. This is marked datum A on the interface drawing.

1 Position the benching pins in from either end. 20% of the overall scale length is the recommended location from the edge.

2 Be sure the benching pins do not extend too high in the Z direction to prevent mechanical interference with the sensor or sensor mount.



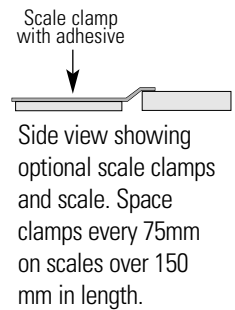
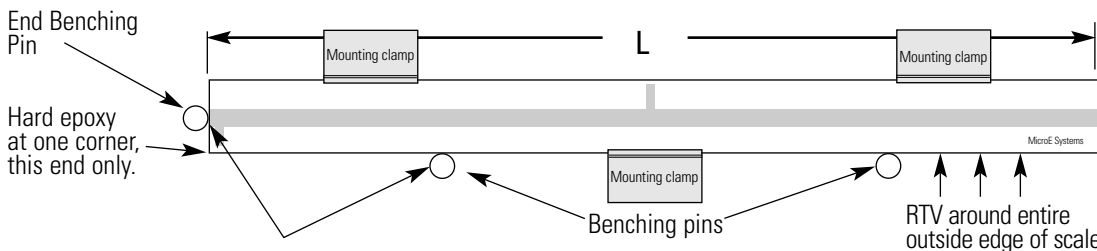
Mounting the Scale

MicroE Systems' linear scales should be affixed to the mounting surface. Two different approaches are described below:

Epoxy and RTV Mounting (Recommended for best accuracy)

1 Make sure the mounting surface is clean and dry.

3 Optionally, scale clamps may be used to secure the scale while the adhesive cures. Avoid damage to the top surface.



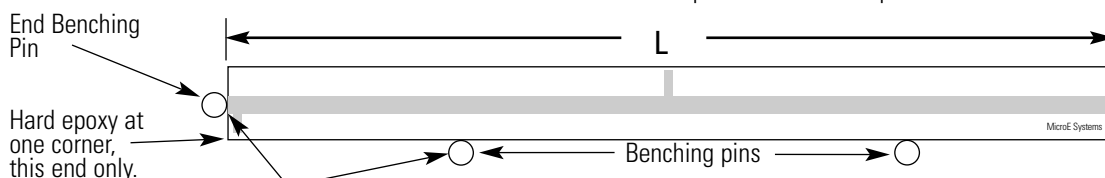
2 Align the scale by placing the edges against the benching pins.

4 Apply a hard epoxy, such as Tra-Con's Tra-Bond 2116, to the end of the scale at the end benching pin. Apply 100% Silicone RTV adhesive around the edges of the scale. This method allows thermal expansion from the benched end of the scale. After adhesive curing, remove the scale mounting clamps or, if permanently installing clamps, make sure they do not interfere with the sensor or sensor mount.

Two Sided Adhesive Tape Mounting

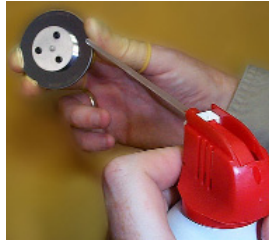
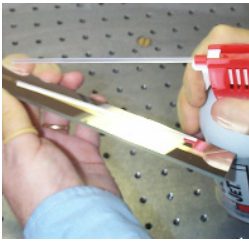
1 Make sure the mounting surface is clean and dry. Peel the cover paper off and place the scale above the final location.

3 Gently place the scale on the mounting surface. Positioning adjustments can be made until the scale is firmly pressed down. After final positioning, push down on the top of the scale to secure it.



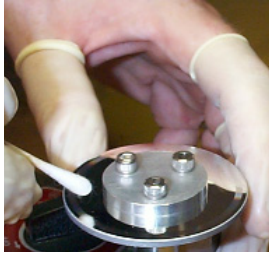
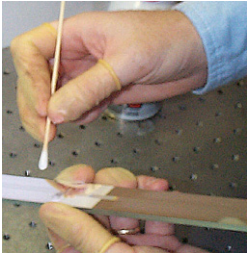
2 Align the scale by placing the edges against the benching pins.

Cleaning scales



General Particle Removal

Blow off the contamination with nitrogen, clean air, or a similar gas.

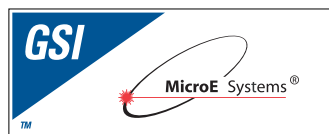


Contamination Removal

Use a lint-free cleanroom wipe or cotton swab dampened with isopropyl alcohol or acetone only to wipe the surface clean. Handle the scale by the edges. Do not scrub the scale.

Contact MicroE Systems

Thank you for purchasing a MicroE product. You should expect the highest level of quality and support from MicroE. If you have any questions or want to download the Mercury Encoder Installation Manual, Data Sheet or Interface Drawing, browse www.microesys.com and click on the appropriate product button. You'll find everything you need right there.

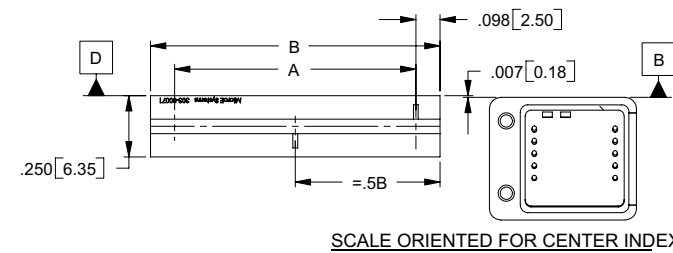
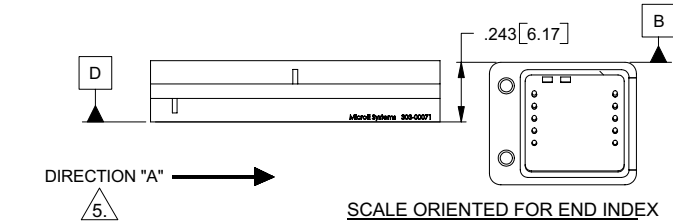


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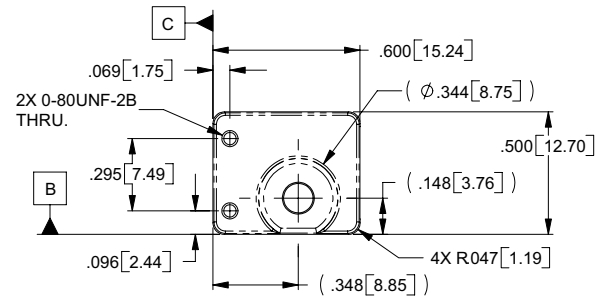
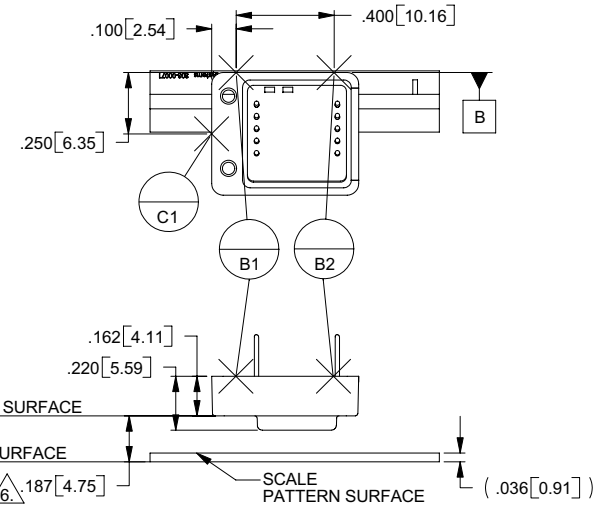
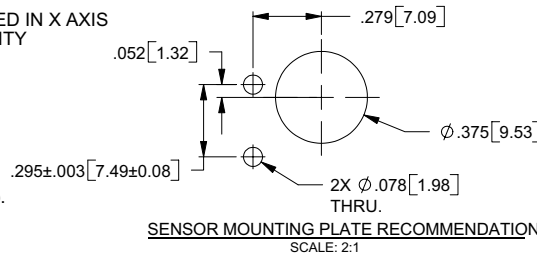
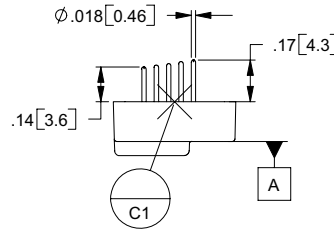
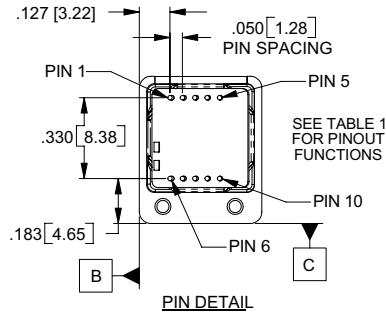
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Mercury 1200 Encoder System Interface Drawing: Short Linear Scales

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SCALES SHOWN IN THESE VIEWS TRANSLATED IN X AXIS OUT OF OPERATING RANGE FOR CLARITY



- NOTE:**
- IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF BOTH THE SENSOR AND THE SCALE FOR PROPER ALIGNMENT. (REFERENCE DATUMS B1, B2 AND C1 FOR SENSOR BENCHING PINS).
 - HEIGHT OF SENSOR BENCHING PINS MUST BE A MINIMUM OF .162 [4.11] IN HEIGHT FROM DATUM A.
 - HEIGHT OF SCALE BENCHING PINS NOT TO EXCEED THE THICKNESS OF THE SCALE.
 - RECOMMENDED SENSOR MOUNTING PLATE THICKNESS: ALLOW FOR PLATE THICKNESS AND CLEARANCE OF SCREW HEAD TO SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACES, CLAMPS, HUBS, ETC.)

5. WHEN SCALE MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY READHEAD, OUTPUT SIGNAL SIN+ (PIN 1) LEADS OUTPUT SIGNAL COS+ (PIN 3).

6. FOR SCALES ATTACHED WITH ADHESIVE TAPE (LXX-T), THE SCALE MOUNTING SURFACE MUST BE .006" FURTHER AWAY FROM SENSOR MOUNTING SURFACE FOR NOMINAL Z HEIGHT DIM = .193 [4.90]

SCALE IDENTIFICATION AND SIZE.

Scale Identification #	Dim A. Measured Length	Dim B. Scale Length
LXX	XXmm-5mm	XXmm
L30	30mm-5mm = 25mm	30mm
L(max) L130	130mm-5mm = 125mm	130mm

THESE ARE EXAMPLES

TABLE 1.

Pin	Function
1	SIN+
2	SIN-
3	COS+
4	COS-
5	+5V
6	N/C
7	N/C
8	INDEX WINDOW-
9	INDEX WINDOW+
10	GND

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES (millimeters) DIM. APPLY AFTER PROCESSING INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994

TOLERANCES ARE:
DECIMALS: .XX [X] ± .01 [25]
XXX [X] ± .005 [13]

ANGULAR: ±30 MIN.

APPROVALS	DATE
DRAWN: S.BUTURLIA	4/23/01
CHECKED:	
ENGRG: DON GRIMES	6/5/02
INFO ENG: M.SKWIRA	6/6/02
QA: J.FARNAM	6/6/02

UNITS: .in [mm]

MicroE Systems
A MICROELECTRONICS COMPANY

DESCRIPTION:
INTERFACE, ENCODER, 20um, SHORT LINEAR MERCURY 1200 SENSOR

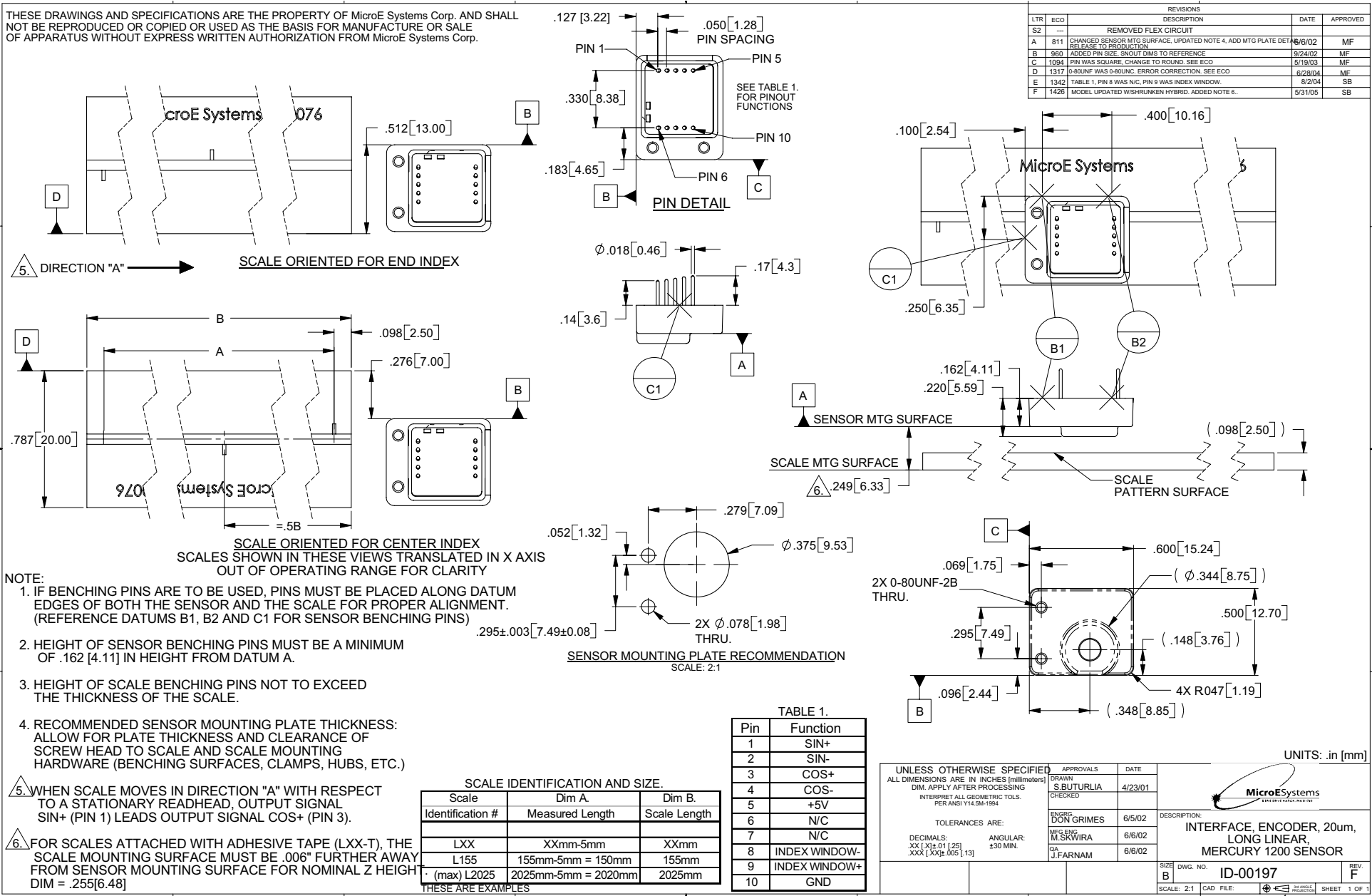
SIZE: B
DWS. NO.: ID-00196
REV: F

SCALE: 2:1 CAD FILE: [Symbol] SHEET 1 OF 1

REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
S2	---	REMOVED FLEX CIRCUIT		
A	811	CHANGE SENSOR MTG SURFACE, UPDATED NOTES, ADD DETAIL MTG PLATE, RELEASE TO PRODUCTION	6/6/02	MF
B	860	ADDED PIN SIZE, SNOUT DIMS TO REFERENCE, THK WAS .037	9/24/02	MF
C	1094	PIN WAS SQUARE, CHANGED TO ROUND, SEE ECO	9/19/03	MF
D	1317	INDEX PIN WAS 0-RUNING, ERROR CORRECTION	6/22/04	MF
E	1342	TABLE 1, PIN 8 WAS N/C, PIN 9 WAS INDEX WINDOW.	8/2/04	SB
F	1426	MODEL UPDATED W/SHRUNKEN HYBRID, ADDED NOTE 6.	5/25/05	SB

Mercury 1200 Encoder System Interface Drawing: Long Linear Scales

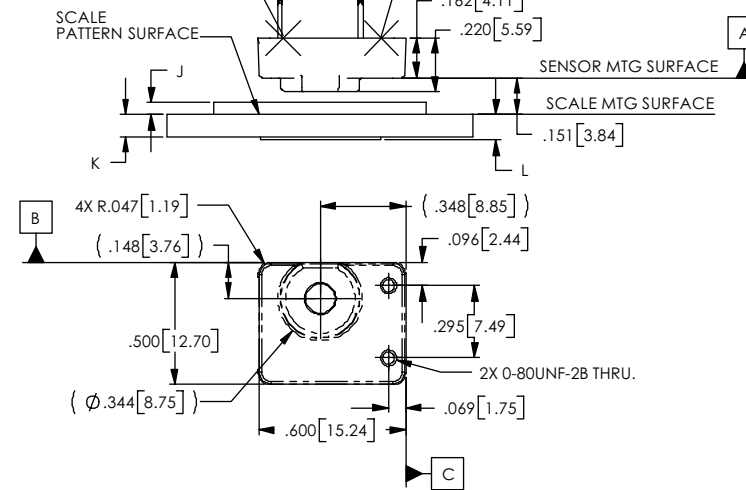
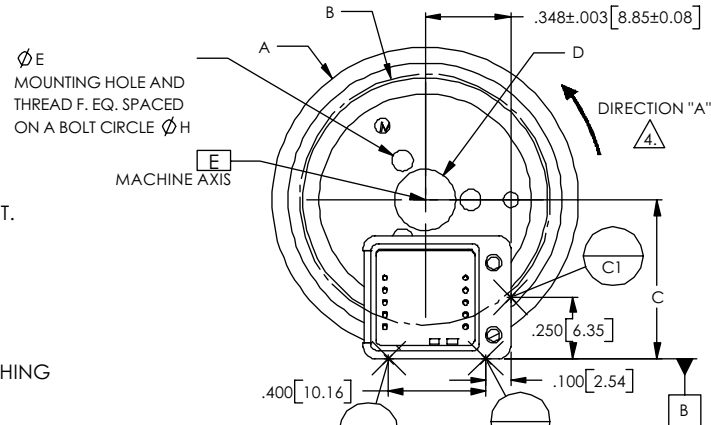
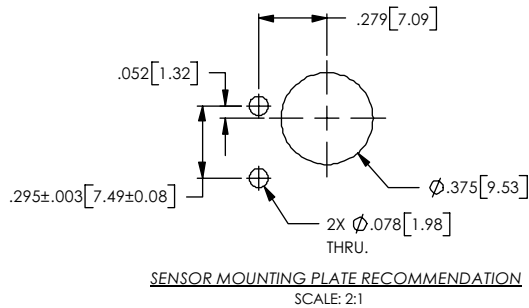
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Mercury 1200 Encoder System Interface Drawing: Rotary Scale without Hub

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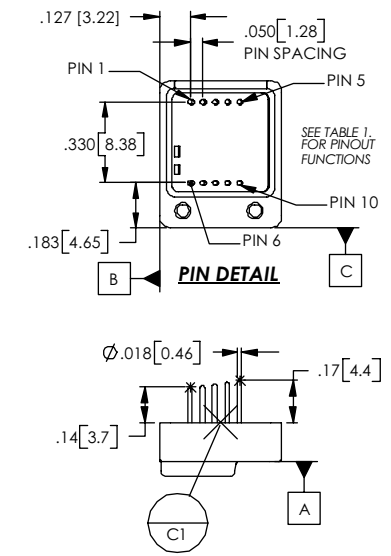
- NOTE:
- IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF SENSOR FOR PROPER ALIGNMENT. (REFERENCE DATUMS B1, B2 AND C1).
 - HEIGHT OF SENSOR BENCHING PINS MUST BE A MINIMUM OF .162 [4.11] IN HEIGHT FROM DATUM A.
 - RECOMMENDED SENSOR MOUNTING PLATE THICKNESS: ALLOW FOR PLATE THICKNESS AND CLEARANCE OF SCREW HEAD TO SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACES, CLAMPS, HUBS, ETC.)
- ▲ WHEN SCALES MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY READHEAD, OUTPUT SIGNAL COS+ (PIN 3) LEADS OUTPUT SIGNAL SIN+ (PIN 1).



LR	ECO	DESCRIPTION	DATE	APPROVED
A	811	CHANGED SENSOR MTG SURFACE. UPDATED NOTES. ADDED MTG PLATE DETAIL. RELEASE TO PRODUCTION.	6/6/02	MF
B	954	CORRECTED DIMS IN TABLE (DIM D1). DIM CONVERSION INCORRECT.	9/29/02	MF
C	960	ADDED PIN SIZE. SMOOTH DIMS REFERENCE.	9/24/02	MF
D	1094	PIN WAS SQUARE. CHANGE TO ROUND. SEE ECO.	5/19/03	MF
E	1124	UPDATED SCALE TABLE. ADDED HUB I.D. HEIGHT TO R1206. SEE ECO.	6/26/03	MF
F	1159	UPDATED SCALE THICKNESS TOLERANCE IN TABLE (WAS ±.008) SEE ECO.	3/8/04	MF
G	1317	ADDLINE WAS 0.001IN. ERROR CORRECTION. SEE ECO.	6/28/04	MF
H	1342	TABLE 1. PIN 8 WAS N/C. PIN 9 WAS INDEX WINDOW.	6/2/04	SB

TABLE 1.

Pin	Function
1	SIN+
2	SIN-
3	COS+
4	COS-
5	+5V
6	N/C
7	N/C
8	INDEX WINDOW-
9	INDEX WINDOW+
10	GND



SCALE SIZE AND MOUNTING OPTIONS. DIMENSIONS IN INCHES [MILLIMETERS]

Scale Identification	Counts/Rev	Dim. A Scale O.D.	Scale I.D.	Dim. B Optical Dia.	Dim. C Mounting Dim.	Dim D. Hub I.D.	Dim E. Mounting Hole Dia.	Thread F	Dim H. Bolt Circle	Dim. J Hub Height	Dim. K Scale Thickness	Dim. L Hub Relief
R1206	1,650	0.472 [12.00]	.250+/- .005 [6.35+/- .13]	0.413 [10.50]	0.341+/- .002 [8.66+/- .05]	0.1253+ .0005/- .0000 [3.182+ .013/- .000]	N/A	N/A	N/A	0.040 [1.02]	.036+/- .002 [.91+/- .05]	0.045 [1.14]
R1910	2,500	0.750 [19.05]	.375+/- .005 [9.53+/- .13]	0.627 [15.92]	0.447+/- .002 [11.36+/- .05]	0.1253+ .0005/- .0000 [3.182+ .013/- .000]	0.047 [1.19]	0-80 [6.35]	0.250 [6.35]	0.040 [1.02]	.090+/- .004 [2.29+/- .10]	0.105 [2.67]
R3213	4,096	1.250 [31.75]	.500+/- .005 [12.70+/- .13]	1.027 [26.08]	0.647+/- .002 [16.44+/- .05]	0.2503+ .0005/- .0000 [6.357+ .013/- .000]	0.070 [1.78]	2-56 [9.40]	0.370 [9.40]	0.050 [1.27]	.090+/- .004 [2.29+/- .10]	0.105 [2.67]
R5725	8,192	2.250 [57.15]	1.000+/- .005 [25.40+/- .13]	2.053 [52.15]	1.161+/- .002 [29.48+/- .05]	0.5003+ .0005/- .0000 [12.707+ .013/- .000]	0.136 [3.45]	8-32 [19.05]	0.750 [19.05]	0.060 [1.52]	.090+/- .004 [2.29+/- .10]	0.105 [2.67]
R10851	16,384	4.250 [107.95]	2.000+/- .005 [50.80+/- .13]	4.106 [104.30]	2.187+/- .002 [55.56+/- .05]	1.0003+ .0005/- .0000 [25.408+ .013/- .000]	0.136 [3.45]	8-32 [19.05]	1.375 [34.93]	0.080 [2.03]	.090+/- .004 [2.29+/- .10]	0.105 [2.67]

UNLESS OTHERWISE SPECIFIED

APPROVALS: S.BUTURLIA, DATE: 4/23/01

ALL DIMENSIONS ARE IN INCHES (millimeters). DIM. APPLY AFTER PROCESSING. INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994

TOLERANCES ARE:
DECIMALS: .XX [X]±.01 [25] .XXX [XX]±.005 [1.3]
ANGULAR: ±30 MIN.

ENGRS: DON GRIMES, DATE: 6/5/02
MGR: J. FARNAM, DATE: 6/6/02
QA: J. FARNAM, DATE: 6/6/02

DESCRIPTION: INTERFACE, ENCODER, 20um, ROTARY w/HUB, MERCURY 1200 SENSOR

SCALE: 2:1 CAD FILE: [Symbol] SHEET 1 OF 1

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UNITS: .in [mm]