

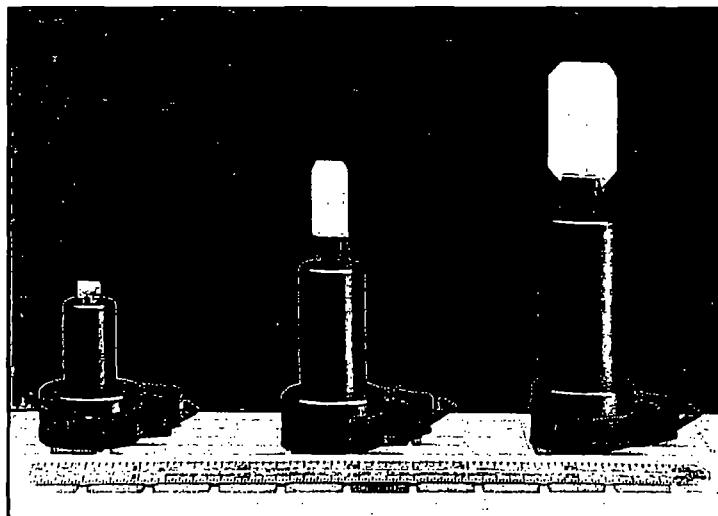


Cambridge Technology's line of Moving Magnet Optical Scanners are designed for a wide variety of applications where the predominant concern is scanning speed.

The selected magnetic material for the rotor is state of the art neodymium-iron-boron, resulting in exceptional flux densities in the air gap. The intense magnetic field strength combined with low rotor inertias gives these products significantly higher torque to inertia ratios when compared with competing products, resulting in superior peak accelerations.

The moving magnet scanner line uses an efficient low inertia optical position detector design developed by Cambridge Technology. This simple design allows us to offer an inexpensive but fast and reliable closed loop product.

The product line was initiated with the Model 6800HP scanner. The Model's 6810P and 6850P incorporate technical advances that were originally developed in the 6800HP. Consistent with our moving coil scanner product line, the moving magnet scanners do not use torsion bars. The advantages of this technique are high reliability, wide angle operation and that minimal power is required to achieve or hold any given position.



Cambridge Technology offers a variety of supporting products for the moving magnet scanners including controlling electronics, X/Y Mounts and mirror sets. Custom single and dual axis optical apertures can be supported, consult the factory for details.

Specifications

All Specifications Apply After a 30 Second Warm-up. All Angles are in Mechanical Degrees

	Model			
	6800HP	6810P	6850P	Units and Tolerances
Mechanical and Electrical Specifications				
Optical Apertures Supported, Two Axis	3	5	10	MM, Typical
Maximum Recommended Load	0.18	1.0	5.0	GM*CM ²
Mechanical Specifications				
Rated Angular Excursions	+/-20	+/-20	+/-20	Degrees
Rotor Inertia	0.018	0.1	0.5	GM*CM ² , +/-10%
Torque Constant	2.5	5.7	9.5	x10 ⁴ Dyne-CM/Ampere, +/-10%
Coil Temperature	110	110	110	" C, Maximum
Thermal Resistance, Coil to Case	4	2	1.5	" C/Watt, Maximum
Electrical Specifications, Drive Armature				
Coil Resistance	4.2	3.4	1.5	Ohms, at 25° C, +/-10%
Coil Inductance	96	160	160	uH, +/-10%
Back EMF Voltage	0.04	0.10	0.16	mV/Degree/Second, +/-10%
Current, RMS	1.6	2.6	4.3	A, Maximum
Current, Peak	6	12	25	A, Maximum
Small Angle Step Response	0.3	0.4	0.5	mS, with balanced inertia matched load
Electrical Specifications, Position Detector				
Linearity	98	98	98	%, Minimum, over 30 Degrees
Scale Drift	0.05	0.05	0.05	%/° C, Maximum
Zero Drift	0.01	0.01	0.01	Degree/° C, Maximum
Repeatability	20	20	20	Microradians, typical
Output Signal, Common Mode	50	50	50	uA, with AGC Voltage of 10V +/-10%
Output Signal, Differential Mode	3.2	3.2	3.2	uA/Degree, with Common Mode of 50uA, +/-10%

Features

- Extremely high mirror speed positioning • Wide scanning angle of 80° optical
- Precision mounting eliminates most optical realignment • Low wobble and jitter • Highest peak accelerations
- Rugged and reliable design • Minimal power required to achieve and maintain any position



Cambridge Technology Inc. 109 Smith Place, Cambridge, MA 02138 USA

Tel (617) 441-0600 / Fax (617) 497-8800

Web Site Address: <http://www.camtech.com>

Dear Colleague:

Thank you for your inquiry concerning our line of galvanometer based optical scanners. Enclosed with this letter is a brochure describing the full range of optical scanning products offered by Cambridge Technology.

We are presently manufacturing six different moving magnet and five different moving coil optical scanners for driving mirror loads from 0.001 gm*cm² to over 100,000 gm*cm². We also routinely provide controlling electronics, mirrors, and X/Y mounts for all of our scanners.

When you compare Cambridge Technology's optical scanners to competing products, you will find that ours are faster and more repeatable at very competitive prices. Our patented moving dielectric "Butterfly" position sensing technology in the moving coil scanner line rivals the accuracy of rotary interferometers. Our moving magnet scanner line offers some of the highest peak accelerations of any closed loop galvanometer based scanner.

For further technical information, or for a quotation on a system or components to meet your specific needs, please contact *your Regional Representative* by telephone, facsimile or letter.

Best regards,

Redmond P. Aylward

Vice President of Sales and Marketing

With Diode 302119100

~~21F513~~ 7.16

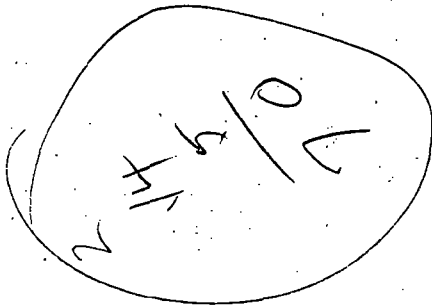
21F553

without

302119000

21F552

6.06



end plate

400402000
21F587

Screws (5)

21F593

412702000

Screws 21F591

Thumbwheel Switches - Newark

(10)	With Provision for Diode	302119100	21F553	7.16
	without " " "	302119000	21F552	6.06
(4)	end plate	400402000	21F587	.42
(4)	Screws	412702000	21F593	2.10
(4)	nuts	403500000	21F591	.21
(10)	Without Provision for Diode, comp BCD	302319000 302H	21F560	6.06

13-782
42-381
42-382
42-383
42-384
42-385
42-386
42-387
42-388
42-389



500 SHEETS, FILLER, 5 SQUARE
100 SHEETS, EYE GLASS, 5 SQUARE
100 SHEETS, EYE GLASS, 5 SQUARE
200 SHEETS, EYE GLASS, 5 SQUARE
100 RECYCLED WHITE, 5 SQUARE
200 RECYCLED WHITE, 5 SQUARE
Made in U.S.A.

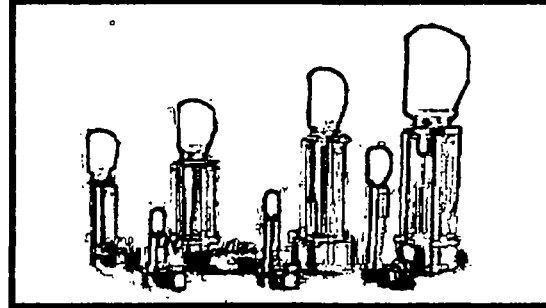


Cambridge
Technology

109 Smith Place, Cambridge, MA 02138
617-441-0600 617-497-8800
www.cambridgetechnology.com

The 6200H Series Scanners

**Moving Magnet
Series with
Advanced Optical
Position Detector**



The 6200H Series of closed loop galvanometer based optical scanners combines our new moving magnet actuator technology with our innovative patented advanced optical position detector design. This combination offers the highest torque per watt and closed loop bandwidths, resulting in the highest positioning speed, precision and reliability available in any compact closed loop galvanometer in today's market.

The 6200H Series compact design and material selection deliver the fastest step response times and high RMS speeds. The neodymium-iron boron rotor material allows for exceptional flux densities in the air gap. The intense magnetic field strength combined with the highest rotor and mounted mirror resonant frequencies give the 6200H Series products superior peak accelerations and the fastest step response times possible in galvo technology.

Instrumentation level accuracy and stability. Exceptional closed loop positioning accuracy and stability are achieved through Cambridge Technology's patented advanced optical position detector providing instrumentation level accuracy and stability at a very cost effective price.

The fastest step response times. Sized for the fastest step response times, high RMS speeds at wide angles and for a broad range of apertures with single and dual axis solutions from 3 to 25mm, the 6200H series provides the broadest range of choices to optimize your system price/performance for any application. It is available in several different connector and cable options to meet specific system requirements.

Designed for a wide variety of applications. The 6200H Series is the optimal choice in for laser marking and material processing, biomedical systems, imaging and printing, semiconductor processing, laser projection or any application where speed, size and accuracy are critical to system performance.

Cambridge Technology, Inc. also offers a variety of integral supporting products for the 6200H Series, including servo electronics, mirrors sets with coating options and X/Y system mounts. Custom single and dual axis optical apertures can be supported, consult the factory for more details.

Mechanical and Electrical Specifications

	<u>6200H</u>	<u>6210H</u>	<u>6215H</u>	<u>6220H</u>	Units and Tolerances
Optical Apertures Supported, Two Axis	3, 5, 6	3, 5, 6	3, 5, 6	5, 8, 10	MM
Maximum Recommended Inertial Load	0.13	0.2	0.28	1.25	gm*cm ² , +/-10%
Mechanical Specifications					
Rated Angular Excursions	± 20	± 20	± 20	± 20	Degrees
Rotor Inertia	0.013	0.018	0.028	0.125	gm*cm ² , +/-10%
Torque Constant	1.2	2.79	3.78	6.17	10 ⁴ Dyne-cm/Amp, +/-10%
Coil Temperature	110	110	110	110	°C, Maximum
Thermal Resistance, Coil to Case	3.8	2	1	1	°C/Watt, Maximum
Electrical Specifications, Drive Armature					
Coil Resistance	2.1	3.72	2.53	2.79	Ohms, +/-10%
Coil Inductance	52	109	94	180	μH, +/-10%
Back EMF Voltage	20.9	48.7	66	108	μV/Degree/Second, +/-10%
Current, RMS	2.3	2.4	4.1	3.9	A, Maximum
Current, Peak	6	8	20	20	A, Maximum
Small Angle Step Response	130	100	130	200	μs, with appropriate CTI Y mirror
Electrical Specifications, Position Detector					
Linearity	99.9	99.9	99.9	99.9	%, minimum, over 40° optical
Scale Drift	50	50	50	50	PPM/°C, Maximum
Zero Drift	15	15	15	15	Microradians/°C, Maximum
Repeatability	8	8	8	8	Microradians, Maximum
Output Signal, Common Mode	155	155	155	155	μA, with AGC Voltage of 30mA, +/-20%
Output Signal, Differential Mode	12	12	12	12	μA/Deg., with Common Mode of 155μA, ± 20%
	<u>6231HC</u>	<u>6230H</u>	<u>6240H</u>		Units and Tolerances
Optical Apertures Supported, Two Axis	8,10,12,15	8,10,12,15	12,15,20,25		MM
Maximum Recommended Inertial Load	8	10	24		gm*cm ² , +/- 10%
Mechanical Specifications					
Rated Angular Excursions	±20	±20	±20		Degrees
Rotor Inertia	0.82	0.97	2.4		gm*cm ² , +/-10%
Torque Constant	1.11	1.31	2.00		10 ⁵ Dyne-cm/Amp, +/-10%
Coil Temperature	110	110	110		°C, Maximum
Thermal Resistance, Coil to Case	1	0.80	0.62		°C/Watt, Maximum
Electrical Specifications, Drive Armature					
Coil Resistance	1.2	1.07	1.03		Ohms, +/-10%
Coil Inductance	176	173	350		μH, +/-10%
Back EMF Voltage	195	229	346		μV/Degree/Second, +/-10%
Current, RMS	5.8	7.1	8.2		A, Maximum
Current, Peak	25	25	25		A, Maximum
Small Angle Step Response	250	250	350		μs, with appropriate CTI Y mirror
Electrical Specifications, Position Detector					
Linearity	99.9	99.9	99.9		%, minimum, over 40° optical
Scale Drift	50	50	50		PPM/°C, Maximum
Zero Drift	15	15	15		Microradians/°C, Maximum
Repeatability	8	8	8		Microradians, Maximum
Output Signal, Common Mode	155	155	155		μA, with AGC Voltage of 30mA, +/-20%
Output Signal, Differential Mode	12	12	12		μA/Deg., with Common Mode of 155μA, ±20%



Moving Magnet Optical Scanner Product Line

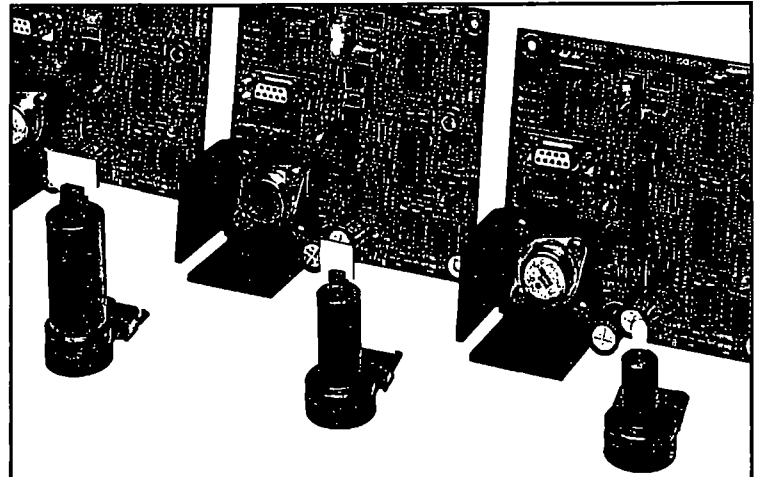
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The moving magnet scanner line uses an efficient low inertia optical position detector design developed by Cambridge Technology. This simple design allows us to offer an inexpensive but fast and reliable closed loop product.

The product line was initiated with the Model 6800HP scanner. The Model's 6810P and 6850P incorporate technical advances that were originally developed in the 6800HP. Consistent with our moving coil scanner product line, the moving magnet scanners do not use torsion bars. The advantages of this technique are high reliability, wide angle operation and that minimal power is required to achieve or hold any given position.

Cambridge Technology offers a variety of supporting products for the moving magnet scanners including controlling electronics, X/Y Mounts and mirror sets. Custom single and dual axis optical apertures can be supported, consult the factory for details.



CTI's Moving Magnet Optical Scanners and controlling electronics

Specifications

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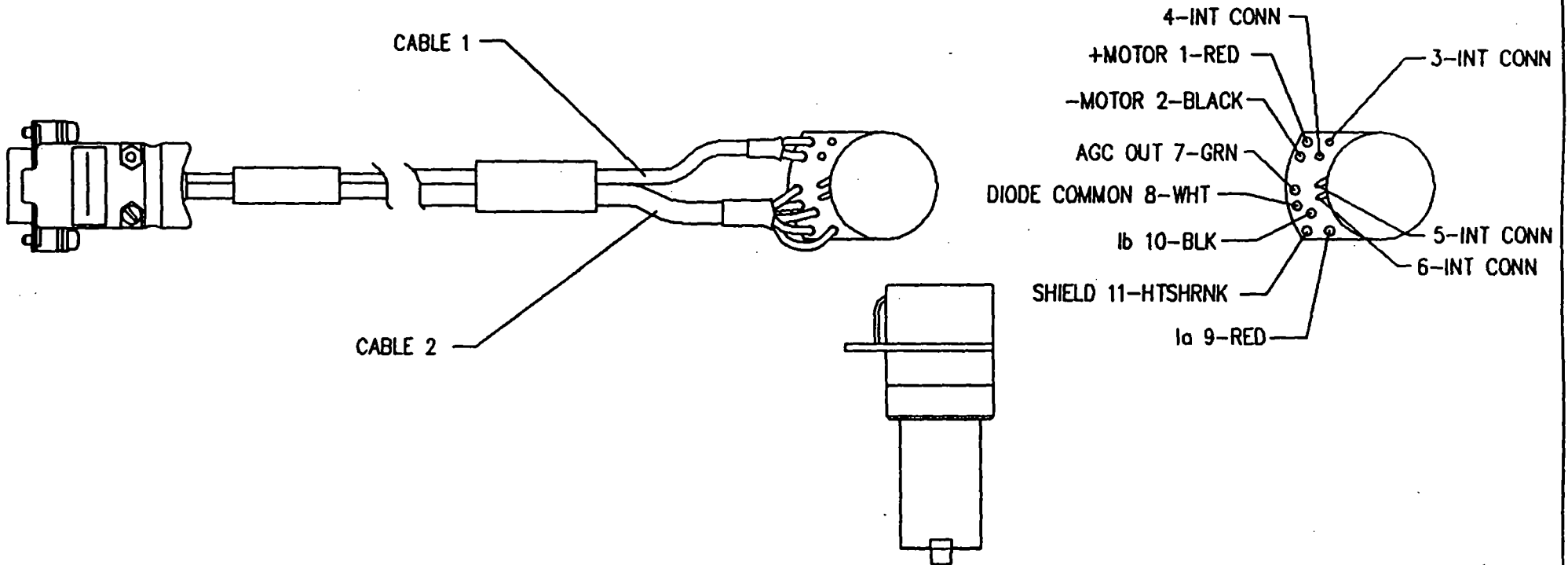
	Model			
	6800HP	6810P	6850P	Units and Tolerances
Mechanical and Electrical Specifications				
Optical Apertures Supported, Two Axis	3	5	10	MM, Typical
Recommended Inertial Load	0.016	0.1	0.5	GM*CM ²
Maximum Inertial Load	0.15	1.0	5.0	GM*CM ²
Mechanical Specifications				
Rated Angular Excursions	+/-20	+/-20	+/-20	Degrees
Rotor Inertia	0.016	0.1	0.5	GM*CM ² , +/-10%
Torque Constant	2.5	5.7	9.3	x10 ⁴ Dyne-CM/Ampere, +/-10%
Coil Temperature	110	110	110	° C, Maximum
Thermal Conductivity, Coil to Case	4	2	1.25	° C/Watt, Maximum
Electrical Specifications, Drive Armature				
Coil Resistance	4.0	3.4	1.4	Ohms, at 25°, C, +/-10%
Coil Inductance	120	250	350	uH, +/-10%
Back EMF Voltage	0.04	0.10	0.16	mV/Degree/Second, +/-10%
Current, RMS	1.6	2.6	5.0	A, Maximum
Current, Peak	6	12	25	A, Maximum
Small Angle Step Response	0.3	0.5	1.0	mS, with balanced inertia matched load
Electrical Specifications, Position Detector				
Linearity	98	98	98	%, Minimum, over 40 Degrees
Scale Drift	0.05	0.05	0.05	%/° C, Maximum
Zero Drift	0.01	0.01	0.01	Degree/° C, Maximum
Repeatability	20	20	20	Microradians, typical
Output Signal, Common Mode	58	58	58	uA, with AGC Voltage of 10V +/-10%
Output Signal, Differential Mode	1.2	1.2	1.2	uA/Degree, with Common Mode of 58uA, +/-10%

Features

- Extremely high mirror speed positioning • Wide scanning angle of 80° optical
- Precision mounting eliminates most optical realignment • Low wobble and jitter • Highest peak accelerations
- Rugged and reliable design • Minimal power required to achieve and maintain any position

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REVISION				
ECO	REV	DESCRIPTION	APPR	DATE
1453	B	PINS 9,10 & 11 CORRECTED	PTH	5/99



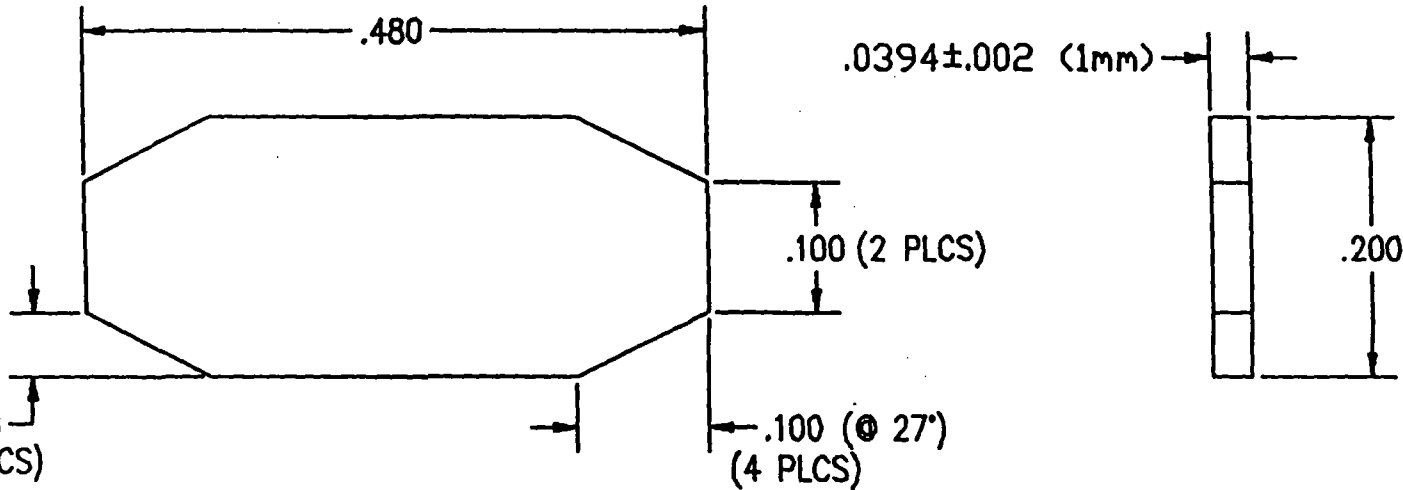
HOLE #	CBL #	WIRE COLOR	DESCRIPTION
1	1	RED	+MOTOR
2	1	BLACK	-MOTOR
3	--	--	INTERNAL CONNECTION
4	--	--	INTERNAL CONNECTION
5	--	--	INTERNAL CONNECTION
6	--	--	INTERNAL CONNECTION
7	2	GREEN	AGC OUT
8	2	WHITE	DIODE COMMON
9	2	RED	Ia
10	2	BLK	Ib
11	2	HTSHRNK	SHIELD

	UNLESS OTHERWISE SPECIFIED	DRN 12/30/98	PTH	CAMBRIDGE TECHNOLOGY, INC. 109 SMITH PLACE CAMBRIDGE, MA. 02138 - USA
	TOLERANCES			
	.XX±.010			62XX/6010-8L WIRING DIAGRAM
	.XXX±.005			
	() INDICATES mm			D03762
	ANGLES± 0°-30°			
	SURFACE ROUGHNESS $\sqrt{63}$			SCALE: NTS
	BREAK ALL SHARP EDGES			
	MATERIAL	REVISION		SHEET 1 OF 1
	FINISH	B		
USED ON				

J=2.4MGM*CM2

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REVISION				
ECO	REV	DESCRIPTION	APPR	DATE



MIRROR COATING SUFFIX TABLE

SUFFIX	DESCRIPTION	WAVELENGTH	THICKNESS	REFLECTIVITY	∠ OF INCIDENCE	PROT. COATING
-V	DELECTRIC VISIBLE	450-675nm	MULTI-LAYER	98% MIN	16.5° TO 65°	
-S	PROTECTED SILVER	400nm-10.6um	1000 A			SiO
-A	PROTECTED ALUMINUM	300-800nm	1000 A			MgF
-G	PROTECTED GOLD	>2.0um	1000 A			SiO
-Y	DELECTRIC YAG	1.06um				
-C	DELECTRIC CO2	10.6um				
-E	EXIMER					

NOTES:

(SUBSTRATE)

- 1) FLATNESS: LAMBDA/2 @ 633NM
- 2) SCRATCH/DIG: 60/40
- 3) MAXIMUM CHAMFER .005
- 4) POLISH BOTH SIDES

(COATING)

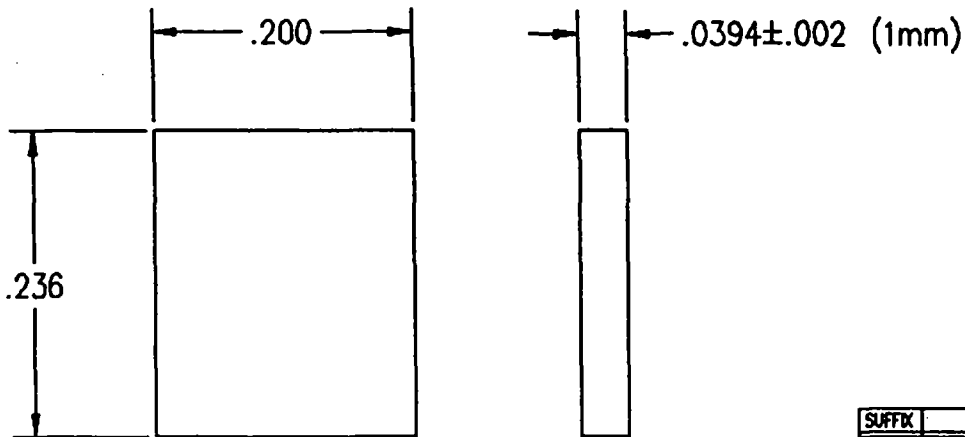
- 4) REFLECTIVE COATING ON ONE SIDE ONLY PER SUFFIX TABLE.
- 5) CONSULT CTI ENGINEERING FOR IRRADIANCE POWER RATINGS.

UNLESS OTHERWISE SPECIFIED TOLERANCES	DRN 02/03/99	AMB	CAMBRIDGE TECHNOLOGY, INC. 23 ELM ST. WATERTOWN, MA 02172 - USA
.XX± .010	DES		
.XXX± .005	CHK		
() INDICATES mm	ENG		
ANGLES± 0°-30°	APPR		
MATERIAL	PROJECTION		6200/6210 3mm STANDARD Y .0394 THK. SUBSTRATE
FUSED SILICA			
FINISH	REVISION		D03783
USED ON	SEE NOTES		SCALE: NONE

J=2.1MGM*CM2

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REVISION				
ECO	REV	DESCRIPTION	APPR	DATE



MIRROR COATING SUFFIX TABLE

SUFFIX	DESCRIPTION	WAVELENGTH	THICKNESS	REFLECTIVITY	∠ OF INCIDENCE	PROT. COATING
-V	DIELECTRIC, VISIBLE	450-675nm	MULTI-LAYER	98% MIN	16.5° TO 65°	
-S	PROTECTED SILVER	400nm-10.8um	1000 A			SiO
-A	PROTECTED ALUMINUM	300-600nm	1000 A			MgF
-G	PROTECTED GOLD	2.0um	1000 A			SiO
-Y	DIELECTRIC, YAG	1.06um				
-C	DIELECTRIC, CO2	10.8um				
-E	EXIMER					

NOTES:

(SUBSTRATE)

- 1) FLATNESS: LAMBDA/2 @ 633NM
- 2) SCRATCH/DIG: 60/40
- 3) MAXIMUM CHAMFER .005
- 4) POLISH BOTH SIDES

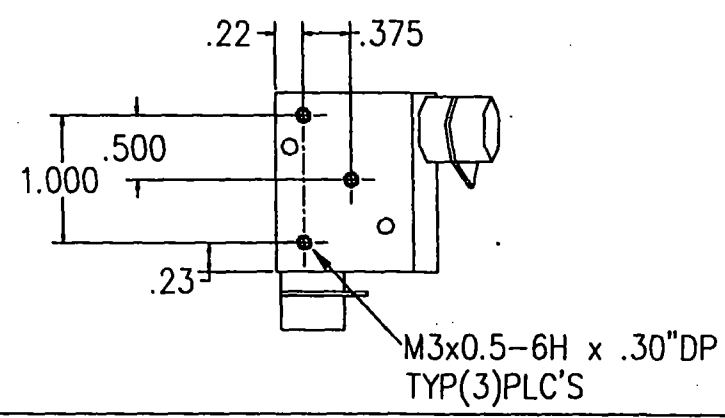
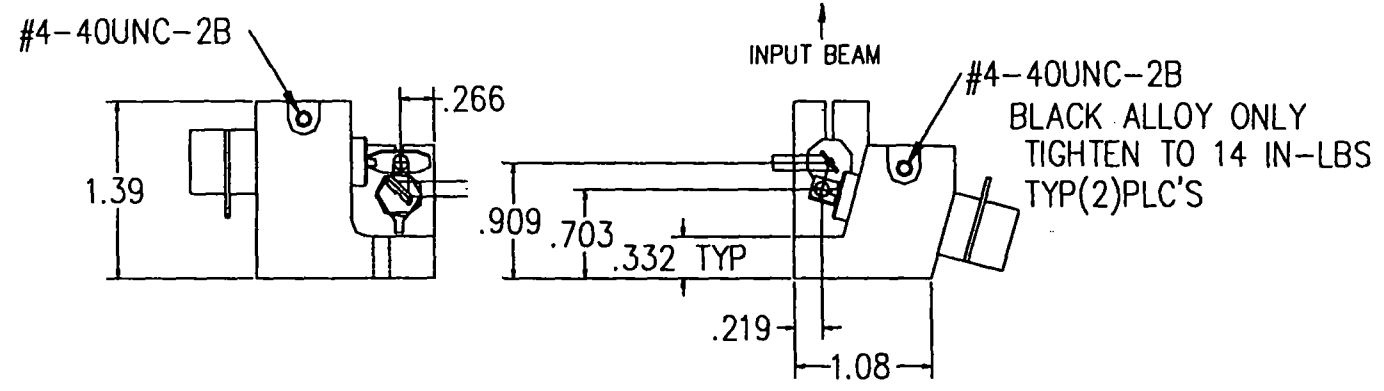
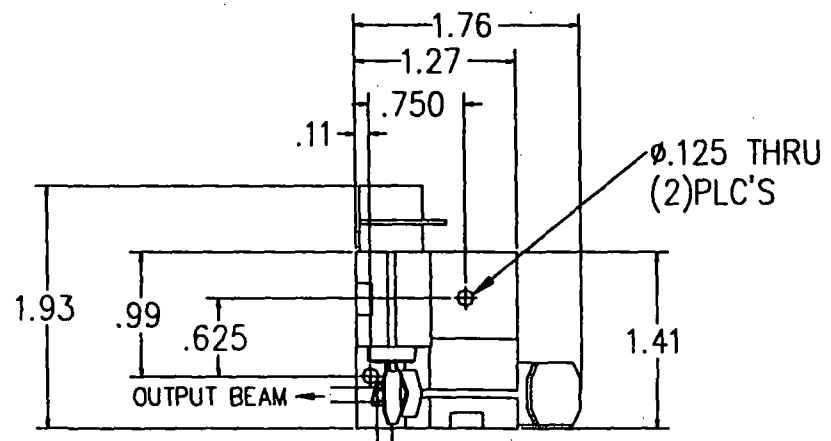
(COATING)

- 4) REFLECTIVE COATING ON ONE SIDE ONLY PER SUFFIX TABLE.
- 5) CONSULT CTI ENGINEERING FOR IRRADIANCE POWER RATINGS.

	UNLESS OTHERWISE SPECIFIED TOLERANCES .XX± .010 .XXX± .005 () INDICATES mm ANGLES± 0°-30'	DRN 02/2/99	AMB	CAMBRIDGE TECHNOLOGY, INC. 23 ELM ST. WATERTOWN, MA. 02172 - USA
		DES		
	MATERIAL FUSED SILICA	CHK		6200/6210 3mm STANDARD X .0394 THK SUBSTRATE
		ENG 02/2/99	AMB	
	FINISH SEE NOTES	APPR		D03782
		PROJECTION		
USED ON		REVISION		SCALE NONE
				SHEET 1 OF 1

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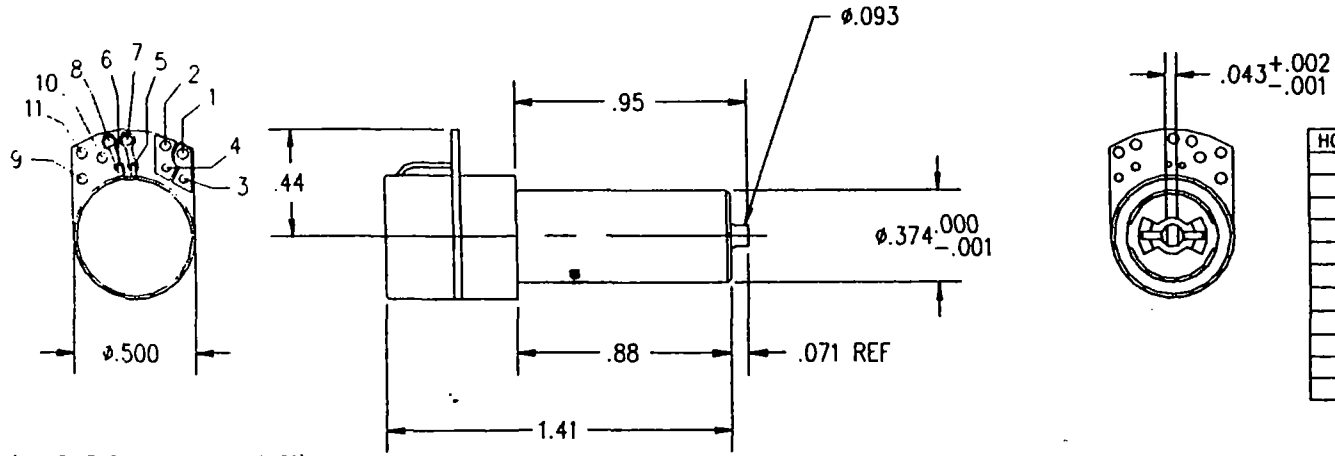
REVISION			
REV	DATE	DESCRIPTION	BY



UNLESS OTHERWISE SPECIFIED	DATE: 01/28/78	PR:	CAMBRIDGE TECHNOLOGY, INC.
TOLERANCES	DES:		100 BRIM PLACE
FRA = 0.0005	ENG:		CAMBRIDGE, MA 02138 - USA
DEC = 0.0005	APP:		6210 XY INTERFACE RH
() INDICATES DIM	PROJECTION:		3mm ±15' MECH
ANGLES 0°-30°	REVISION:		D03793
SURFACE FINISH			SCALE: 1:1
SEE ALL DIMS SHEET			
MATERIAL:			
FRESH	A		
VERO: CH			

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REVISION				
ECO	REV	DESCRIPTION	APPR	DATE
-	B	.88 WAS .89, .95 WAS .96	PTH	10/98
-	C	.043 ^{+0.002} _{-.001} WAS .034 ^{+0.002} _{-.001} . ROT 90°	PTH	2/99



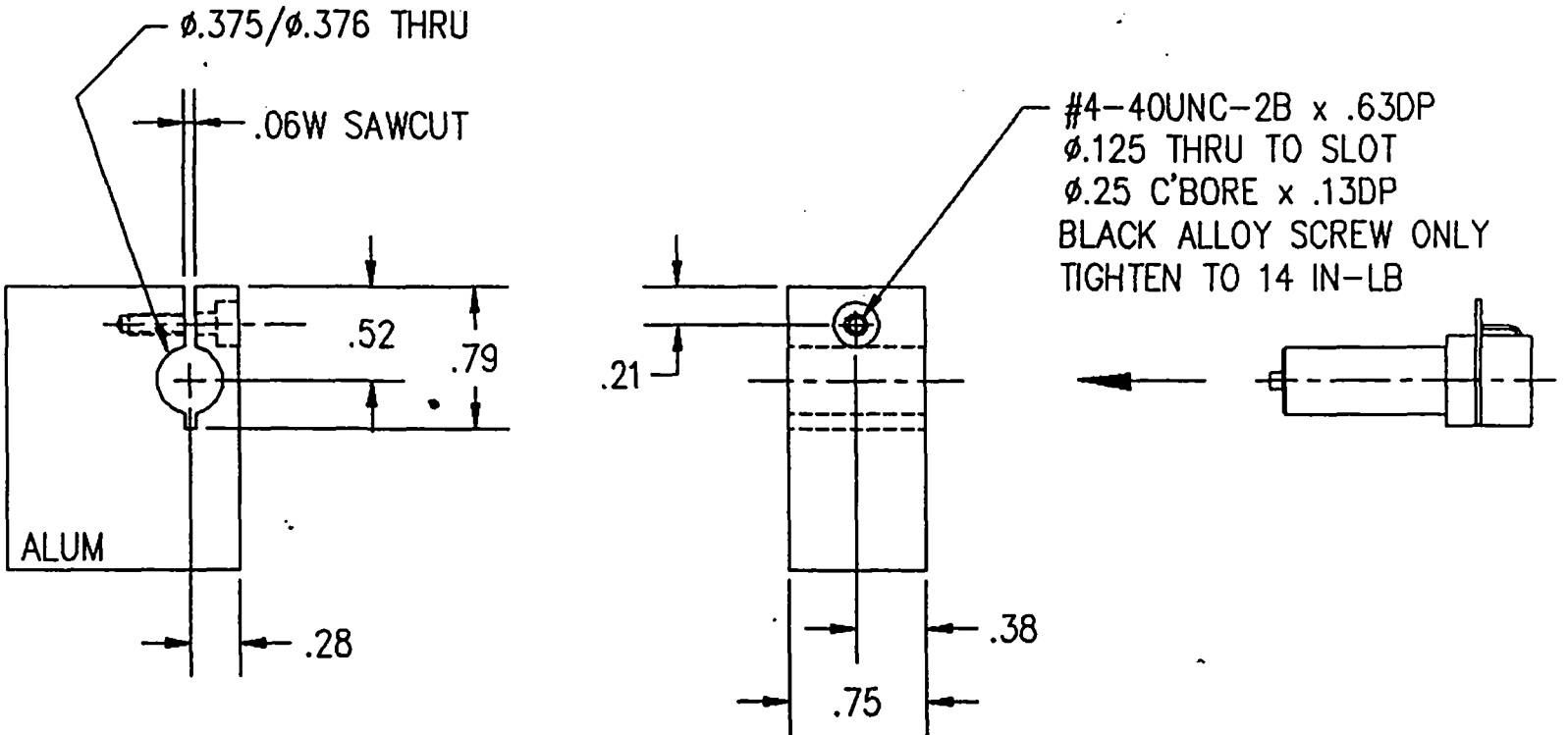
HOLE #	DESCRIPTION
1	+MOTOR
2	-MOTOR
3	+MOTOR (INTERNAL CONNECTION)
4	-MOTOR (INTERNAL CONNECTION)
5	LED1 ANODE (INTERNAL CONNECTION)
6	LED1 CATHODE (INTERNAL CONNECTION)
7	AGC OUT
8	DIODE COMMON
9	1a
10	1b
11	SHIELD

(ALL DIMENSIONS ARE IN INCHES)
 MASS = 17 GRAMS

UNLESS OTHERWISE SPECIFIED TOLERANCES .XX±.010 .XXX±.005 () INDICATES mm ANGLES± 0°-30' SURFACE ROUGHNESS 63 BREAK ALL SHARP EDGES	DRN		CAMBRIDGE TECHNOLOGY, INC. 109 SMITH PLACE CAMBRIDGE, MA. 02138 - USA
	DES		
	CHK		
	ENG		
MATERIAL	APPR		6210 OUTLINE DWG.
	PROJECTION		
FINISH	REVISION		D03628
	USED ON	C	
			SCALE NONE SHEET 1 OF 1

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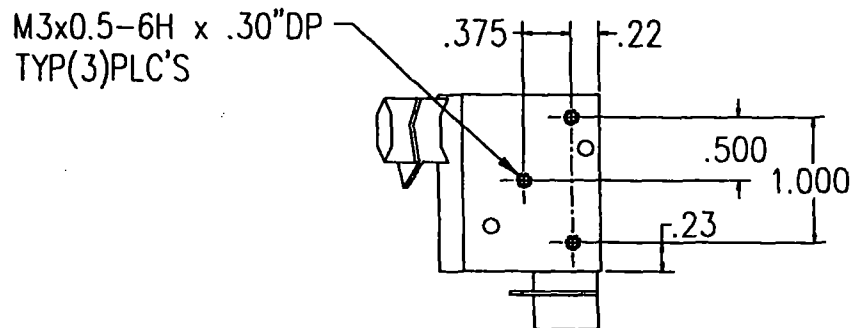
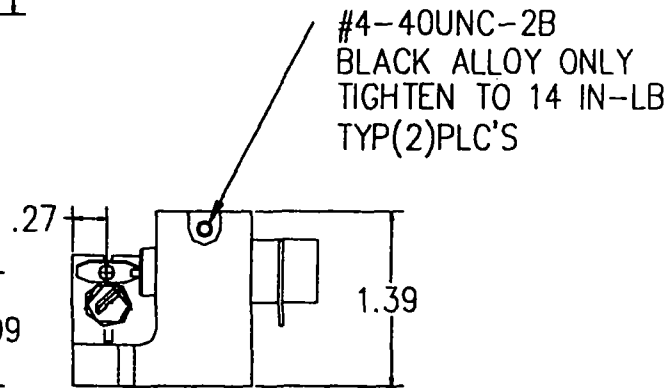
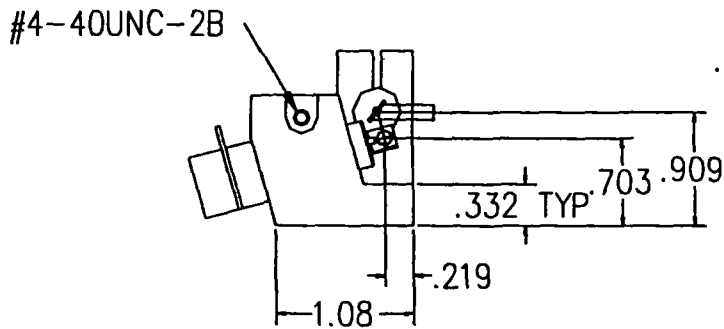
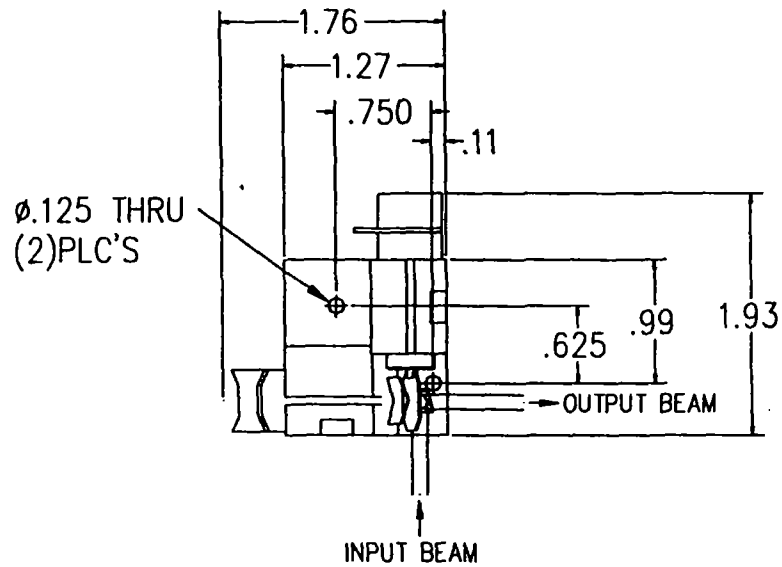
REVISION			
ECO	REV	DESCRIPTION	APPR DATE



UNLESS OTHERWISE SPECIFIED TOLERANCES .XX±.010 .XXX±.005 () INDICATES mm ANGLES± 0°-30'	DRN 02/11/99	PTH	CAMBRIDGE TECHNOLOGY, INC. 109 SMITH PLACE CAMBRIDGE, MA. 02138 - USA
	DES		
MATERIAL	CHK		6210 PREFERRED MOUNTING SCHEME
	ENG		
FINISH	APPR		D03800
	PROJECTION		
	REVISION	A	SCALE ; NONE SHEET 1 OF 1

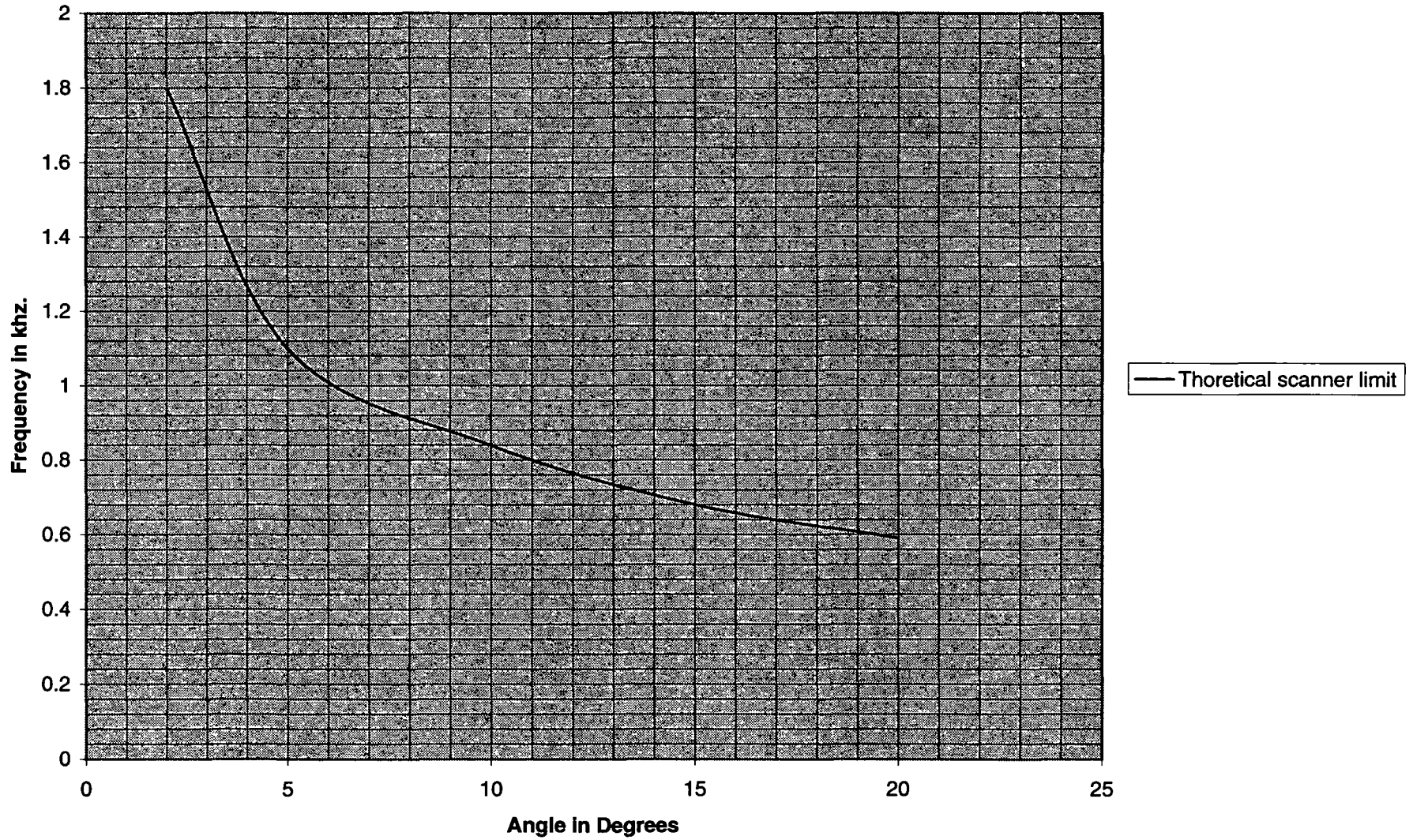
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REV		DESCRIPTION	DATE	BY

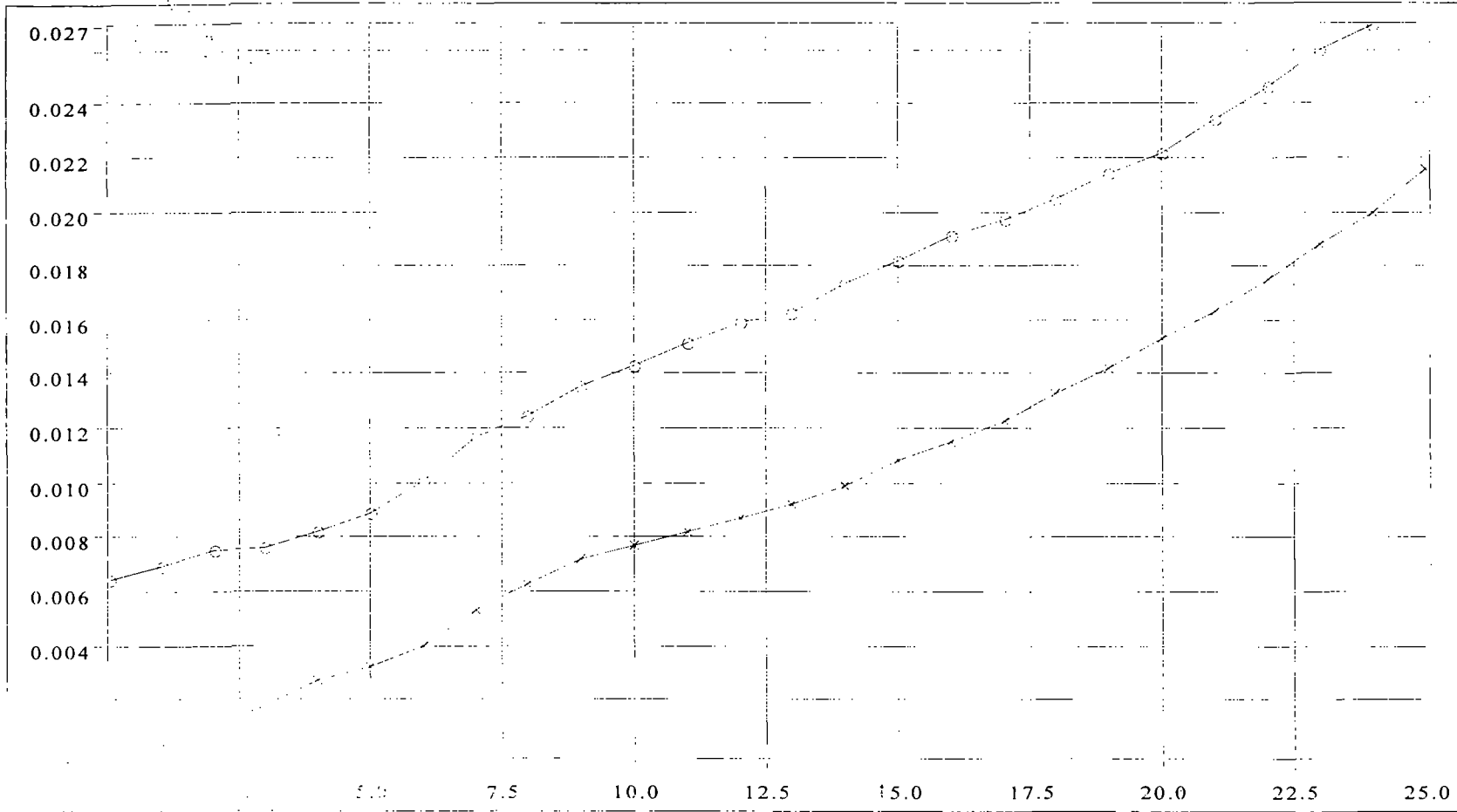


UNLESS OTHERWISE SPECIFIED	CON. CLASS/IN	PH	CAMBRIDGE TECHNOLOGY, INC. 100 BRIM PLACE CAMBRIDGE, MA 02138 - USA
TOLERANCES	FIN.		
XX = ±0.004			6210 XY INTERFACE LH 3mm ±15' MECH
XXX = ±0.002			
(1) INDICATES diam			D03807
ANGLES 0°-30°			
SURFACE FINISHES	PROJECTION		SCALE: D
BREAK ALL SHARP EDGES			
MATERIAL	REVISION		HEET 1 OF 1
USED BY	A		

Thoretical scanner angle limit for sin drive



ERROR v. POSITION



Run Time

0 Hour 6 Minutes

Sample #

51 of 51

Stage Model

CMA-25PP

Stage S/N

012550

Target / Init Position

0.0000

Measured Position

0.0064

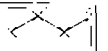
ESP Position

0.0000

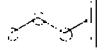
Error

0.0064

Forward



Reverse



Max Error

0.0078

Max Straggle

0.0067

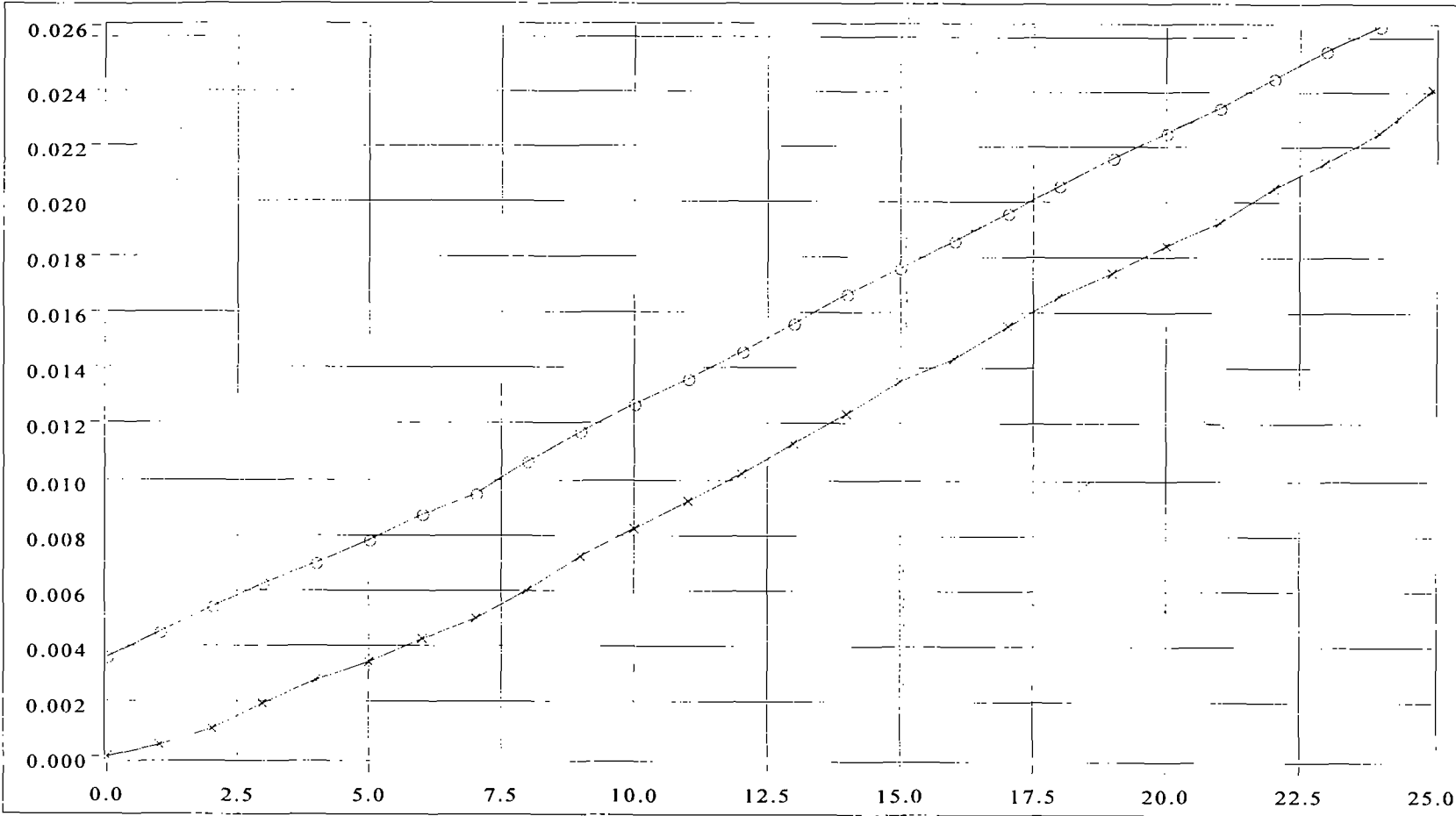
Absolute Accuracy

0.0269

STOP

4

ERROR v. POSITION



Run Time
0 Hour 6 Minutes.

Sample #
51 of 51

Stage Model
CMA-25PP



Stage S/N
012553

Target / Init Position
0.0000

Measured Position
0.0036

ESP Position
0.0000

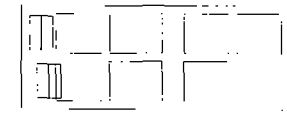
Error
0.0036

Forward 
Reverse 

Max Hysteresis
0.0046

Avg Hysteresis
0.0042

Absolute Accuracy
0.0264



STOP

