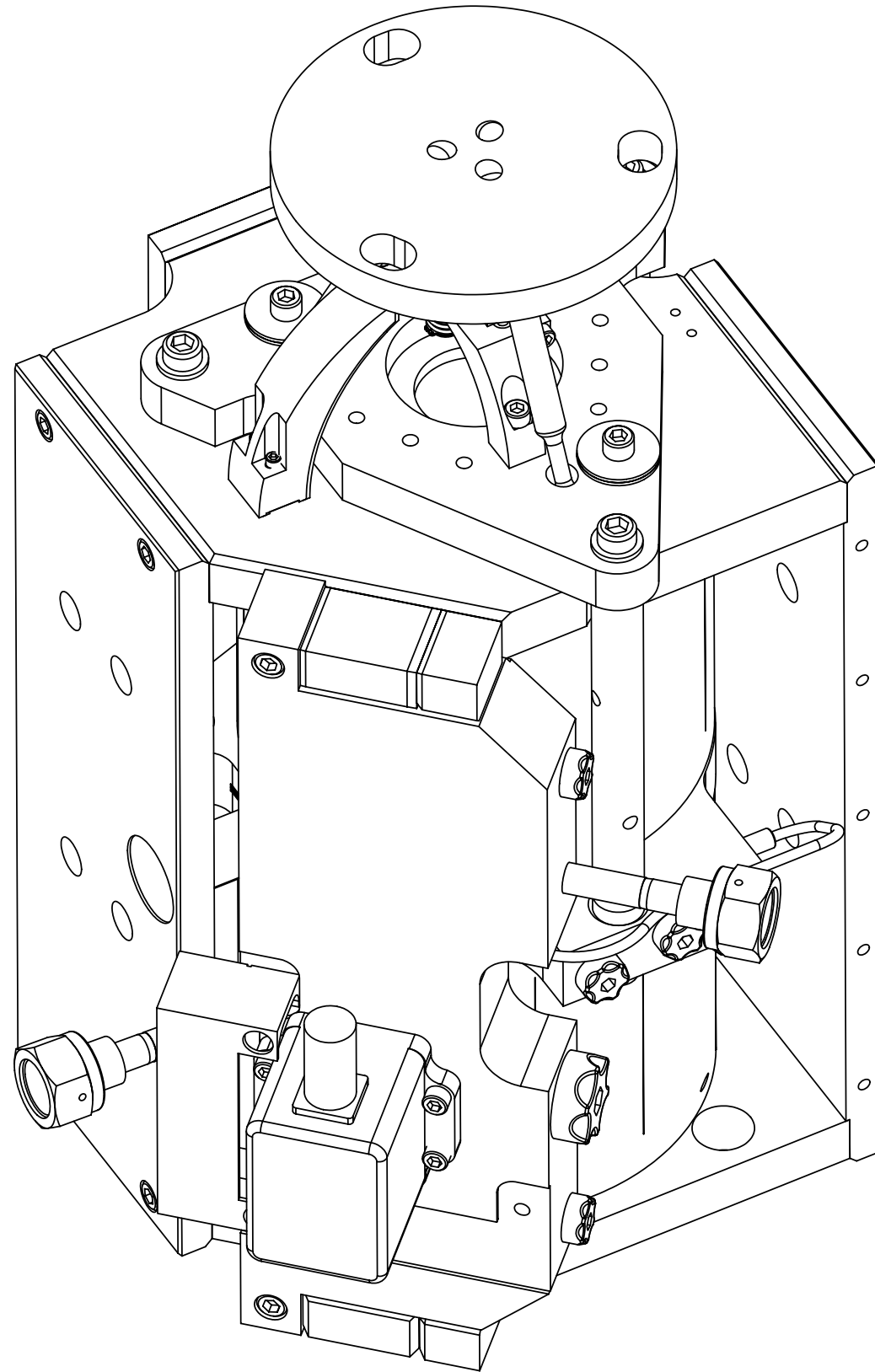


LIGO HEPI

Quiet Hydraulic Actuator

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



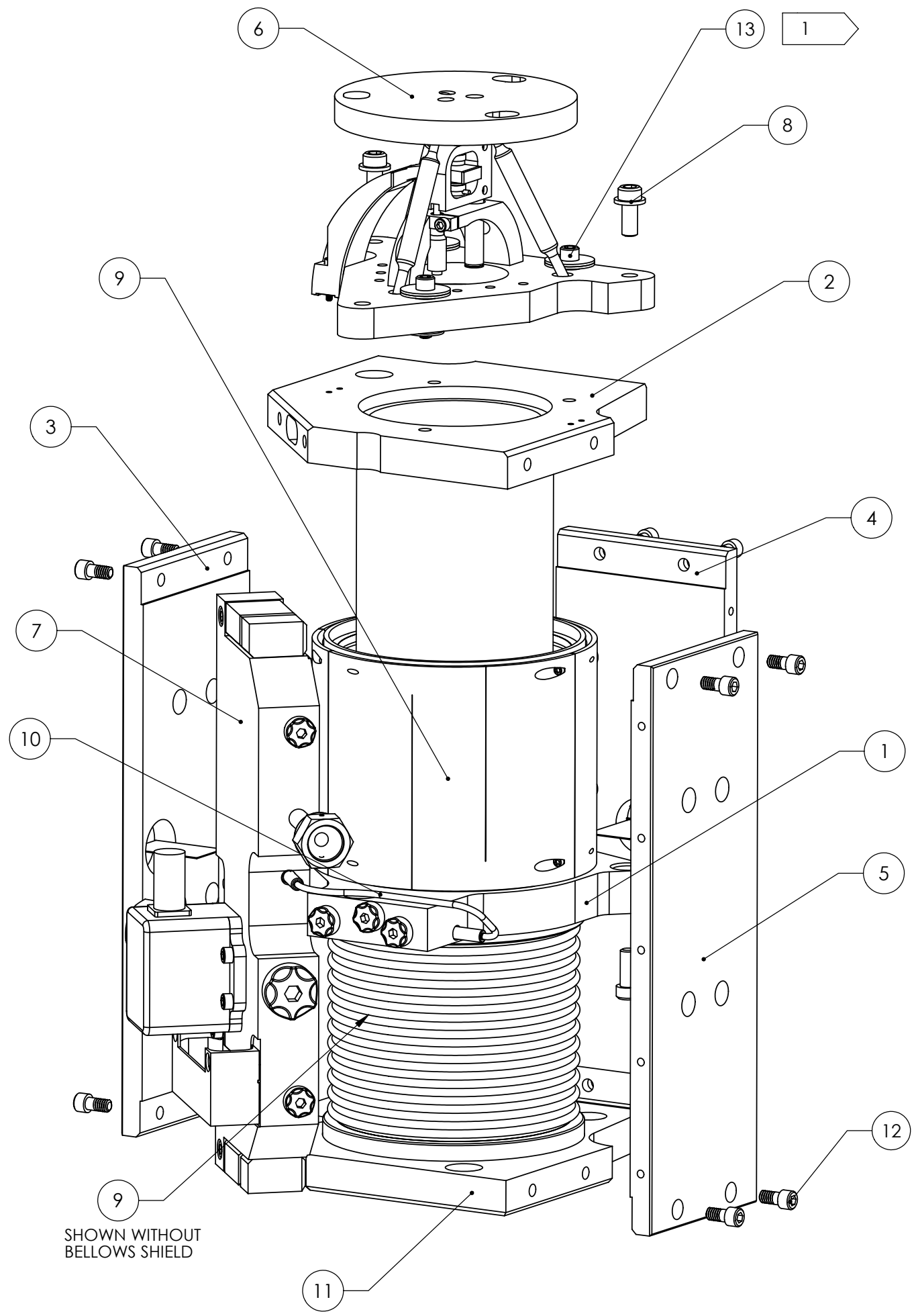
SHEET NO.	DRAWING NO.	PART NAME
1	D020284-B-E	Actuator General View
2	D020357-B-E	Actuator Exploded Assembly
3	D020358-B-E	Actuator Plate Exploded View
4	D020285-B-E-Sht. 1 of 2	Actuation Plate
5	D020285-A-E-Sht. 2 of 2	Actuation Plate Details
6	D020359-D-E-Sht. 1 of 2	Actuator Plate, Plug and Small Pin Valve
7	D020359-D-E-Sht. 2 of 2	Actuator Plate, Plug and Small Pin Valve
8	D020286-B-E	Actuator Diaphragm
9	D020287-A-E	Diaphragm Restraint
10	D020288-A-E	Bypass Resistor
11	D020289-A-E	Bypass Resistor Cap
12	D020361-B-E	Exploded Top Foundation Plate Sub-Assembly
13	D020291-B-E	Top Bellow Slug & Cap
14	D020290-A-E-Sht. 1 of 2	Top Foundation Plate
15	D020290-A-E-Sht. 2 of 2	Top Foundation Plate Details
16	D020362-B-E	Exploded Bottom Foundation Plate Sub-Assembly
17	D020293-B-E	Bottom Bellow Slug & Cap
18	D020292-A-E-Sht. 1 of 2	Bottom Foundation Plate
19	D020292-A-E-Sht. 2 of 2	Bottom Foundation Plate Details
20	D020360-B-E	Bellows Assembly Exploded View
21	D020294-A-E	Bellows Assembly
22	D020295-A-E	Bellows & Shield Rings
23	D020302-B-E	Bellows Shield
24	D020363-B-E	Side Foundation Assembly view with Flexure
25	D020297-A-E	Left Side Foundation Plate
26	D020299-A-E	Parallel Motion Flexure
27	D020296-A-E	Right Side Foundation Plate
28	D020364-B-E	Back Foundation Plate Assembly view with Flexure
29	D020298-A-E	Back Foundation Plate
30	D020365-B-E	Manifold Assembly
31	D020300-B-E-Sht. 1 of 3	Manifold Sheet 1 of 3
32	D020300-B-E-Sht. 2 of 3	Manifold Sheet 2 of 3
33	D020300-A-E-Sht. 3 of 3	Manifold Sheet 3 of 3 with Large Pin Valve
34	D020301-B-E	Manifold Weld Caps
35	D020367-B-E	Manifold Large Plug
36	D020303-B-E	Oil Catch
37	D020368-B-E	Tripod Assembly
38	D020369-A-E	Tripod Bar, Attachment Plate and Sensor Holster
39	D020371-B-E	Tripod Base and Vertical Post
40	D020372-A-E	Tripod Sensor Housing and Sensor Post
41	D030705-A-E	Quarter Round Displacement Sensor Flag
42	D020374-00-E	Actuator Bleed Tube Assembly
43	D020373-00-E	Actuator Bleed Tube Insert Sleeve

SHOP MARKINGS REQUIRED		
PART NO.	REV NO.	SERIAL NO.
X	X	X
X	X	X
X	X	
X	X	
X	X	
X	X	
X	X	
X	X	X
X	X	
X	X	
X	X	X

SERIAL NO. SHALL BE OF THE FORMAT Dxxxxxx-REV-SN, WHERE Dxxxxxx IS THE PART NUMBER, REV IS THE DRAWING REVISION, AND SN IS THE SEQUENTIAL SERIAL NUMBER 001 THRU 999 IN THE ORDER PRODUCED.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± 0.020" .XXX ± 0.005" ANGULAR ± 30'	DATE	4/02	NAME	Hardham	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY SYSTEM LASTI SUB-SYSTEM HEPI NEXT ASSY PART NAME HEPI Actuator General View SIZE DWG. NO. D020284 REV B SCALE: 2:3 unless noted Sht. No. 1 / 43
	DRAWN				
	REDRAWN	Fall'02	Hammond		
	REDRAWN	7/16/03	Spjeld		
	CHECKED	2/9/03	Kern		
MATERIAL	COMMENTS:				
FINISH 120 RMS unless noted					

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/25/03	E030373-00-E	

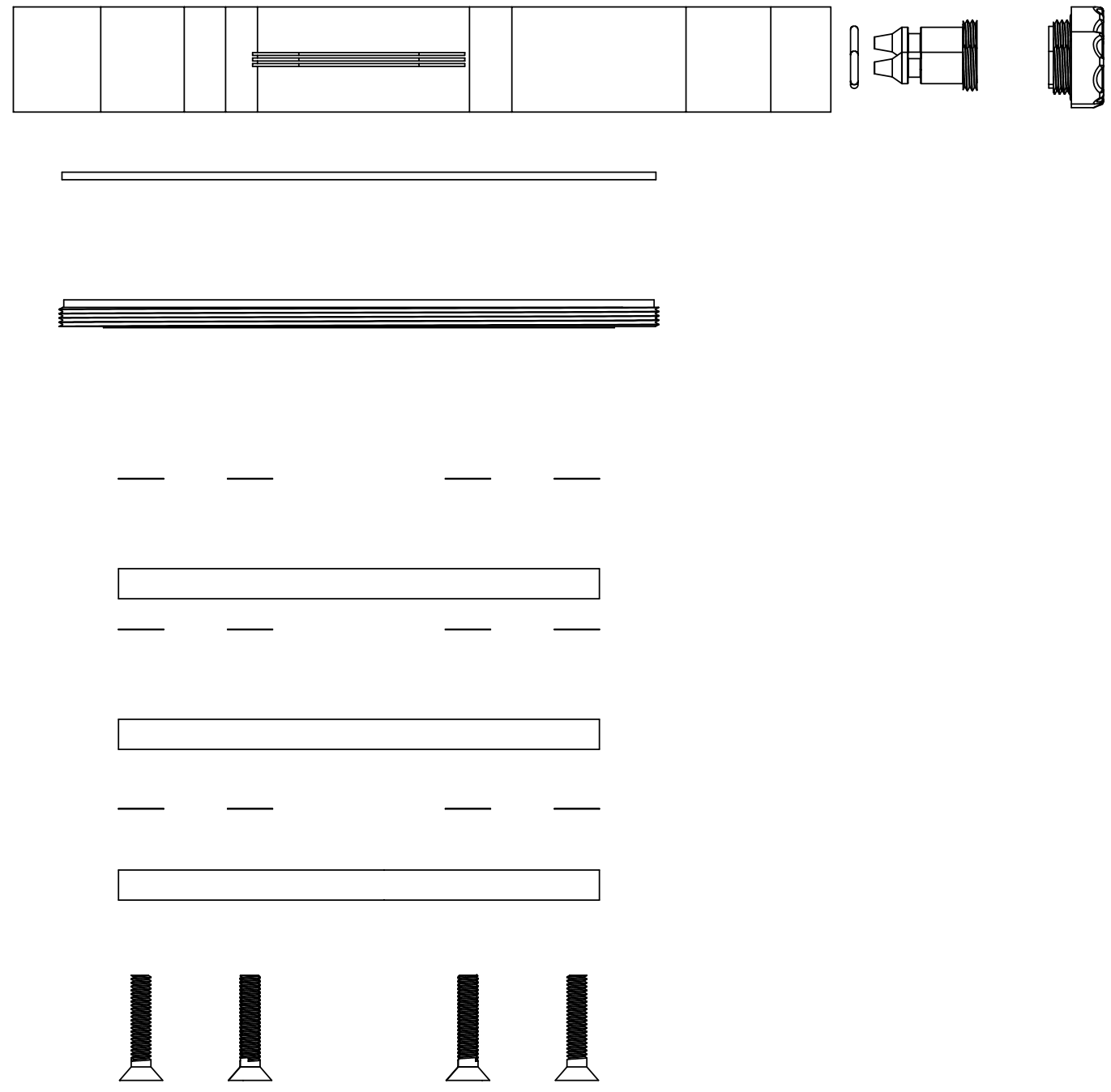
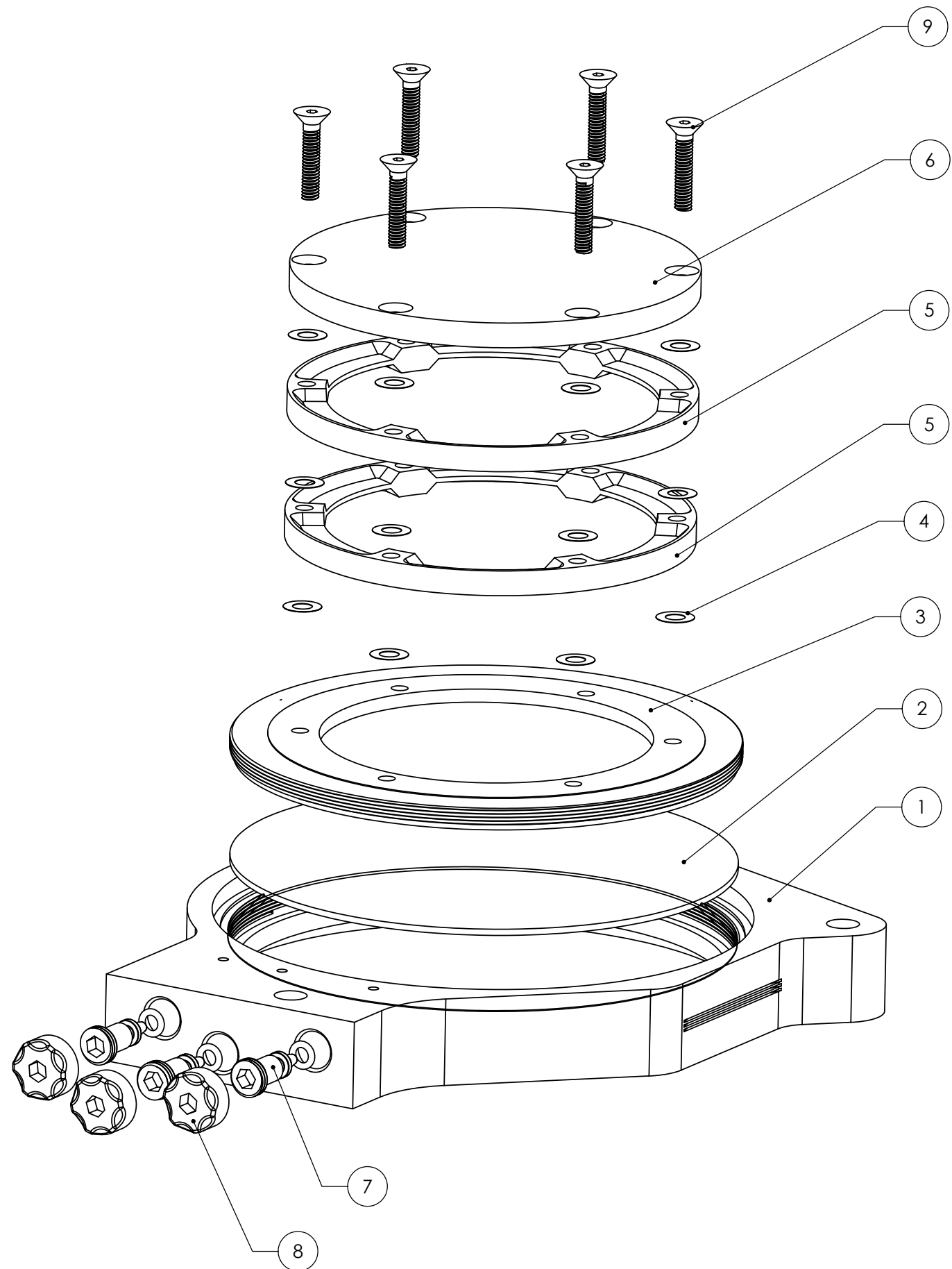


1 For Shipping and Installation Only

ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
1	1	D020358-B	ACTUATOR PLATE ASSEMBLY		3
2	1	D020361-B	TOP FOUNDATION PLATE ASSEMBLY		12
3	1	D020363-B	SIDE FOUNDATION ASSEMBLY		24
4	1	D020364-B	BACK FOUNDATION PLATE ASSEMBLY		28
5	1	D020296-A	RIGHT SIDE FOUNDATION PLATE		27
6	1	D020368-A	TRIPOD ASSEMBLY		37
7	1	D020365-B	MANIFOLD ASSEMBLY		30
8	6	-	SCH CAP SCR 7/16-20 ~ 75 W/ WSH ASSEMBLY		-
9	2	D020360-B	BELLOWS ASSEMBLY		20
10	1	D020374-00	ACTUATOR BLEED TUBE ASSEMBLY		42
12	1	D020362-B	BOTTOM FOUNDATION PLATE ASSEMBLY		16
13	14	-	S.H.C.S. 1/4-20 x 0.50	SST	-
15	3	-	LIMIT ASSEMBLY		-

UNLESS OTHERWISE SPECIFIED:	DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DRAWN	4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.020"	REDRAWN	Fall '02	Hammond	SUB-SYSTEM
.XXX ± 0.005"	REDRAWN	7/25/03	Sjeld	NEXT ASSY
ANGULAR ± 30°	CHECKED	3/9/03	Kern	PART NAME
MATERIAL	COMMENTS:		SIZE	DWG. NO.
FINISH	120 RMS unless noted		C	DO20357
			SCALE:	1:2
			Sht. No. 2 / 43	

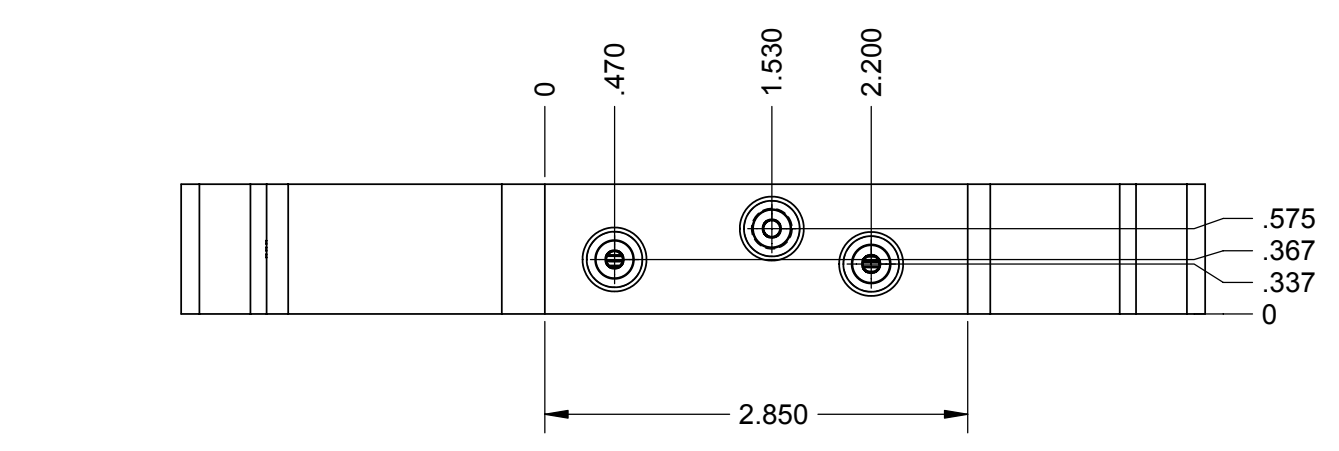
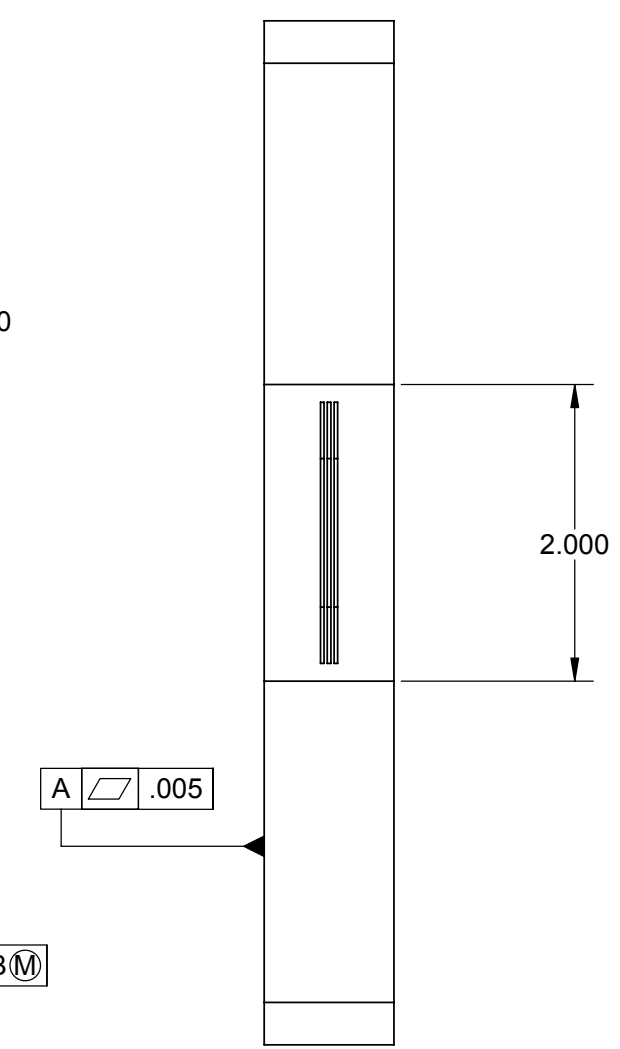
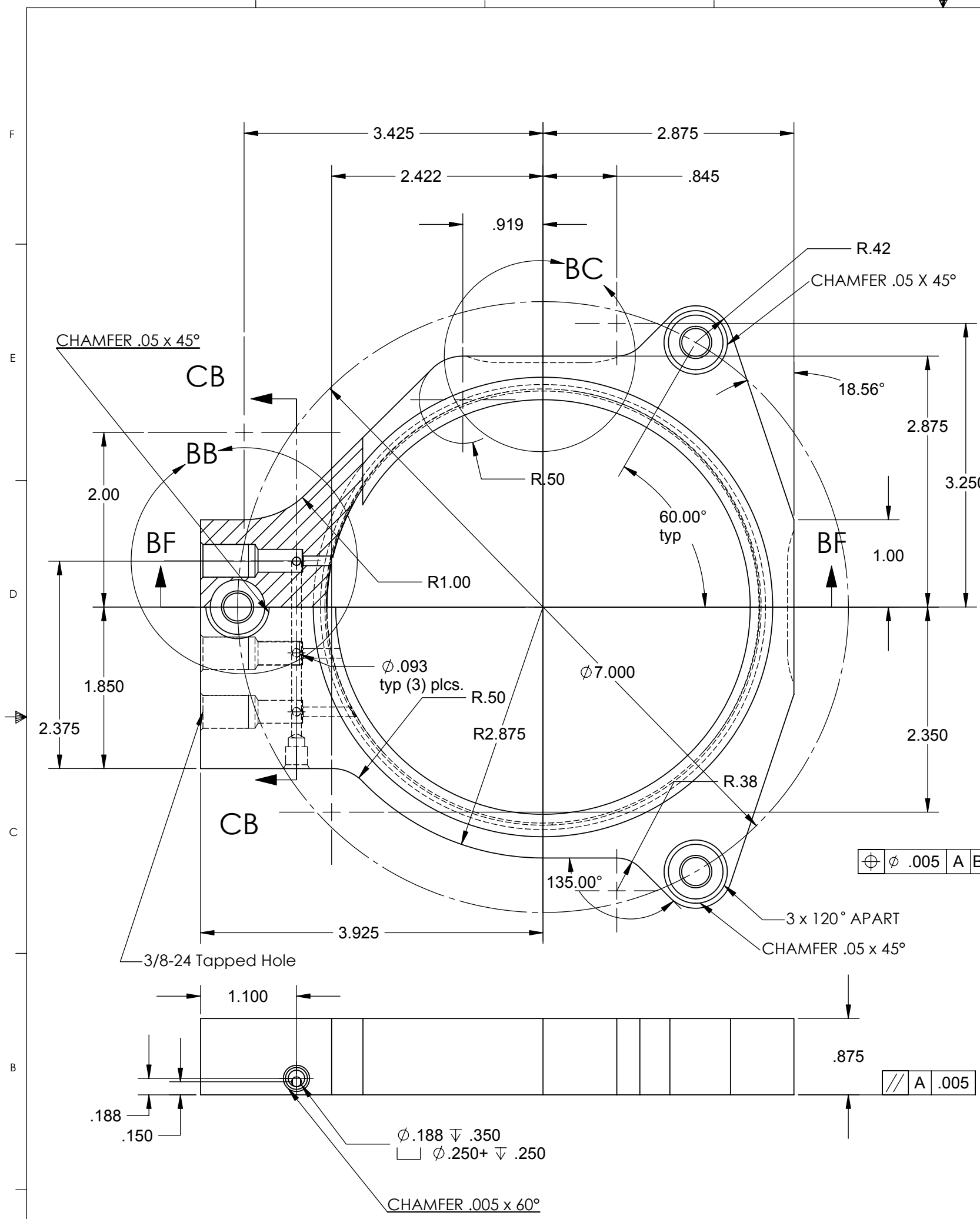
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
9	6	-	F.H.S.S. 8-32 x .625		-
8	3	D020359-B	SMALL ACTUATOR PLUG W/ O-RING		6
7	3	D020359-B	ACTUATOR SMALL PIN VALVE ASSEMBLY		
6	1	D020289-A	BYPASS RESISTOR CAP		11
5	2	D020288-A	BYPASS RESISTOR RING		10
4	18	-	BYPASS SPACER		-
3	1	D020286-B	DIAPHRAM RESTRAINT		9
2	1	D020286-B	DIAPHRAM		8
1	1	D020285-B	ACTUATION PLATE		4

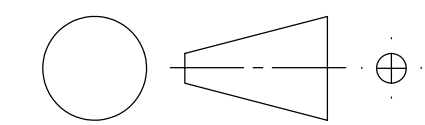
ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
UNLESS OTHERWISE SPECIFIED:					
DRAWN		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
REDRAWN		DATE	NAME	SYSTEM LASTI	
REDRAWN		DATE	NAME	SUB-SYSTEM HEPI	
CHECKED		DATE	NAME	NEXT ASSY	
PART NAME HEPI Actuator Plate Exploded View				SIZE	DWG. NO.
COMMENTS:				D020358	REV
1 Required for each actuator					B
FINISH 32 RMS unless noted				SCALE:	1:1 unless noted
				Sht. No.	3 / 43

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/23/03	E030373-00-E	

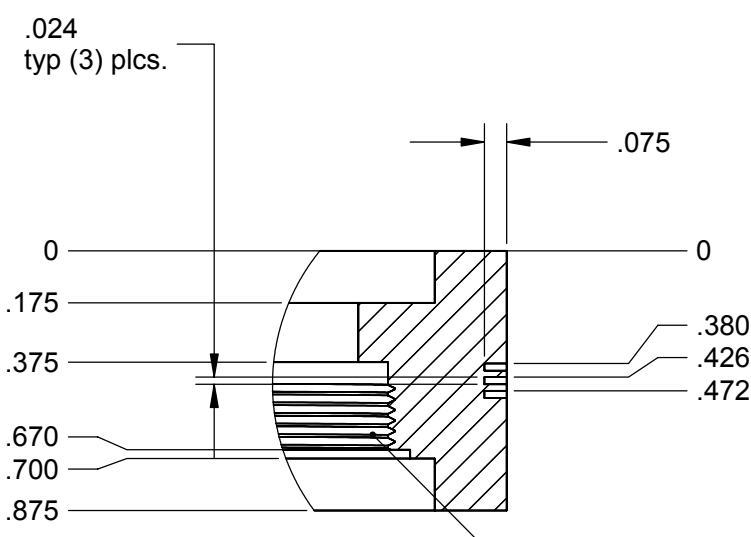


NOTE: ENGRAVE D020285-B-(SN)

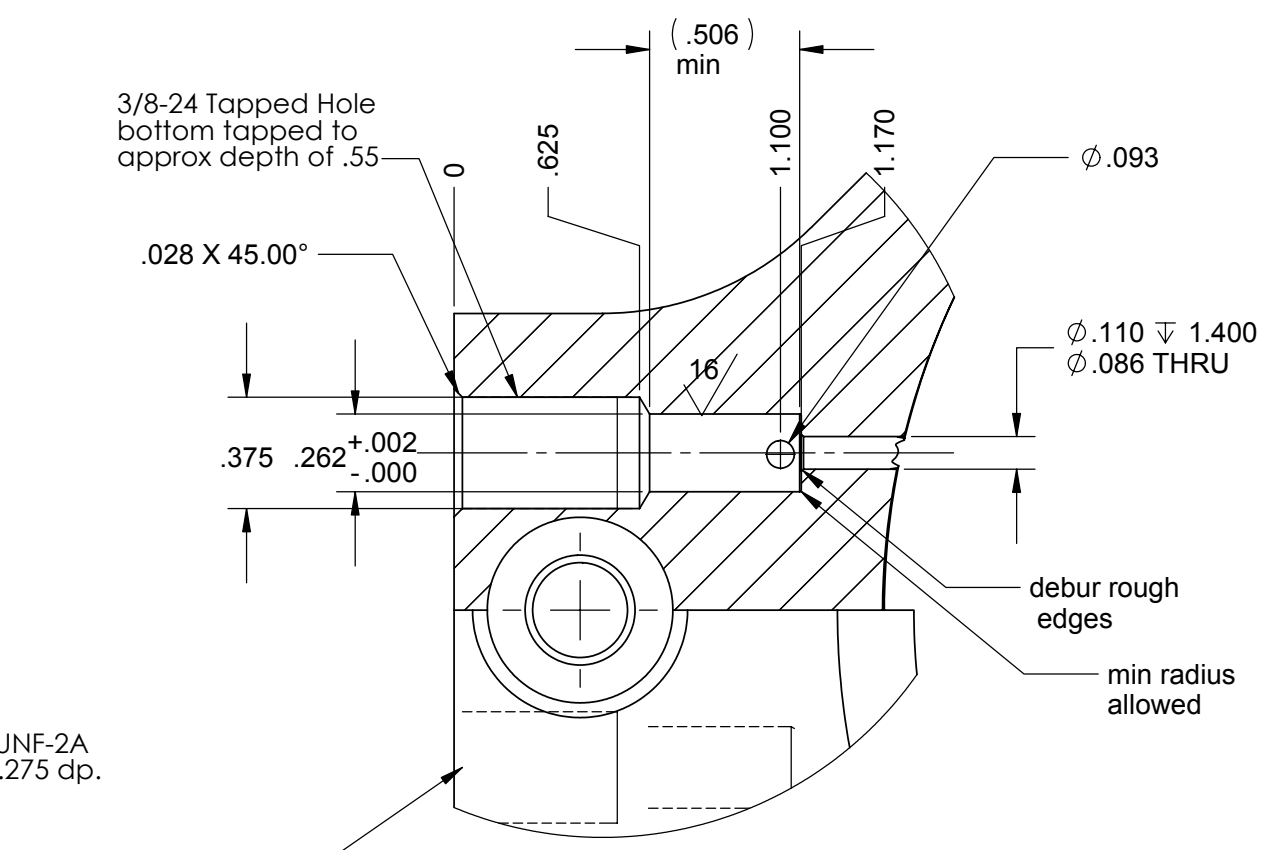
UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES:		Fall'02	Hammond	SYSTEM LASTI
.XX ± 0.020"		6/23/03	Spjeld	SUB-SYSTEM HEPI
.XXX ± 0.005"		6/23/03	Spjeld	NEXT ASSY
ANGULAR ± 30°		6/23/03	Spjeld	PART NAME HEPI Actuation Plate
MATERIAL	304 L	COMMENTS:		SIZE DWG. NO.
FINISH	120 RMS unless noted	1 Required for each actuator		D020285 Sheet 1 of 2
		SCALE:		1:1 unless noted
				Sht. No. 4 / 43



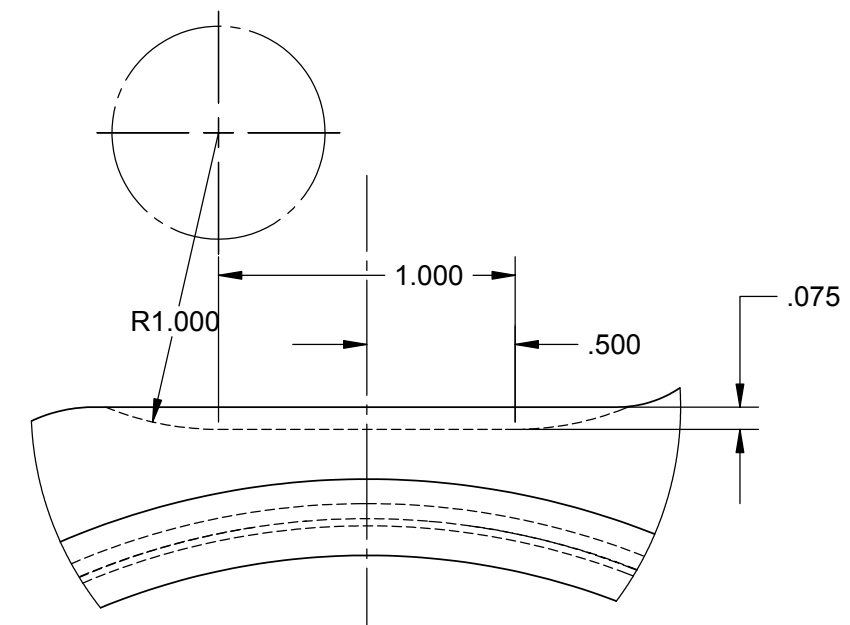
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	07/21/03	E030373-00-E	



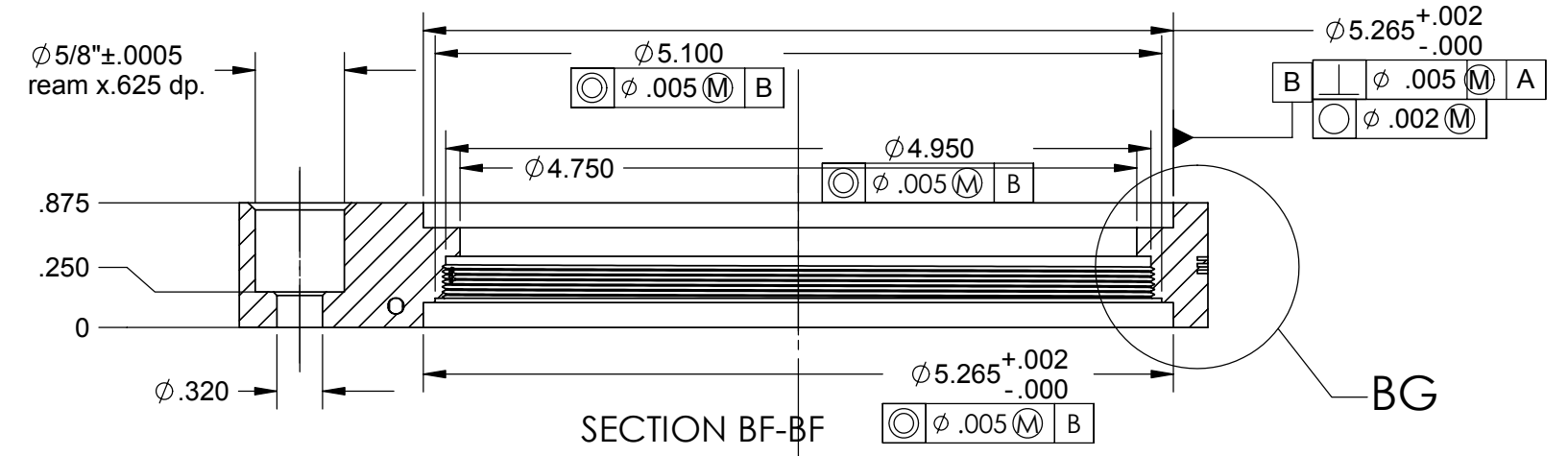
DETAIL BG
SCALE 2 : 1



DETAIL BB
SCALE 2 : 1

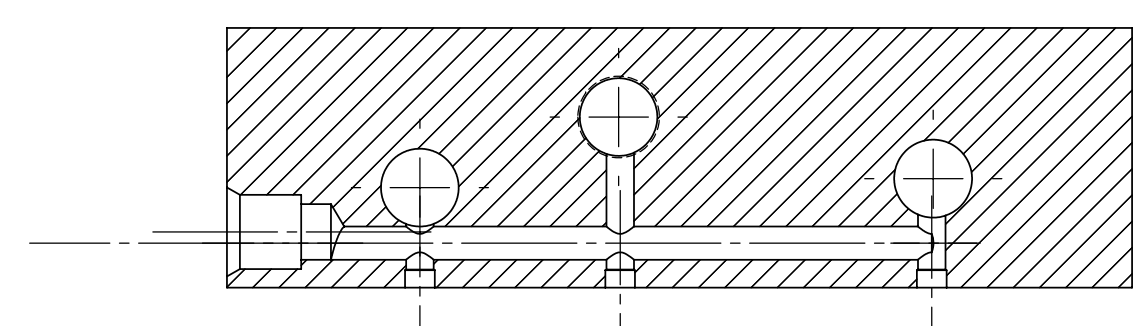


DETAIL BC
SCALE 2 : 1



SECTION BF-BF

BG



SECTION CB-CB
SCALE 2 : 1

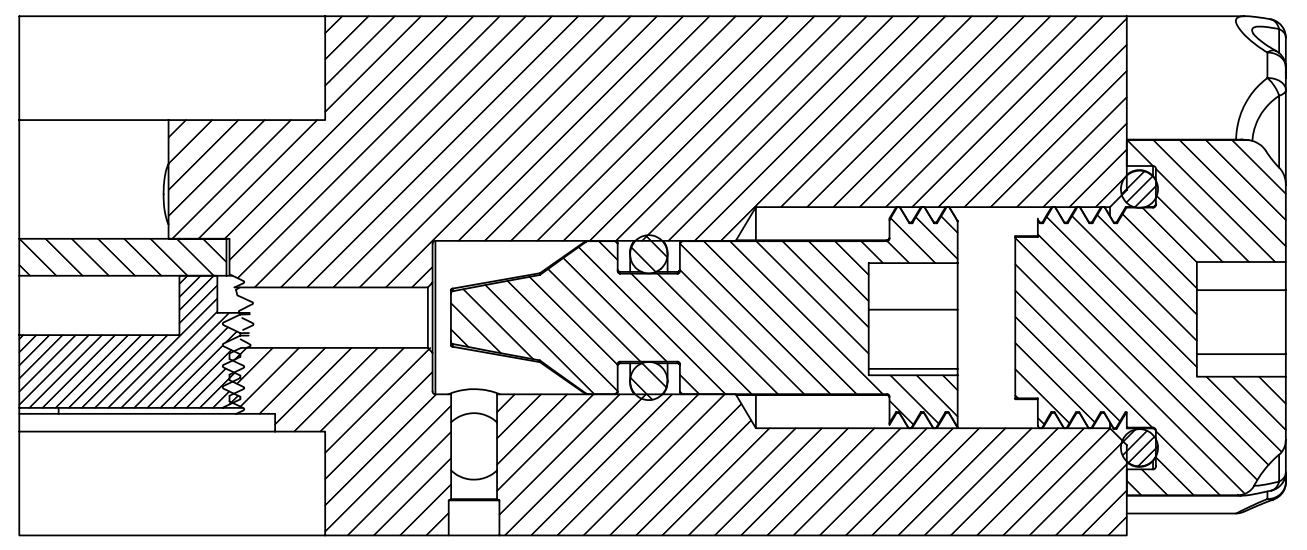
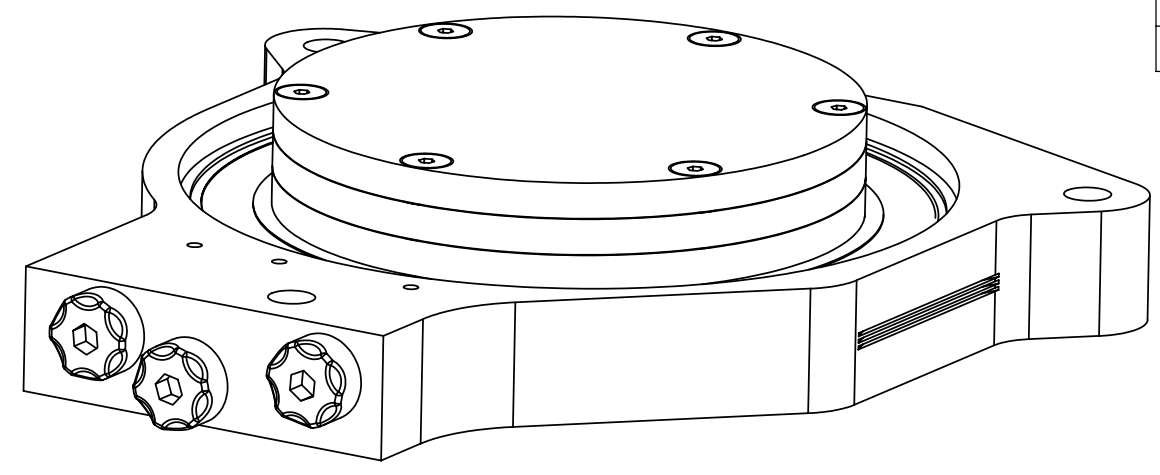
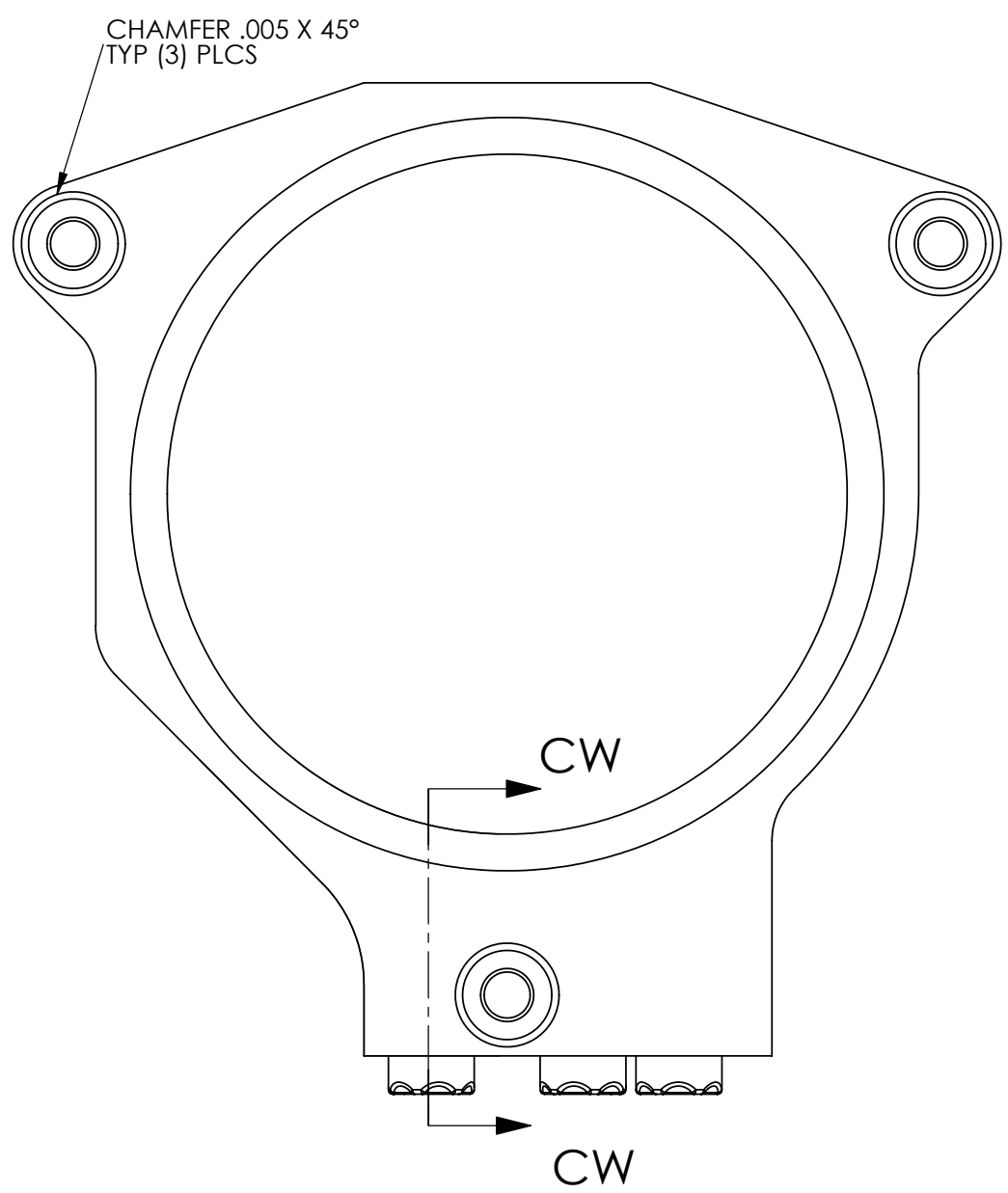
UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN	4/02	Hardham	
TOLERANCES: .XX ± 0.020"		REDRAWN	Fall' 02	Hammond	SYSTEM LASTI
.XXX ± 0.005"		REDRAWN	7/21/03	Spjeld	SUB-SYSTEM HEPI
ANGULAR ± 30°		REDRAWN	6/23/04	Spjeld	NEXT ASSY
MATERIAL		COMMENTS:		PART NAME HEPI Actuation Plate Details	
FINISH 120 RMS unless noted				SIZE DWG. NO.	REV B
				SCALE:	1:1 unless noted Sht. No. 5 / 43



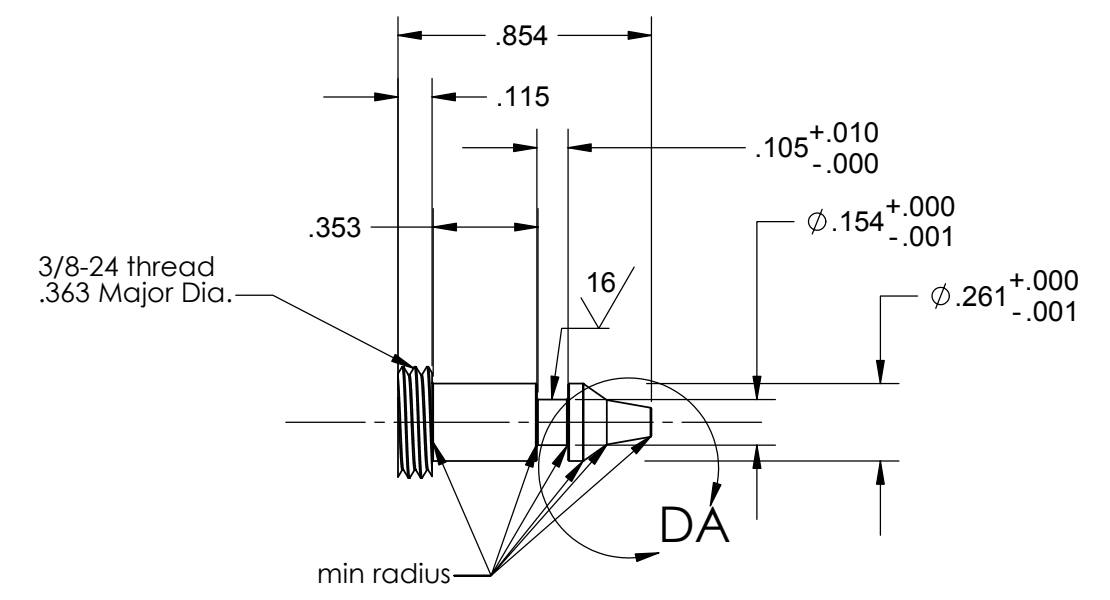
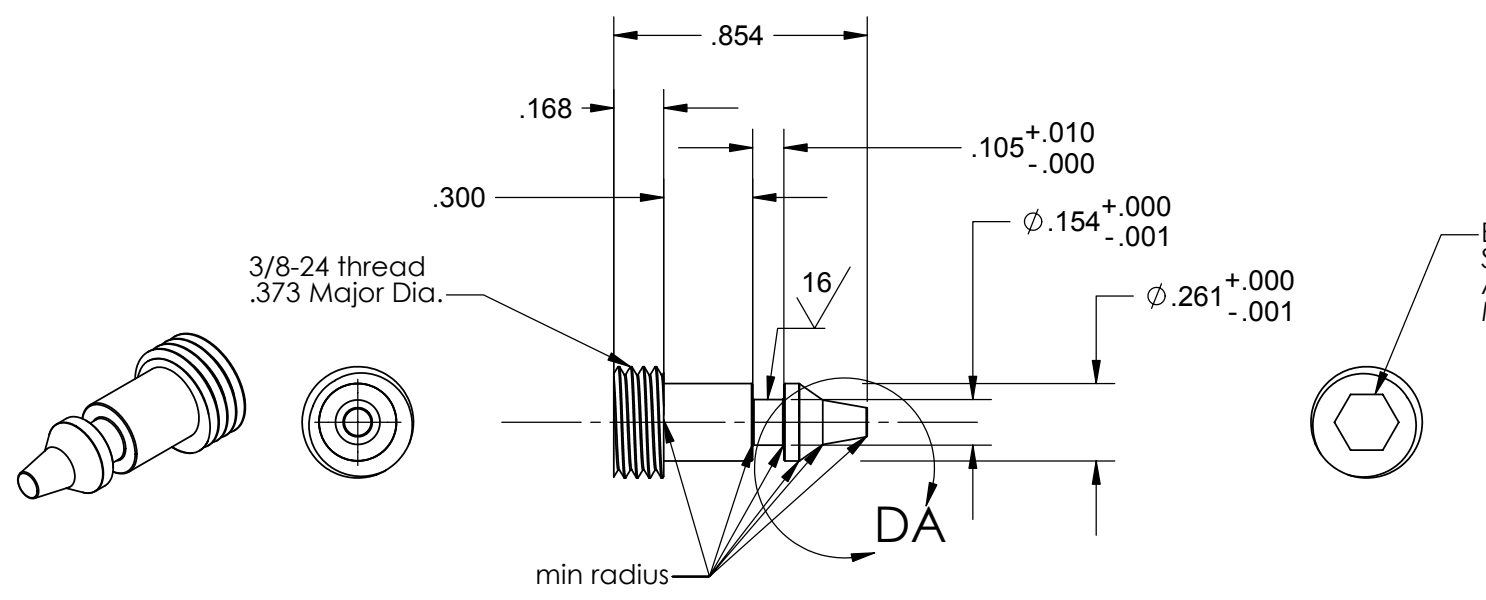
SIZE
C

SCALE: 1:1 unless noted Sht. No. 5 / 43

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/21/03	E030373-00-E	
C	4/27/04		
D	5/3/04	E040210-00-E	

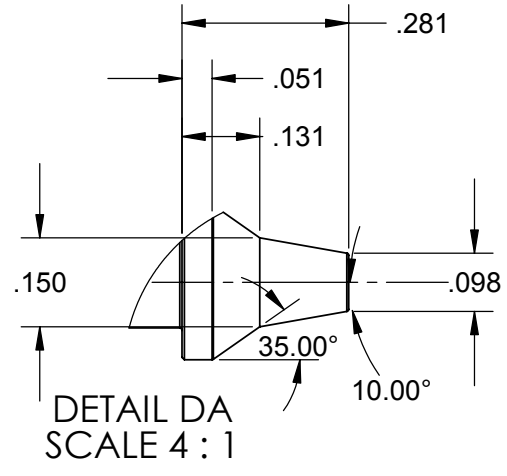


SECTION CW-CW
SCALE 4 : 1



**Actuation Plate
Small Pin Valve
D020359-D-E Part 1
Mat'l: 17-4 PH
(2) required**

**for use only on
D020365-B Manifold
Assembly**

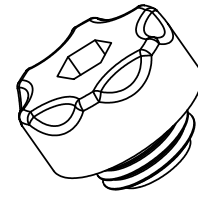
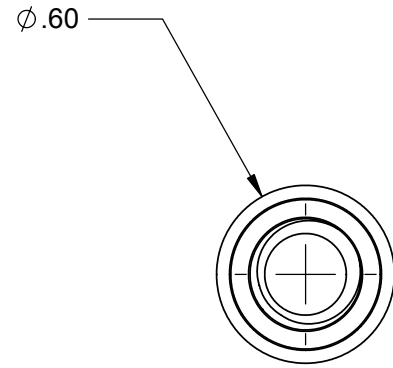


**Actuation Plate
Small Pin Valve
D020359-D-E Part 1A
Mat'l: 17-4 PH
(3) required**

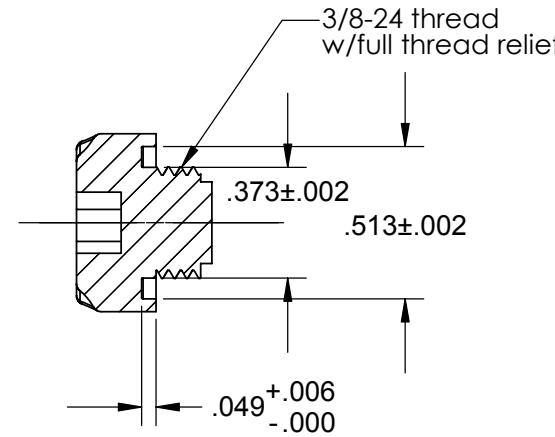
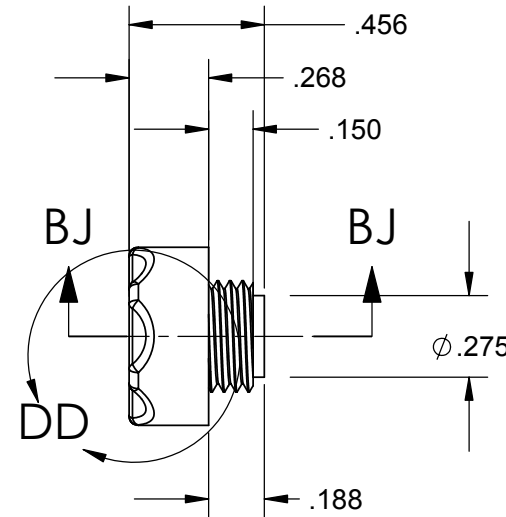
**for use only on
D020358-B Resistor
Stack Sub-Assembly**

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.020"		Fall' 02	Hammond	SUB-SYSTEM	HEPI
.XXX ± 0.005"		8/12/03	Spjeld	NEXT ASSY	
ANGULAR ± 30°		5/3/04	Coyne	PART NAME HEPI Actuation Plate, Plug and Small Pin Valve	
MATERIAL		COMMENTS:		SIZE	DWG. NO.
FINISH 32 RMS unless noted				C	D020359 Sheet 1 of 2
				SCALE:	1:1 unless noted
					Sht. No. 6 / 43

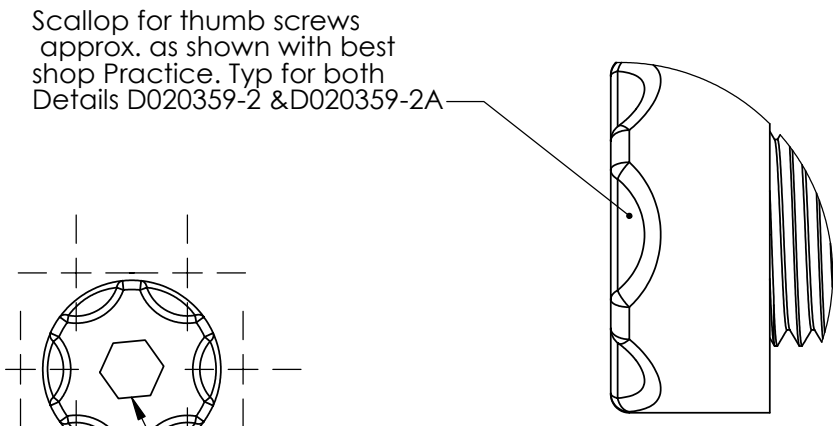
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/11/03	E030373-00-E	
C	4/27/04		
D	5/3/04	E040210-00-E	



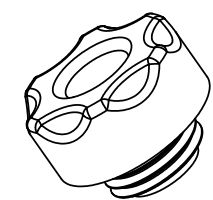
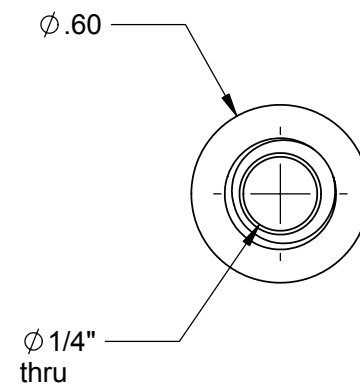
**Actuator Plate Plug
D020359-D-E Part 2
Mat'l: 304-L
(5) required**



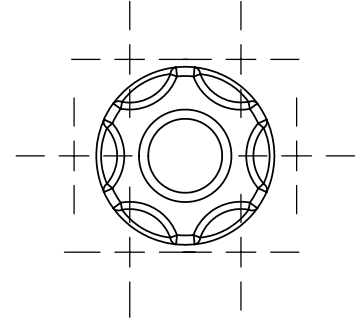
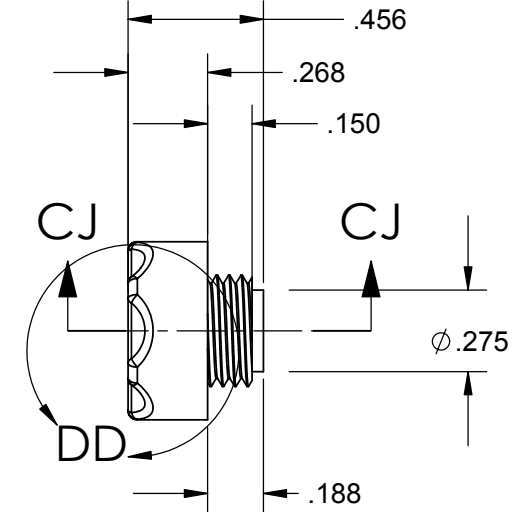
SECTION BJ-BJ
SCALE 2 : 1



DETAIL DD
SCALE 4 : 1



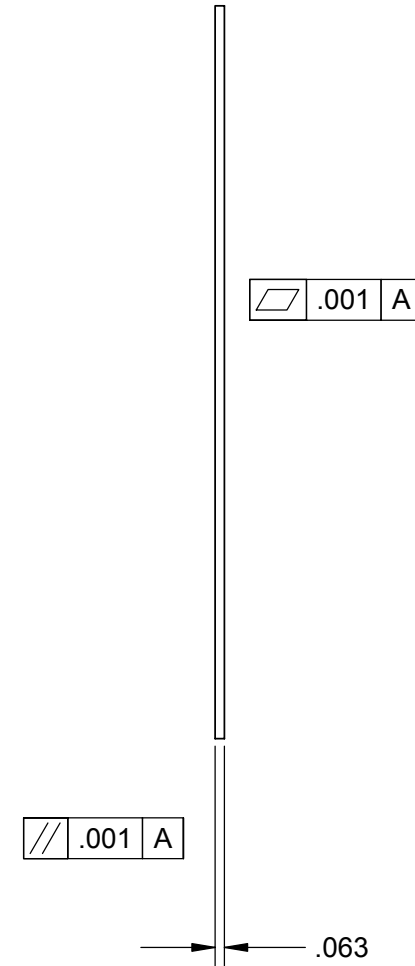
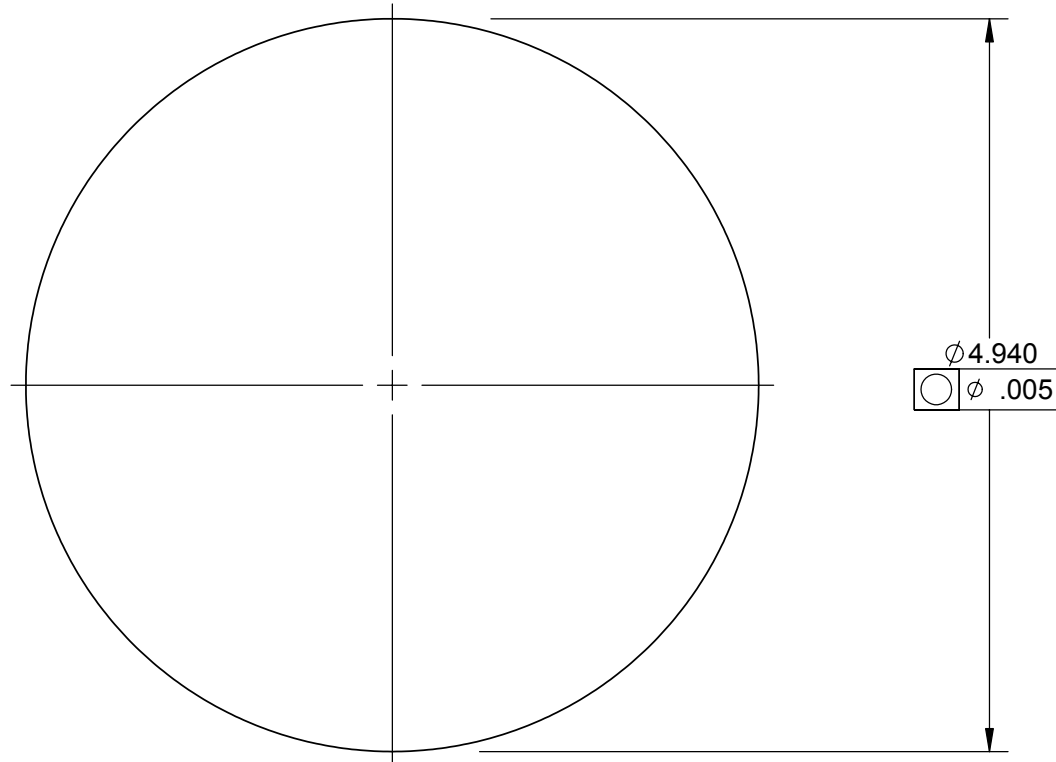
**Actuator Plate Plug
D020359-B-E Part 2A
Mat'l: 6061-T6
(5) required**



SECTION CJ-CJ
SCALE 2 : 1

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.020"		Fall' 02	Hammon	SUB-SYSTEM	HEPI
.XXX ± 0.005"		8/12/03	Spjeld	NEXT ASSY	
ANGULAR ± 30°		5/3/04	Coyne	PART NAME HEPI Actuation Plate, Plug and Small Pin Valve	
MATERIAL	6061-T6	COMMENTS:		SIZE	DWG. NO.
FINISH	32 RMS unless noted	ANODIZE ALL ALUMINUM COLOR: CLEAR		C	D020359 Sheet 2 of 2
				SCALE:	1:1 unless noted
				Shf. No. 7 / 43	

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/9/03	E030373-00-E	



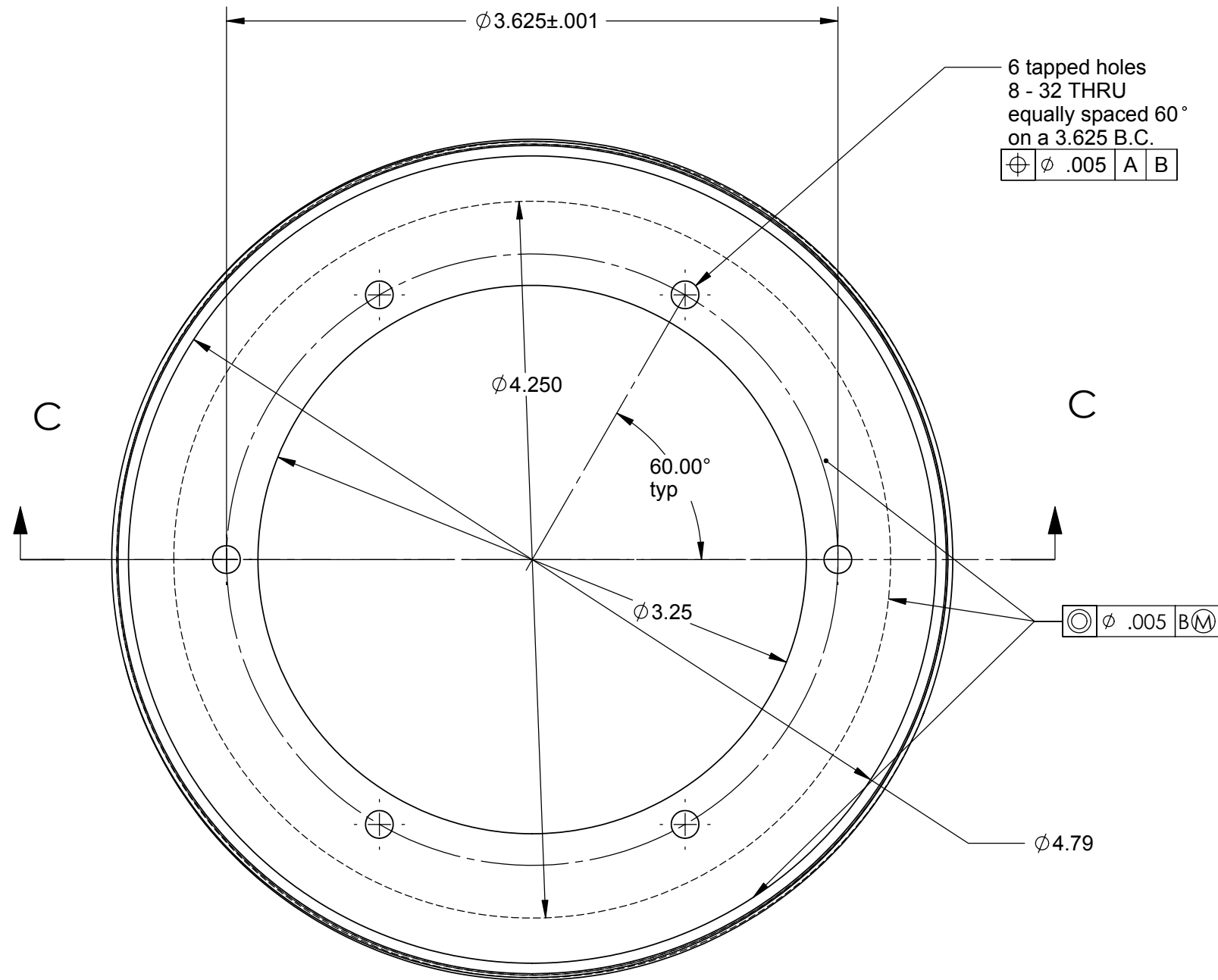
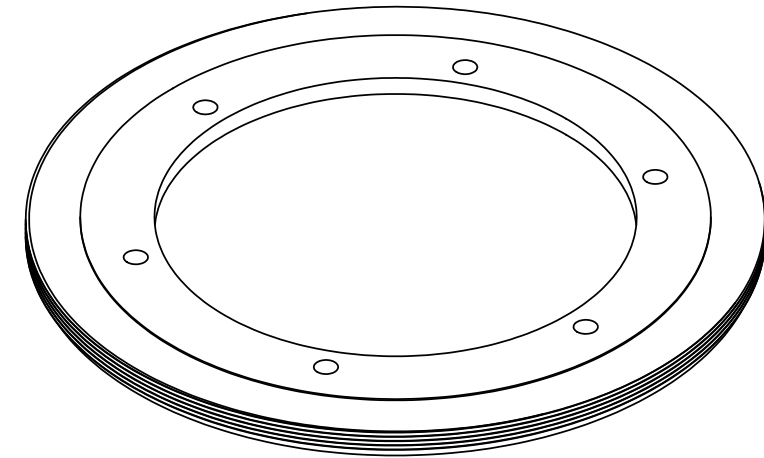
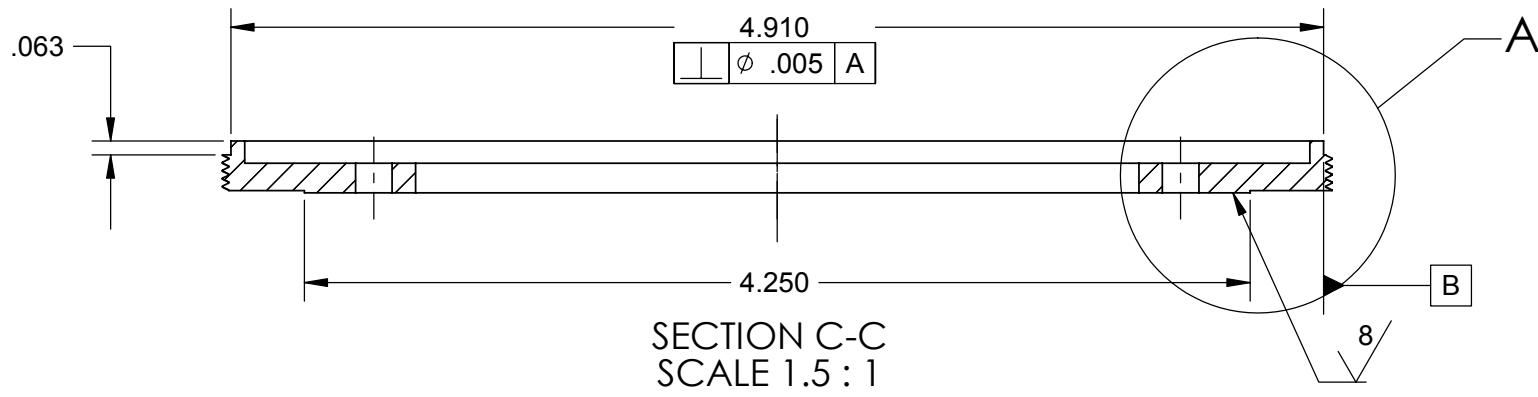
Break all Sharp Edges

**NOTE: HEAT TREAT H-900
FLATNESS CRITICAL**

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	LIGO	
TOLERANCES: .XX ± 0.020 "		REDRAWN	Fall' 02	Hammond	LASTI
.XXX ± 0.005 "		REDRAWN	6/9/03	Spjeld	HEPI
ANGULAR $\pm 30^\circ$		CHECKED	2/9/03	Kern	NEXT ASSY
MATERIAL 17-4PH		COMMENTS: 1 Required for each actuator			PART NAME HEPI Actuator Diaphragm
FINISH 120 RMS unless noted		SIZE C		DWG. NO. D020286	REV B
		SCALE: 1:1 unless noted		Shf. No. 8 / 43	

NOTES: (UNLESS OTHERWISE SPECIFIED)

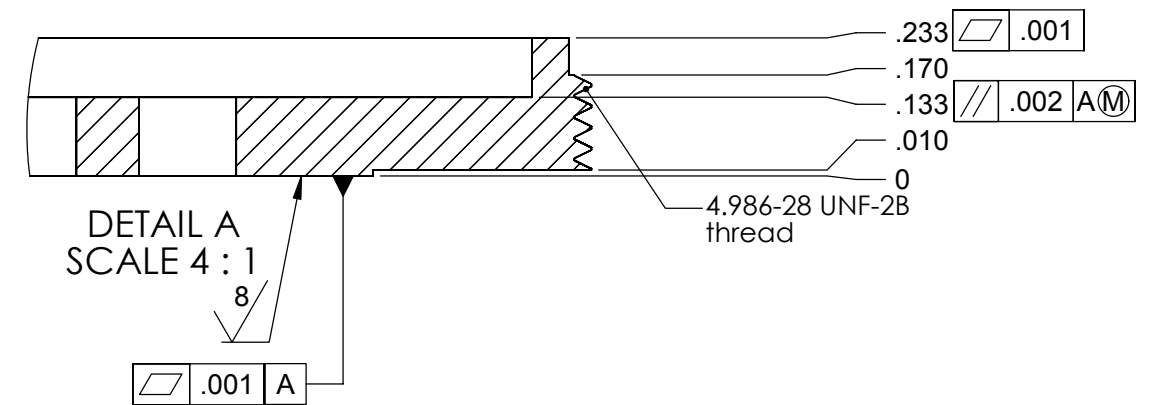
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



6 tapped holes
8 - 32 THRU
equally spaced 60°
on a 3.625 B.C.

\varnothing	.005	A	B
---------------	------	---	---

\varnothing	.005	B	M
---------------	------	---	---



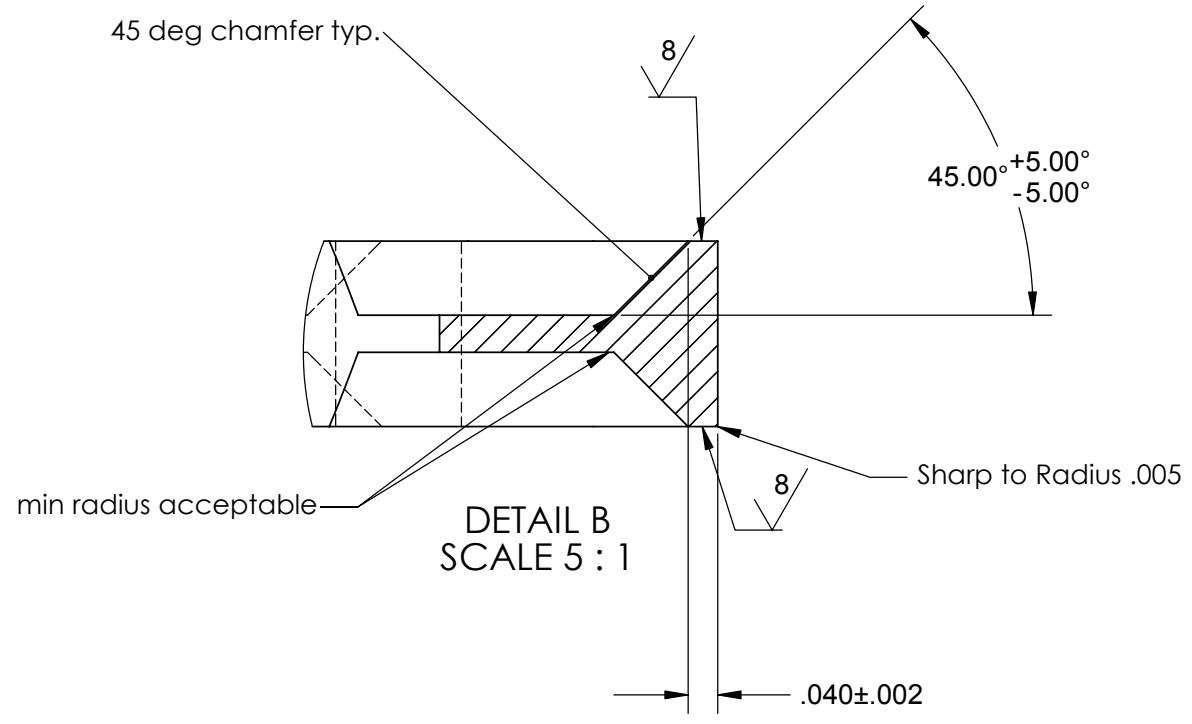
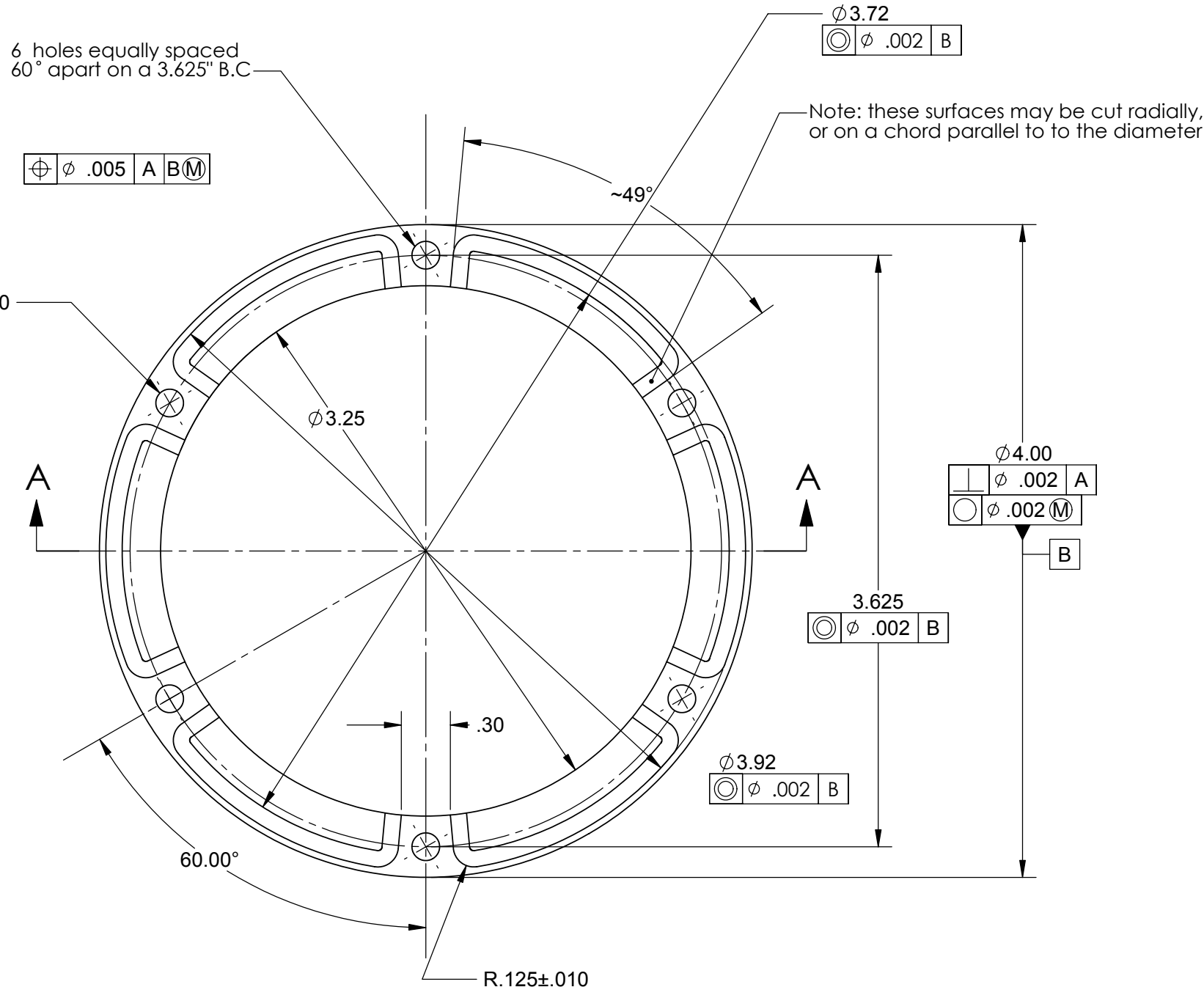
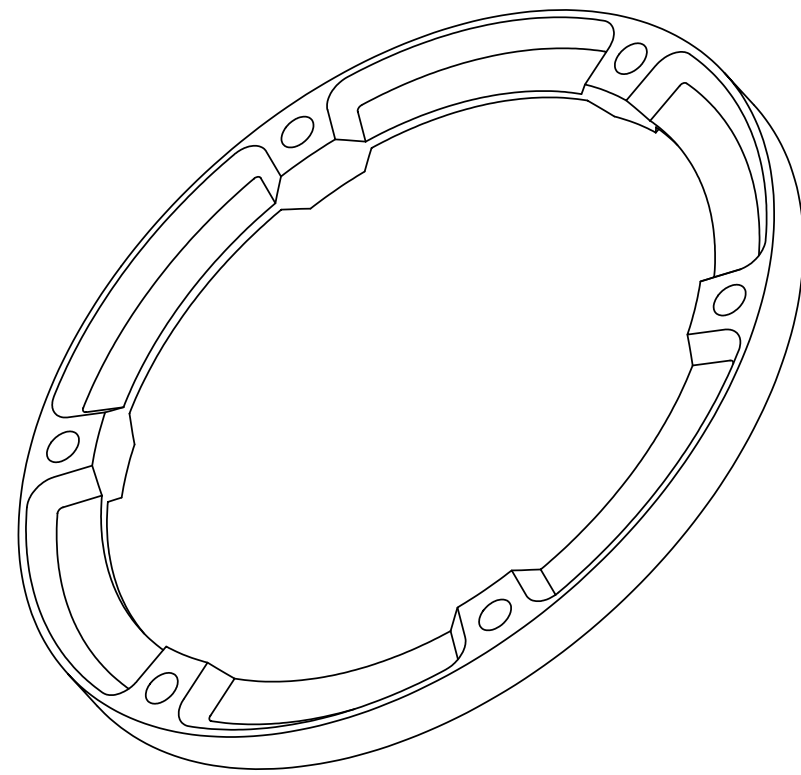
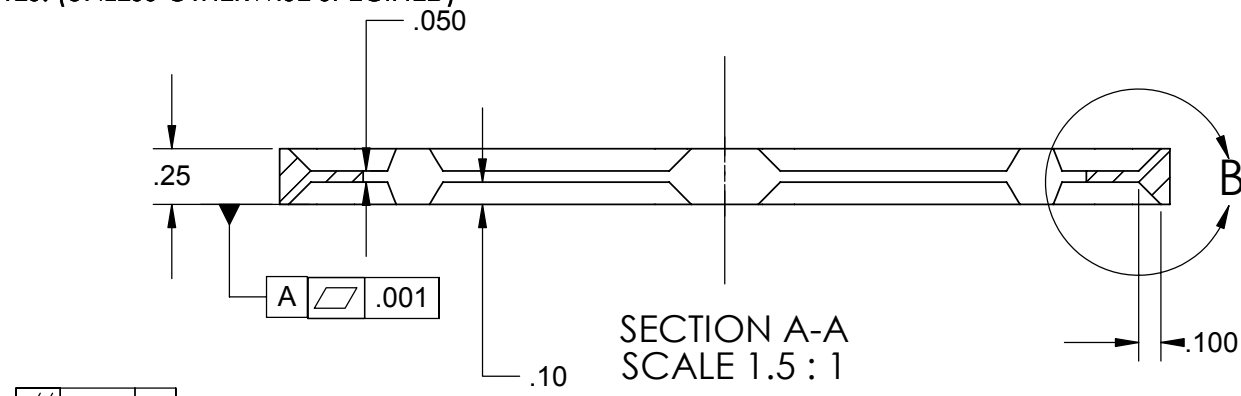
DETAIL A
SCALE 4 : 1

\varnothing	.001	A
---------------	------	---

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.020"		Fall' 02	Hammond	SUB-SYSTEM	HEPI
.XXX ± 0.005"		2/9/03	Kern	NEXT ASSY	
ANGULAR ± 30°				PART NAME	HEPI Diaphragm Restraint
MATERIAL	304 L	COMMENTS:		SIZE	DWG. NO.
FINISH	120 RMS unless noted	1 Required for each actuator		C	D020287
				SCALE:	1:1 unless noted
				Sht. No. 9 / 43	

NOTES: (UNLESS OTHERWISE SPECIFIED)

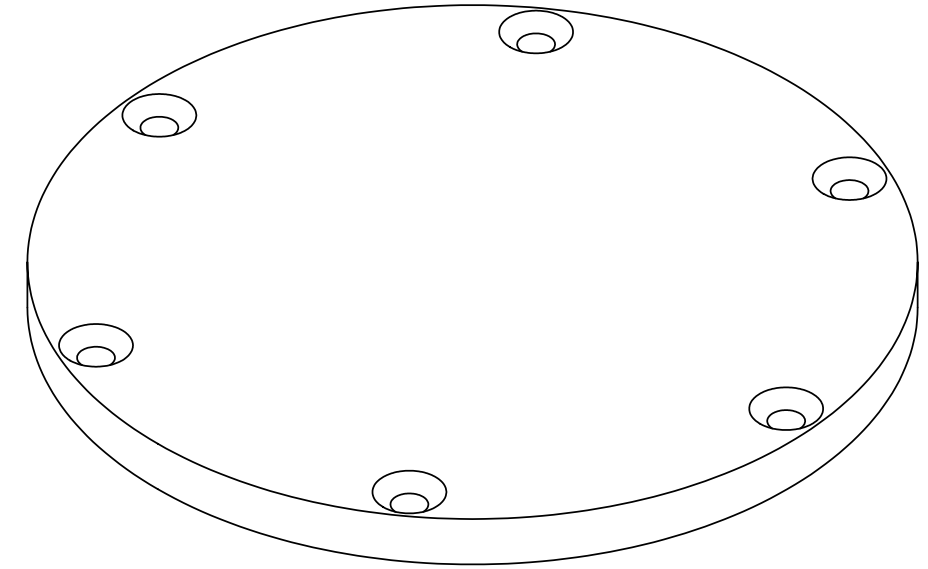
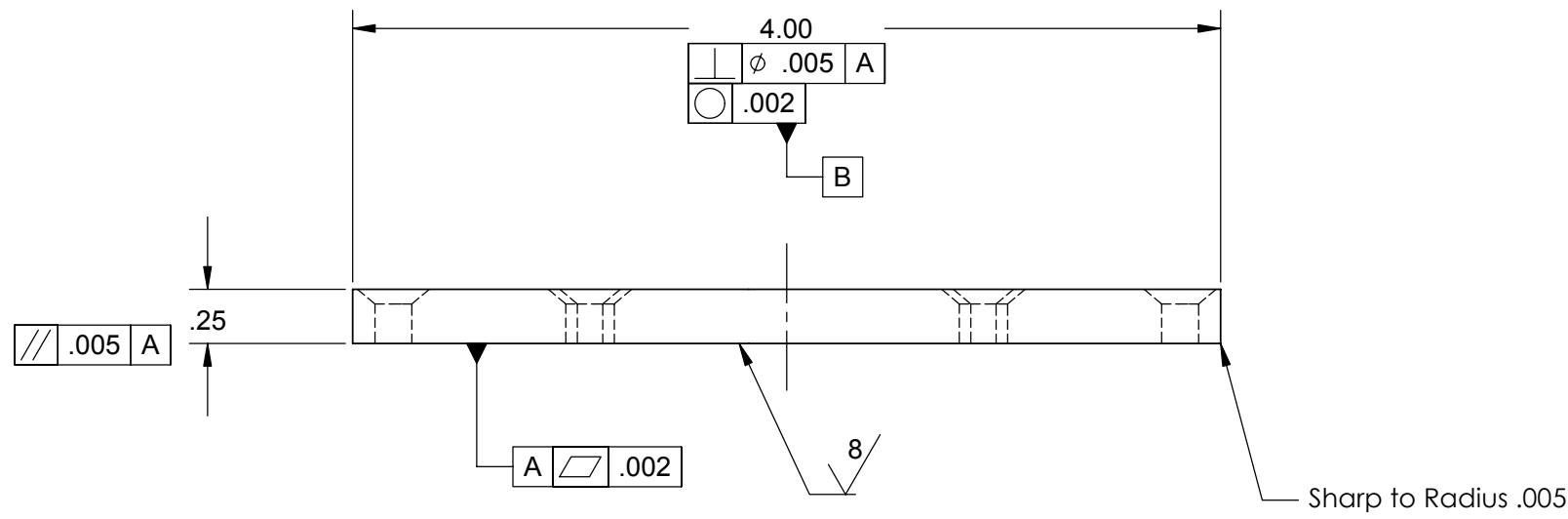
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES:		Fall' 02	Hammond	
.XX ± 0.010"		2/9/03	Kern	
.XXX ± 0.005"				SYSTEM LASTI
ANGULAR ± 30'				SUB-SYSTEM HEPI
MATERIAL 304 L		COMMENTS:		NEXT ASSY
FINISH 120 RMS unless noted		2 Required for each actuator		PART NAME HEPI Bypass Resistor
		SCALE: 1:1 unless noted		SIZE DWG. NO. D020288
		FILENAME/LOCATION:		REV A
		Sht. No. 10 / 43		

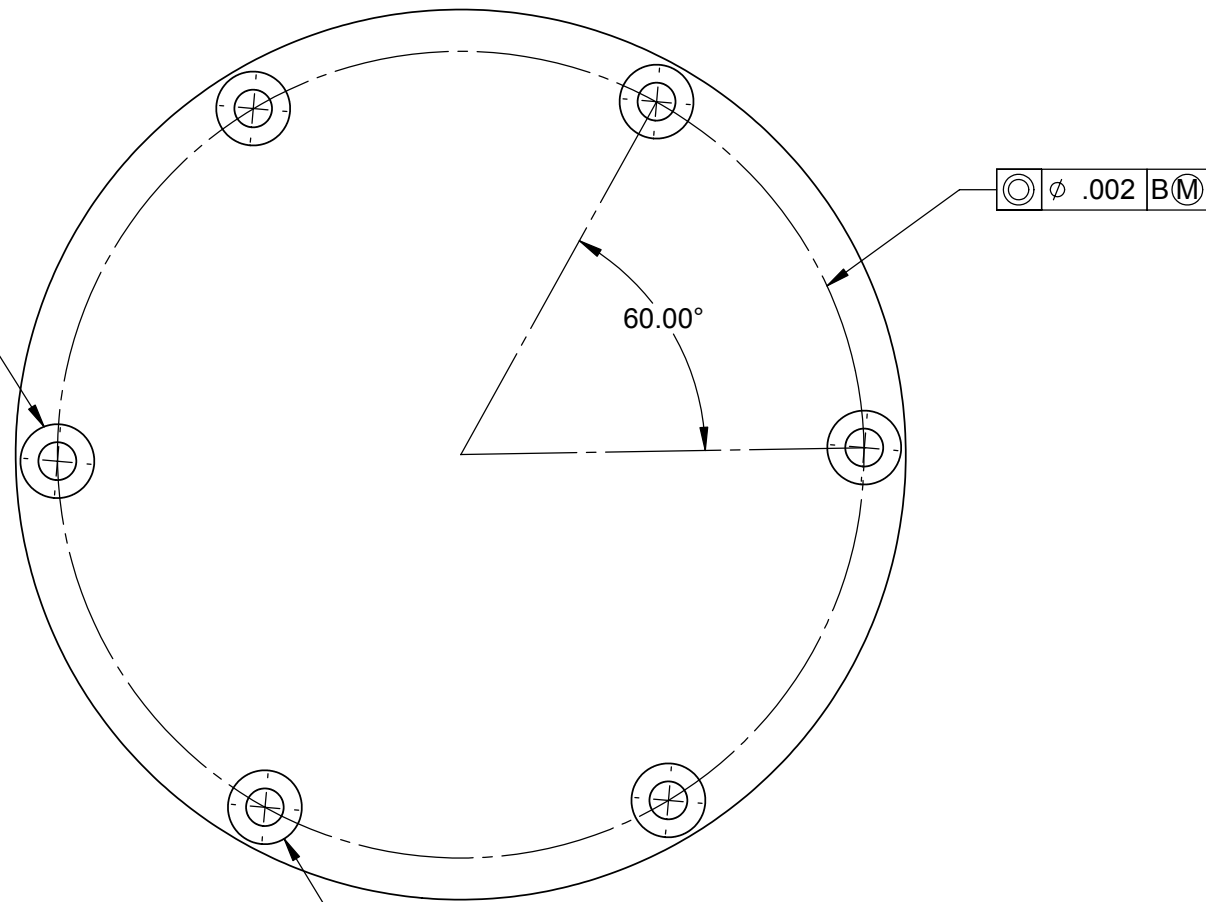
NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



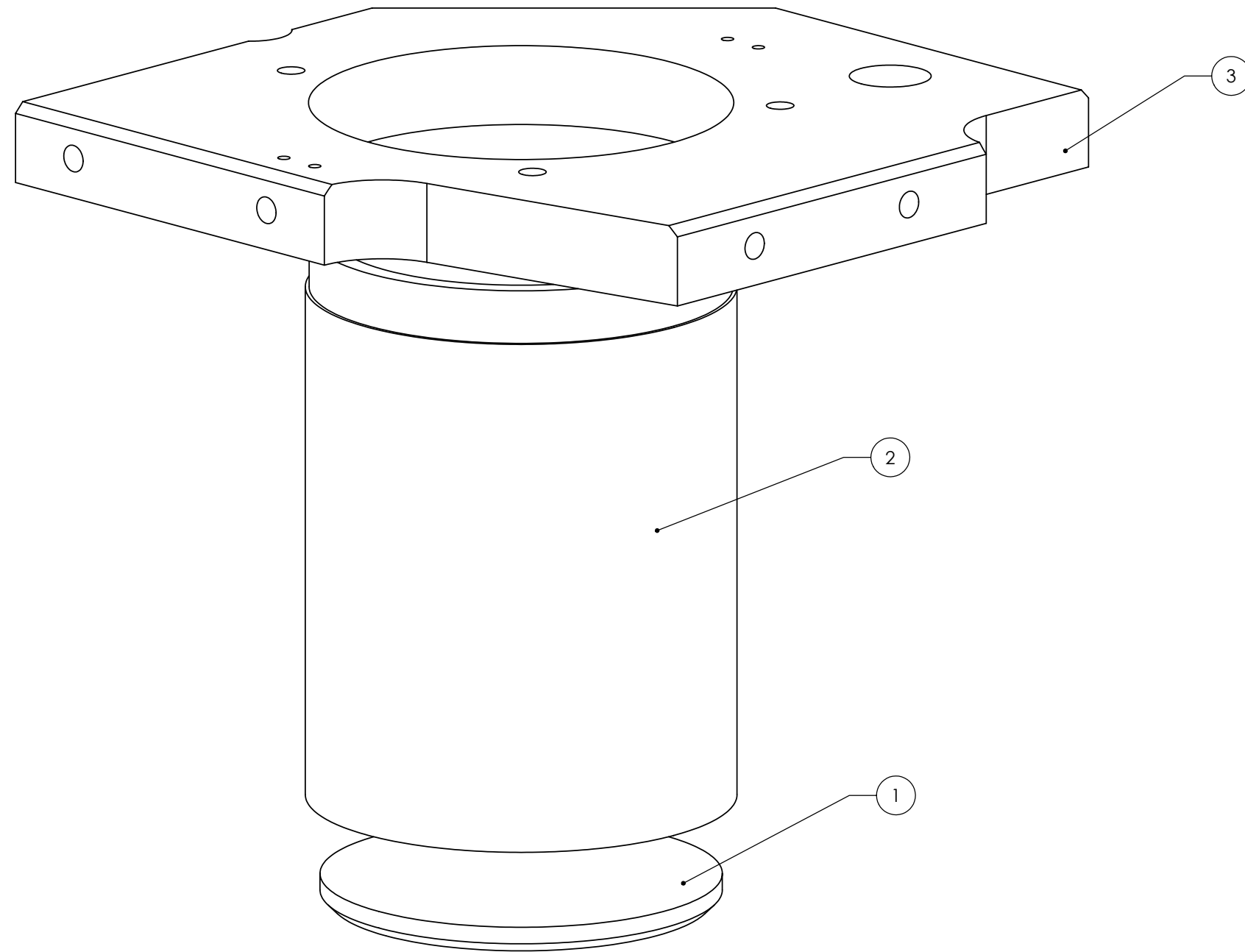
6 holes equally spaced
60° apart on a 3.625" B.C

ϕ .005 A BM




UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES	DRAWN	4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.010"	REDRAWN	Fall' 02	Hammond	SUB-SYSTEM	HEPI
.XXX ± 0.005"	CHECKED	2/9/03	Kern	NEXT ASSY	
ANGULAR ± 30'				PART NAME	HEPI Bypass Resistor Cap
MATERIAL	COMMENTS:		SIZE	DWG. NO.	REV
304 L	1 Required for each actuator		C	D020289	A
FINISH	SCALE:		1:1 unless noted		Shf. No. 11 / 43
120 RMS unless noted					

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	

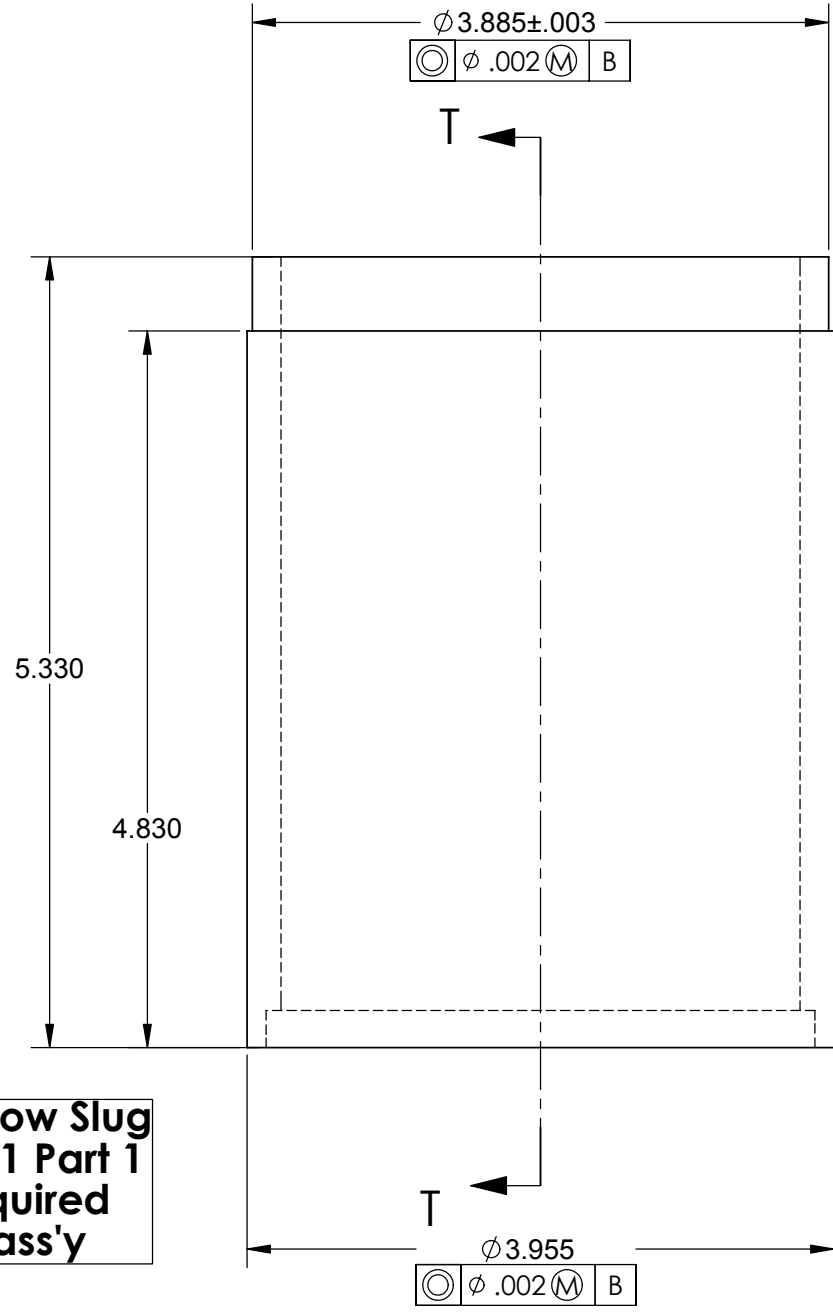


ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
3	1	D020290-A	TOP FOUNDATION PLATE		14
2	1	D020291-B	TOP BELLOW SLUG		13
1	1	D020291-B	TOP BELLOW CAP		13

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES	DRAWN	4/02	Hardham	
TOLERANCES: .XX ± 0.020"	REDRAWN	Fall' 02	Hammond	
.XXX ± 0.005"	REDRAWN	7/16/03	Spjeld	
ANGULAR ± 30°	CHECKED	2/9/03	Kern	SYSTEM LASTI SUB-SYSTEM HEPI NEXT ASSY
MATERIAL	COMMENTS:		SIZE	PART NAME Exploded Top Foundation Plate Sub-assembly DWG. NO. D020361 REV B
FINISH 120 RMS unless noted	1 Required for each actuator		SCALE:	1:1 unless noted Sht. No. 12 / 43

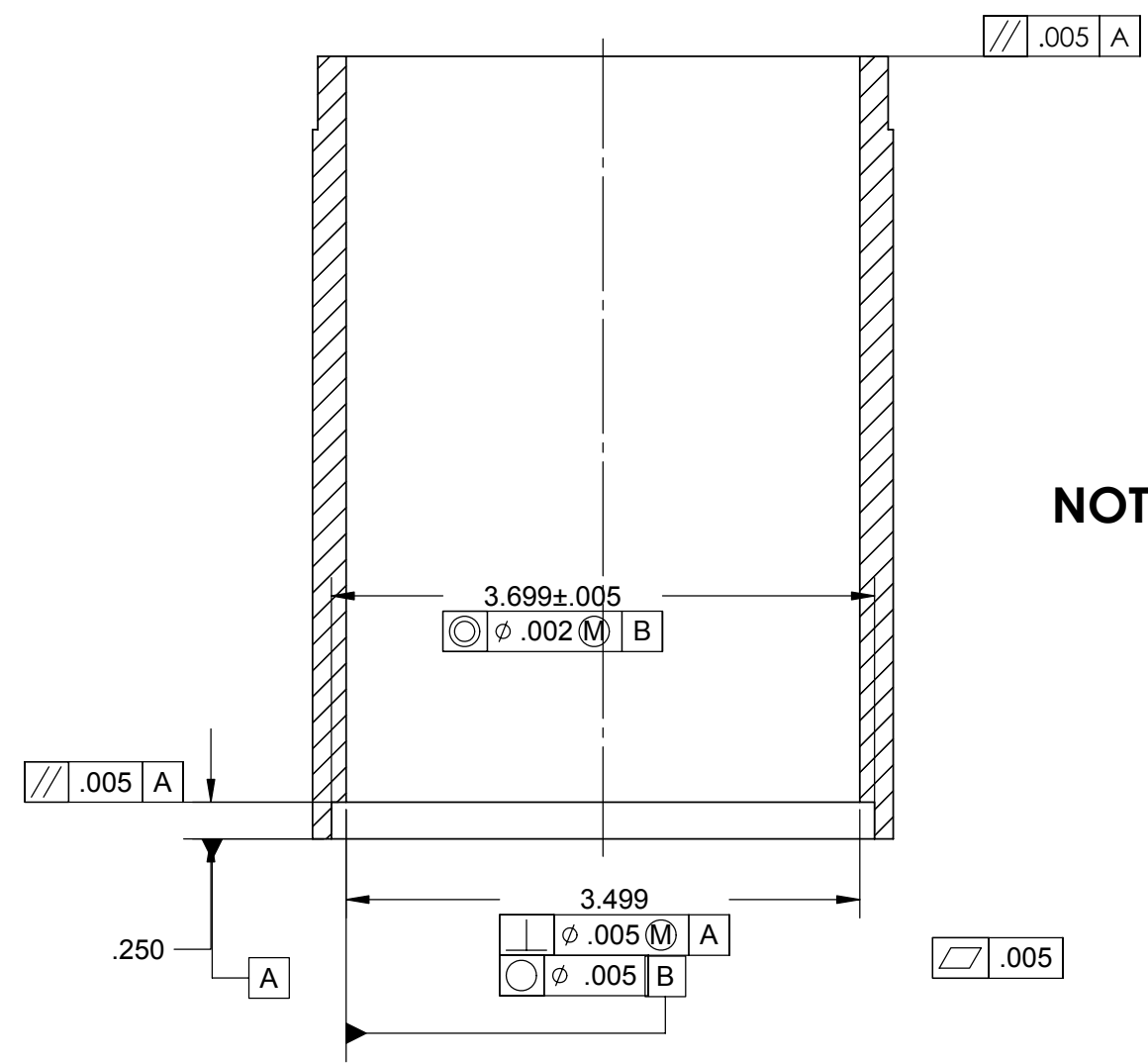
NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/11/03	E030373-00-E	

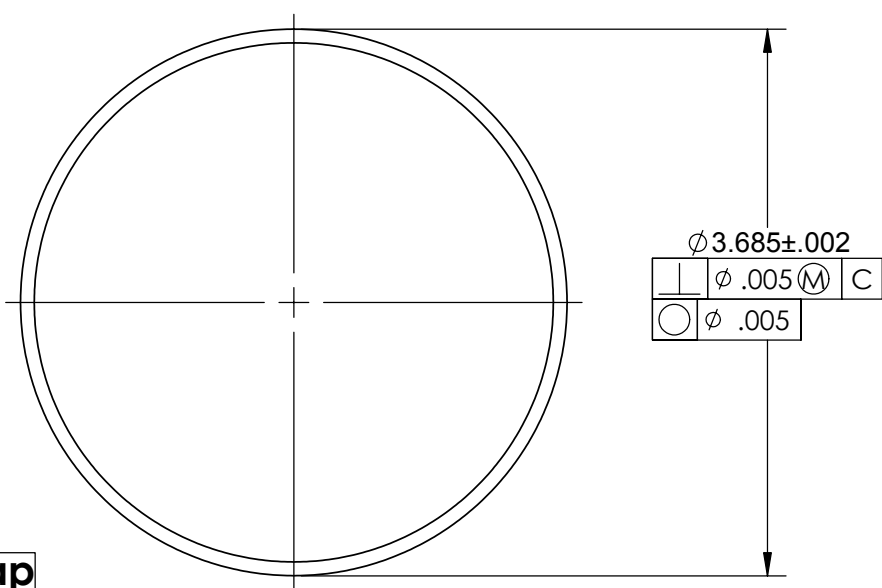


**Top Bellows Slug
D020291 Part 1
(1) required
per ass'y**

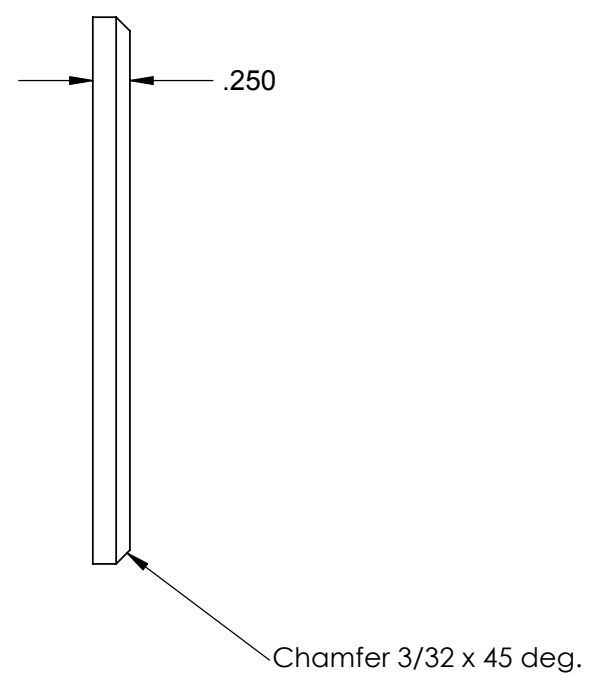
SECTION T-T



NOTE: CHECK FIT WITH TOP PLATE



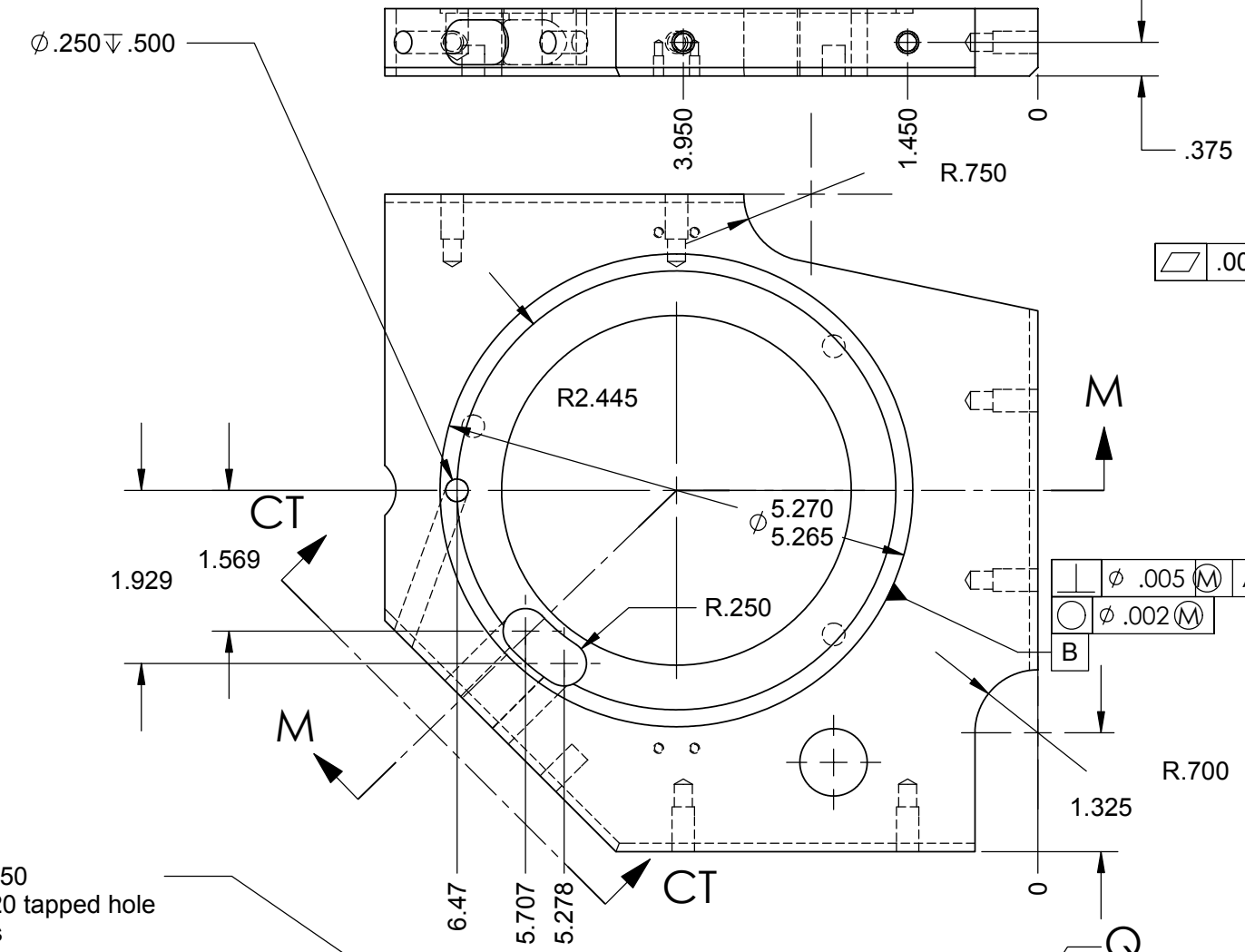
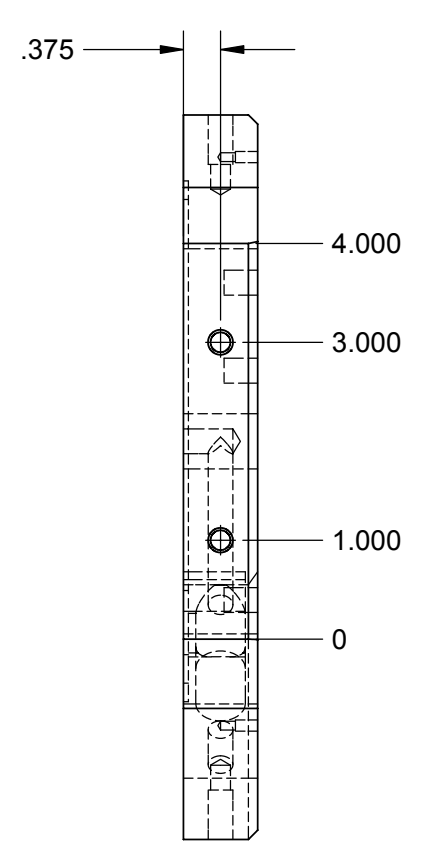
**Top Bellows Cap
D020291 Part 2
(1) required
per ass'y**



UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	LIGO	
TOLERANCES: .XX ± 0.020"		Fall' 02	Hammond	SYSTEM LASTI	
.XXX ± 0.005"		6/11/03	Spielid	SUB-SYSTEM HEPI	
ANGULAR ± 30°		2/9/03	Kern	NEXT ASSY	
MATERIAL 304 L		COMMENTS: 1 Required for each actuator		PART NAME HEPI Top Bellows Slug & Cap	
FINISH 120 RMS unless noted		SCALE: 1:1 unless noted		SIZE DWG. NO. C D020291	REV B
				Shf. No. 13 / 43	

NOTES: (UNLESS OTHERWISE SPECIFIED)

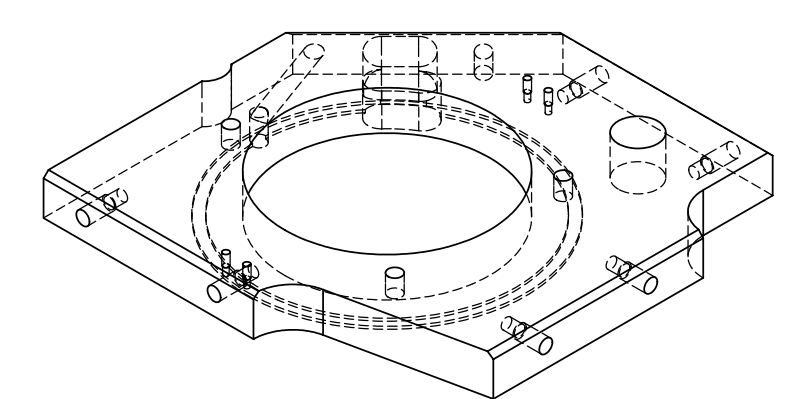
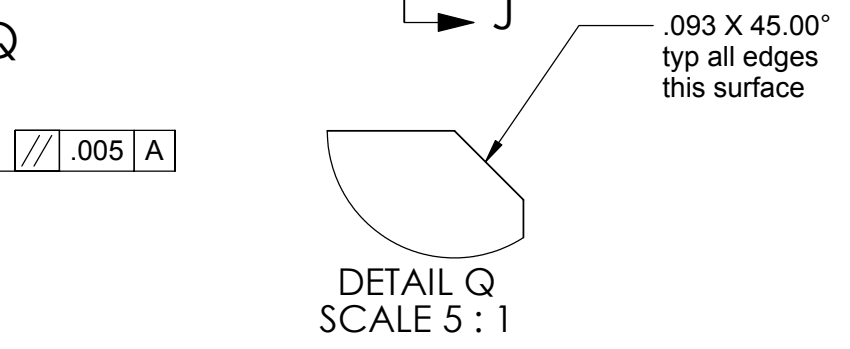
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



$\phi .201 \nabla .750$
For a 1/4-20 tapped hole
typ (6) plcs

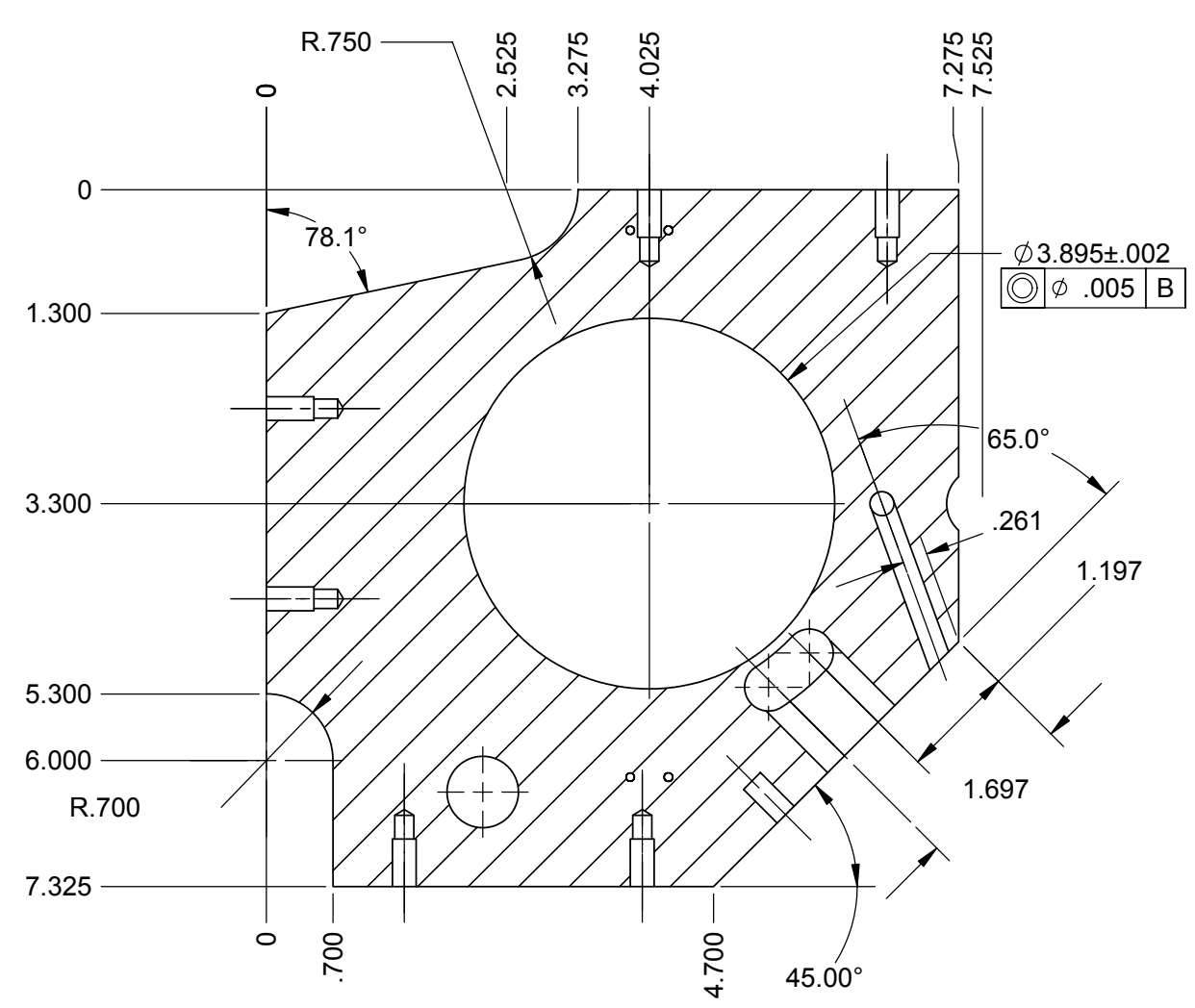
$\phi .089 \nabla .375$
4 - 40 UNF $\nabla 0.224$
4 TYP

Bottom tap
for 1/4-20 x .340 dp.
typ (3) plcs.

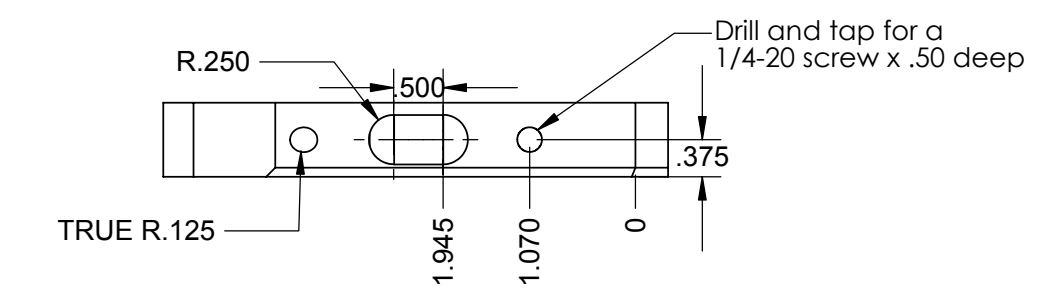


UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES: .XX ± 0.020"		6/7/02	Kern	
.XXX ± 0.005"		2/9/03	Kern	
ANGULAR ± 30°				SYSTEM LASTI
MATERIAL		COMMENTS:		SUB-SYSTEM HEPI
304 L		1 Required for each actuator		NEXT ASSY
FINISH		SCALE:		PART NAME HEPI TOP FOUNDATION PLATE
120 RMS unless noted		1 : 1.5		SIZE DWG. NO. D020290 Sheet 1 of 2
		Sht. No. 14 / 43		REV A

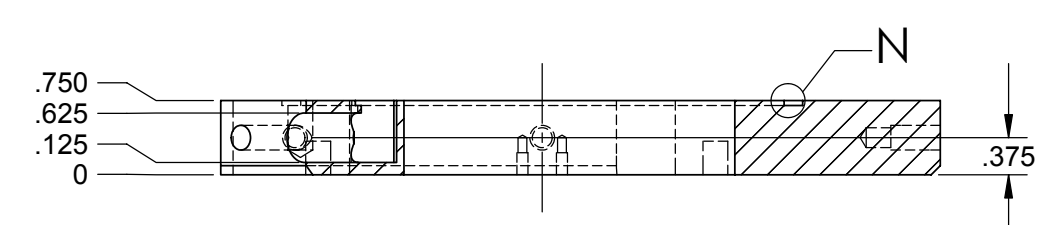
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



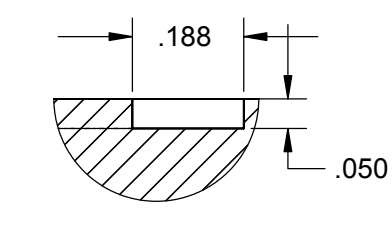
SECTION J-J
SCALE 1 : 1.5



SECTION CT-CT
SCALE 1 : 1.5



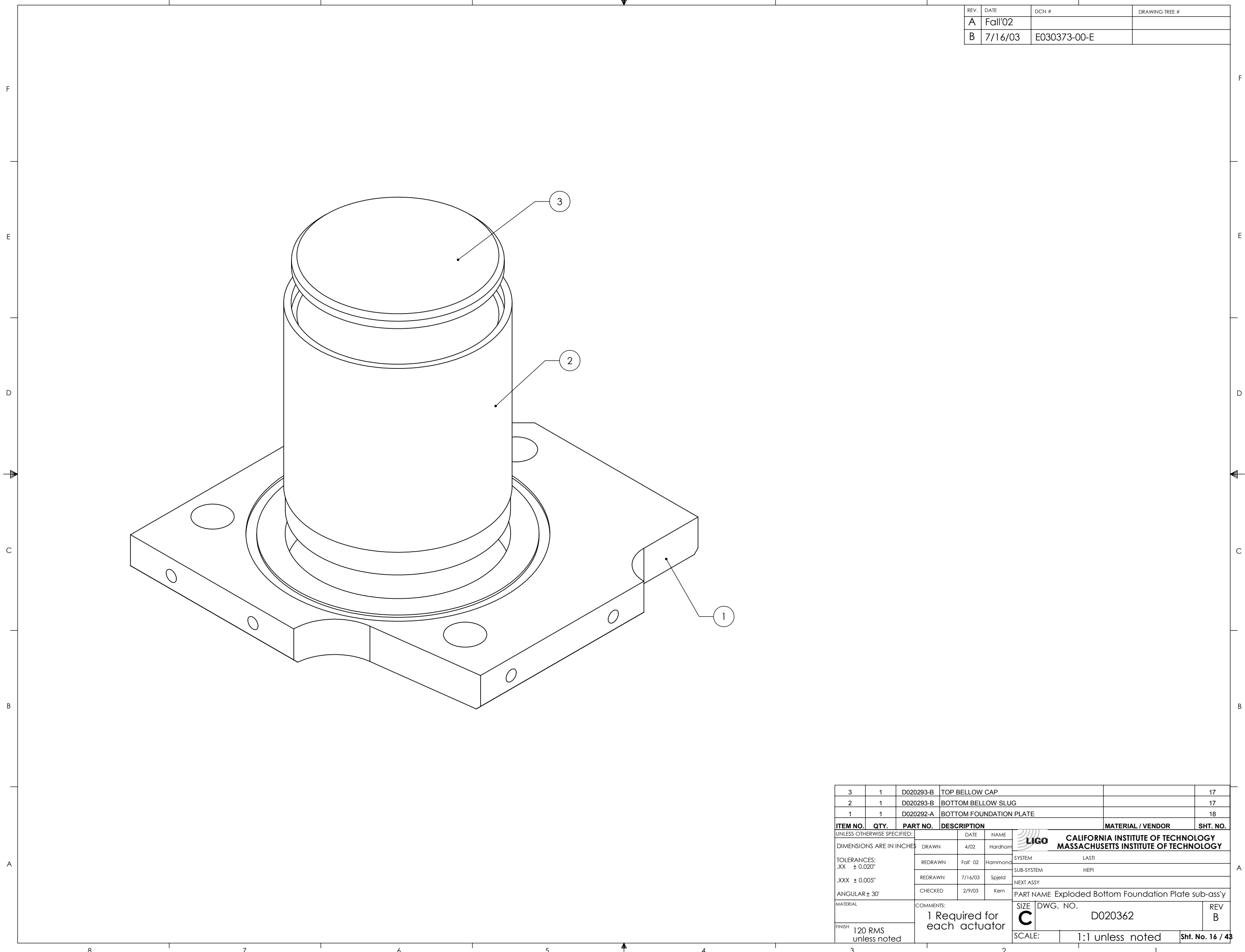
SECTION M-M
SCALE 1 : 1.5




DETAIL N
SCALE 4 : 1

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES:		REDRAWN	Fall' 02	Hammond
.XX ± 0.020"		CHECKED	2/9/03	Kern
.XXX ± 0.005"				SYSTEM LASTI
ANGULAR ± 30'				SUB-SYSTEM HEPI
MATERIAL				NEXT ASSY
FINISH 120 RMS unless noted				PART NAME HEPI Top Foundation Plate Details
		COMMENTS:		SIZE DWG. NO. D020290 Sheet 2 of 2
				REV A
		SCALE: 1 : 1.5		Sht. No. 15 / 43

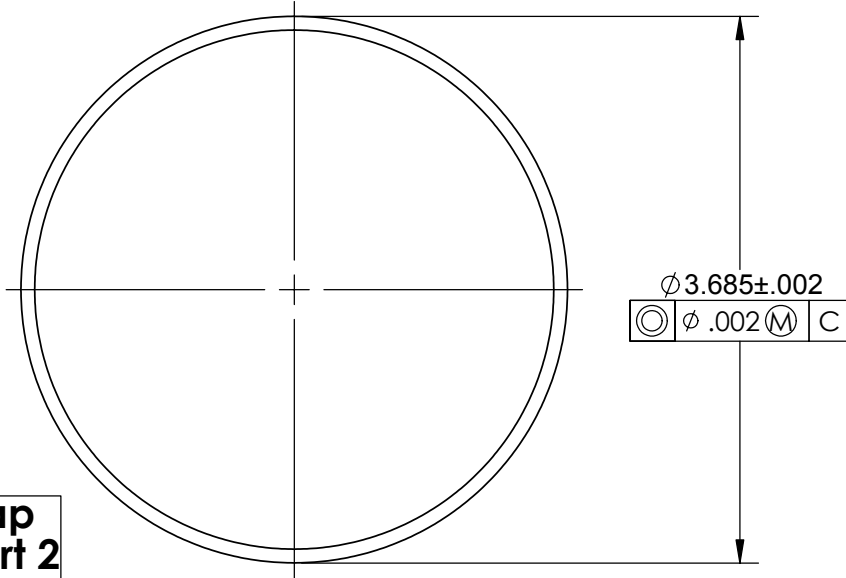
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



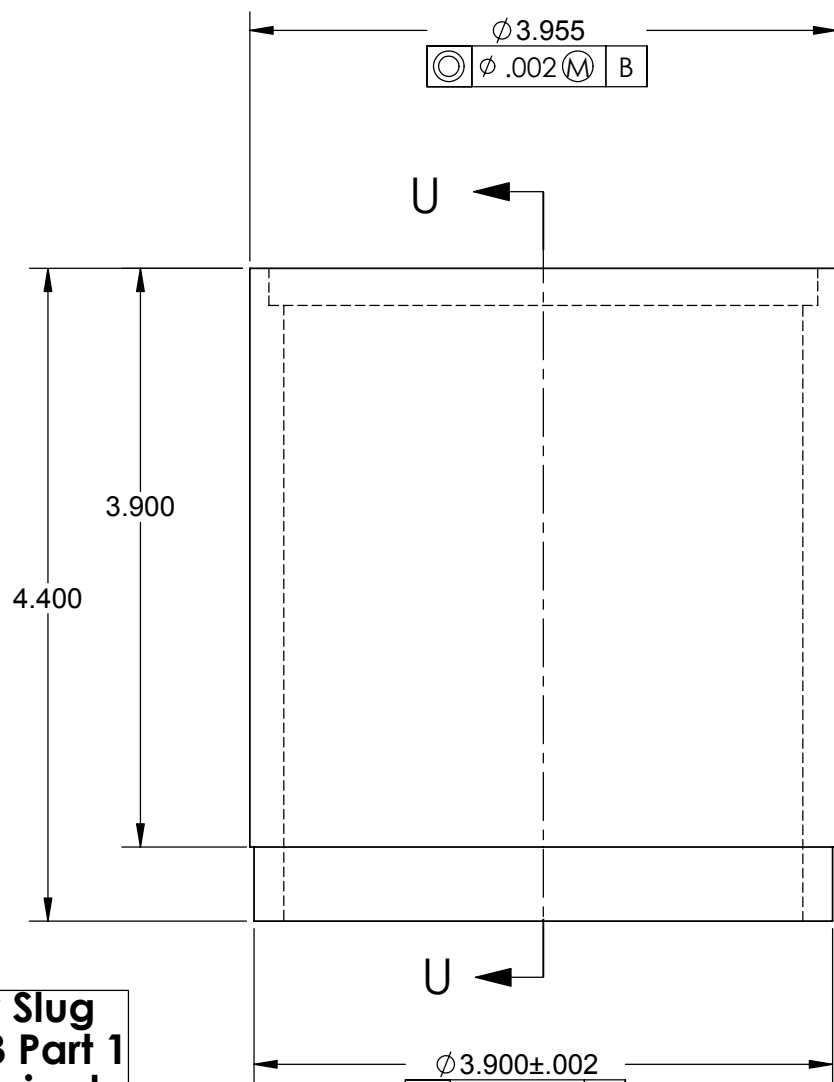
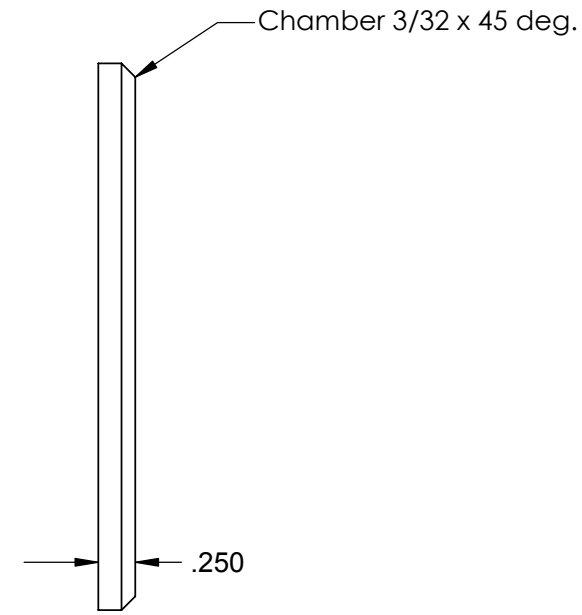
3	1	D020293-B	TOP BELLOW CAP		17
2	1	D020293-B	BOTTOM BELLOW SLUG		17
1	1	D020292-A	BOTTOM FOUNDATION PLATE		18
ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
UNLESS OTHERWISE SPECIFIED:					
DRAWN		4/02	Hardham	 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
REDRAWN		Fall' 02	Hammond		
REDRAWN		7/16/03	Spjeld		
CHECKED		2/9/03	Kern		
MATERIAL			COMMENTS:	SIZE	DWG. NO.
FINISH 120 RMS unless noted			1 Required for each actuator	C	D020362
SCALE:				1:1 unless noted	Sht. No. 16 / 43

NOTES: (UNLESS OTHERWISE SPECIFIED)

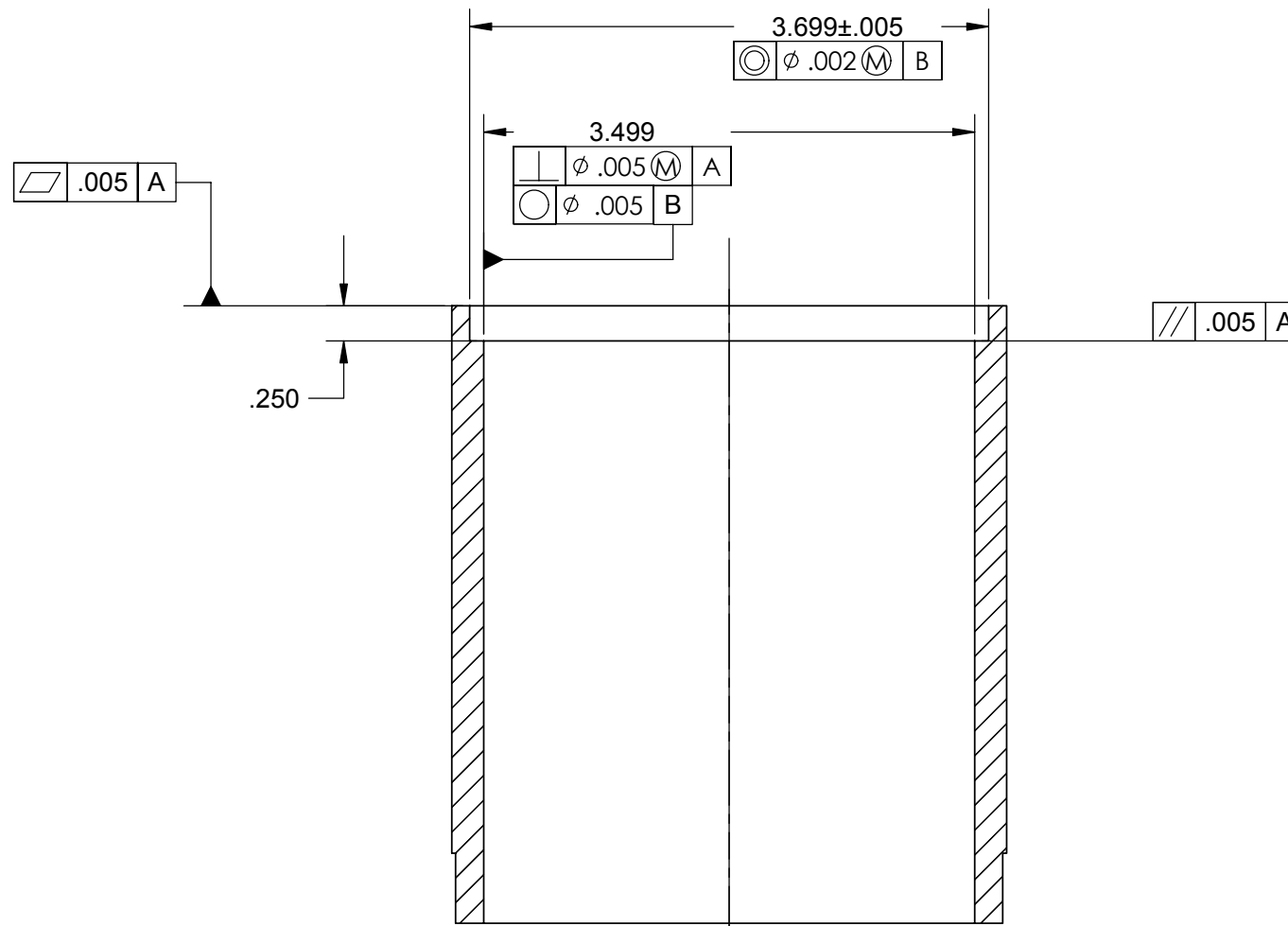
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/11/03	E030373-00-E	



**Bellow Cap
D020293 Part 2
(1) required
per ass'y**



**Bellow Slug
D020293 Part 1
(1) required
per ass'y**



SECTION U-U

**NOTE: CHECK FIT WITH BOTTOM PLATE
(SHOULD NOT FIT IN TOP PLATE)**

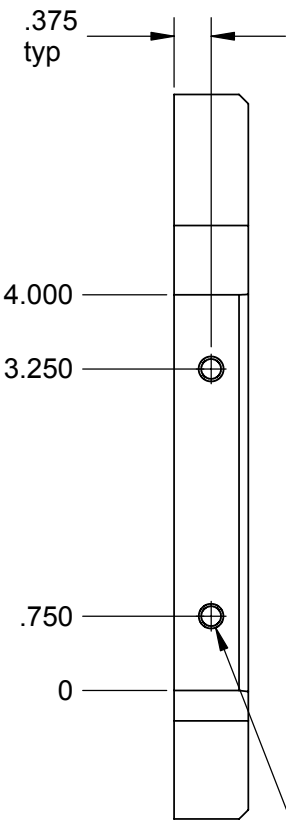
UNLESS OTHERWISE SPECIFIED:		DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	SYSTEM LASTI	
TOLERANCES: .XX ± 0.020"		Fall' 02	Hammond	SUB-SYSTEM HEPI	
.XXX ± 0.005"		6/11/03	Spjeld	NEXT ASSY	
ANGULAR ± 30°		2/9/03	Kern	PART NAME HEPI Bottom Bellow Slug & Cap	
MATERIAL	304 L	COMMENTS:		SIZE DWG. NO.	REV B
FINISH	120 RMS unless noted			C D020293	
				SCALE:	1:1 unless noted Sht. No. 17 / 43

NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		

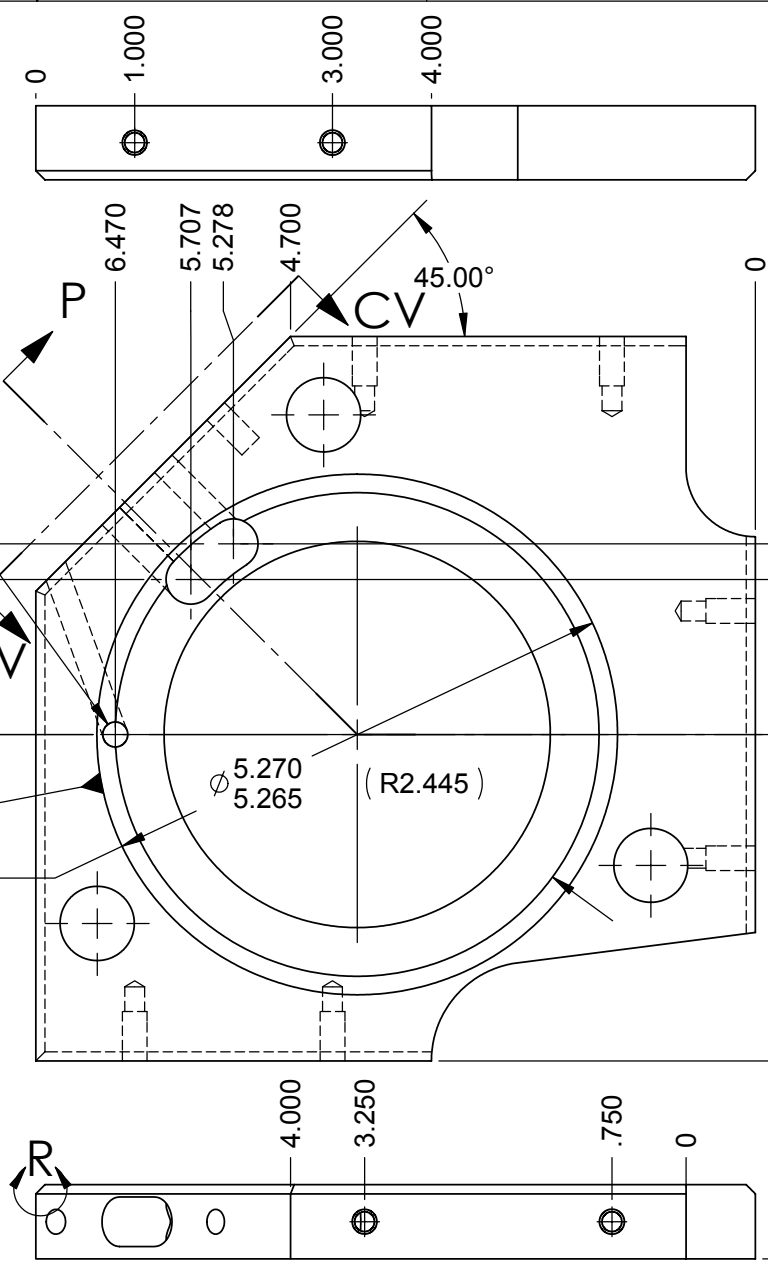
.093 X 45.00°
Typ all edges
this surface

DETAIL R
SCALE 4 : 1



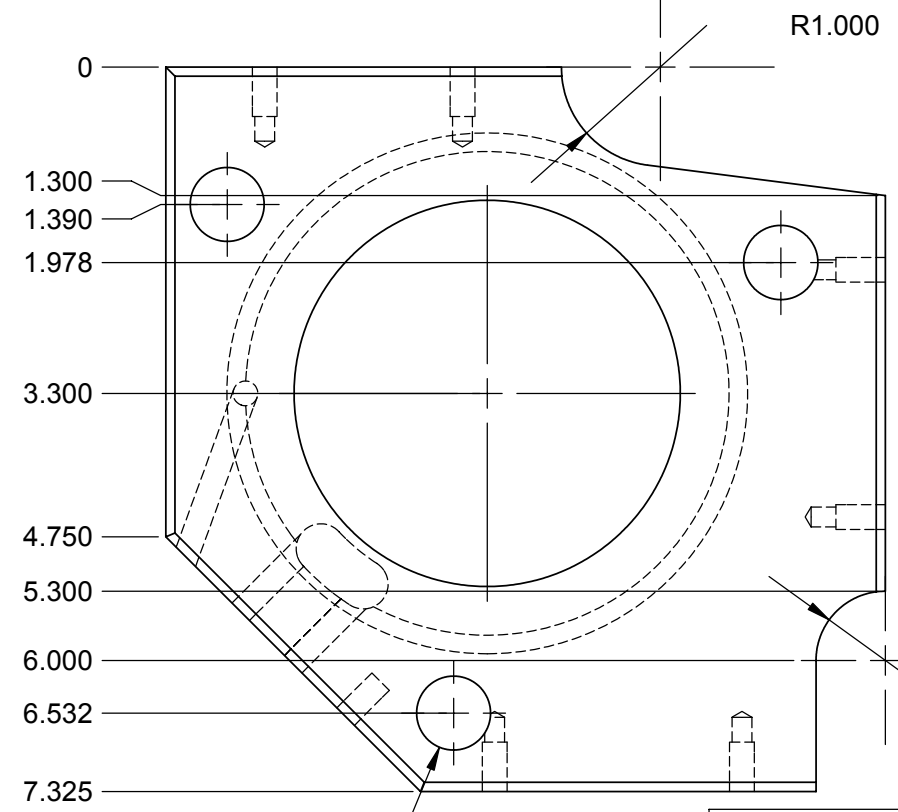
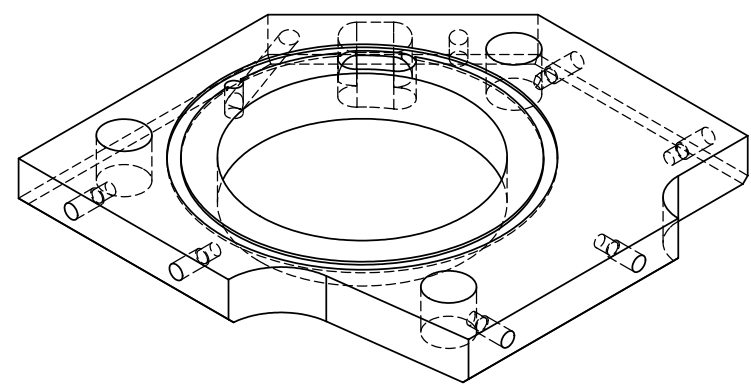
Ø.201 x .75
for a 1/4-20 tapped hole
typ (6) plcs

B	Ø .005 (M) A
	Ø .002 (M)



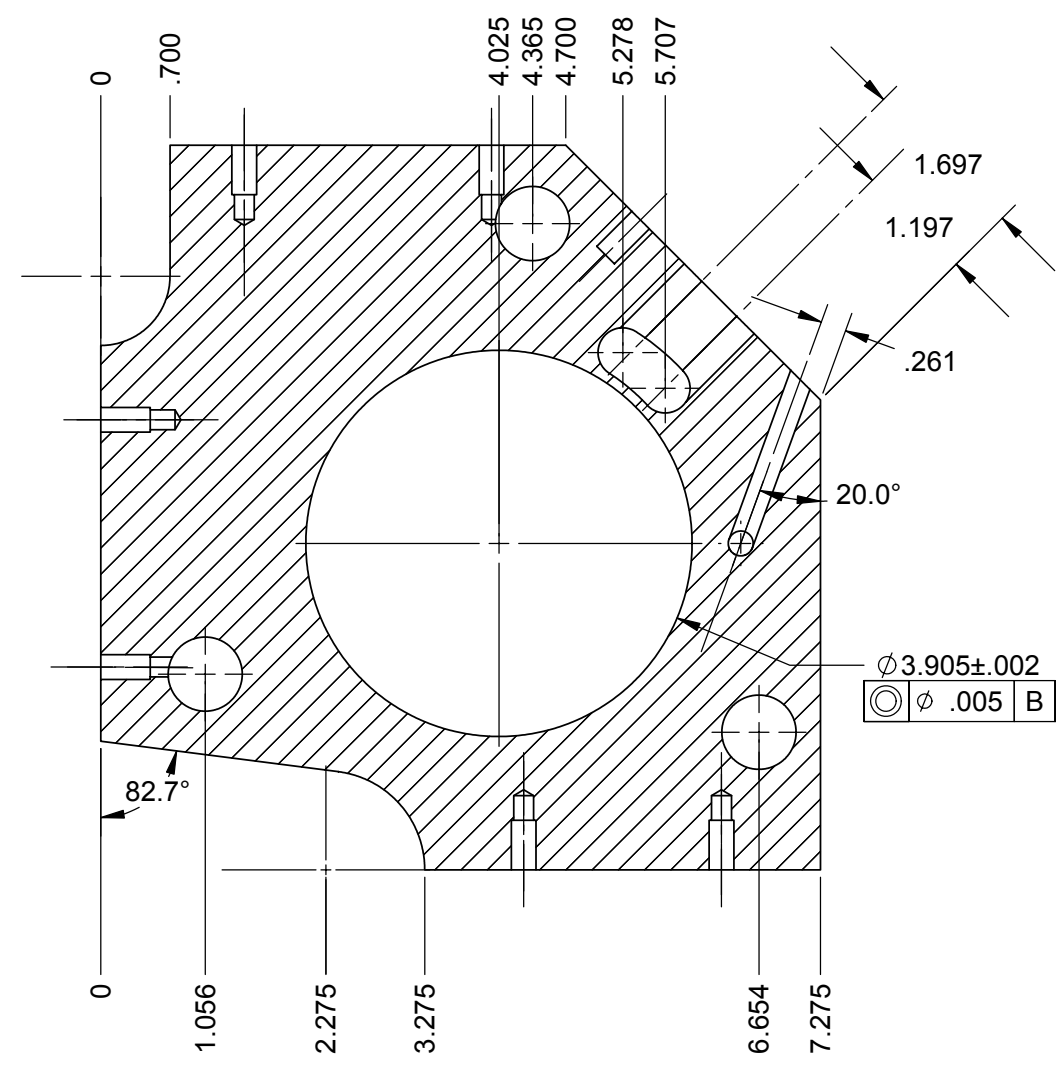
///	.005	A
-----	------	---

///	.005	A
-----	------	---

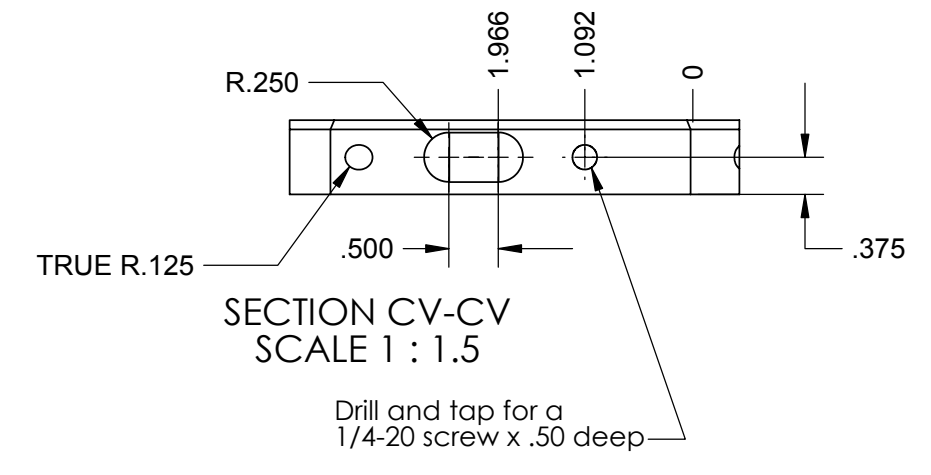


UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES: .XX ± 0.010"		Fall' 02	Hammond	
.XXX ± 0.005"		2/9/03	Kern	
ANGULAR ± 30°				SYSTEM LASTI
MATERIAL 304 L				SUB-SYSTEM HEPI
FINISH 120 RMS unless noted				NEXT ASSY
		COMMENTS: 1 Required for each actuator		PART NAME HEPI Bottom Foundation Plate
		SCALE: 1 : 1.5		SIZE DWG. NO. D020292 Sheet 1 of 2
		FILENAME/LOCATION:		REV A
				Sht. No. 18 / 43

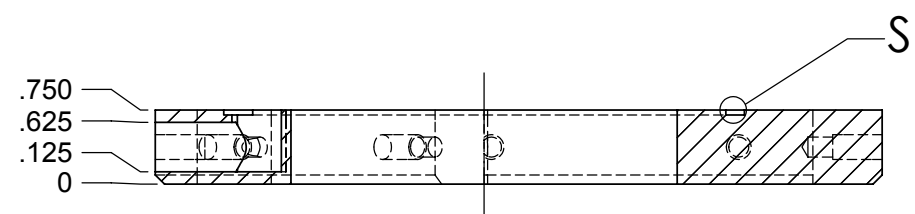
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



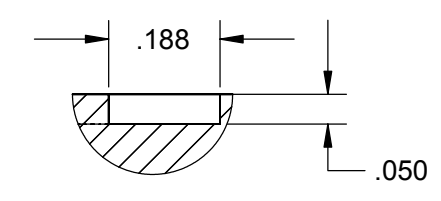
SECTION O-O
SCALE 1 : 1.5



SECTION CV-CV
SCALE 1 : 1.5



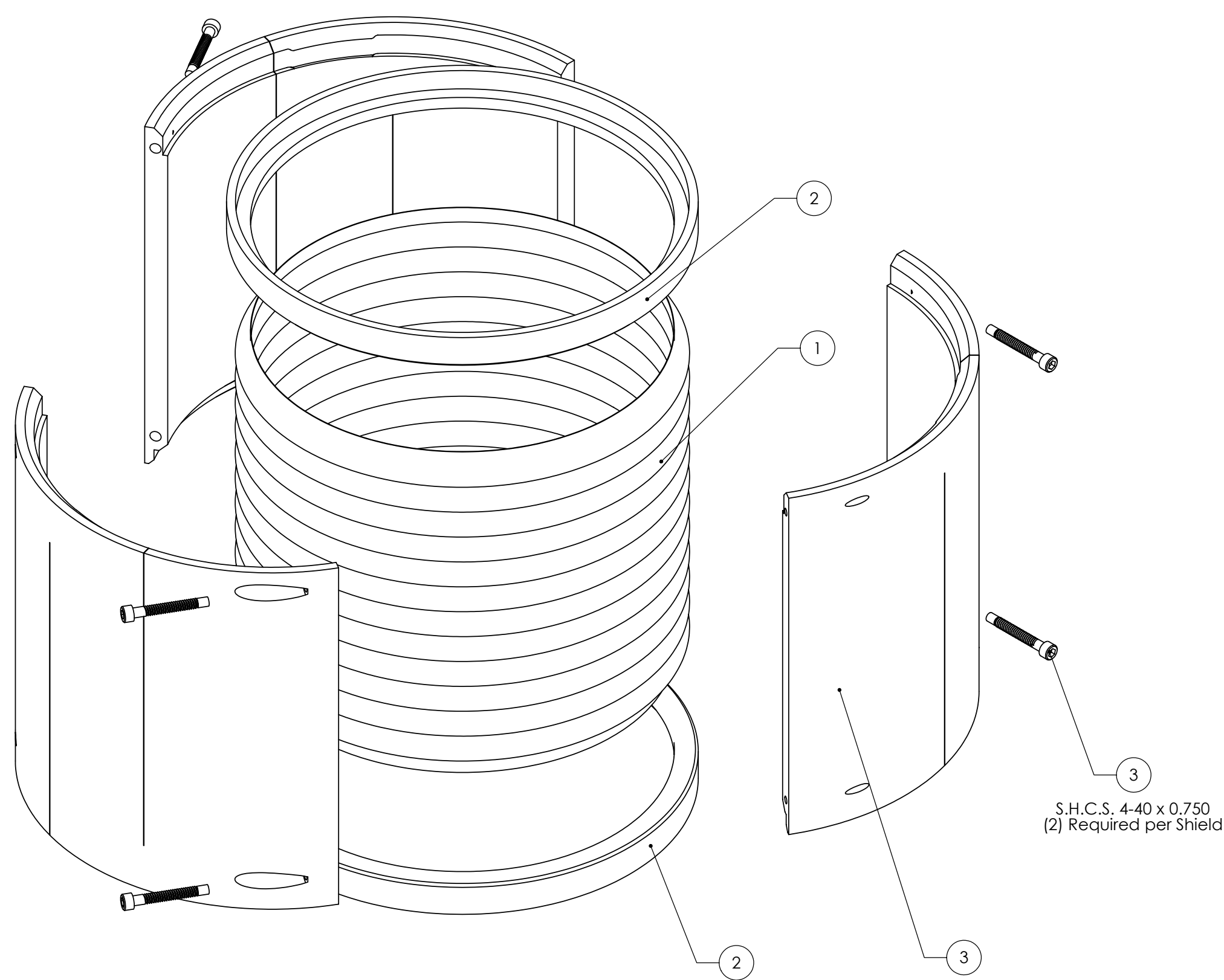
SECTION P-P
SCALE 1 : 1.5



DETAIL S
SCALE 4 : 1

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN	4/02		Hardham
TOLERANCES: .XX ± 0.020"		REDRAWN	Fall' 02		Hammond
.XXX ± 0.005"		CHECKED	2/9 03		Kern
ANGULAR ± 30°					
MATERIAL		COMMENTS:		SYSTEM LASTI SUB-SYSTEM HEPI NEXT ASSY	
FINISH 120 RMS unless noted				PART NAME HEPI Bottom Foundation Plate Details SIZE DWG. NO. C D020292 Sheet 2 of 2 REV A	
		SCALE: 1 : 1.5		Sht. No. 19 / 43	

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



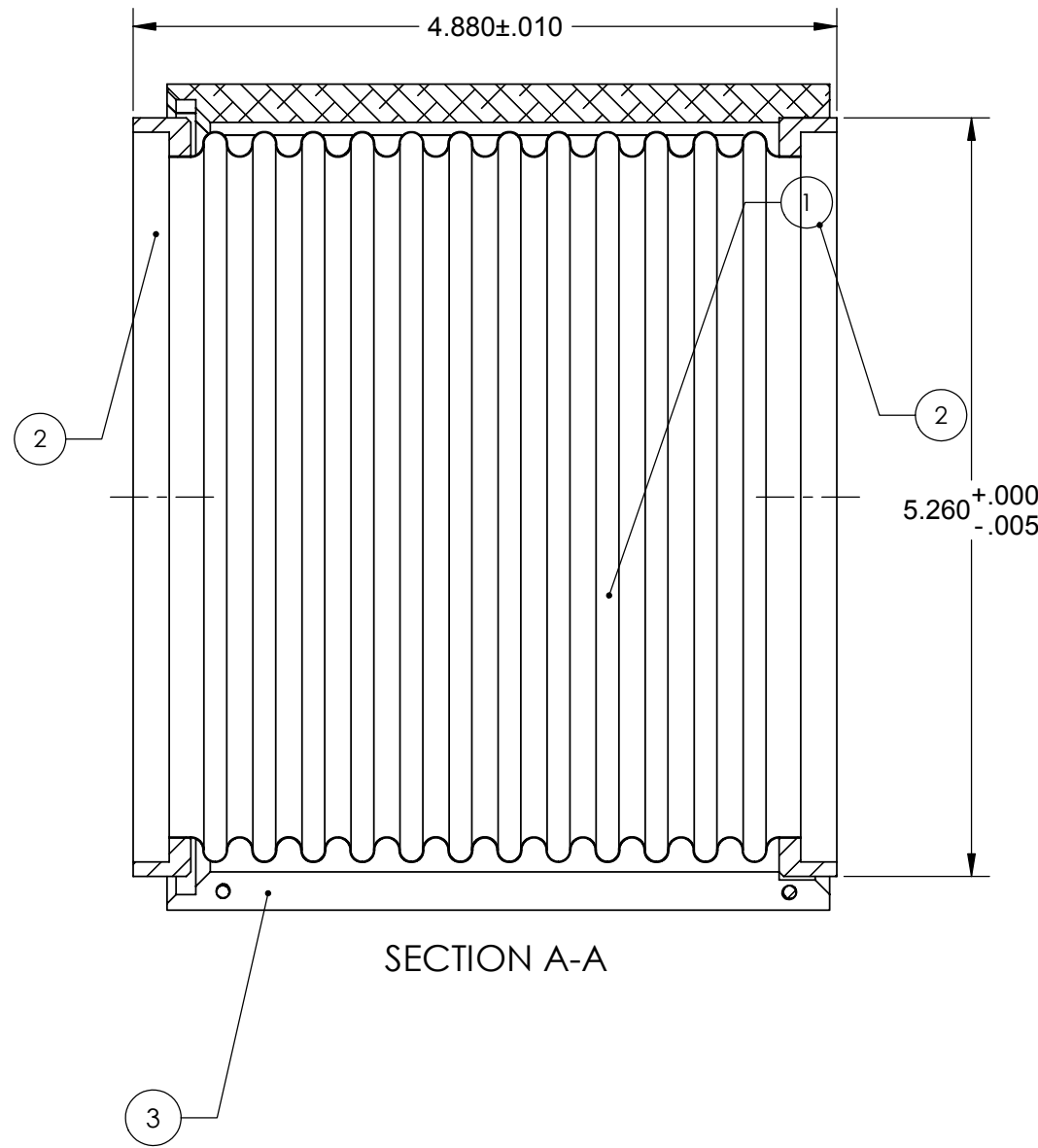
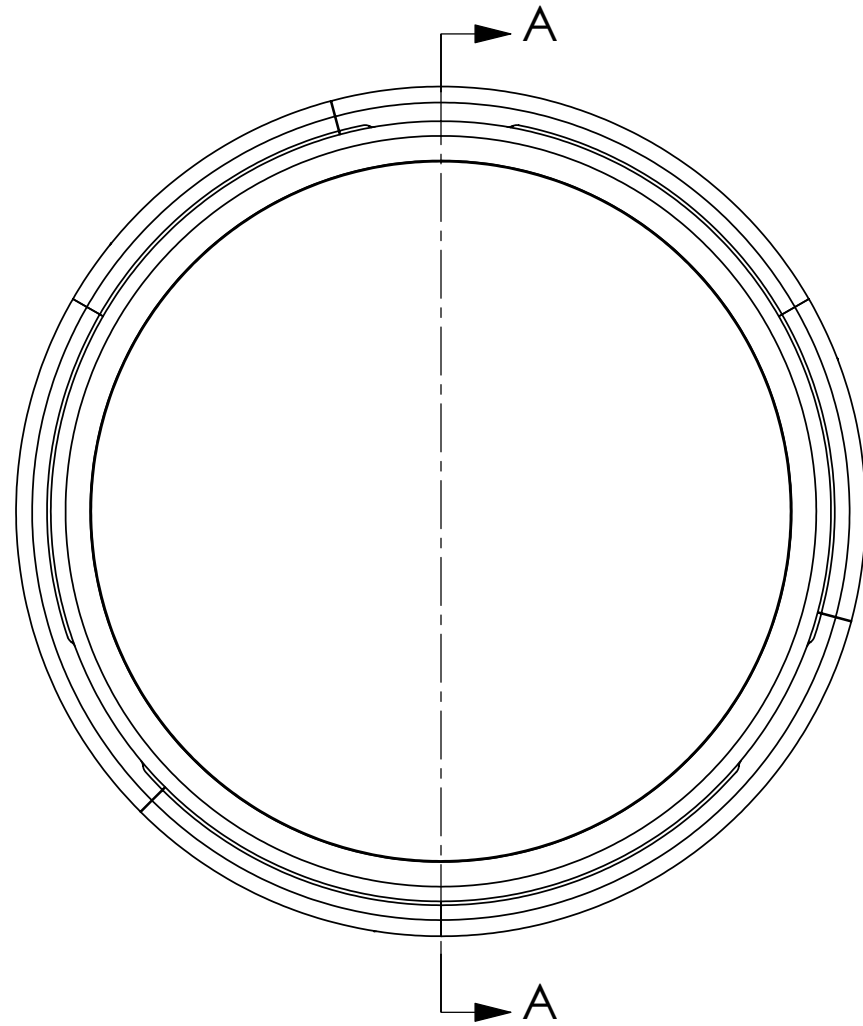
3
S.H.C.S. 4-40 x 0.750
(2) Required per Shield

ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
3	1	D020302-B	BELLOWS SHIELD ASSEMBLY		23
2	2	D020295-A	AMERIFLEX BELLOWS RING		22
1	1	D020294-A	AMERIFLEX BELLOWS		21, 22

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES	DRAWN	4/02	Hardham	
TOLERANCES: .XX ± 0.020"	REDRAWN	Fall' 02	Hammond	
.XXX ± 0.005"	REDRAWN	7/16/03	Spjeld	
ANGULAR ± 30°	CHECKED	2/9/03	Kern	PART NAME HEP1 Exploded Bellows Sub-Assembly
MATERIAL	COMMENTS:		SIZE	DWG. NO.
FINISH 120 RMS unless noted	2 Required for each actuator		C	D020360
	SCALE:	1:1 unless noted		REV B
				Sht. No. 20 / 43

NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



SECTION A-A

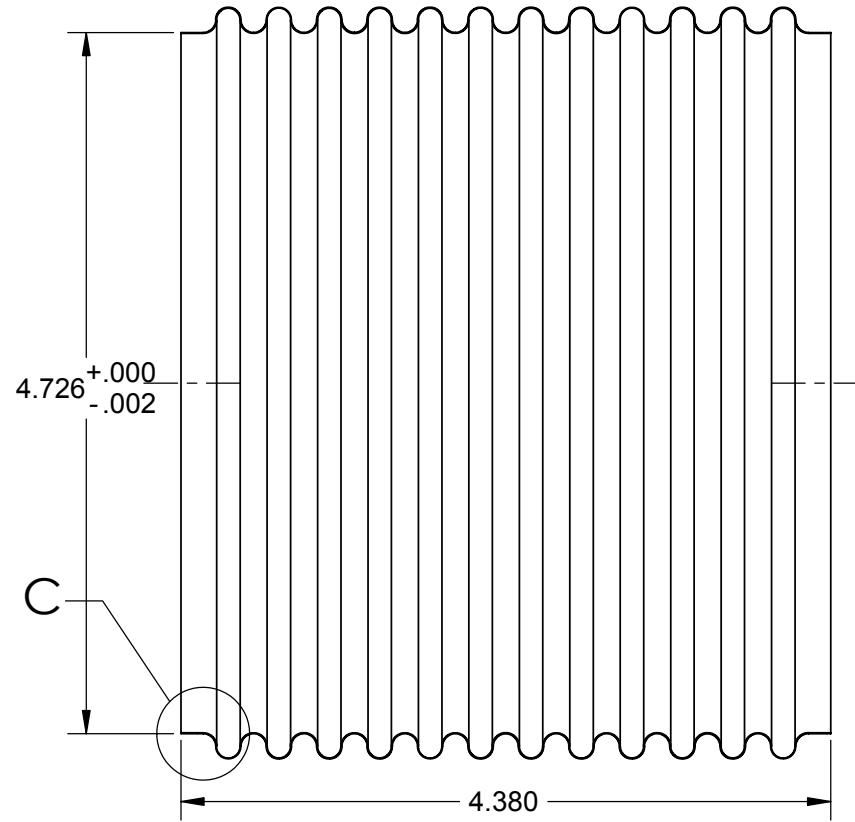
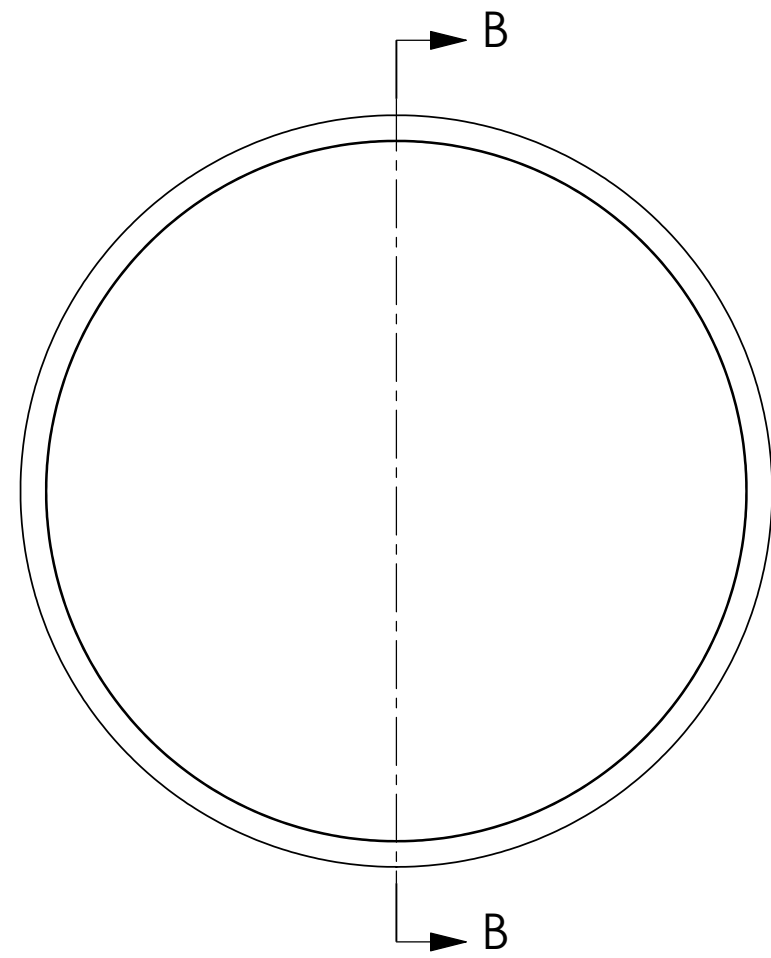
ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
3	1	D020295-A	BELLOWS SHIELD ASSEMBLY		23
2	2	D0202945-A	AMERIFLEX BELLOWS RING		22
1	1	D020294-A	AMERIFLEX BELLOWS		21, 22

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DRAWN		4/02	Hardham	
REDRAWN		5/23/02	Kern	
REDRAWN		7/16/03	Spjeld	
CHECKED		2/9/03	Kern	SYSTEM LASTI
TOLERANCES:		SUB-SYSTEM HEPI		
.XX ± 0.02"		NEXT ASSY		
.XXX ± 0.001"		PART NAME HEPI Bellows Assembly		
ANGULAR ± 30°		SIZE DWG. NO.		
MATERIAL as specified		COMMENTS: 2 Required for each actuator		REV A
FINISH 120 RMS unless noted		SCALE: 1:1 unless noted		Sht. No. 21 / 43

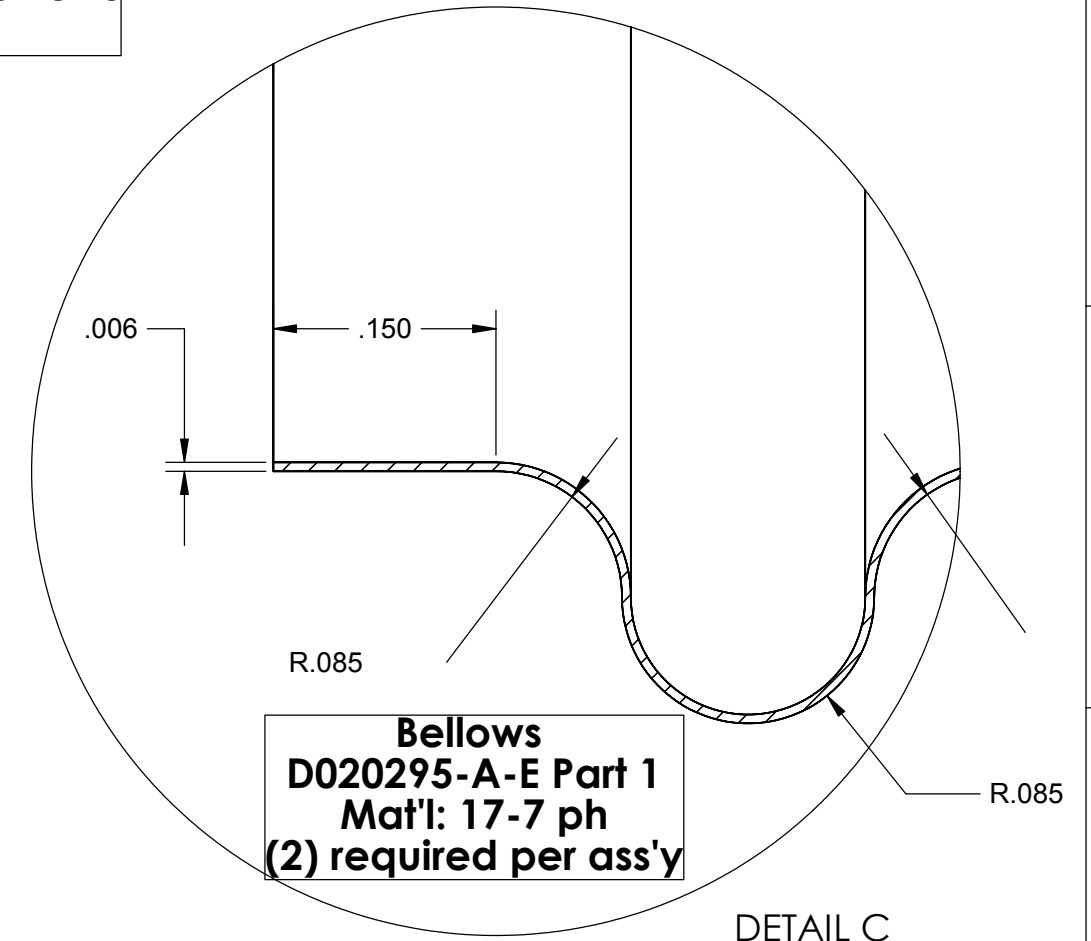
NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		

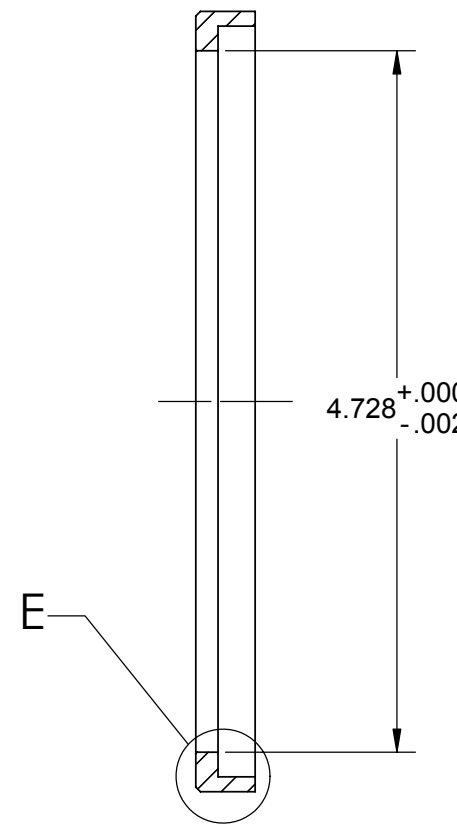
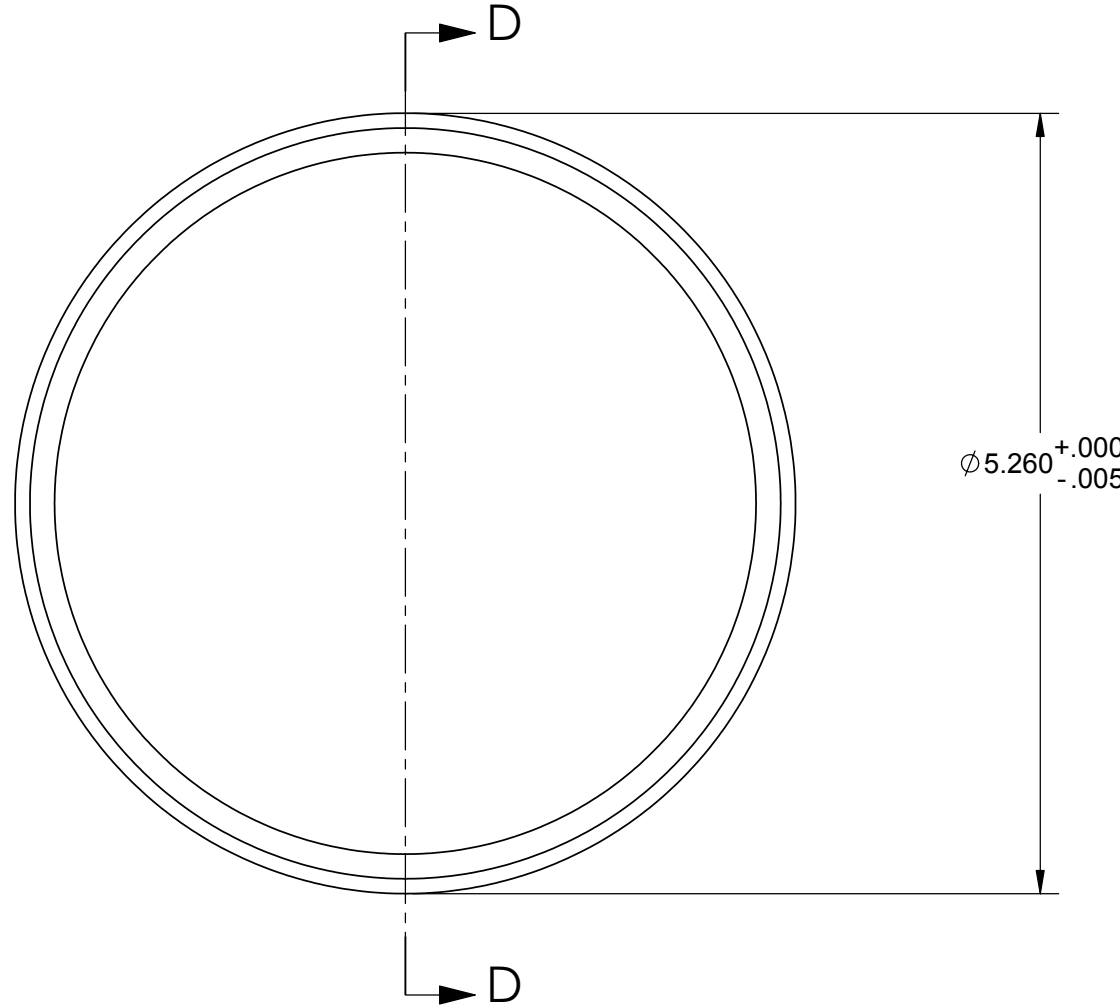
Refer to LIGO-E030066-A-E for design calculations of these bellows



SECTION B-B

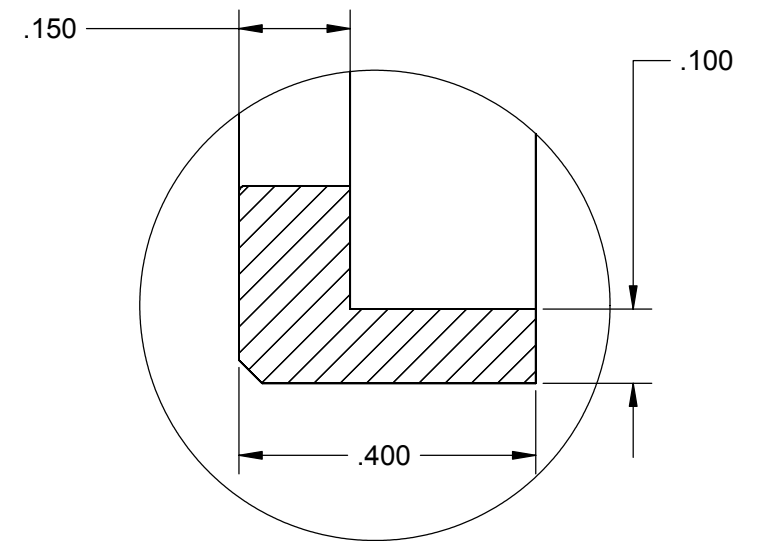


DETAIL C SCALE (10 : 1)



SECTION D-D

Bellows Weld Shield Ring D020295-A-E Part 2 Mat'l: 304 L (4) required per ass'y



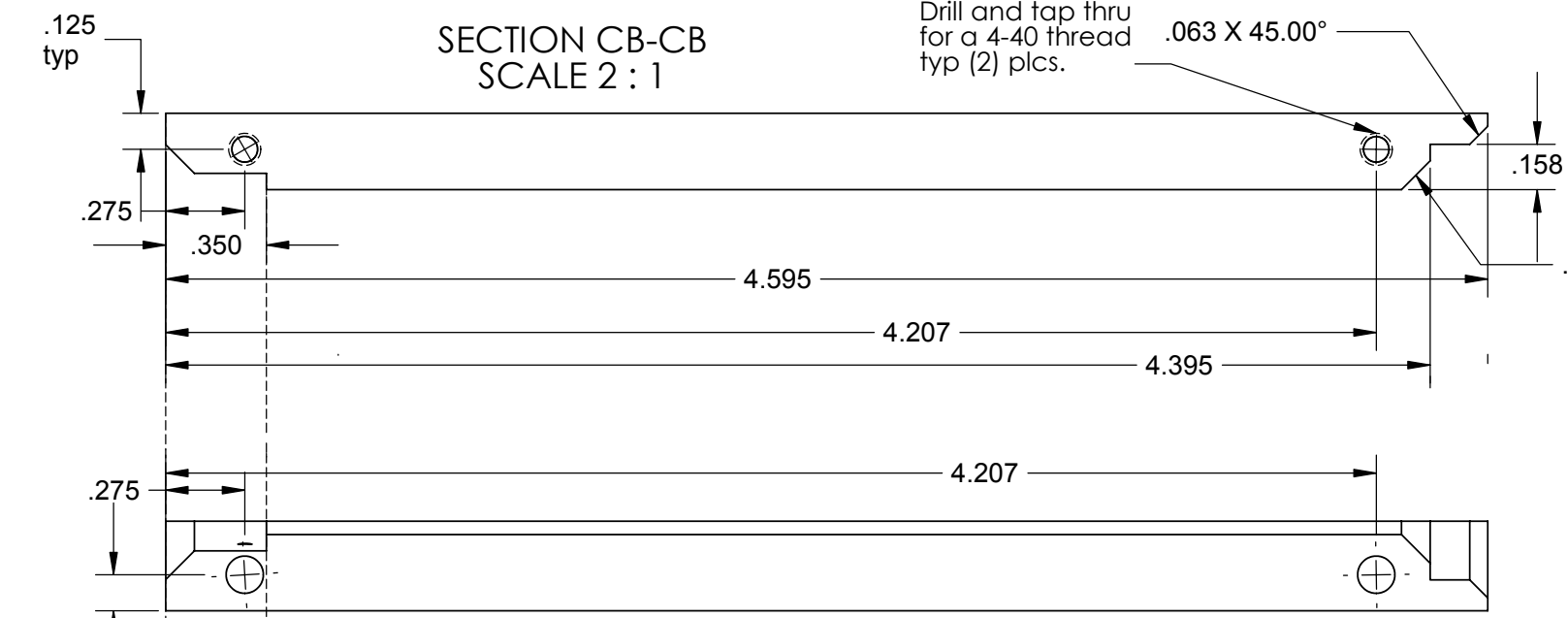
DETAIL E SCALE (5 : 1)

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES:				SYSTEM LASTI
.XX ± 0.02"		Fall '02	Hammond	SUB-SYSTEM HEPI
.XXX ± 0.001"		2/9/03	Kern	NEXT ASSY
ANGULAR ± 30°				PART NAME HEPI Bellows & Shield Rings
MATERIAL	as specified	COMMENTS:		SIZE DWG. NO. D020295
FINISH	120 RMS unless noted			REV A
SCALE:				1:1 unless noted
				Sht. No. 22 / 43

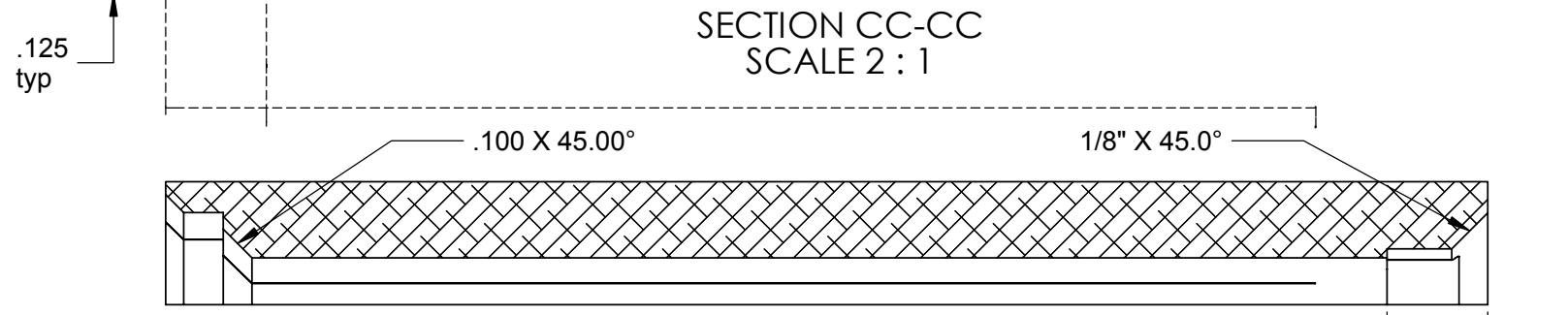
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/11/03	E030373-00-E	

Slit approx. 0.015" by wire EDM, slitting saw or best shop practice.
 Slit extends 0.60" away from bottom.
 Typ (2) places. Near side shown.
 Far side equal and opposite

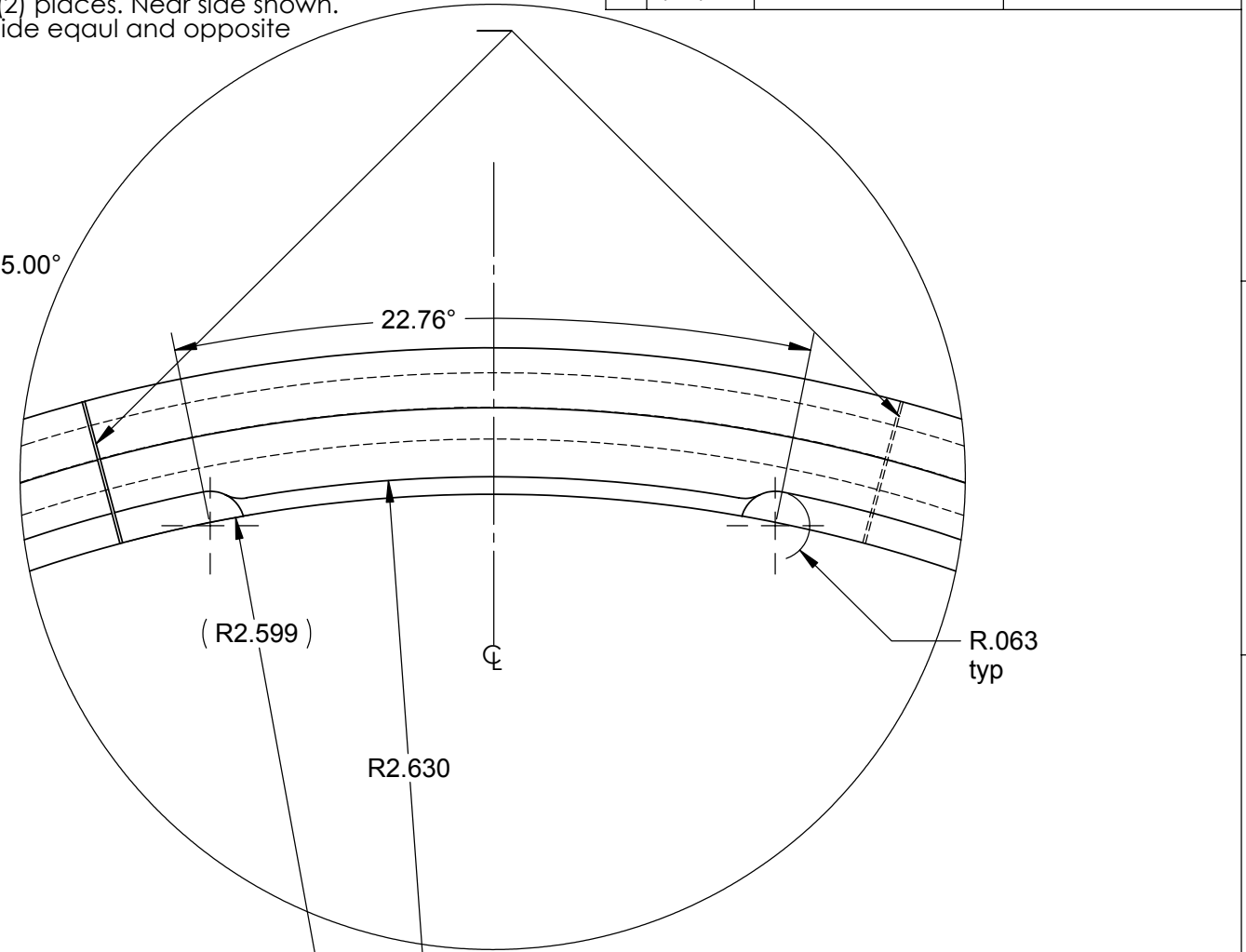
SECTION CB-CB
 SCALE 2 : 1



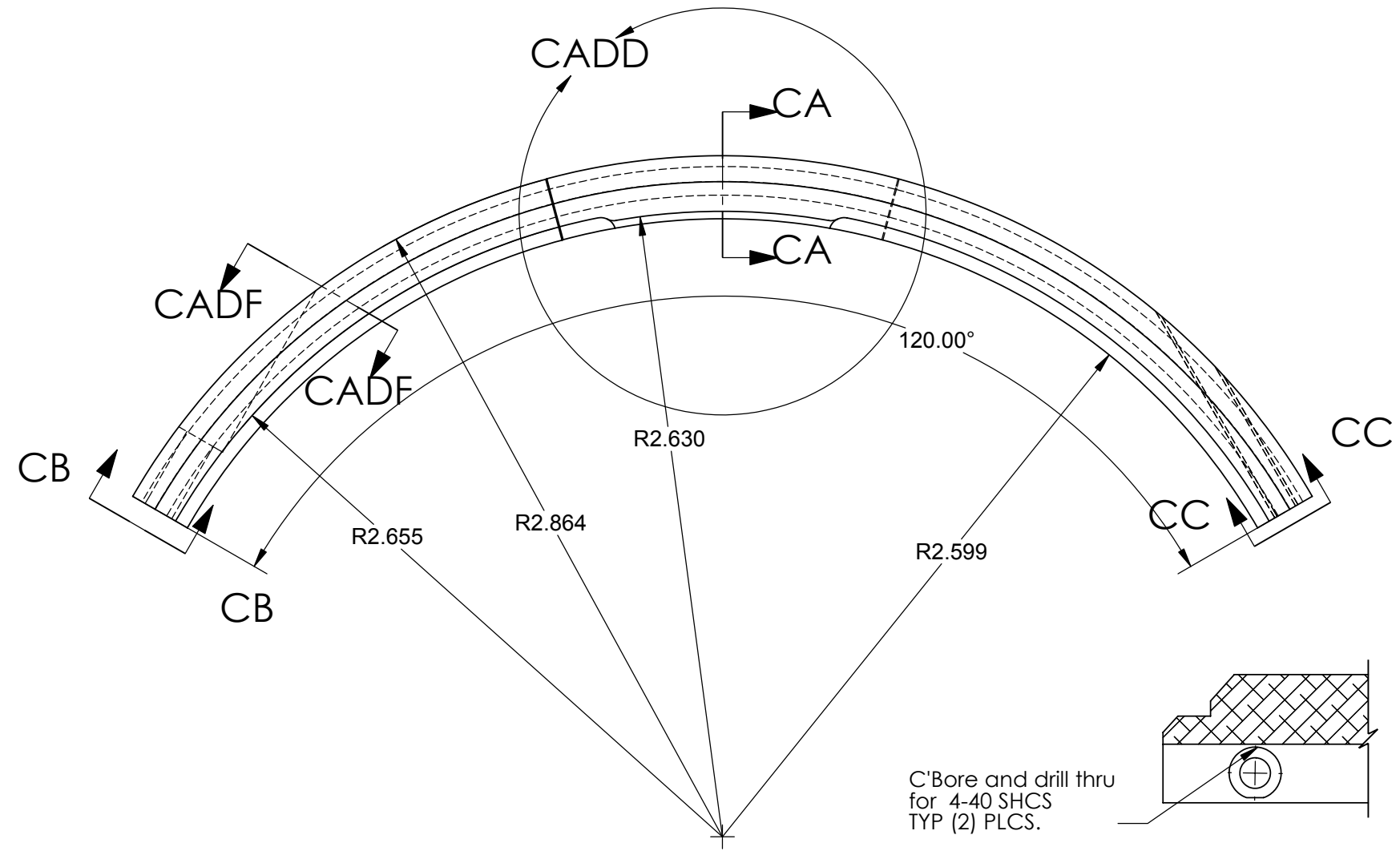
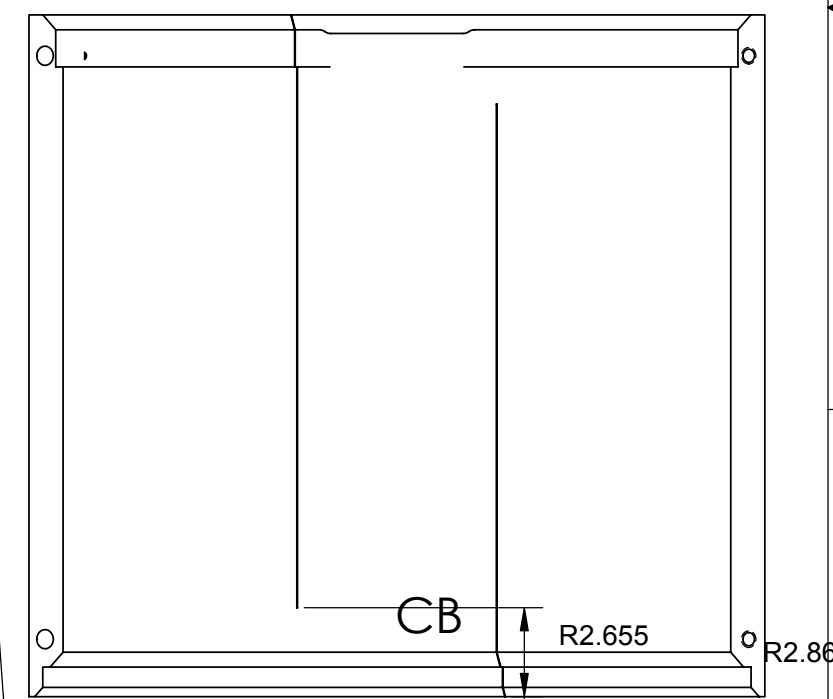
SECTION CC-CC
 SCALE 2 : 1



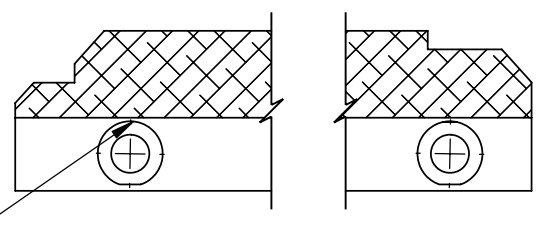
SECTION CA-CA
 SCALE 2 : 1



DETAIL CADD
 SCALE 4 : 1



C'Bore and drill thru
 for 4-40 SHCS
 TYP (2) PLCS.



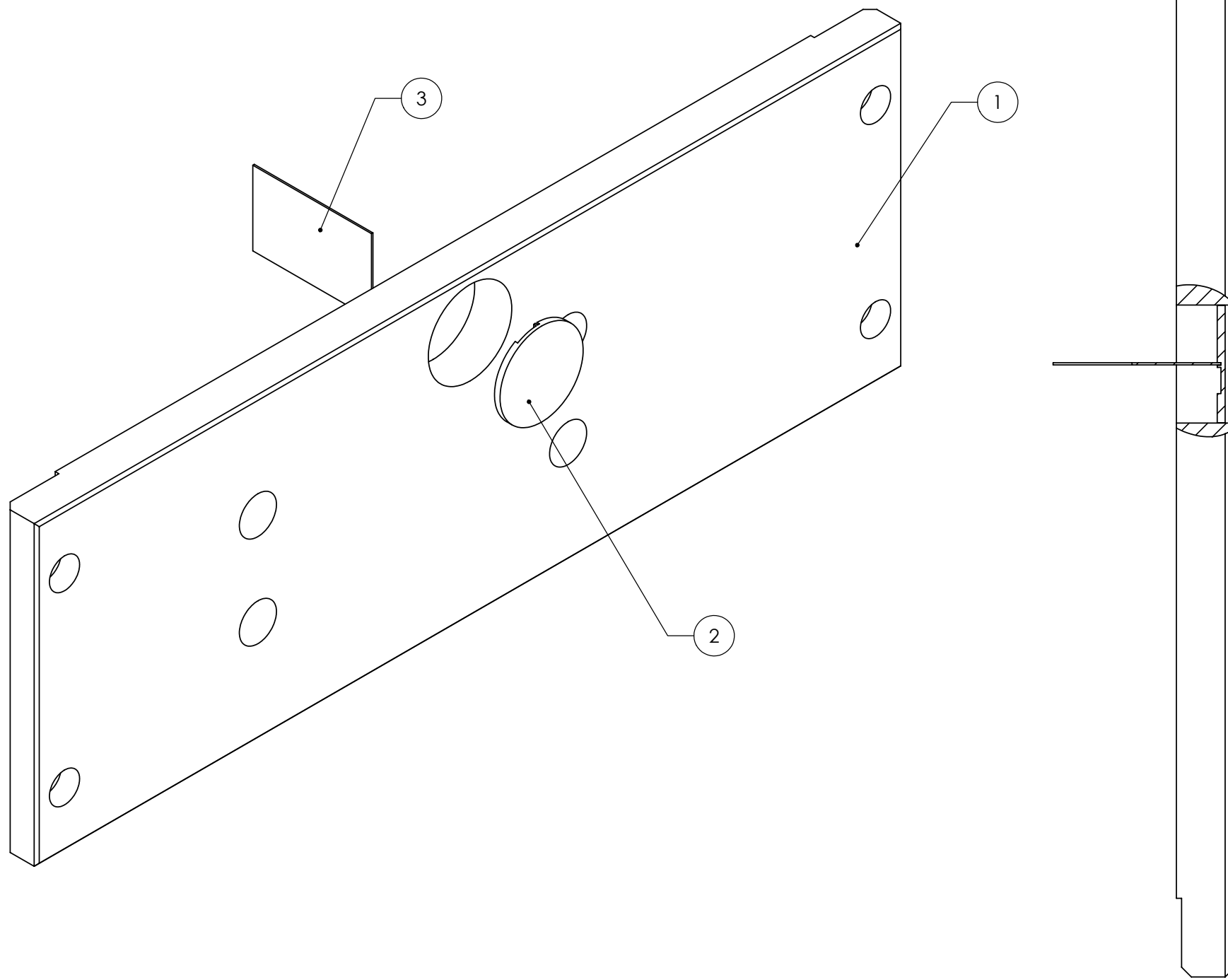
SECTION CADD-CADD
 SCALE 2 : 1

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 .XX ± 0.02"
 .XXX ± 0.001"
 ANGULAR ± 30'
 MATERIAL 6061-T6 Alum
 FINISH 120 RMS unless noted

DATE	NAME	DATE	NAME
4/02	Hardham	4/02	Hardham
Fall '02	Hammond	6/11/03	Spjeld
6/11/03	Spjeld	2/9/03	Kern

SYSTEM: CADD LASTI
 SUB-SYSTEM: HEPI
 NEXT ASSY:
 PART NAME: HEPI Bellows Shield
 SIZE: C DWG. NO. D020302
 ANODIZE COLOR: CLEAR
 SCALE: 1:1 unless noted

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
3	1	D020299-A	PARALLEL MOTION FLEXURE		26
2	1	D020299-A	PARALLEL FLEXURE HOLDER		26
1	1	D020297-A	SIDE FOUNDATION PLATE		25

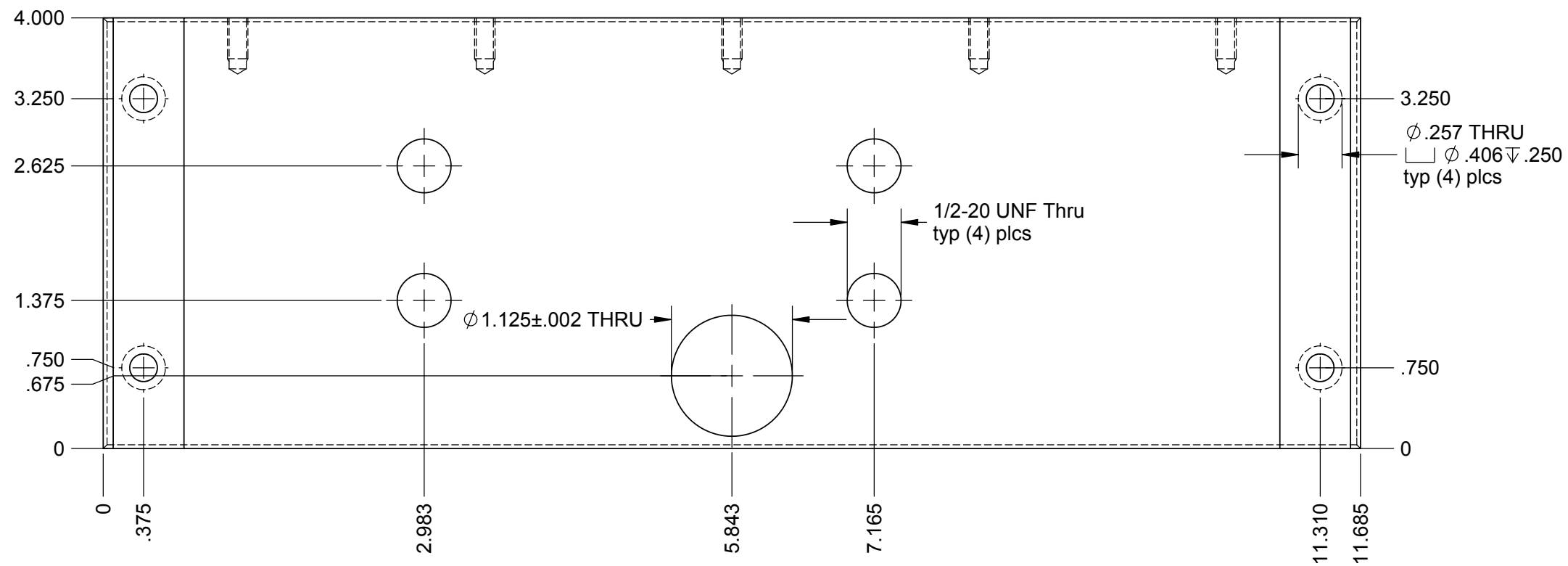
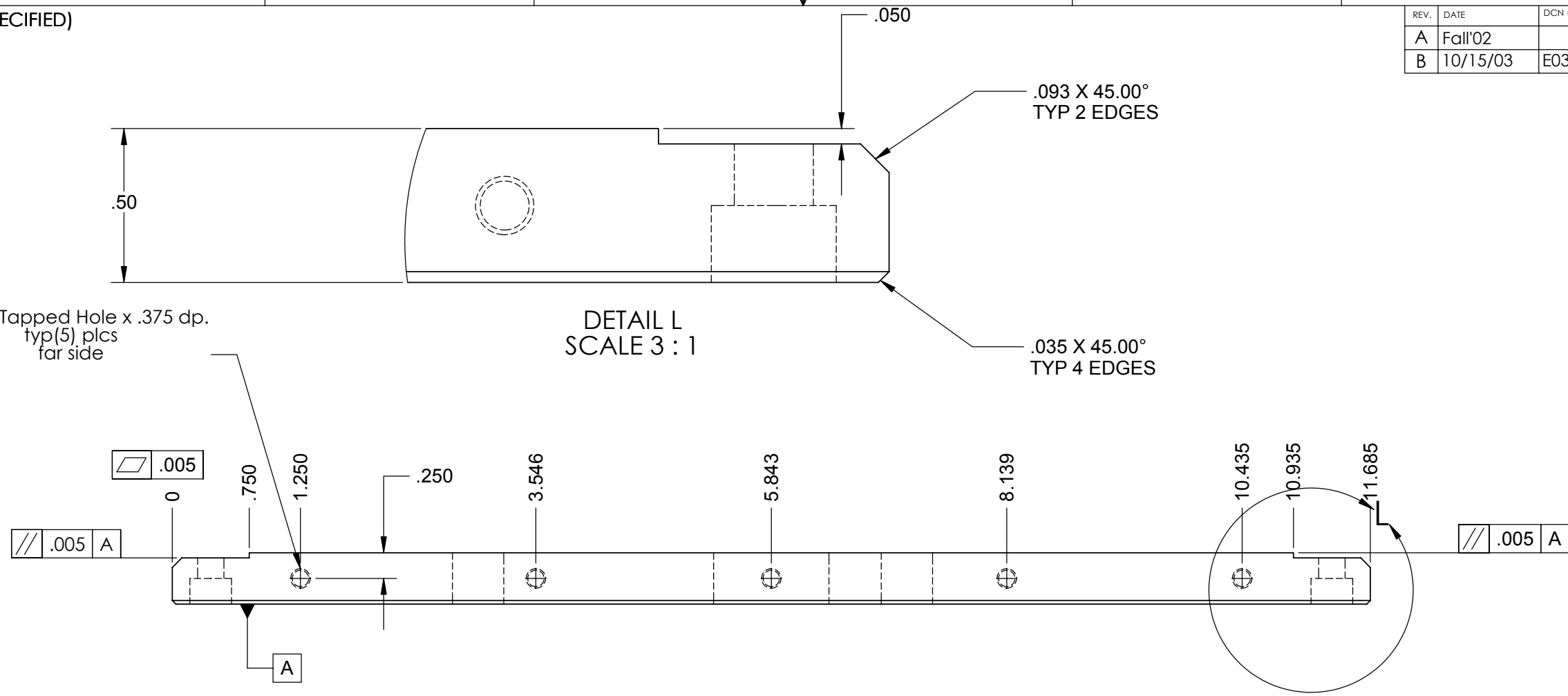
UNLESS OTHERWISE SPECIFIED:	DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DRAWN	4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.020"	REDRAWN	Fall' 02	Hammond	SUB-SYSTEM
.XXX ± 0.005"	REDRAWN	7/16/03	Spjeld	HEPI
ANGULAR ± 30°	CHECKED	2/9/03	Kern	NEXT ASSY
MATERIAL	COMMENTS: 1 Required for each actuator		PART NAME Side Foundation Assembly view with Flexure	
FINISH 120 RMS unless noted	SIZE	DWG. NO.	REV	
	C	D020363	B	
	SCALE:	1:1 unless noted		Sht. No. 24 / 43

NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	10/15/03	E030519-00-E	

#10-32 Tapped Hole x .375 dp.
typ(5) plcs
far side

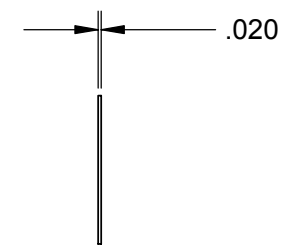
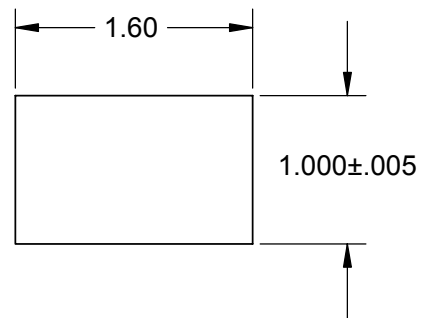
DETAIL L
SCALE 3 : 1



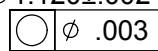
UNLESS OTHERWISE SPECIFIED:		DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN	4/02	Hardham	SYSTEM LASTI
TOLERANCES: .XX ± 0.010"		REDRAWN	Fall' 02	Hammond	SUB-SYSTEM HEPI
.XXX ± 0.005"		CHECKED	2/9/03	Kern	NEXT ASSY
ANGULAR ± 30°		REDRAWN	08/27/03	Hammond	PART NAME HEPI Left Side Foundation Plate
MATERIAL	304 L	COMMENTS:		SIZE	DWG. NO.
FINISH	120 RMS unless noted	1 Required for each actuator		C	D020297
		SCALE:	1:1 unless noted		REV B
				Sht. No. 25 / 43	

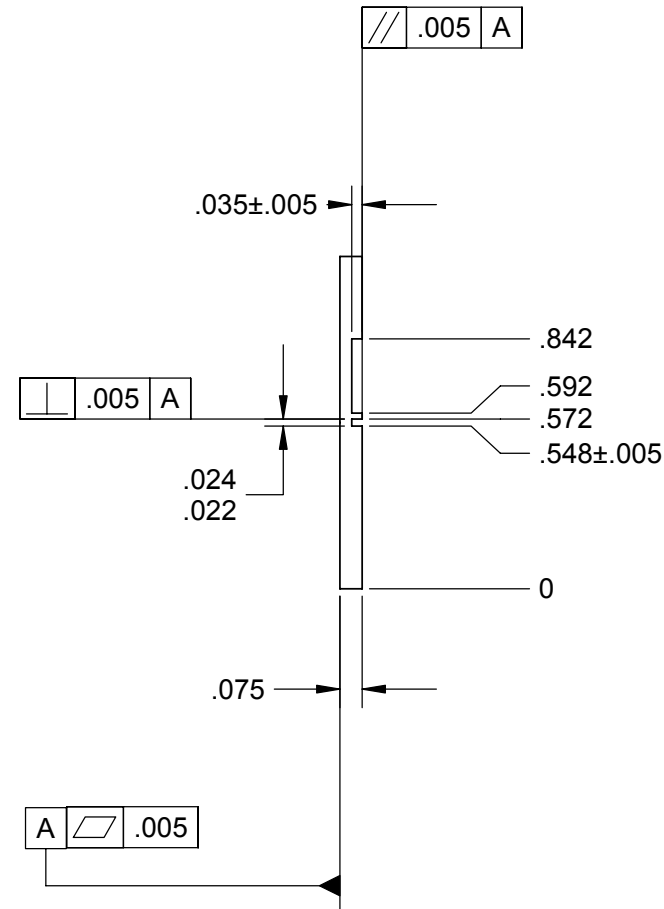
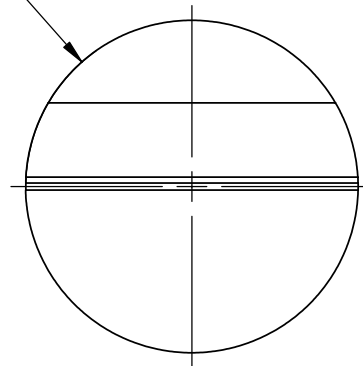
NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	5/23/02		




**Parallel Motion Flexure
D020299-A-E Part 1
(1) required
per ass'y
found in (2) ass'y**

Ø 1.120±.002




**Parallel Motion Mount
D020299-A-E Part 2
(1) required
per ass'y
found in (2) ass'y**

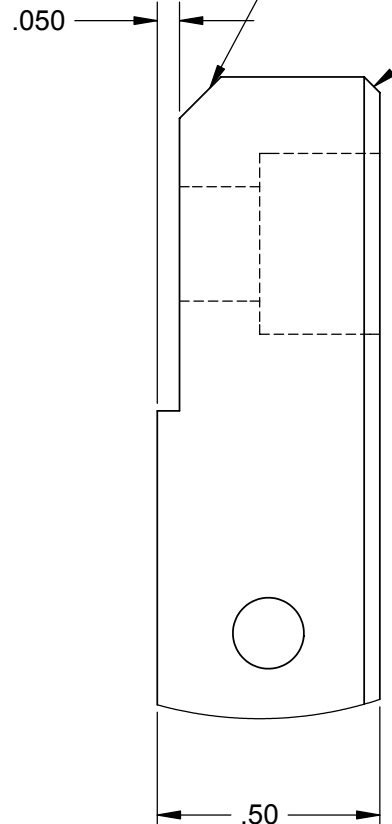
UNLESS OTHERWISE SPECIFIED:				DATE		NAME		 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES				DRAWN	4/02	Hardham			
TOLERANCES: .XX ± 0.010"				REDRAWN	5/23/02	Kern		SYSTEM LASTI	
.XXX ± 0.005"				CHECKED	2/9/03	Kern		SUB-SYSTEM HEPI	
ANGULAR ± 30°								NEXT ASSY	
MATERIAL 304 L				COMMENTS:				PART NAME HEPI Parallel Motion Flexure	
FINISH 120 RMS unless noted								SIZE DWG. NO.	D020299
				SCALE:		1:1 unless noted		Sht. No. 26 / 43	

NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	10/15/03	E030519-00-E	

.093 X 45.00°
TYP 2 EDGES

.035 X 45.00°
TYP 4 EDGES



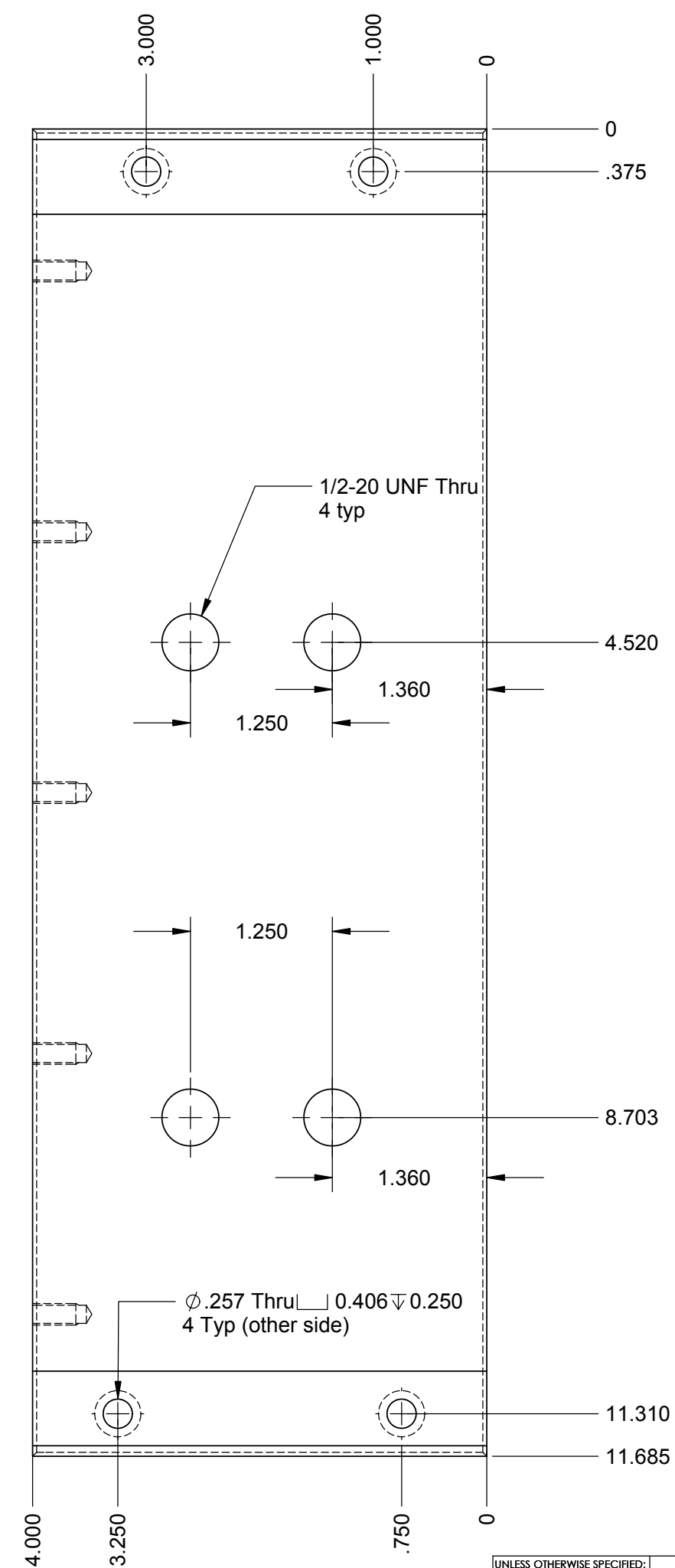
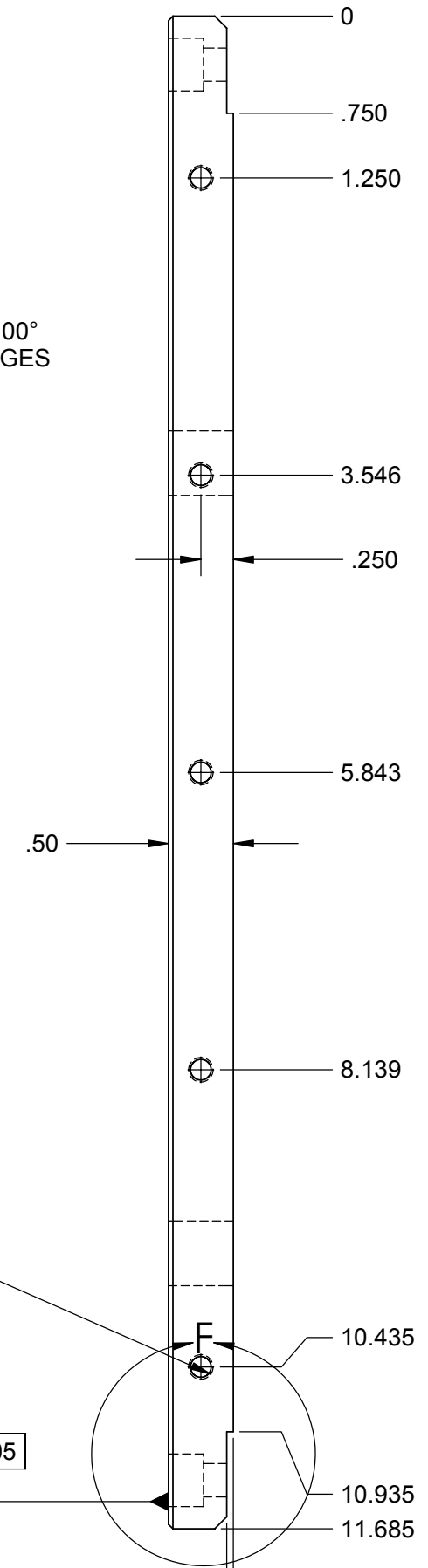
DETAIL F
SCALE 3 : 1

#10-32 Tapped Hole x .375 dp.
typ (5) plcs

A \square .005

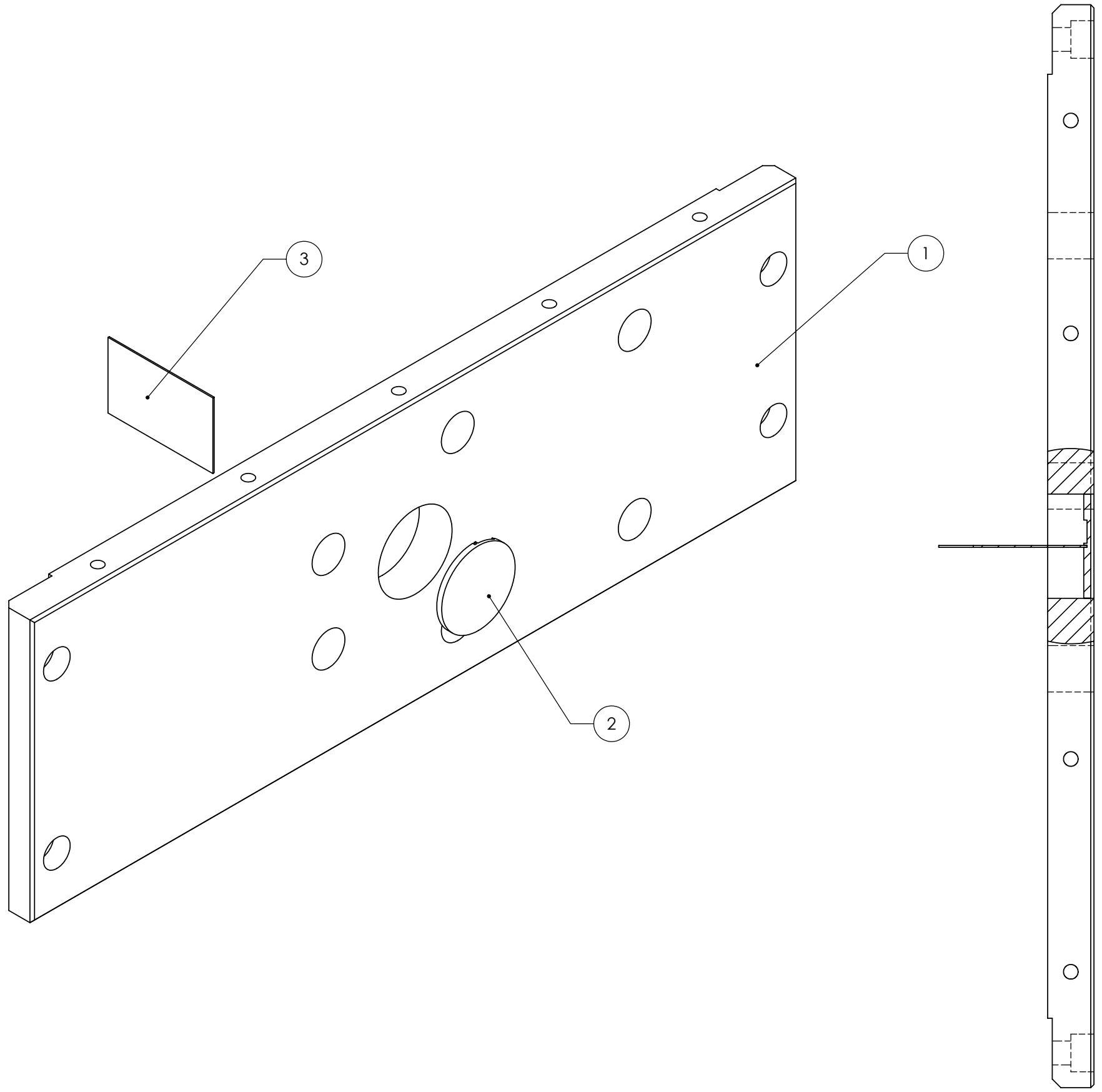
\square .005 A

\square .005 A




UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	LIGO	
TOLERANCES: .XX ± 0.010"		REDRAWN 5/23/02	Kern	SYSTEM LASTI	
.XXX ± 0.005"		REDRAWN 8/27/03	Hammond	SUB-SYSTEM HEPI	
ANGULAR ± 30°		CHECKED 2/9/03	Kern	NEXT ASSY	
MATERIAL 304 L		COMMENTS: 1 Required for each actuator		PART NAME HEPI Right Side Foundation Plate	
FINISH 120 RMS unless noted		SCALE: 1:1 unless noted		SIZE DWG. NO. D020296	REV B
				Sht. No. 27 / 43	

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	

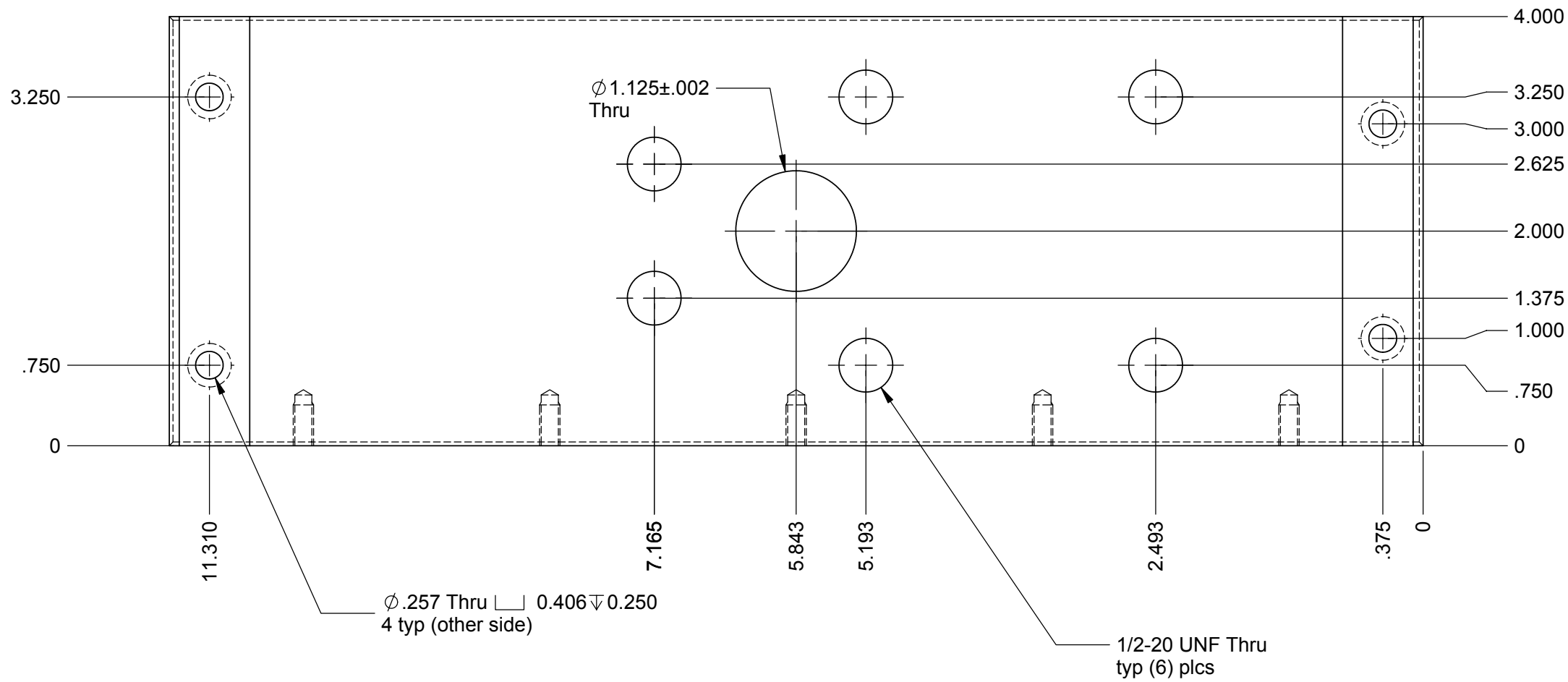
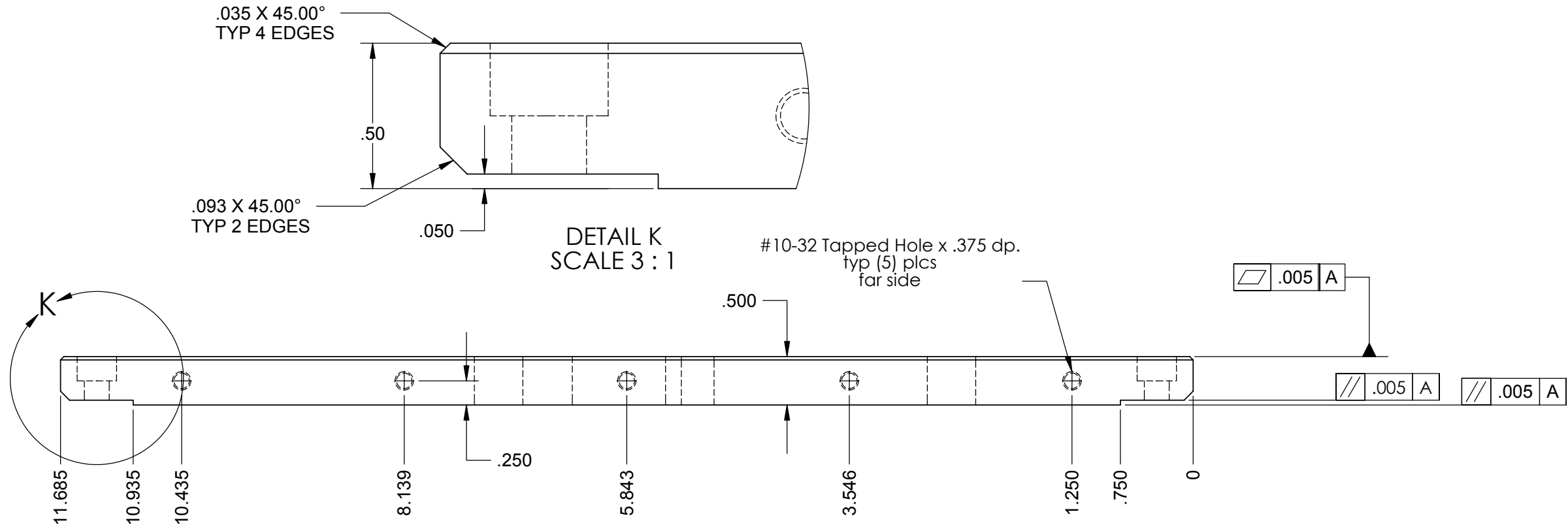


ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
3	1	D020299-A	PARALLEL MOTION FLEXURE		26
2	1	D020299-A	PARALLEL FLEXURE HOLDER		26
1	1	D020298-A	BACK FOUNDATION PLATE		29

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN	4/02		Hardham
TOLERANCES: .XX ± 0.020"		REDRAWN	Fall '02		Hammond
.XXX ± 0.005"		REDRAWN	7/16/03		Spjeld
ANGULAR ± 30°		CHECKED	2/9/03	Kern	
MATERIAL		COMMENTS:		PART NAME Back Foundation Plate Ass'y view with Flexure	
FINISH 120 RMS unless noted		1 Required for each actuator		SIZE DWG. NO. D020364 REV B SCALE: 1:1 unless noted Sht. No. 28 / 43	

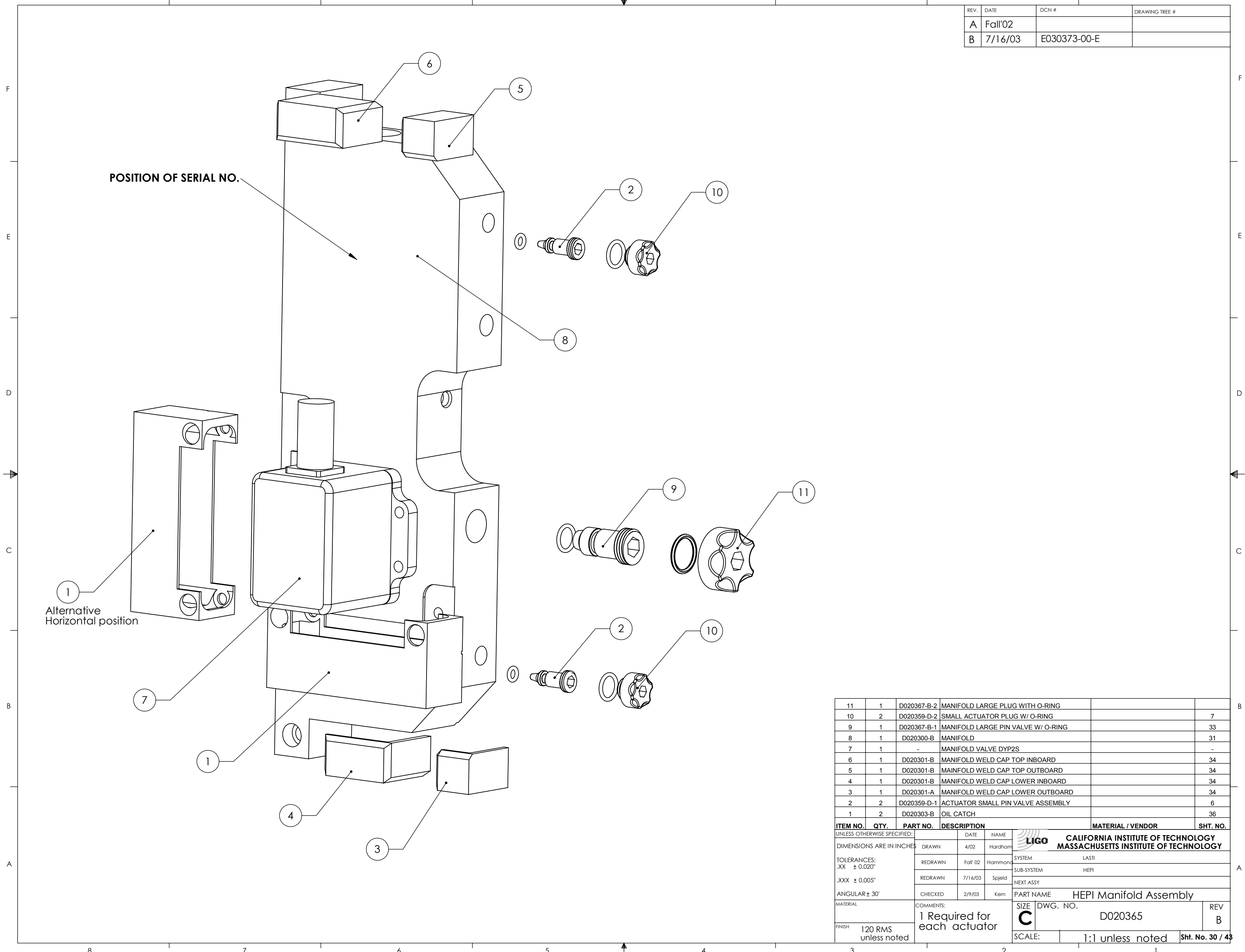
NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	5/23/02		
B	10/15/03	E030519-00-E	



UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	LIGO	
TOLERANCES: .XX ± 0.010"		5/23/02	Kern	SYSTEM LASTI	
.XXX ± 0.005"		8/27/03	Hammond	SUB-SYSTEM HEPI	
ANGULAR ± 30°		2/9/03	Kern	NEXT ASSY	
MATERIAL 304 L		COMMENTS: 1 Required for each actuator		PART NAME HEPI Back Foundation Plate	
FINISH 120 RMS unless noted				SIZE C	DWG. NO. D020298
				SCALE: 1:1 unless noted	REV B
				Sht. No. 29 / 43	

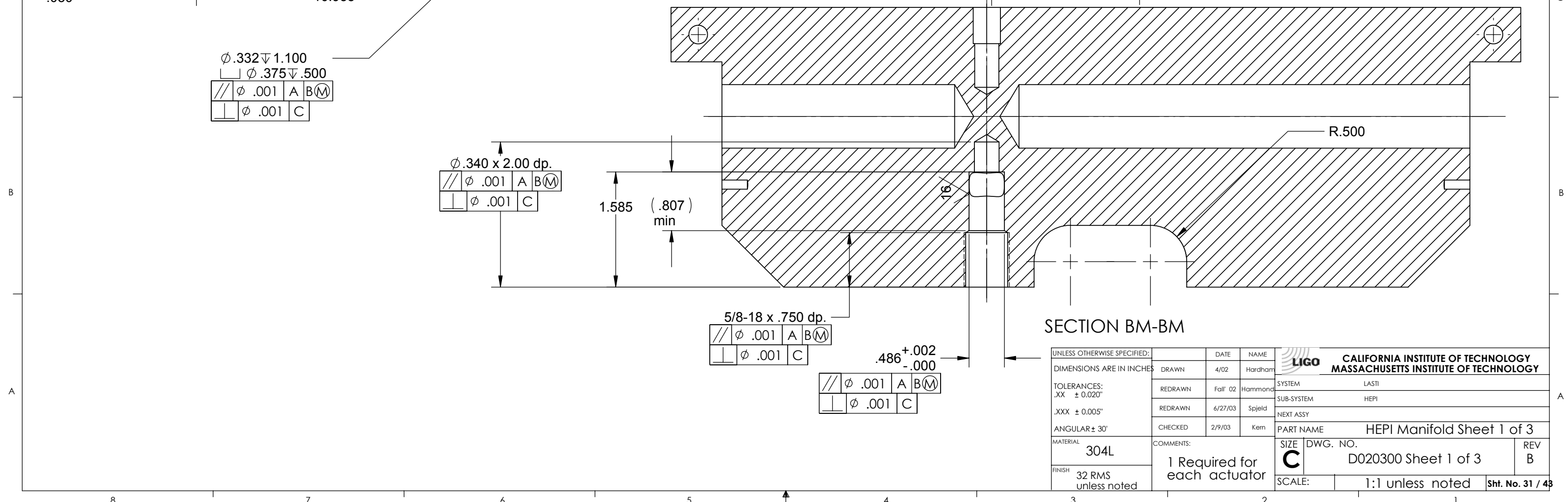
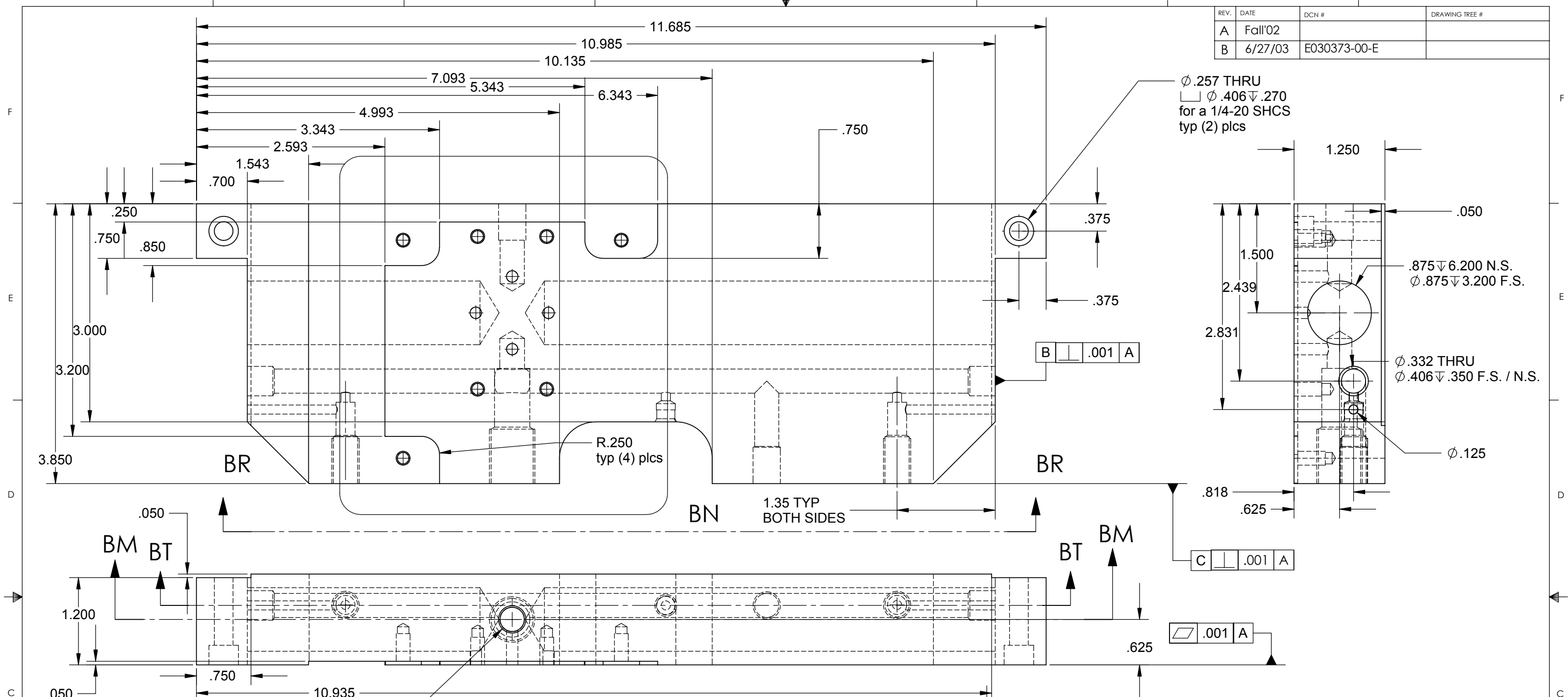
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	



ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
11	1	D020367-B-2	MANIFOLD LARGE PLUG WITH O-RING		
10	2	D020359-D-2	SMALL ACTUATOR PLUG W/ O-RING		7
9	1	D020367-B-1	MANIFOLD LARGE PIN VALVE W/ O-RING		33
8	1	D020300-B	MANIFOLD		31
7	1	-	MANIFOLD VALVE DYP2S		-
6	1	D020301-B	MANIFOLD WELD CAP TOP INBOARD		34
5	1	D020301-B	MANIFOLD WELD CAP TOP OUTBOARD		34
4	1	D020301-B	MANIFOLD WELD CAP LOWER INBOARD		34
3	1	D020301-A	MANIFOLD WELD CAP LOWER OUTBOARD		34
2	2	D020359-D-1	ACTUATOR SMALL PIN VALVE ASSEMBLY		6
1	2	D020303-B	OIL CATCH		36

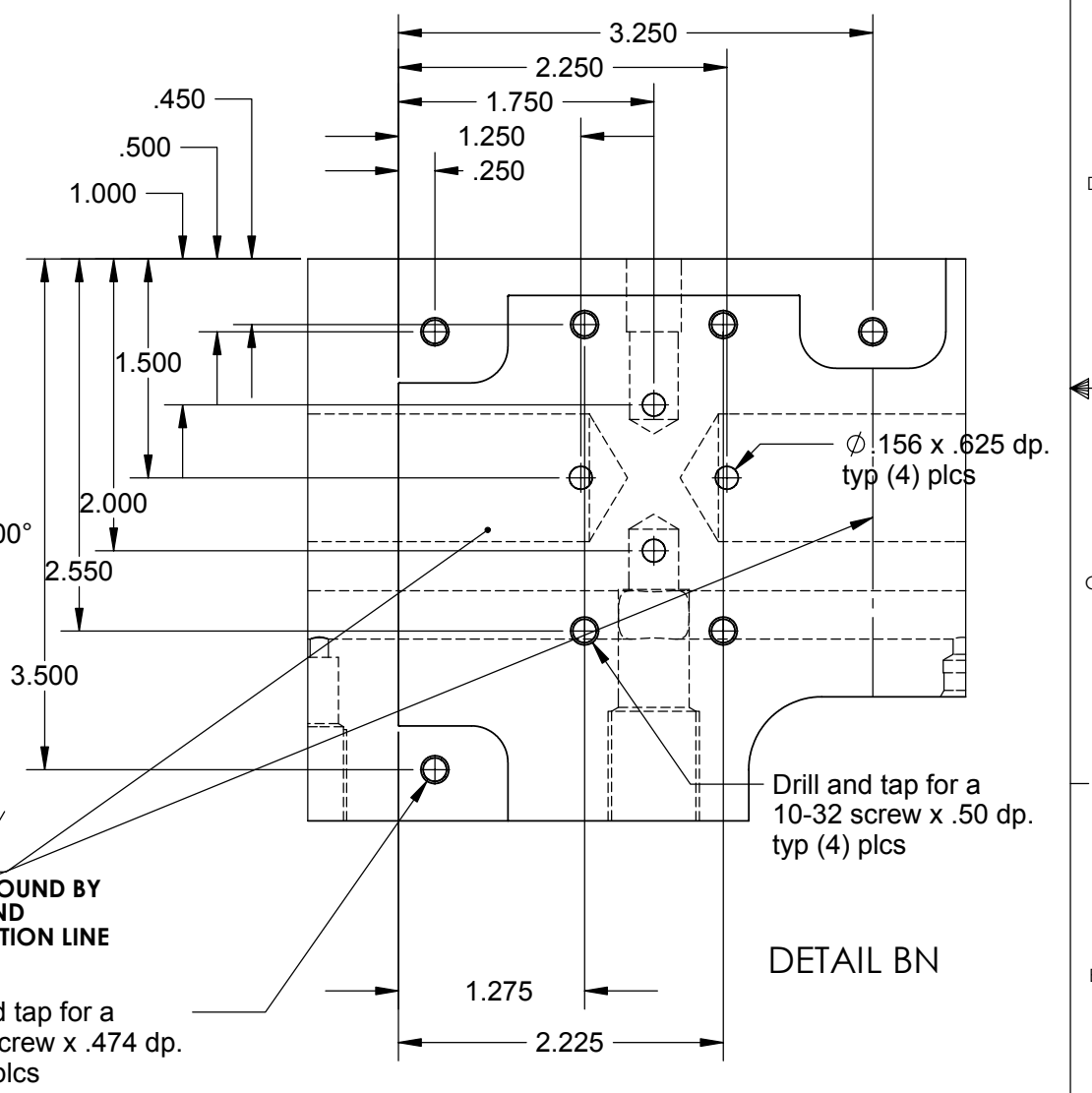
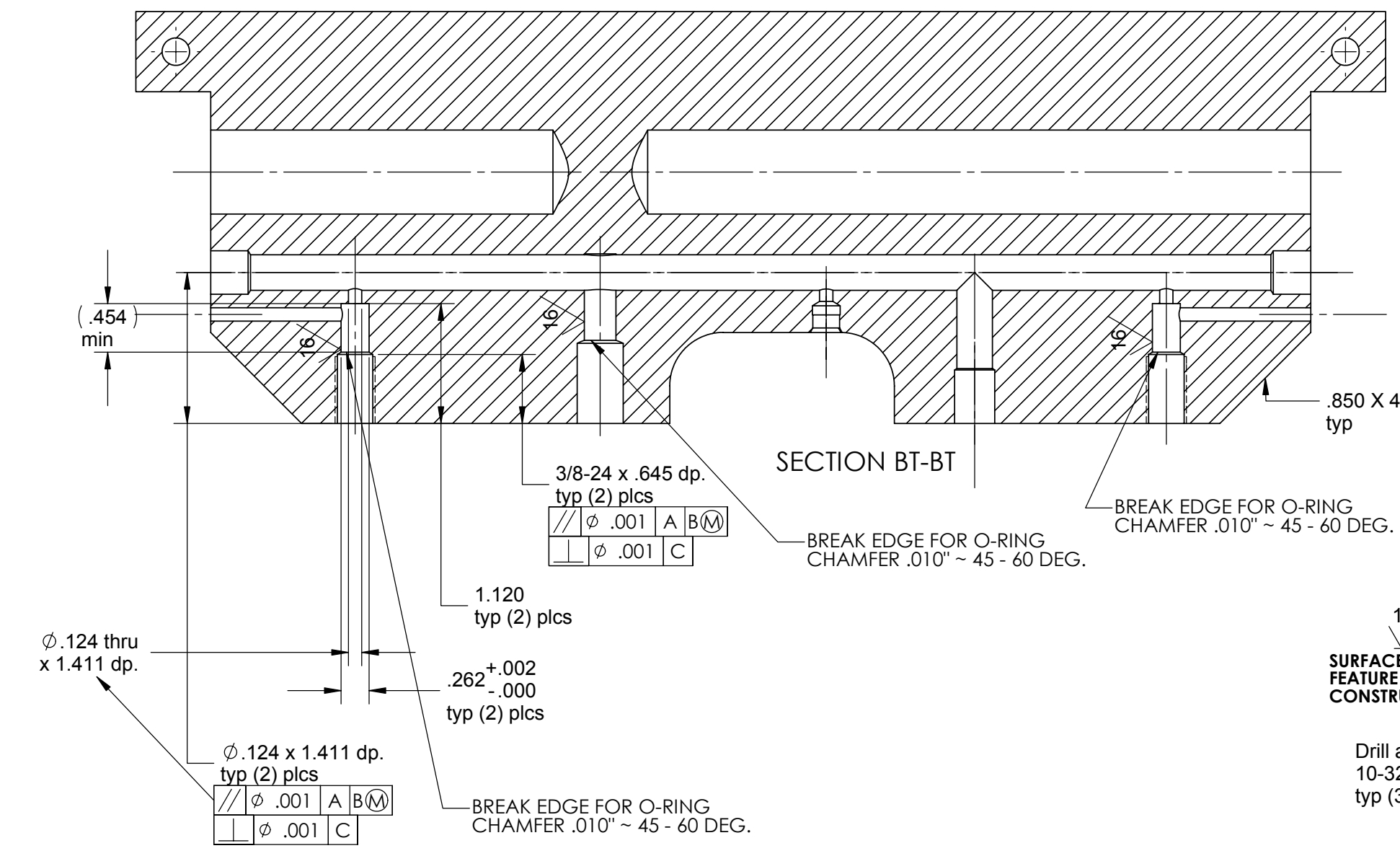
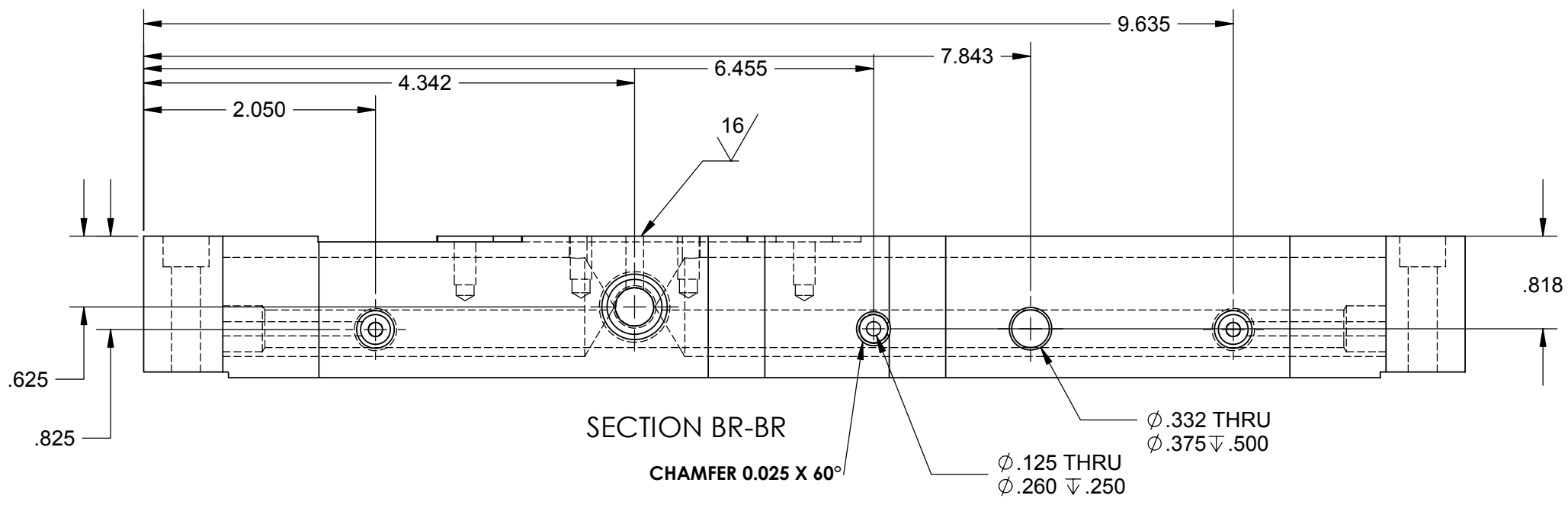
UNLESS OTHERWISE SPECIFIED:	DATE	NAME	SYSTEM	LASTI
DRAWN	4/02	Hardham	SYSTEM	LASTI
REDRAWN	Fall' 02	Hammond	SUB-SYSTEM	HEPI
REDRAWN	7/16/03	Spjeld	NEXT ASSY	
CHECKED	2/9/03	Kern	PART NAME	HEPI Manifold Assembly
MATERIAL	COMMENTS:		SIZE	DWG. NO.
FINISH	120 RMS unless noted	1 Required for each actuator	C	D020365
SCALE:			1:1 unless noted	Sht. No. 30 / 43

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/27/03	E030373-00-E	



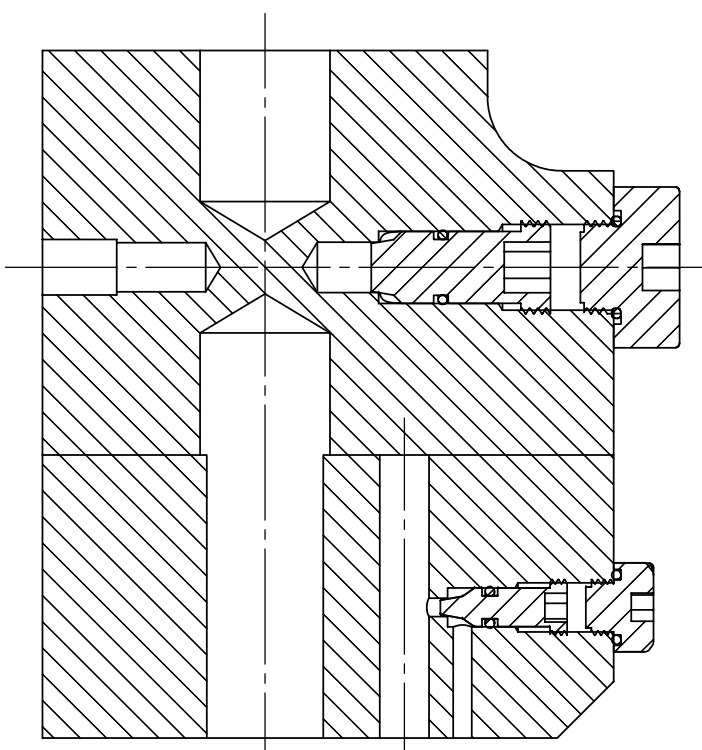
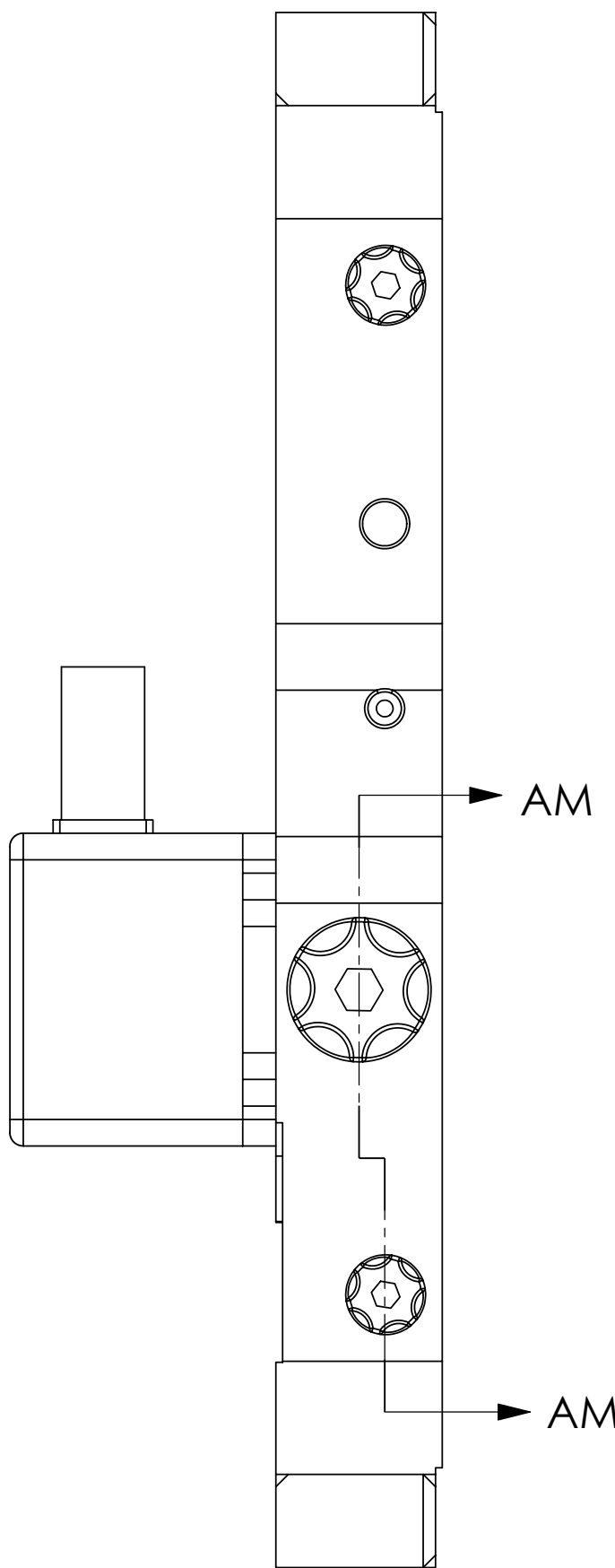
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
TOLERANCES: .XX ± 0.020" .XXX ± 0.005"		DRAWN	4/02	
ANGULAR ± 30°		REDRAWN	Fall' 02	Hammond
MATERIAL 304L		REDRAWN	6/27/03	Spjeld
FINISH 32 RMS unless noted		CHECKED	2/9/03	Kern
COMMENTS: 1 Required for each actuator			SYSTEM LASTI	
SCALE: 1:1 unless noted			SUB-SYSTEM HEPI	
PART NAME HEPI Manifold Sheet 1 of 3			NEXT ASSY	
SIZE C			PART NAME HEPI Manifold Sheet 1 of 3	
DWG. NO. D020300 Sheet 1 of 3			REV B	
Sht. No. 31 / 43			FILENAME/LOCATION:	

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/25/03	E030373-00-E	

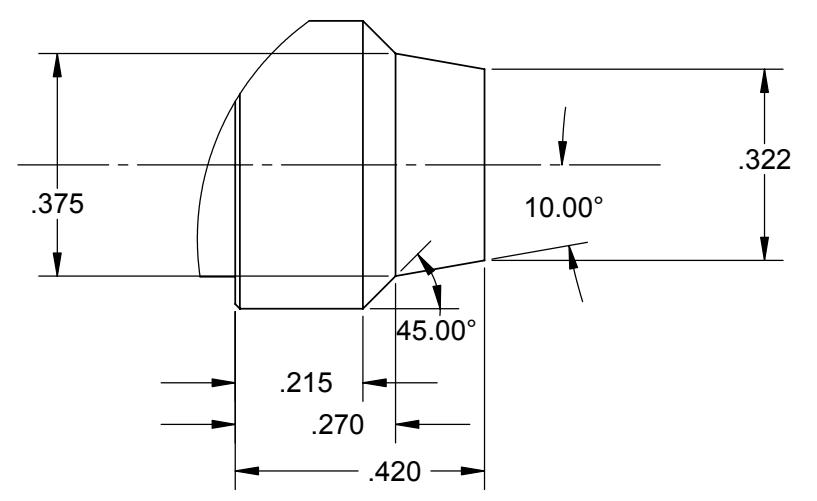
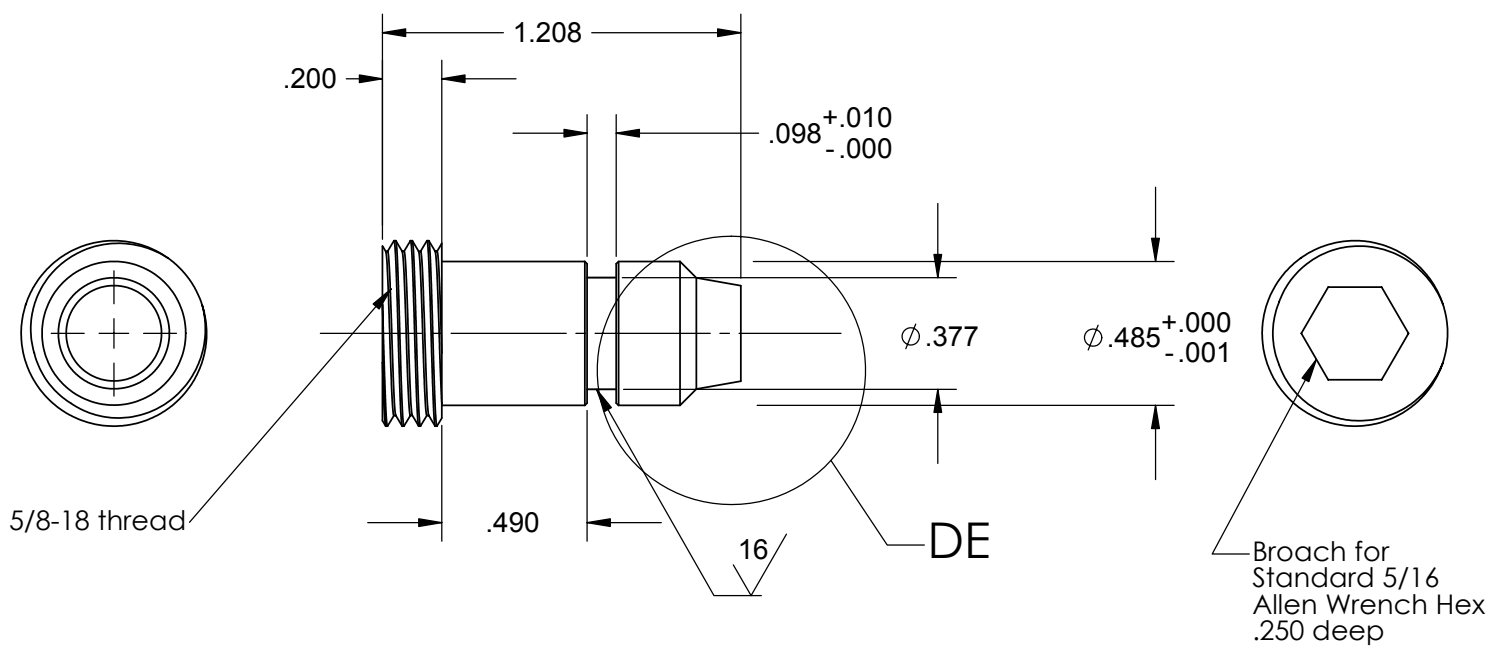


UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	LIGO SYSTEM LASTI	
TOLERANCES: .XX ± 0.020"		Fall' 02	Hammond	SUB-SYSTEM HEPI	
.XXX ± 0.005"		6/25/03	Spjeld	NEXT ASSY	
ANGULAR ± 30°		2/9/03	Kern	PART NAME HEPI Manifold Sheet 2 of 3	
MATERIAL	304 L	COMMENTS:		SIZE DWG. NO.	REV B
FINISH	.32 RMS unless noted			D020300 Sheet 2 of 3	
				SCALE:	1:1 unless noted
				Sht. No. 32 / 43	

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



SECTION AM-AM



DETAIL DE
SCALE 4 : 1

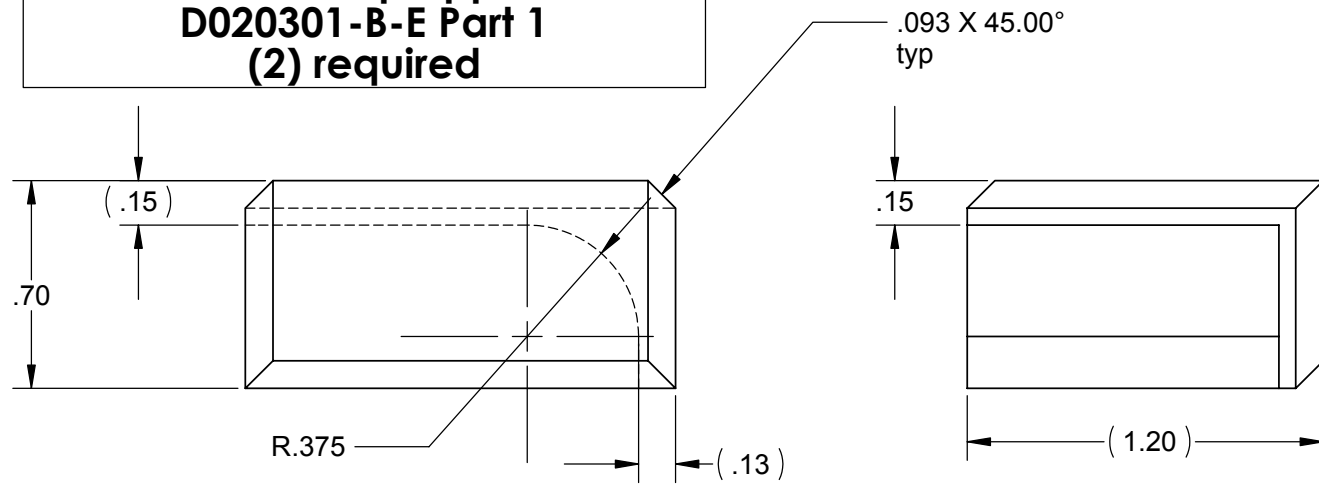
**Manifold
Large Pin Valve
D020367-1
Mat'l: 17-4PH
Heat Treat
H-900
(1) required**

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
TOLERANCES: .XX ± 0.020" .XXX ± 0.005" ANGULAR ± 30'		4/02	Hardham	
MATERIAL 304 L		REDRAWN	Fall' 02	Hammon
FINISH 32 RMS unless noted		CHECKED	2/9/03	Kern
COMMENTS:		PART NAME		HEPI Manifold Sheet 3 of 3 with Large Pin Valve
		SIZE		DWG. NO. D020300 Sheet 3 of 3
		SCALE:		1:1 unless noted
				REV A
				Sht. No. 33 / 43

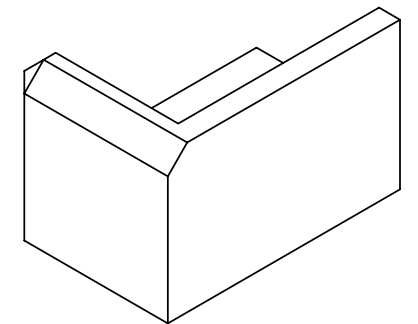
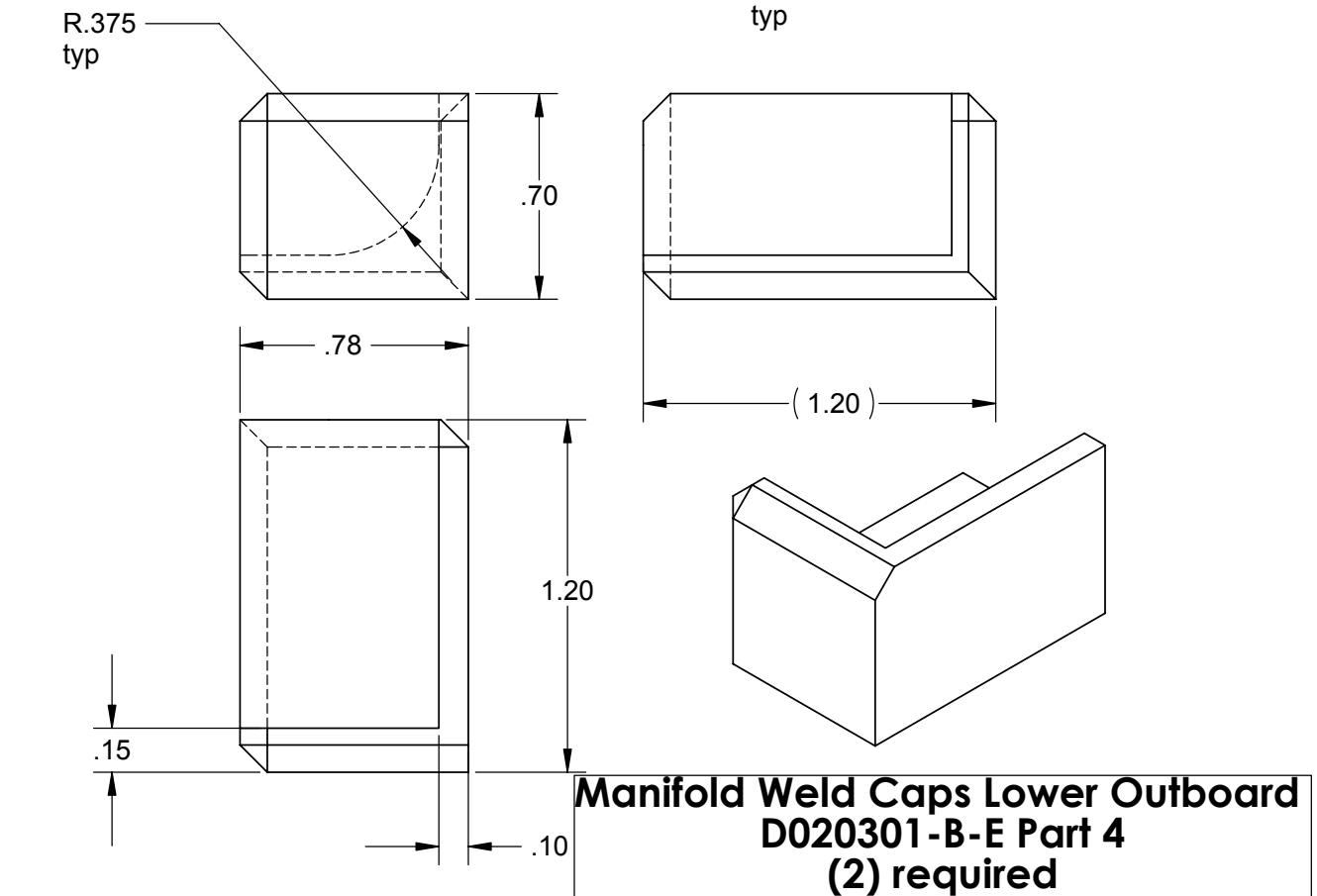
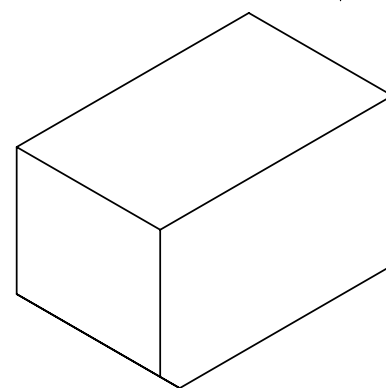
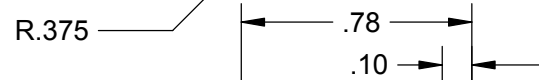
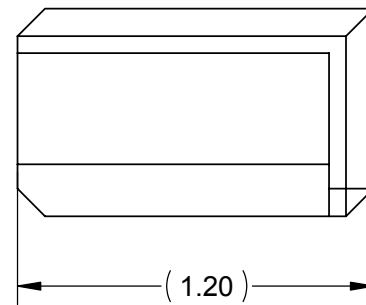
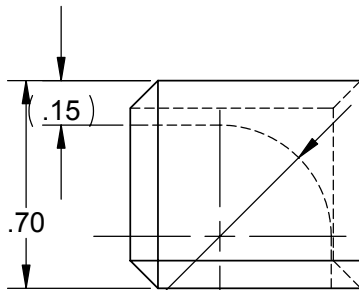
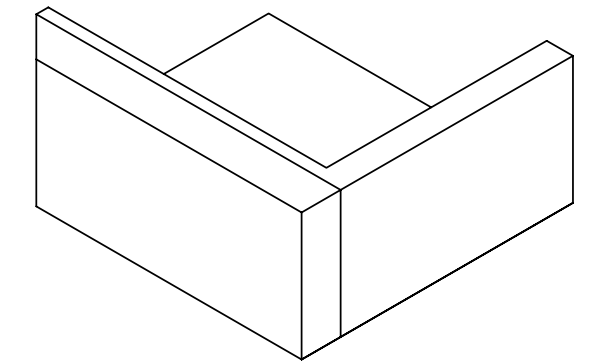
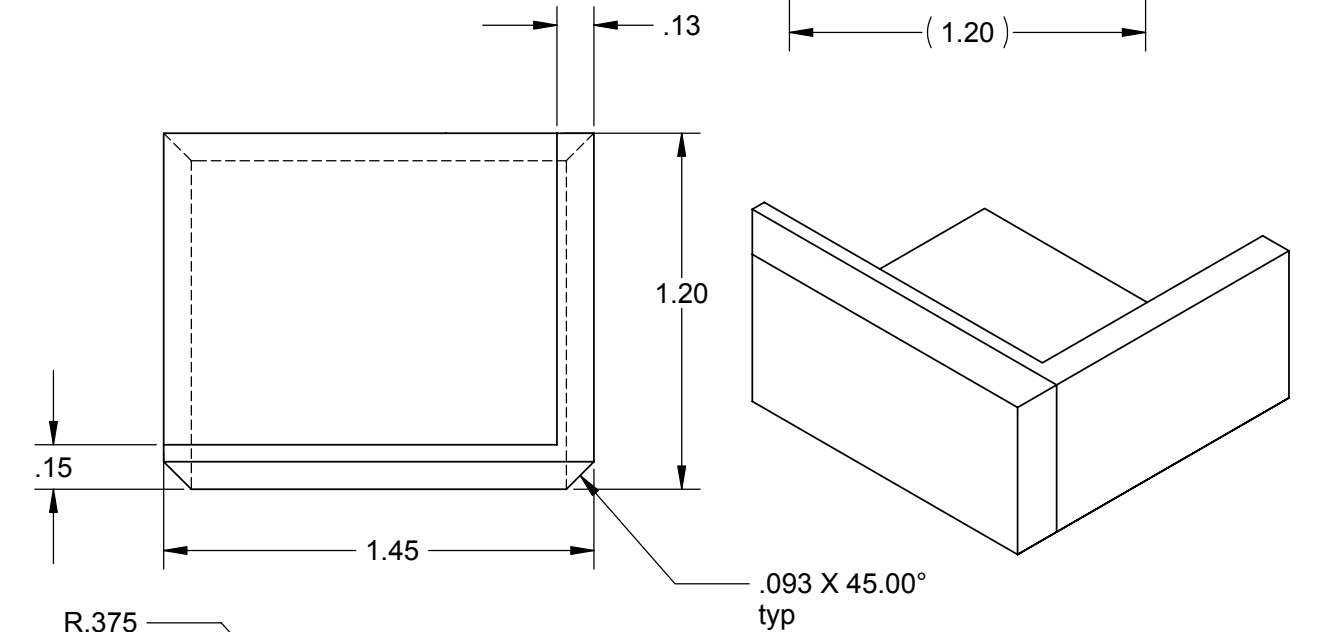
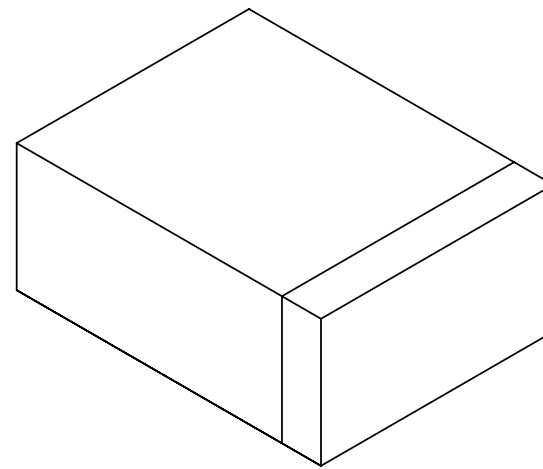
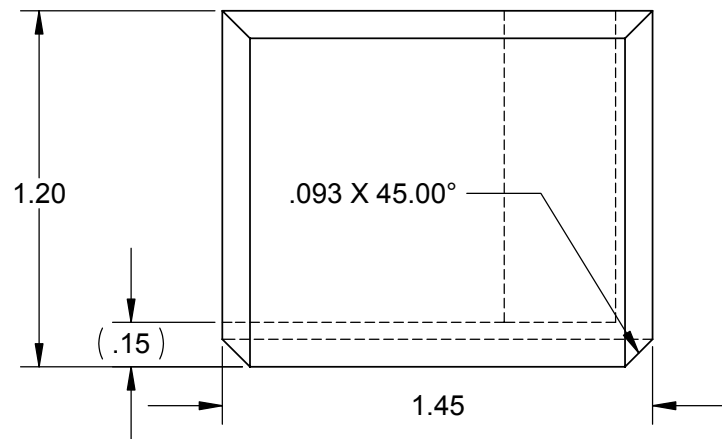
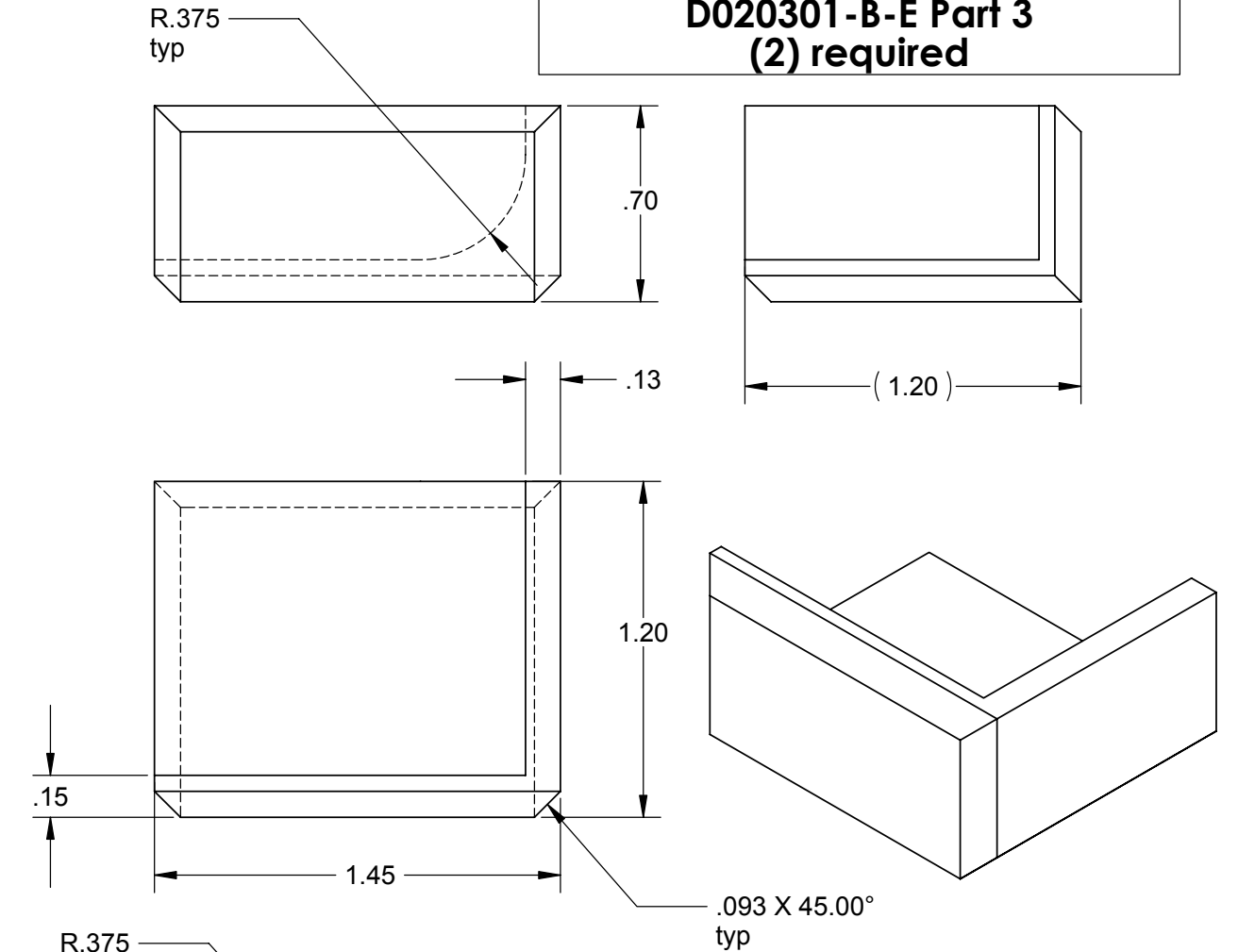
NOTES: Lower manifold caps are mirror images of upper manifold caps

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/11/03	E030373-00-E	

**Manifold Weld Cap Upper Inboard
D020301-B-E Part 1
(2) required**



**Manifold Weld Cap Lower Inboard
D020301-B-E Part 3
(2) required**



**Manifold Weld Caps Upper Outboard
D020301-B-E Part 2
(2) required**

**Manifold Weld Caps Lower Outboard
D020301-B-E Part 4
(2) required**

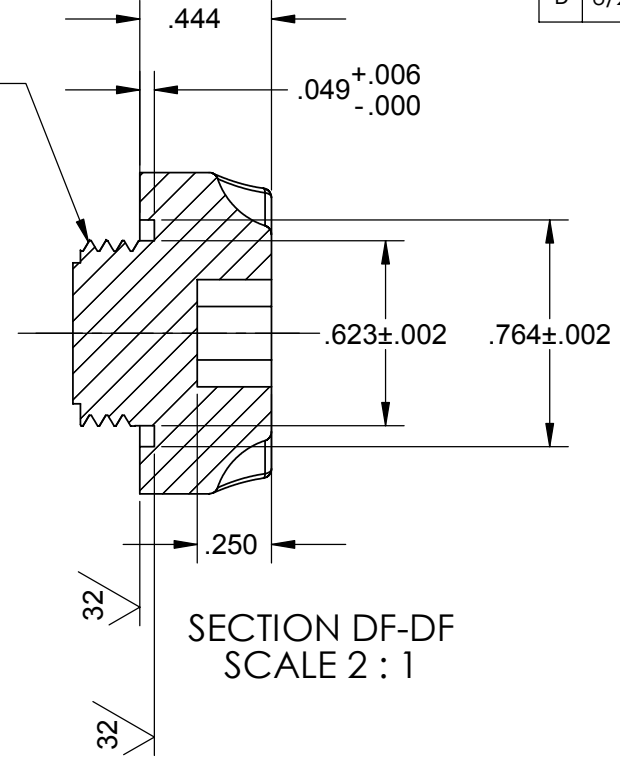
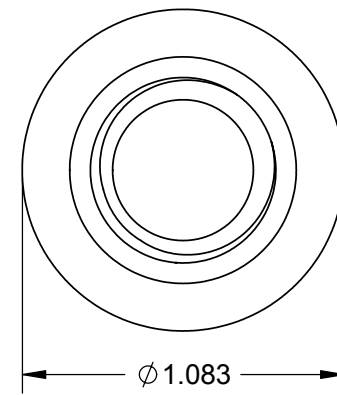
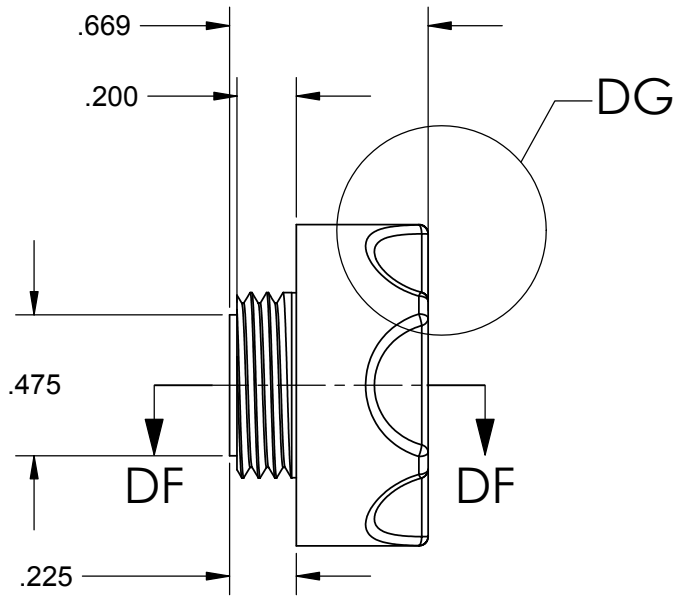
UNLESS OTHERWISE SPECIFIED:		DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN	4/02	Hardham	SYSTEM LASTI
TOLERANCES: .XX ± 0.010"		REDRAWN	Fall'02	Hammond	SUB-SYSTEM HEPI
.XXX ± 0.005"		REDRAWN	6/11/03	Sjeld	NEXT ASSY
ANGULAR ± 30°		CHECKED	2/9/03	Kern	PART NAME HEPI Manifold Weld Caps
MATERIAL 304 L		COMMENTS:			SIZE DWG. NO. C D020301
FINISH 120 RMS unless noted					REV B
		SCALE: 4:1 unless noted			Sht. No. 34 / 43

NOTE: WELD CAPS MUST BE CLEARLY NUMBERED

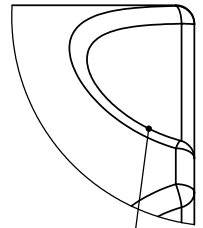
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/25/03	E030373-00-E	



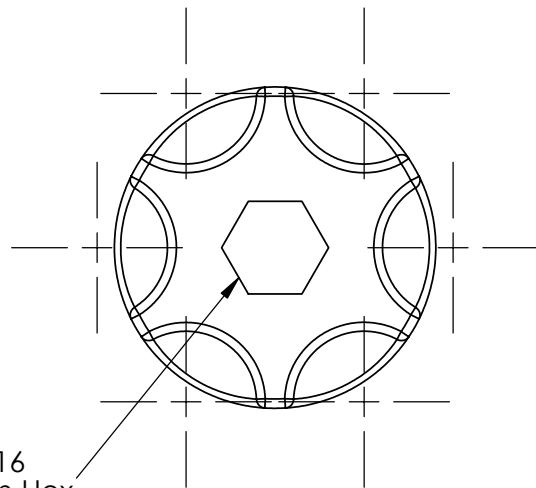
Manifold Large Plug
D020367-B-E
Mat'l: 304 L
(1) required
O-ring: #2-016



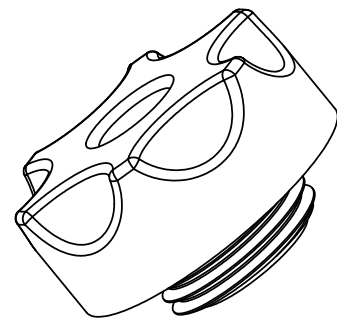
DETAIL DG
SCALE 4 : 1



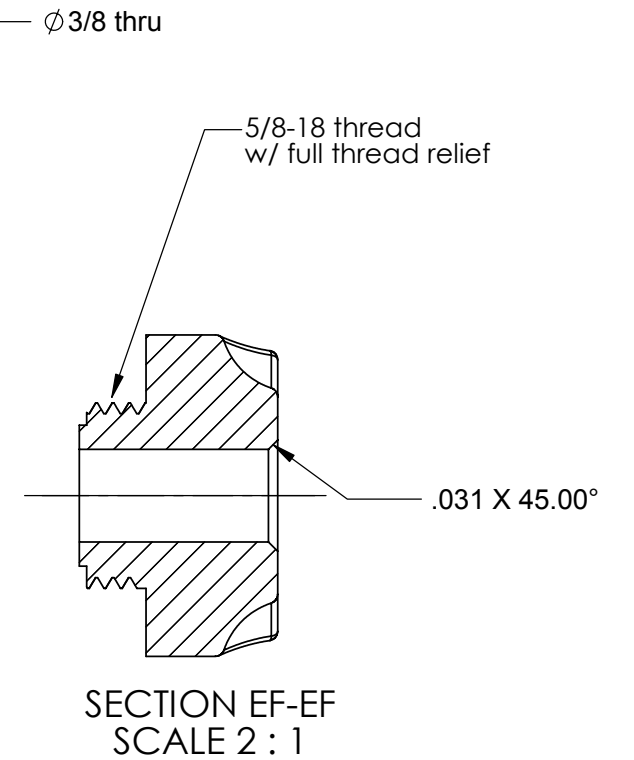
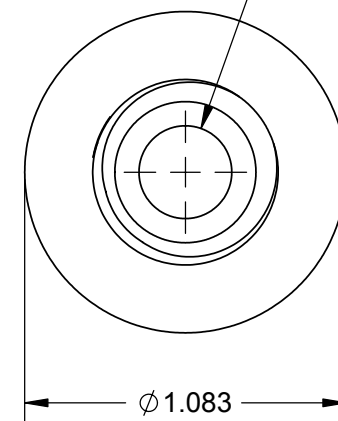
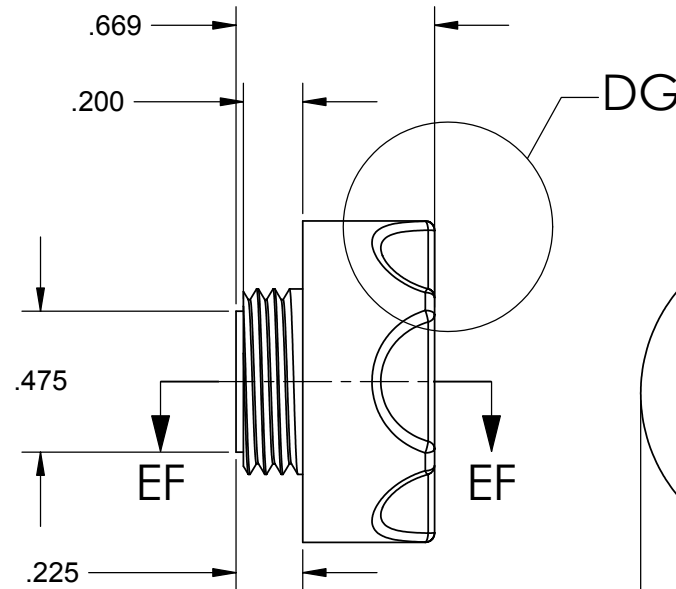
Scallop for thumb screws approx. as shown with best shop practice typ for details D020367-2 and D020367-2A



Broach for Standard 5/16 Allen Wrench Hex .250 deep



Manifold Large Plug
D020367-B-E Part 2A
Mat'l: 6061-T6
Anodize
Color: Clear
(1) required

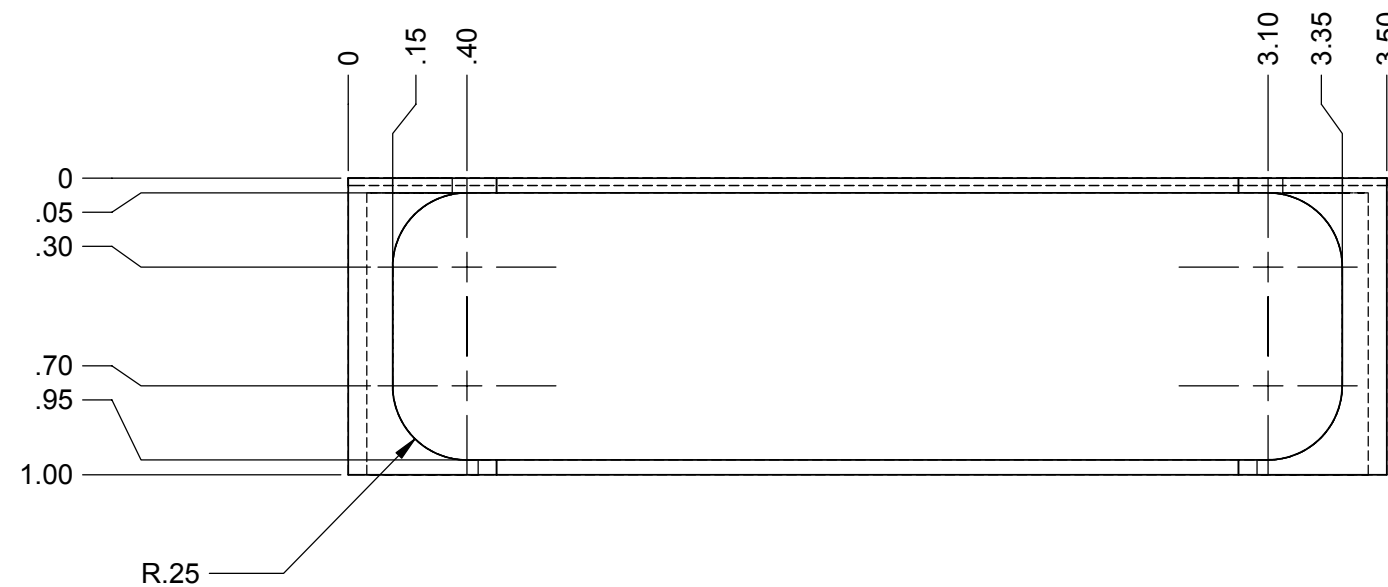
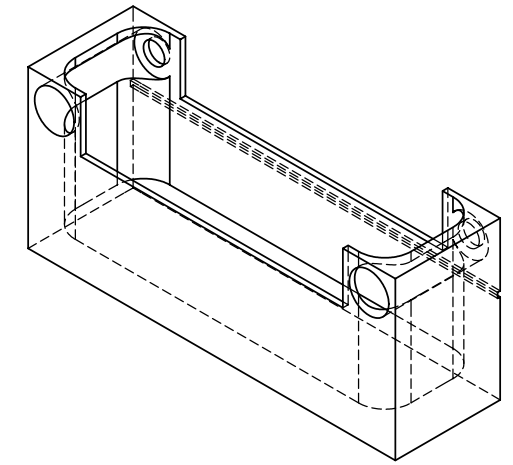
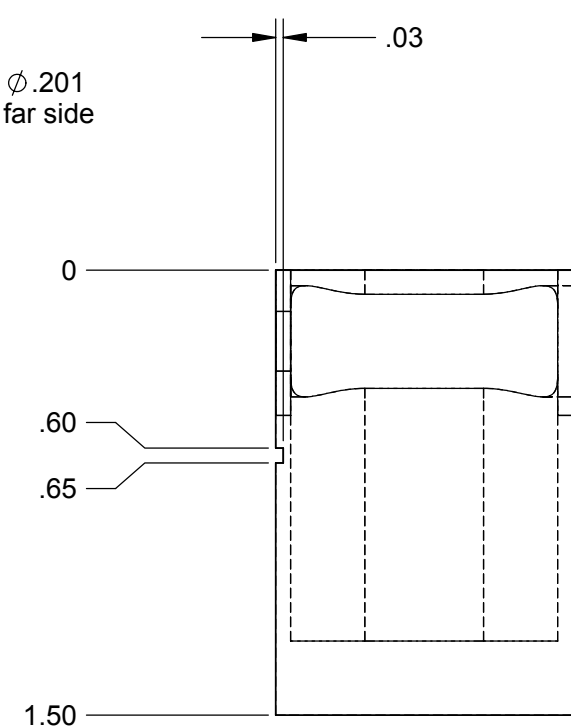
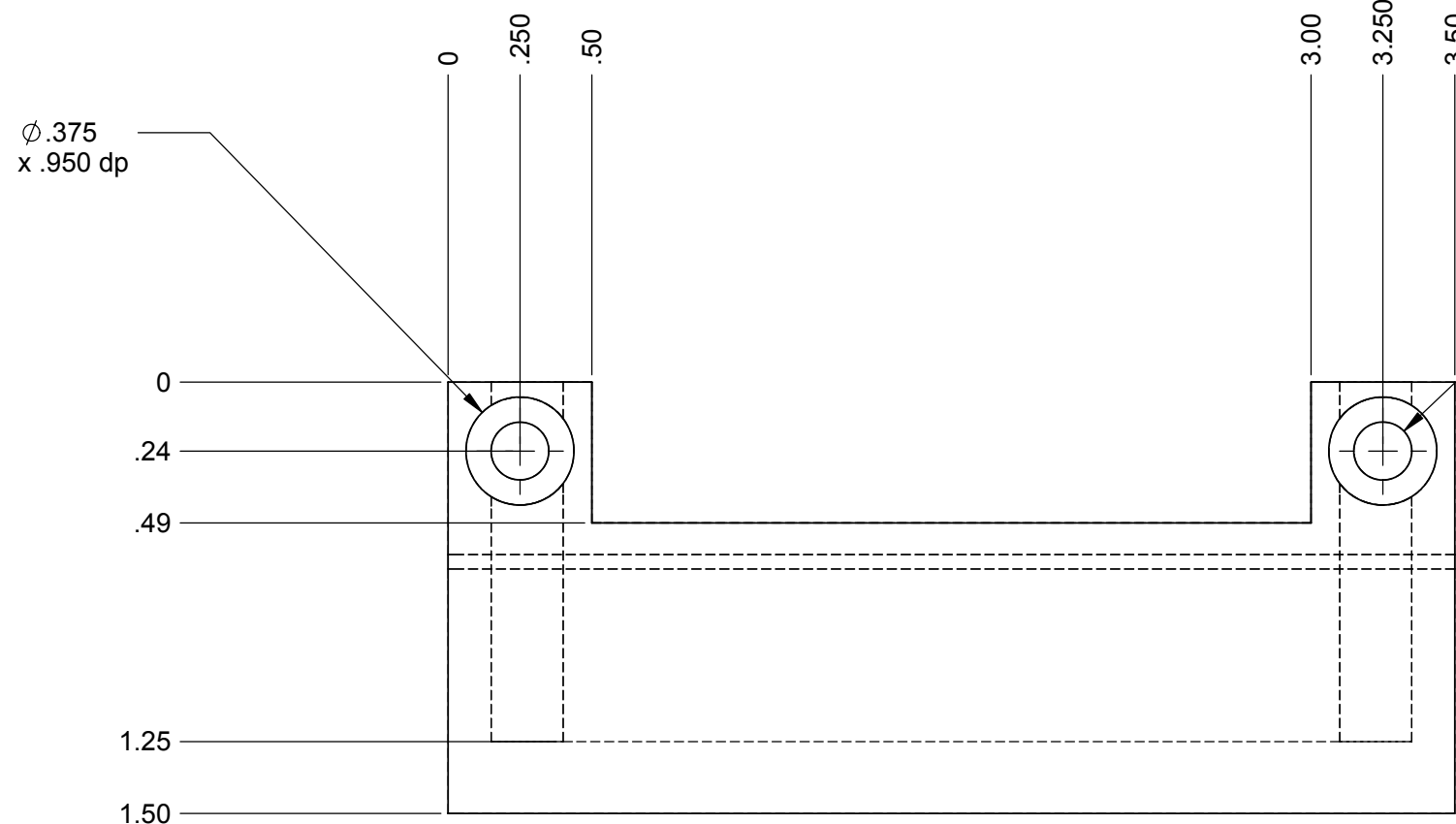


SECTION EF-EF
SCALE 2 : 1

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	LIGO	
TOLERANCES:		Fall' 02	Hammond	SYSTEM LASTI	
.XX ± 0.020"		8/12/03	Spielid	SUB-SYSTEM HEPI	
.XXX ± 0.005"		2/9/03	Kern	NEXT ASSY	
ANGULAR ± 30°				PART NAME HEPI Manifold Large Plug	
MATERIAL		COMMENTS:		SIZE	DWG. NO.
FINISH 120 RMS unless noted				C	D020367
				SCALE:	1:1 unless noted
				Sht. No. 35 / 43	

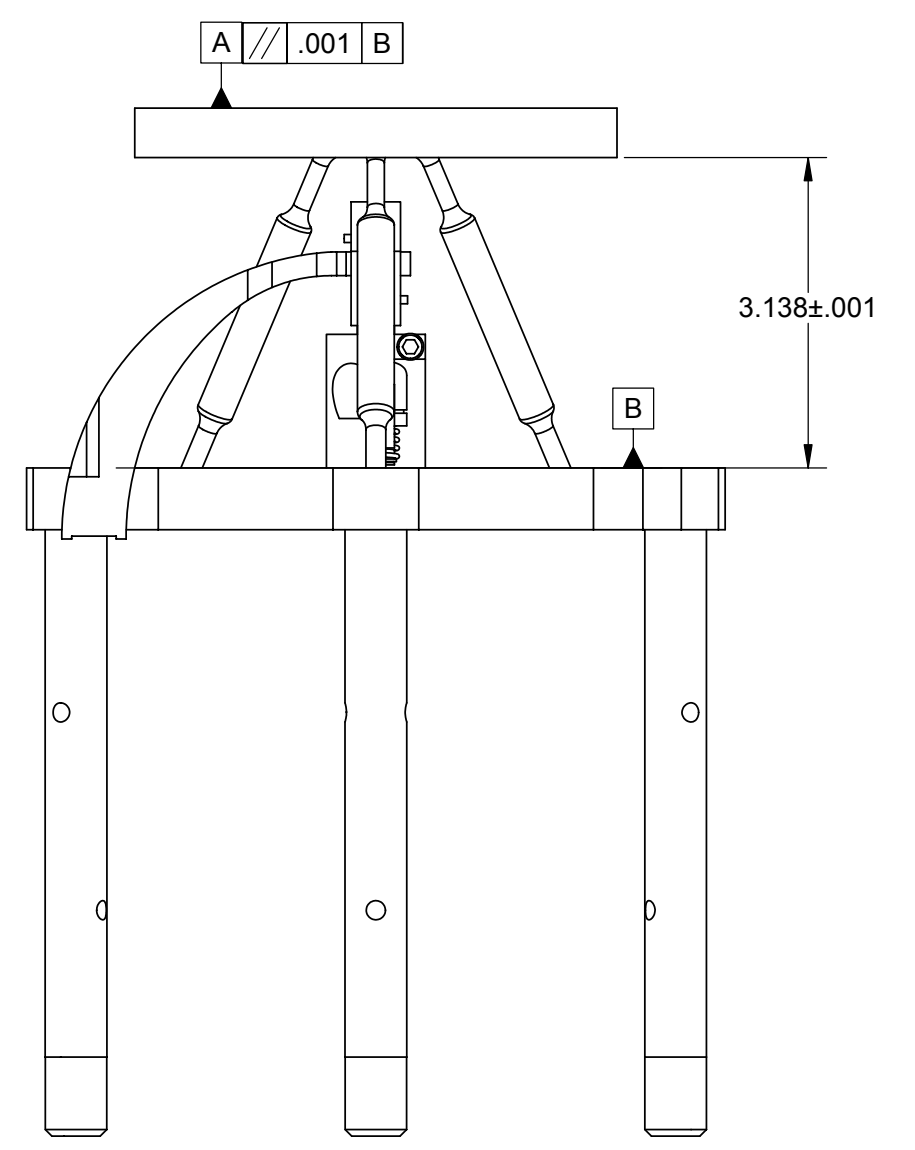
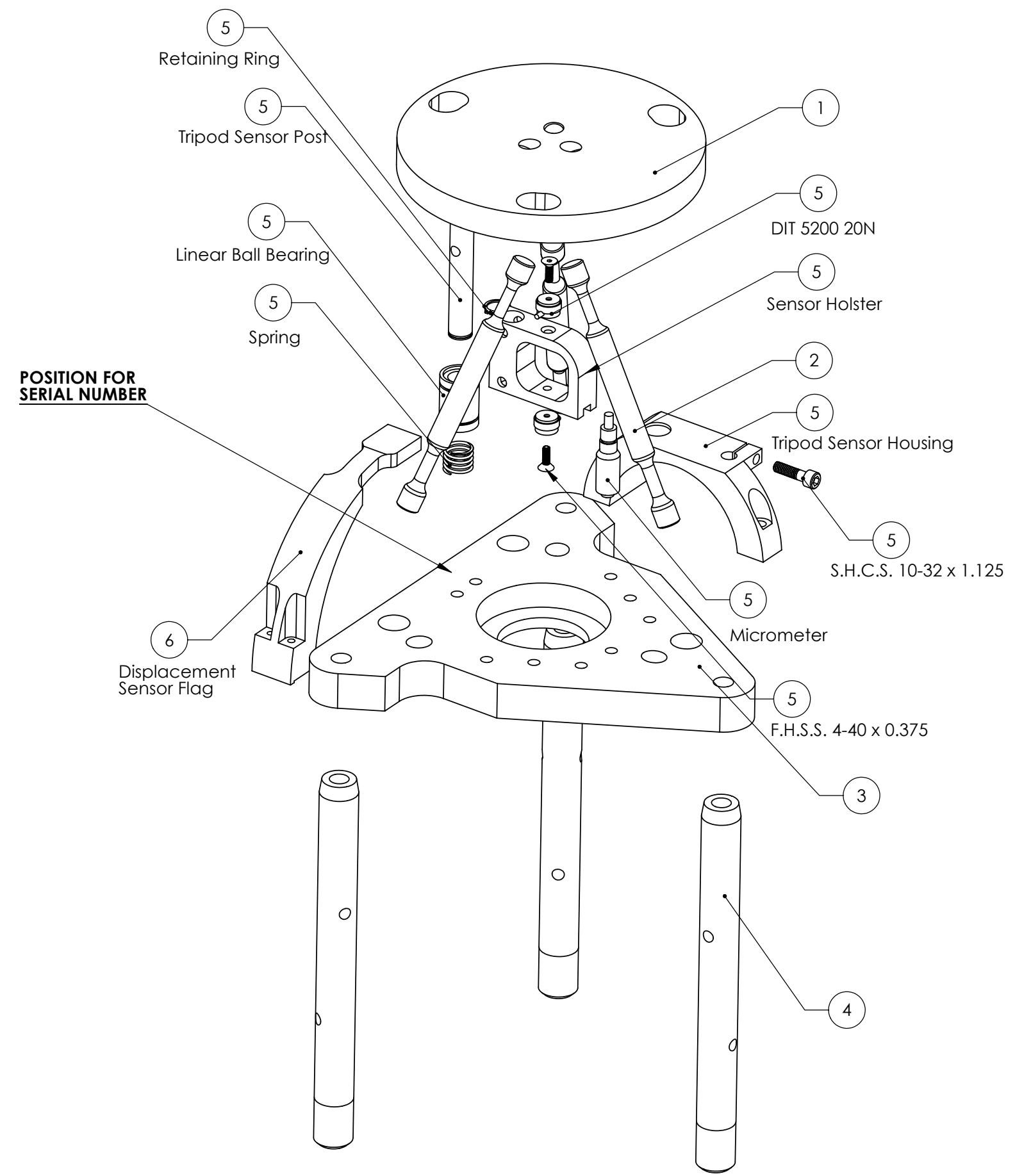
NOTES: (UNLESS OTHERWISE SPECIFIED)

REV.	DATE	DCN #	DRAWING TREE #
A	5/23/02		
B	6/11/03	E030373-00-E	



UNLESS OTHERWISE SPECIFIED:		DATE	NAME	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN 4/02	Hardham	SYSTEM LASTI	
TOLERANCES: .XX ± 0.02"		REDRAWN 5/23/02	Kern	SUB-SYSTEM HEPI	
.XXX ± 0.005"		REDRAWN 6/11/03	Spjeld	NEXT ASSY	
ANGULAR ± 30°		CHECKED 2/9/03	Kern	PART NAME HEPI Oil Catch Horiz & Vert	
MATERIAL	ALUM 6061-T6 Anodized Clear	COMMENTS: 1 Required for each actuator		SIZE DWG. NO.	REV B
FINISH	120 RMS unless noted	SCALE:		2 : 1	Sht. No. 36 / 43

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	7/16/03	E030373-00-E	

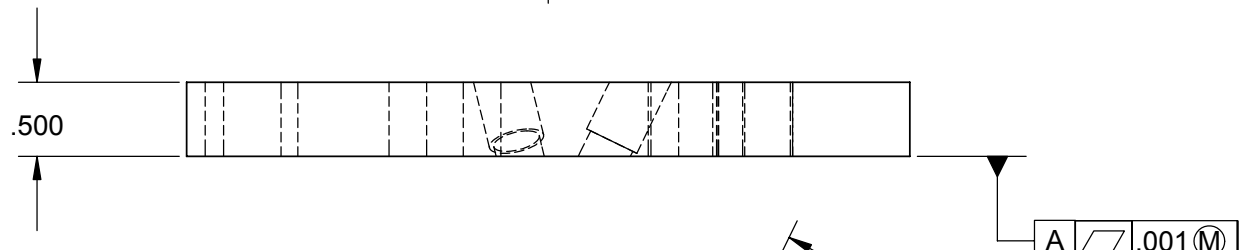
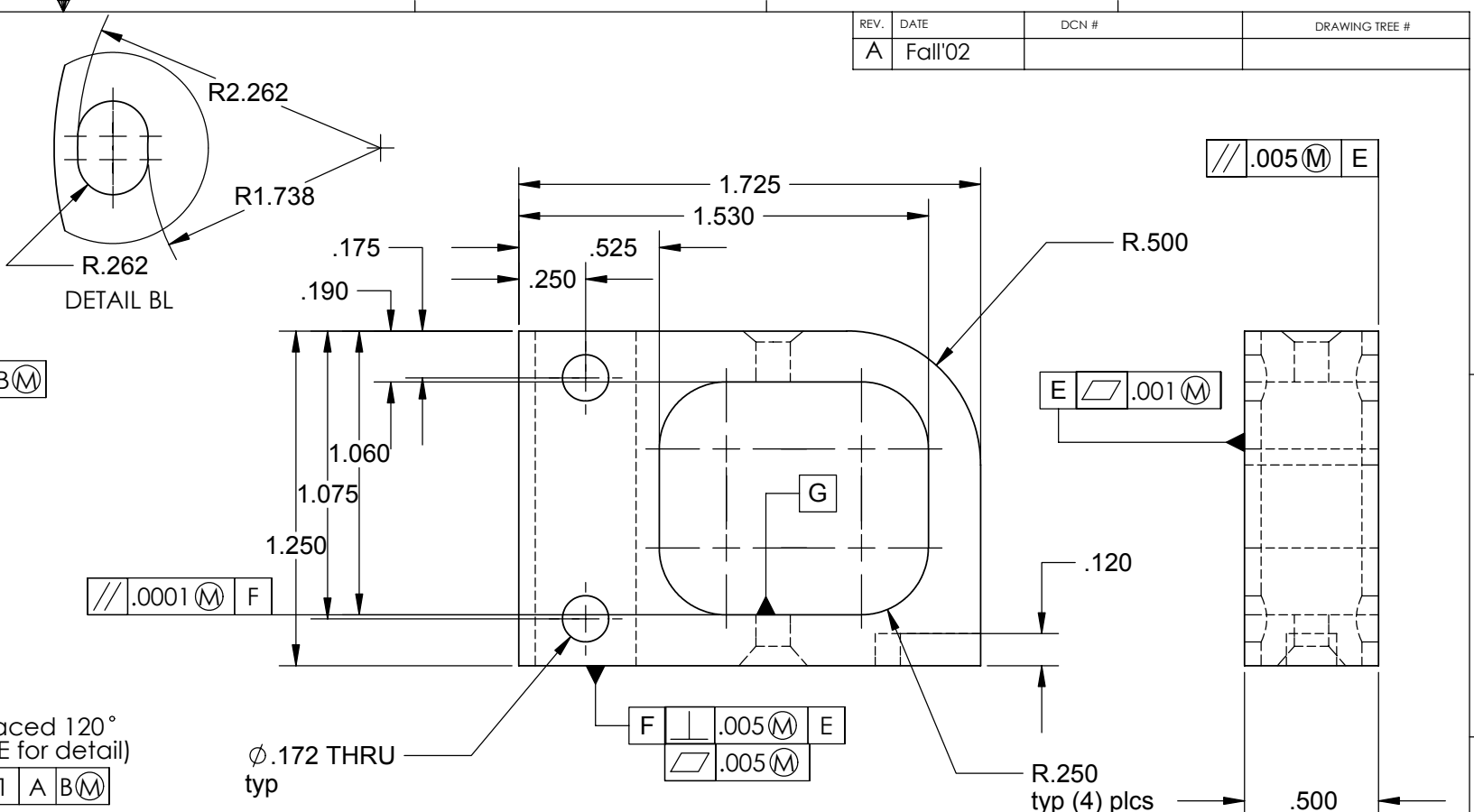
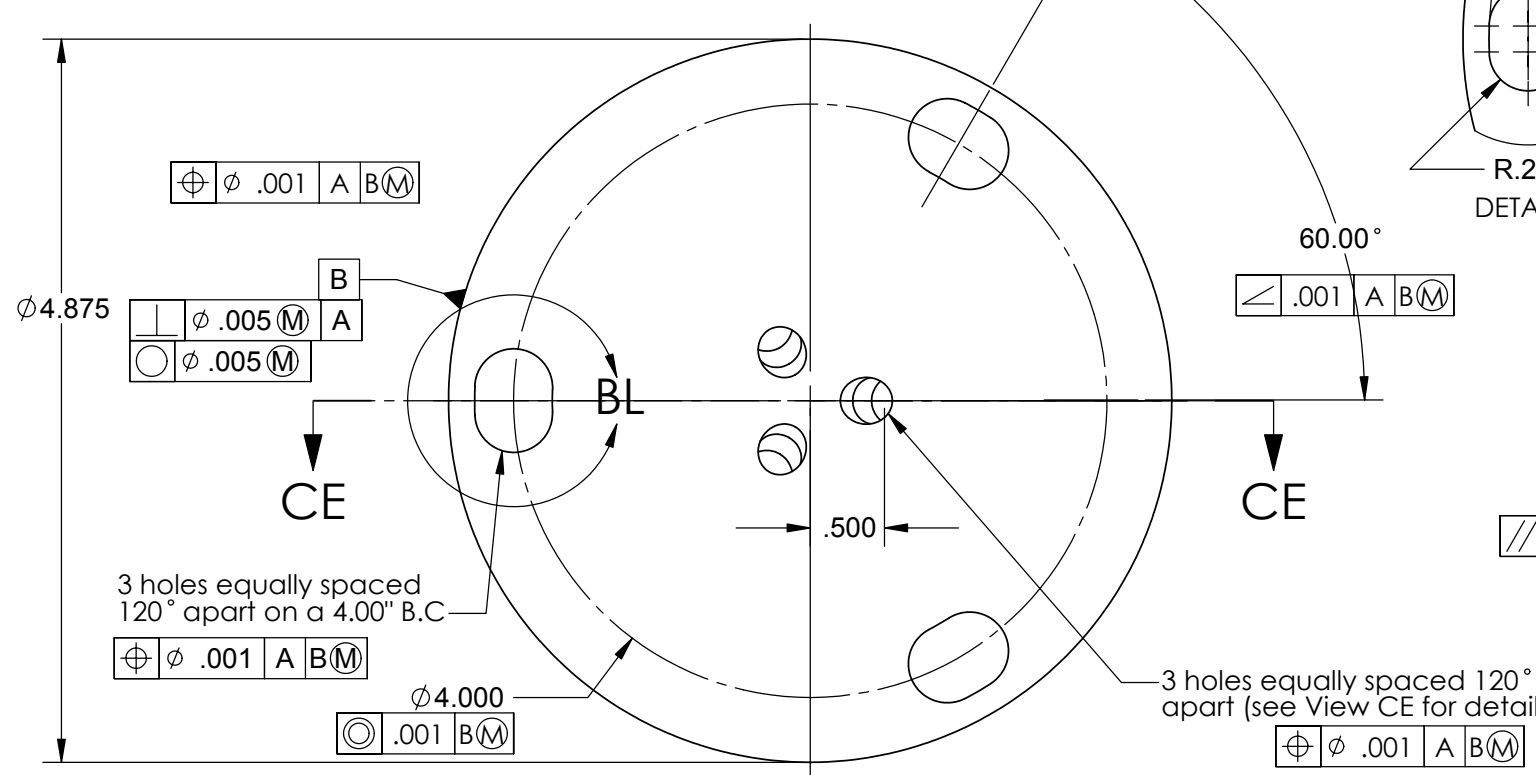


NOTE:
ASSEMBLE IN FIXTURE, TACK WELD 6 SPOTS
AND VACCUM BRAZE TRIPOD BARS TO
ATTACHMENT PLATE AND TRIPOD BASE

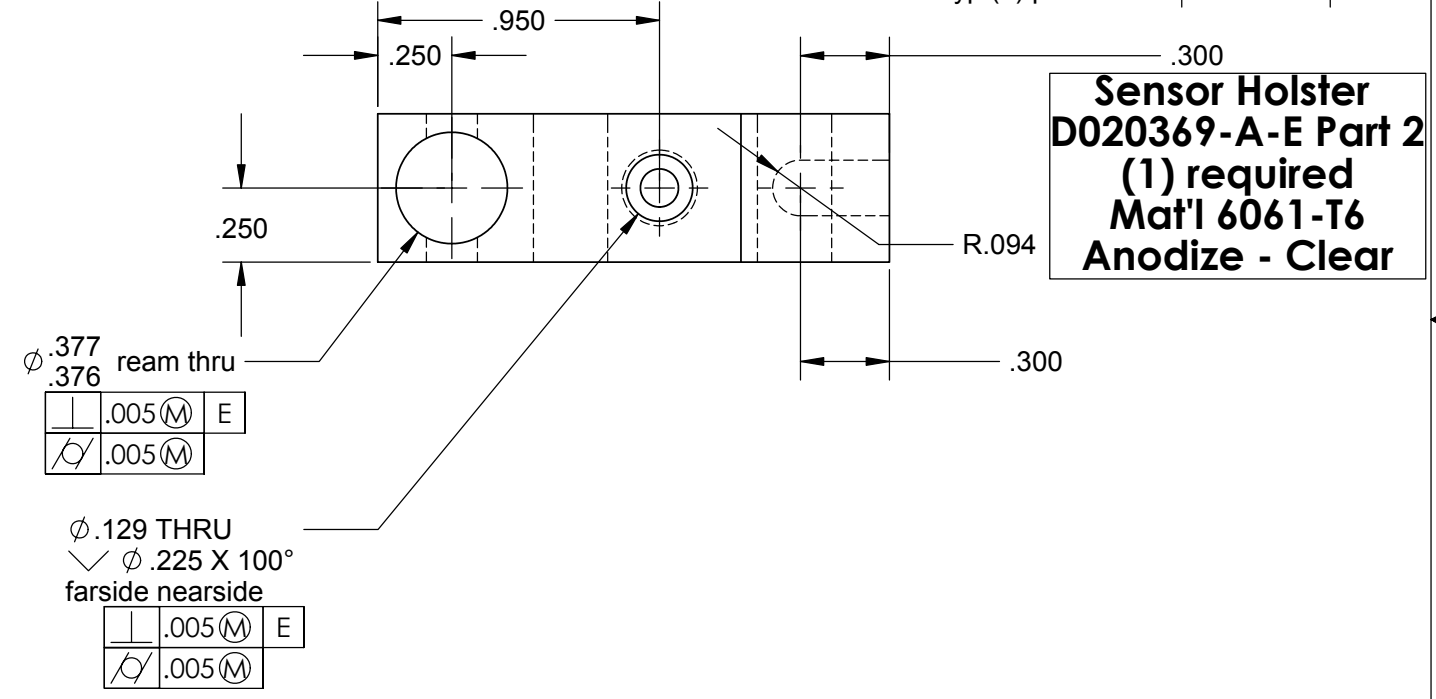
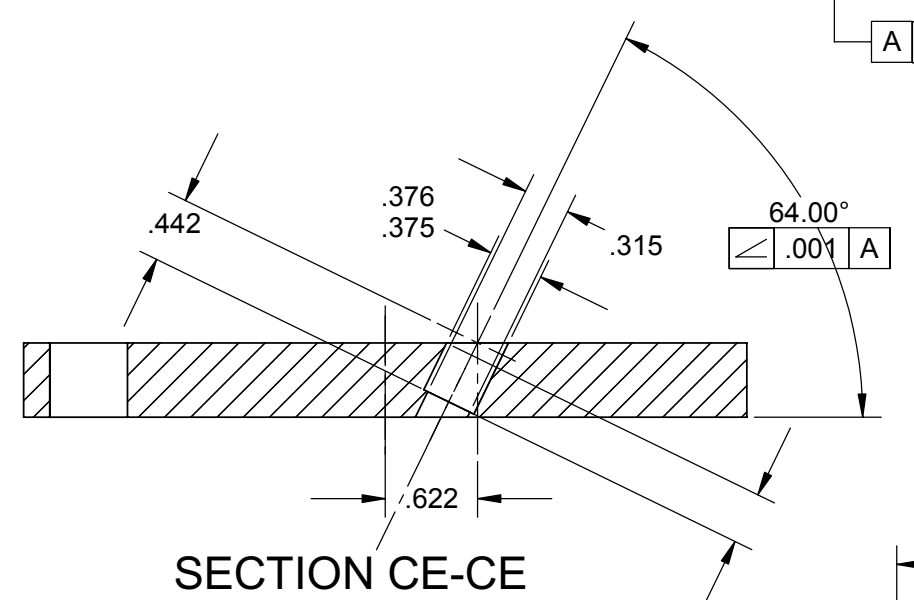
ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
6	1	D030705-A	Quarter Round Displacement Sensor Flag		41
5	1	D020368-B	TRIPOD DISPLACEMENT ASSEMBLY		37
4	3	D020371-B	TRIPOD VERTICAL POST		39
3	1	D020371-B	TRIPOD BASE		39
2	3	D020369-A	TRIPOD BAR		38
1	1	D020369-A	ATTACHMENT PLATE		38

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES	DRAWN	4/02	Hardham	
TOLERANCES: :XX ± 0.020"	REDRAWN	Fall' 02	Hammond	
:XXX ± 0.005"	REDRAWN	7/16/03	Spjeld	
ANGULAR ± 30°	CHECKED	2/9/03	Kern	SYSTEM LASTI SUB-SYSTEM HEPI NEXT ASSY PART NAME HEPI Tripod Assembly
MATERIAL	COMMENTS:		SIZE DWG. NO.	REV
FINISH 32 RMS unless noted	1 Required for each actuator		C D020368	B
SCALE: 1:1 unless noted			Sht. No. 37 / 43	

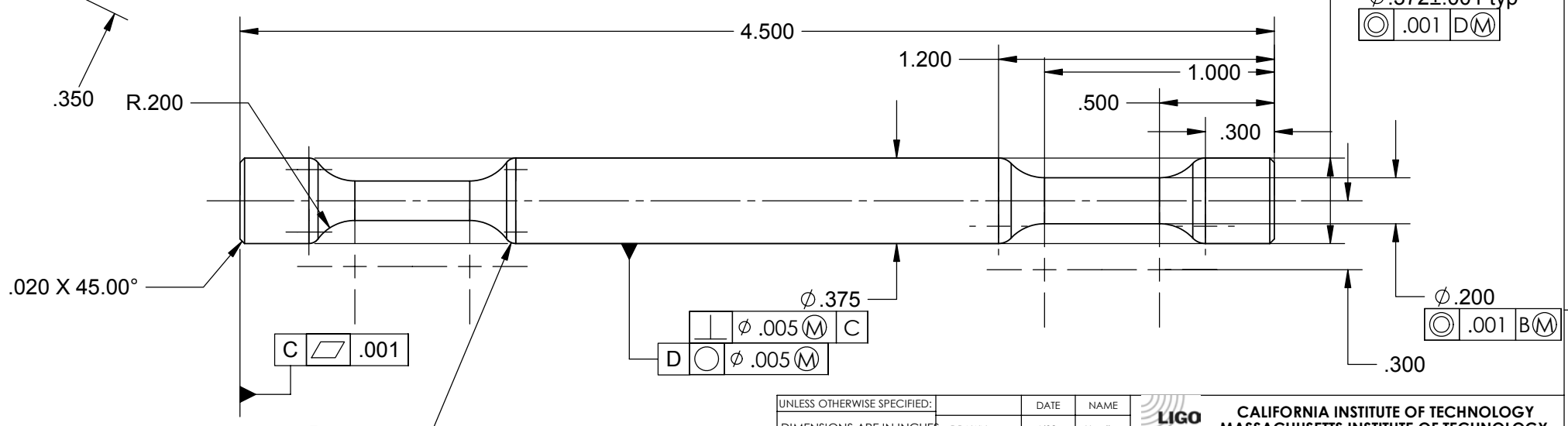
REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



**Attachment Plate
D020369-A-E Part 1
(1) required
Mat'l 304 L**



**Sensor Holster
D020369-A-E Part 2
(1) required
Mat'l 6061-T6
Anodize - Clear**

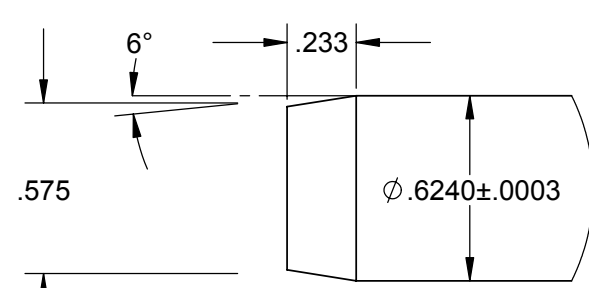
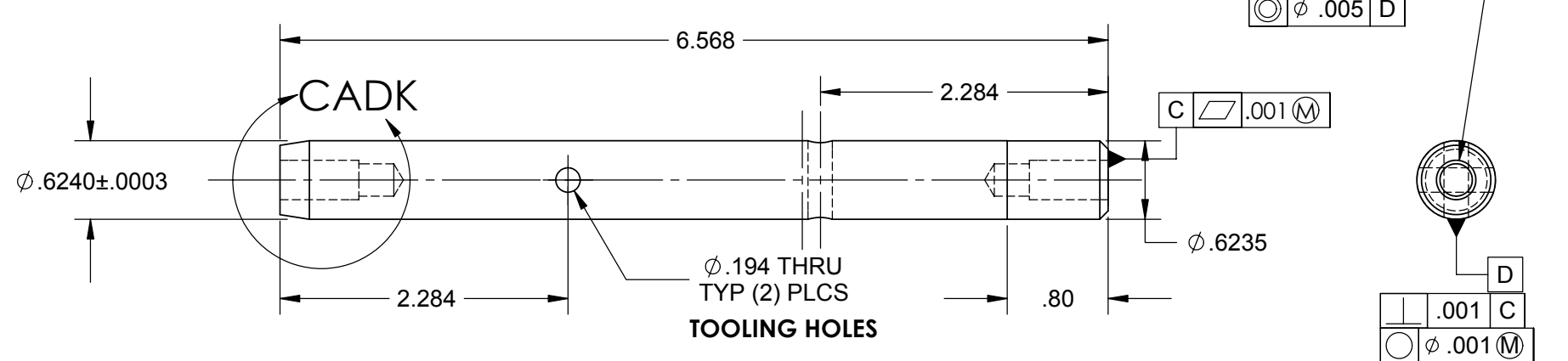
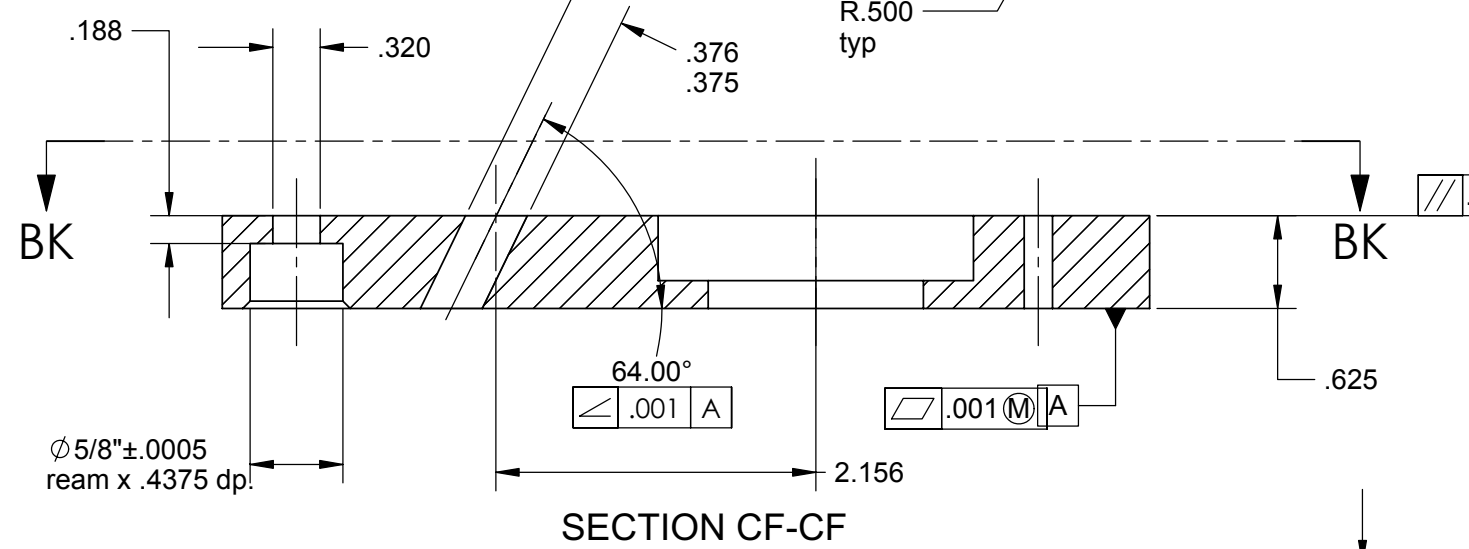
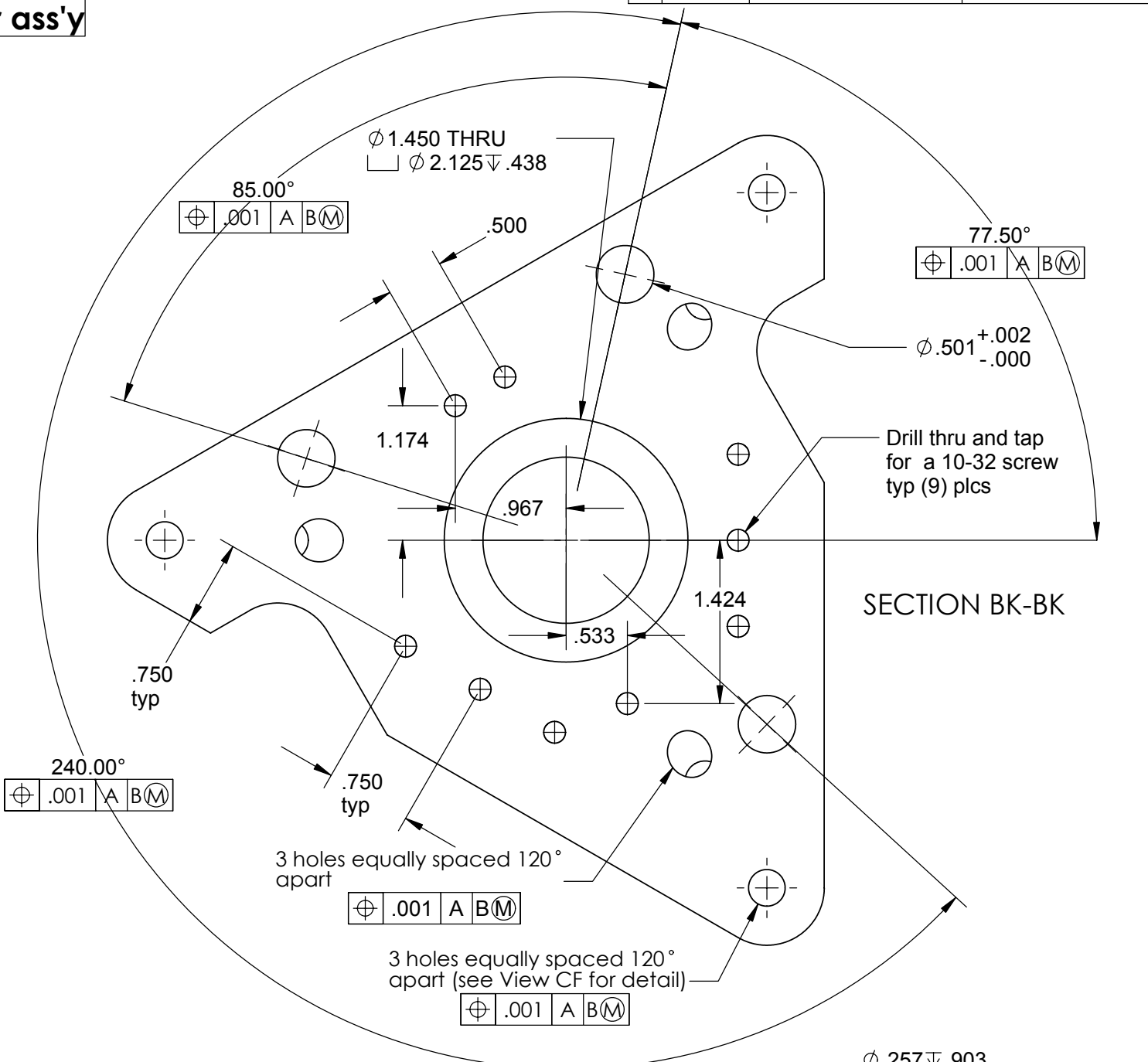
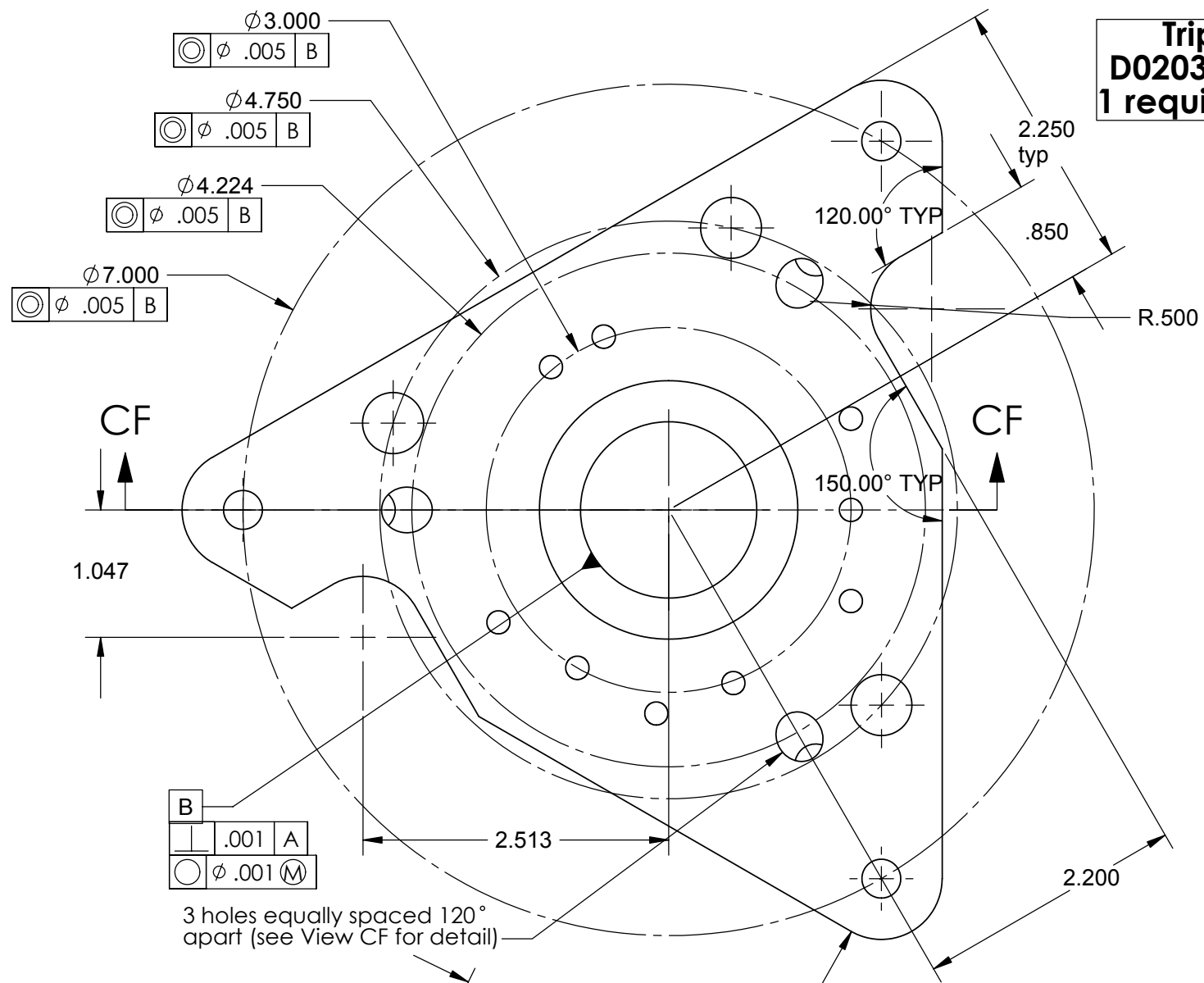


**Tripod Bar
D020369-A-E Part 3
(3) required
Mat'l 304 L**

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES: .XX ± 0.020 "		Fall'02	Hammond	
.XXX ± 0.005 "		2/9/03	Kern	
ANGULAR $\pm 30'$				SYSTEM LASTI
MATERIAL		COMMENTS:		SUB-SYSTEM HEPI
FINISH 120 RMS unless noted				NEXT ASSY
				PART NAME HEPI Tripod Bar, Attach Plate and Sensor Holster
				SIZE C
				DWG. NO. D020369
				REV A
				SCALE: 1:1 unless noted
				Sht. No. 38 / 43

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		
B	6/11/03	E030373-00-E	

Tripod Base
D020371-B-E Part 1
1 required per ass'y



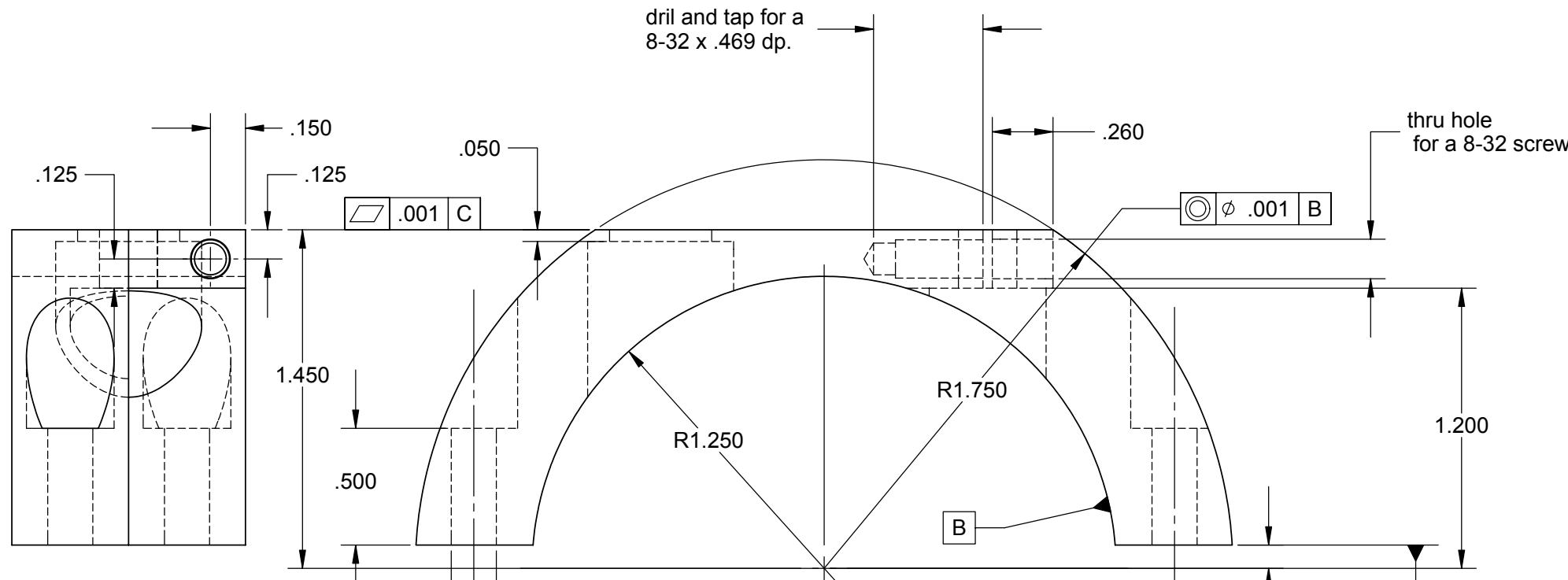
Tripod Vertical Post
D020371-B-E Part 2
3 required per ass'y

UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		4/02	Hardham	SYSTEM	LASTI
TOLERANCES: .XX ± 0.010"		Fall' 02	Hammond	SUB-SYSTEM	HEPI
.XXX ± 0.005"		6/11/03	Spjeld	NEXT ASSY	
ANGULAR ± 30°		CHECKED	2/9/03	Kern	PART NAME HEPI Tripod Base and Vertical Post
MATERIAL 304 L		COMMENTS:		SIZE DWG. NO.	REV A
FINISH 120 RMS unless noted				C	D020371
				SCALE:	1:1 unless noted
				Sht. No. 39 / 43	

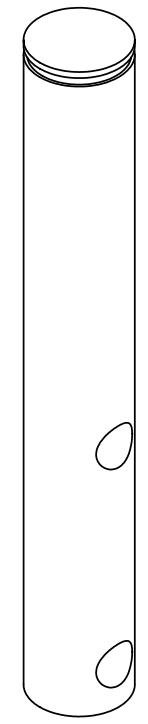
REV.	DATE	DCN #	DRAWING TREE #
A	1/15/03		

drill and tap for a
8-32 x .469 dp.

thru hole
for a 8-32 screw

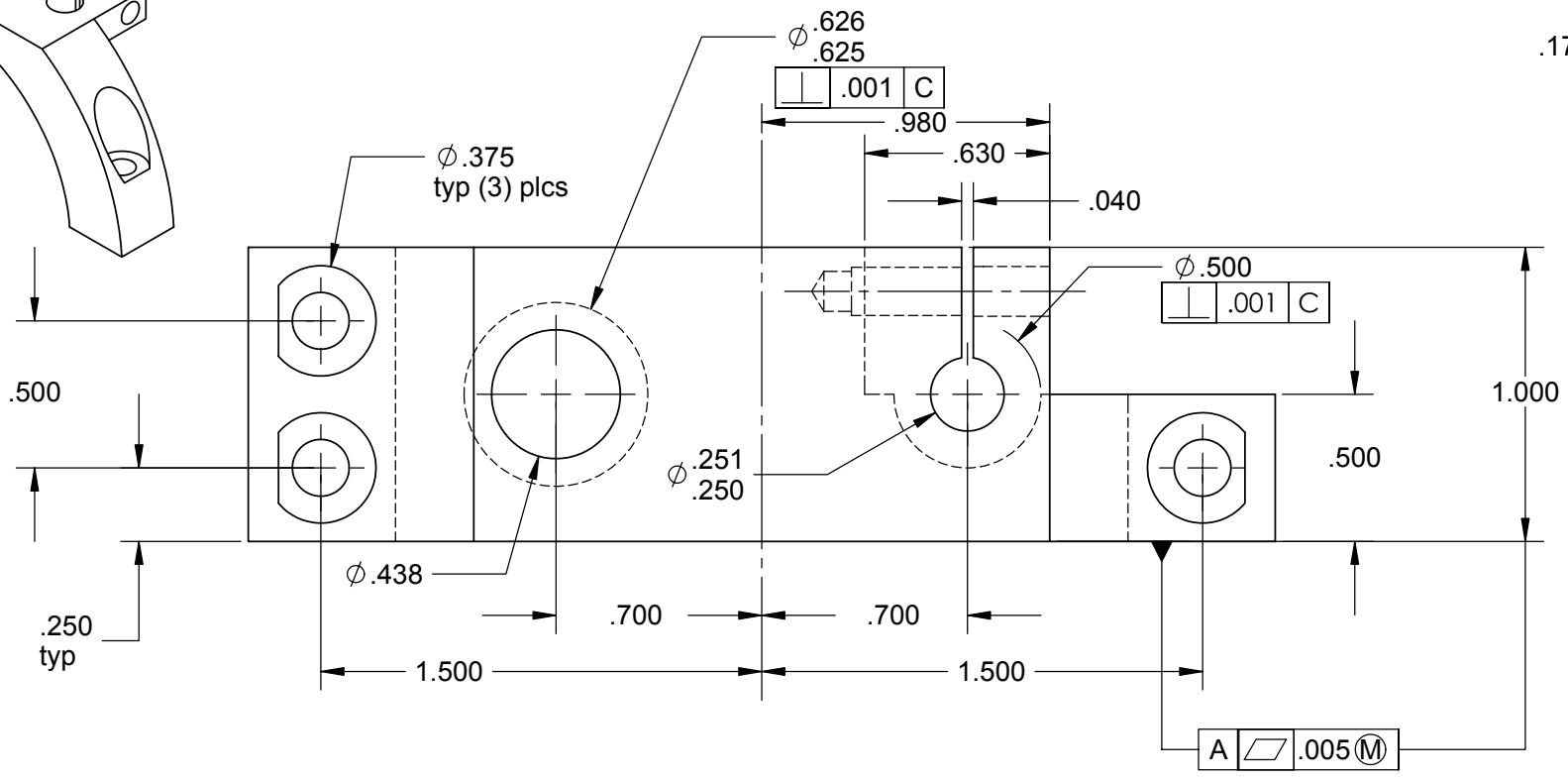
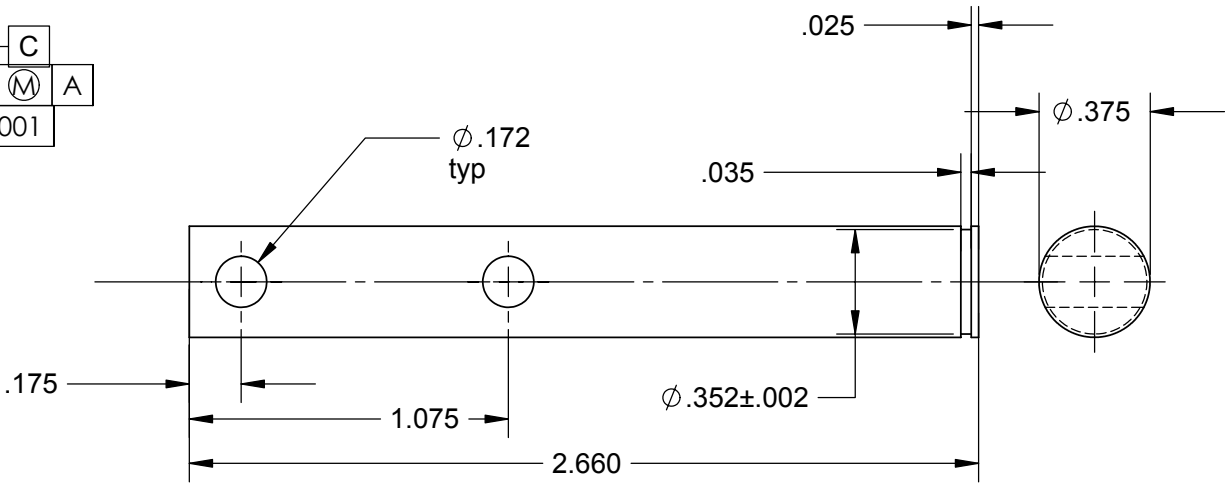
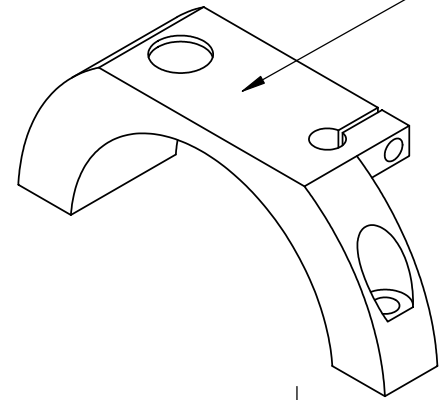


**Tripod
Sensor Post
D020372-A-E Part 2
(1) required
use Thompson Rod
(hardened and ground)**



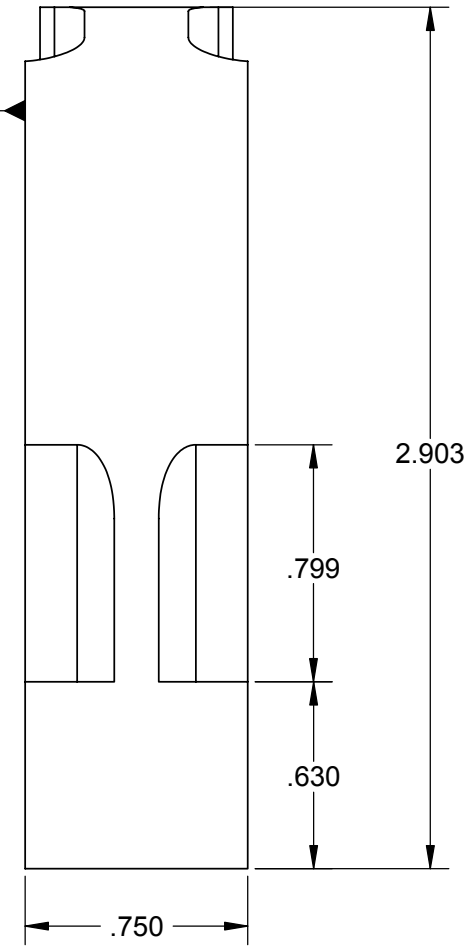
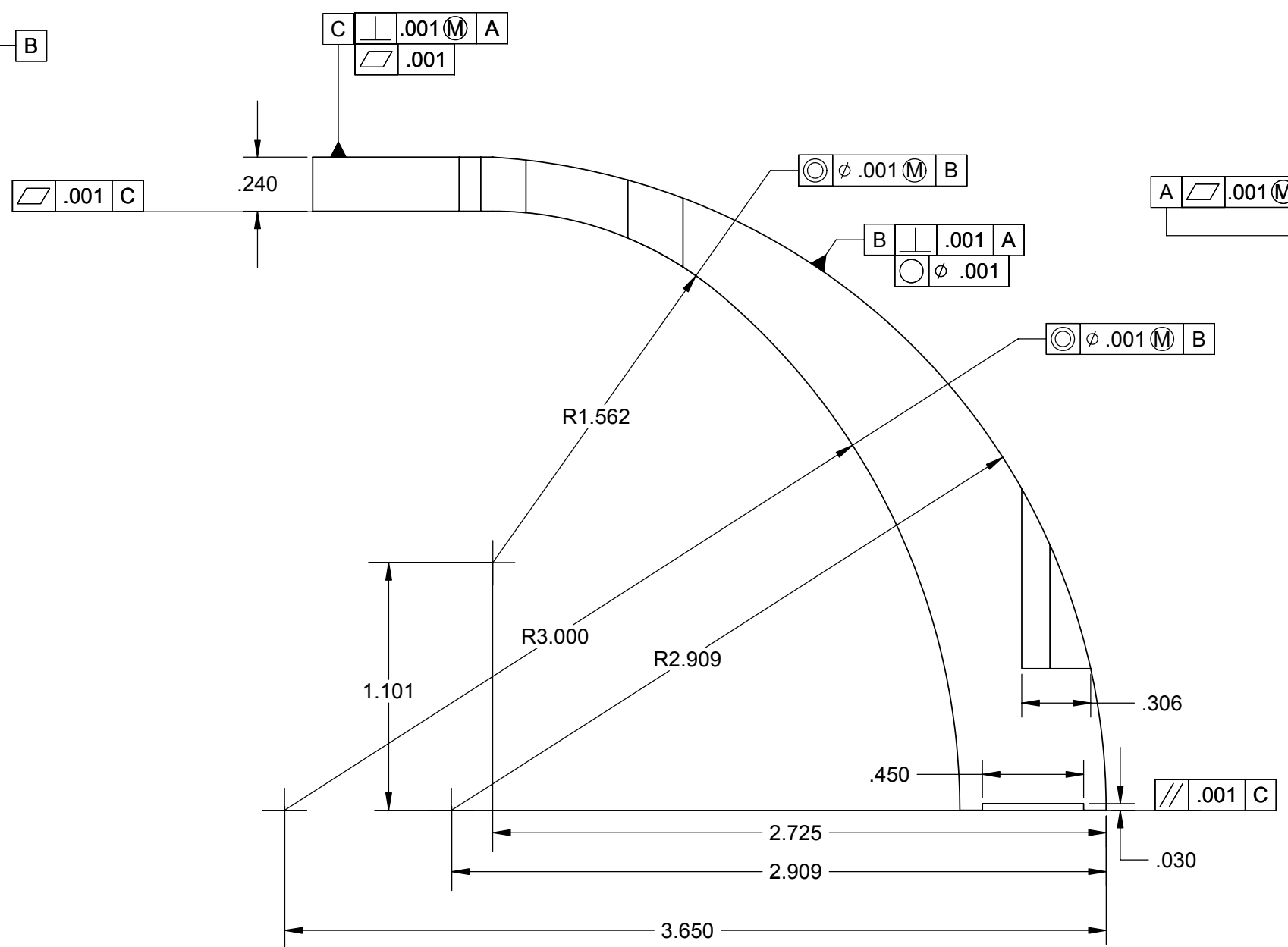
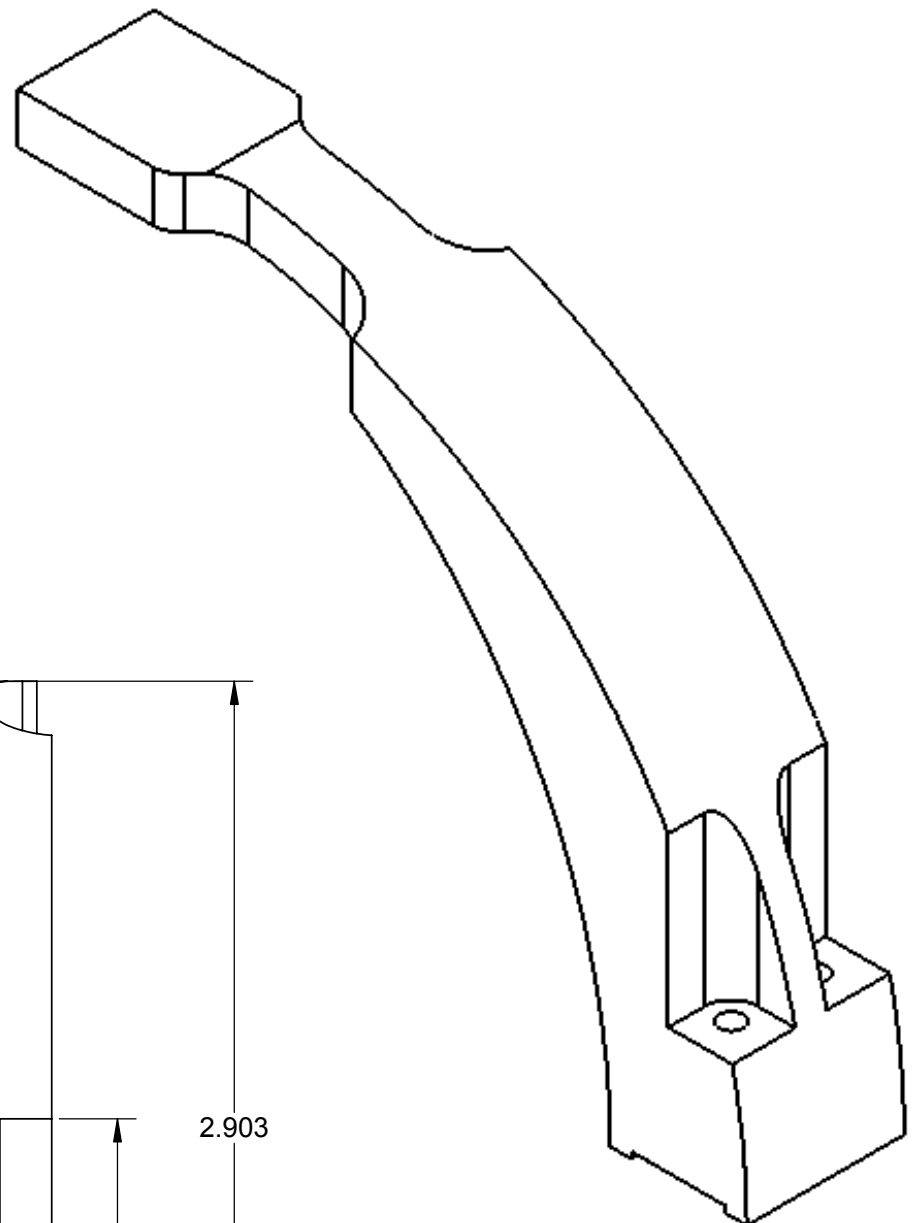
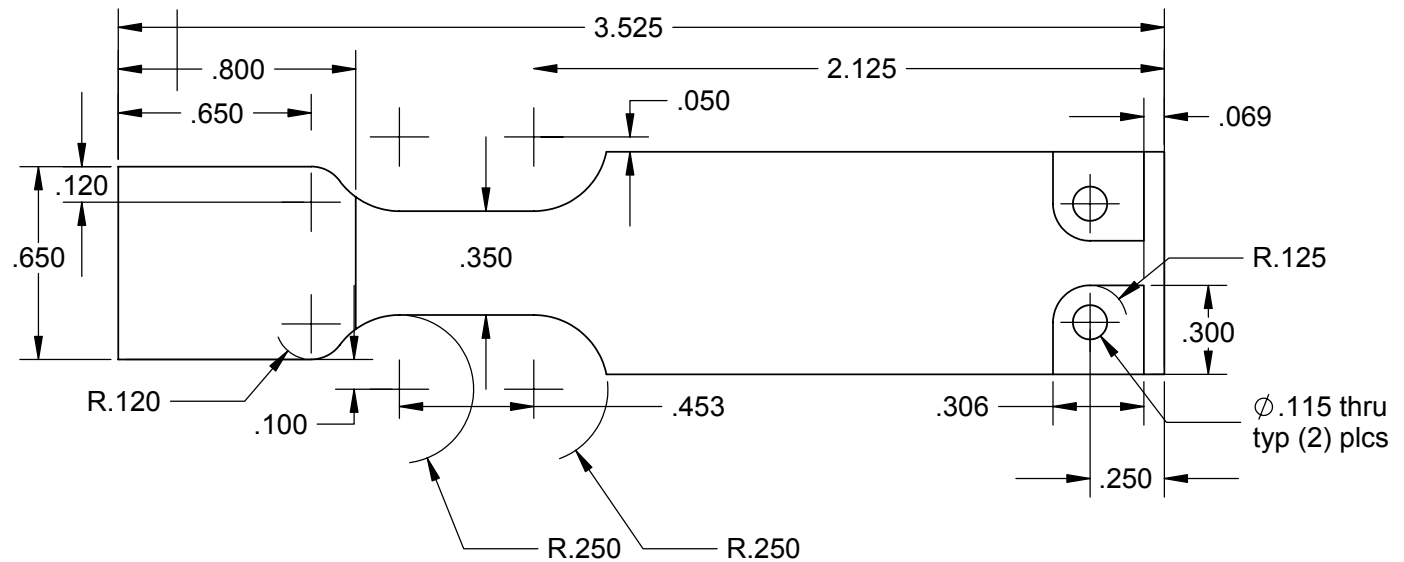
**Tripod
Sensor Housing
D020372-A-E Part 1
(1) required
mat'l: Al 6061-T6
Anodize - Clear**

POSITION OF PART NO.



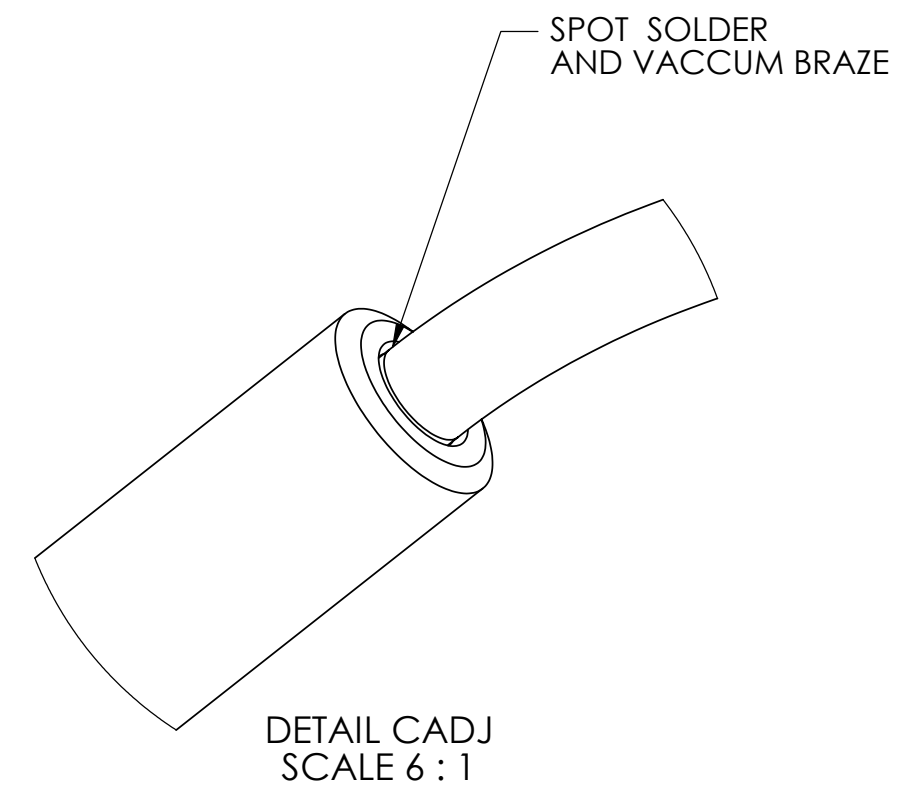
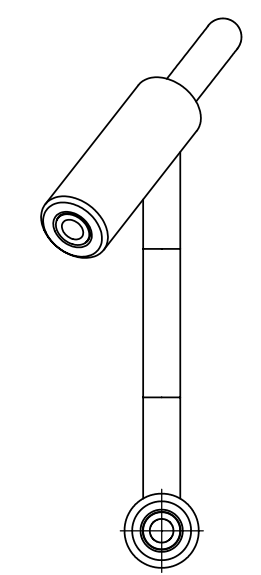
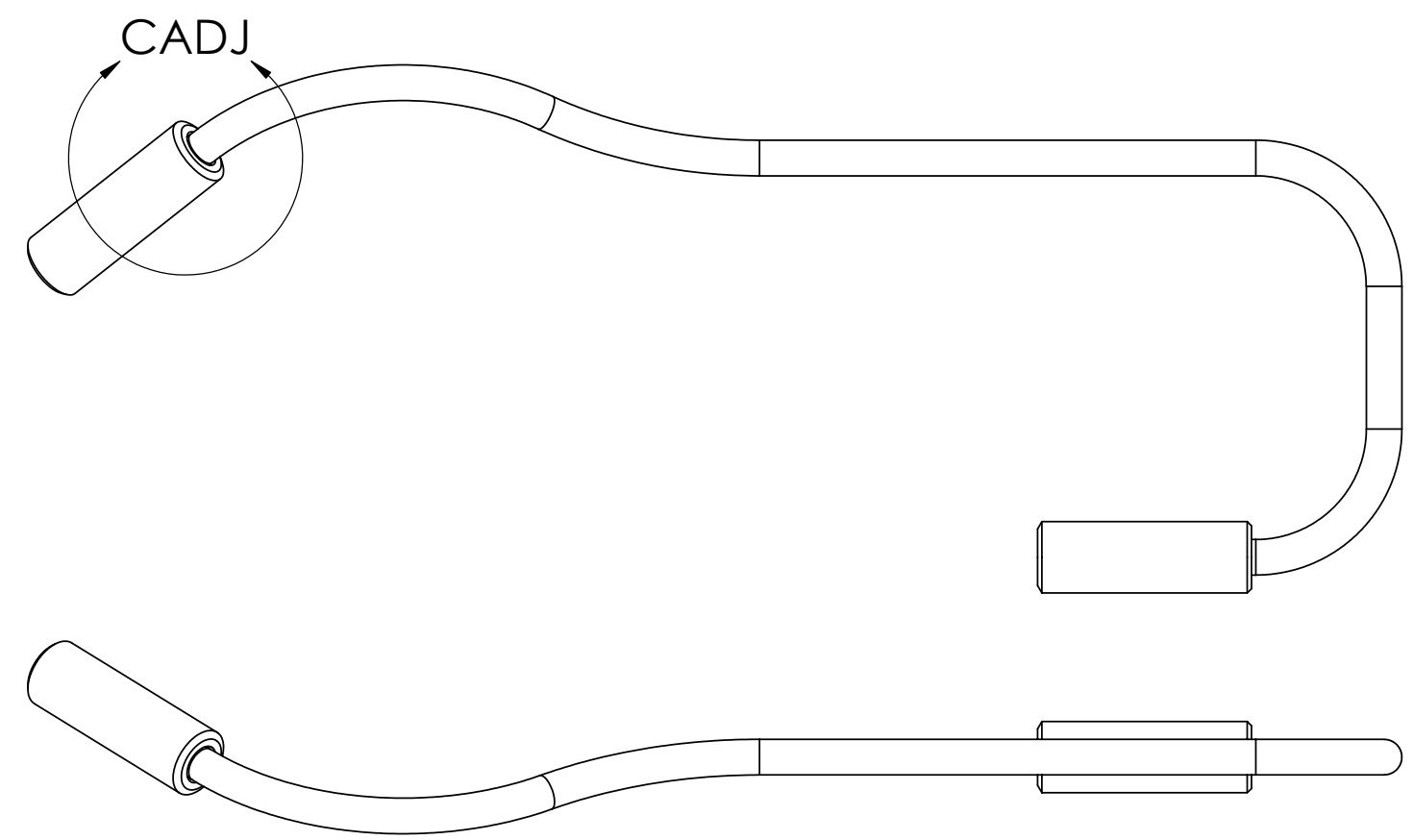
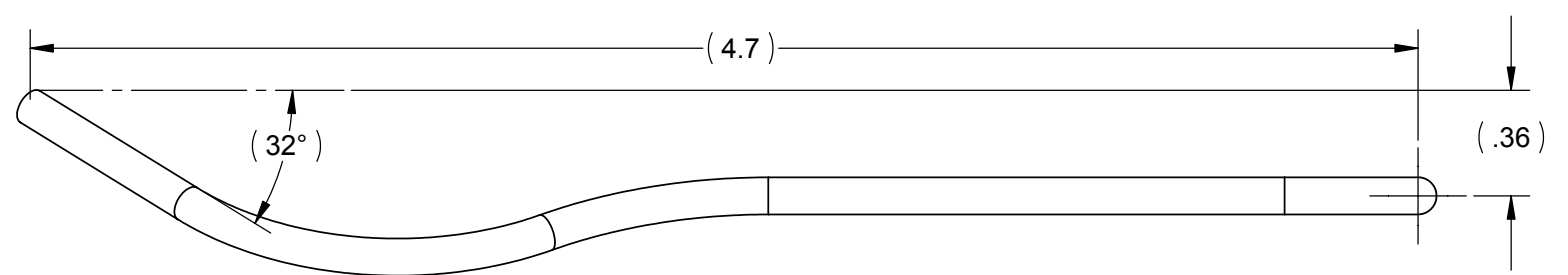
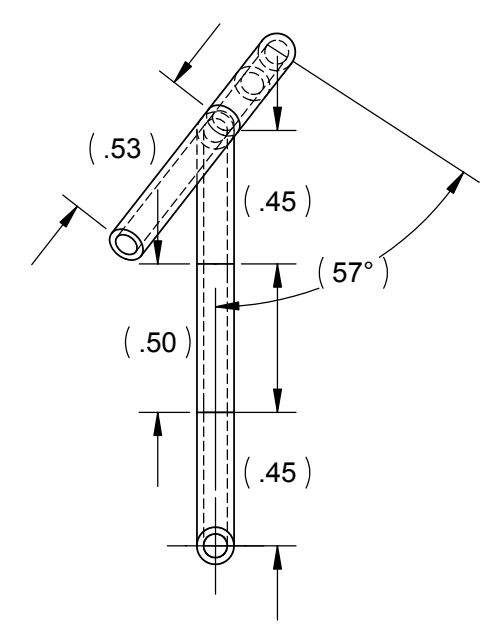
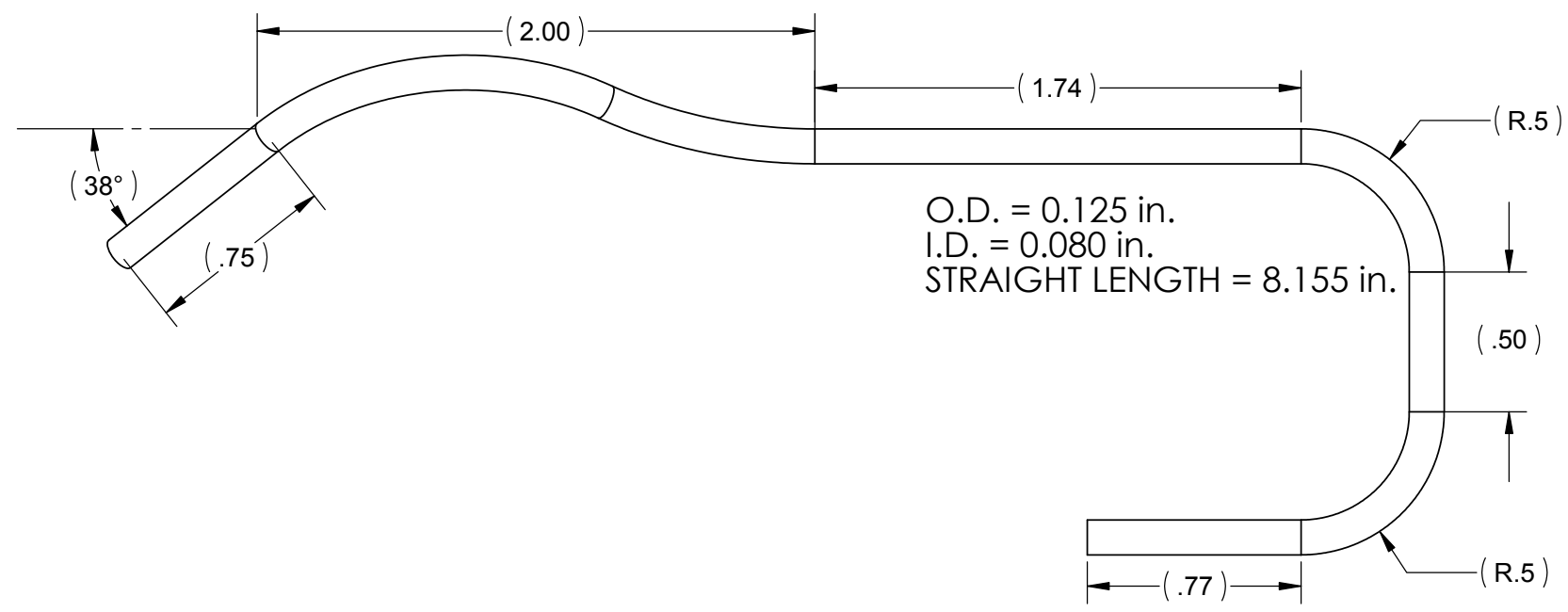
UNLESS OTHERWISE SPECIFIED:		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DIMENSIONS ARE IN INCHES		4/02	Hardham	
TOLERANCES: .XX ± 0.010"		REDRAWN	1/15/03	Hammond
.XXX ± 0.005"		CHECKED	2/9/03	Kern
ANGULAR ± 30'				
MATERIAL	COMMENTS:			
FINISH 120 RMS UNLESS NOTED				
				SYSTEM LASTI SUB-SYSTEM HEPI NEXT ASSY PART NAME HEPI Tripod Sensor Housing and Sensor Post
			SIZE DWG. NO. C D020372	REV A
			SCALE: 1:1 UNLESS NOTED	Sht. No. 40 / 43

REV.	DATE	DCN #	DRAWING TREE #
A	Fall'02		



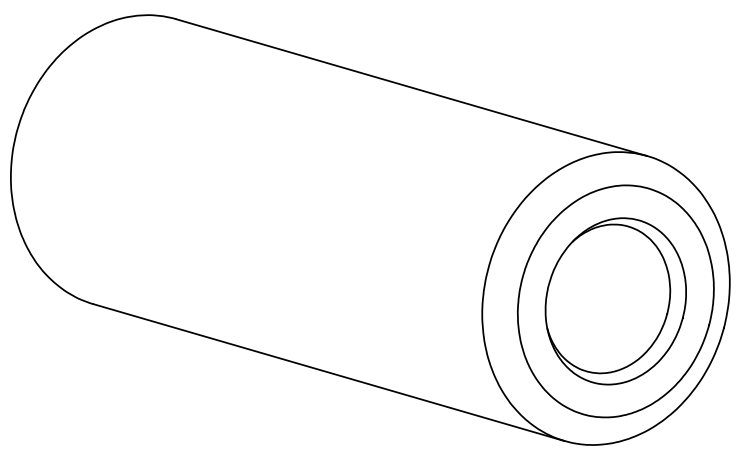
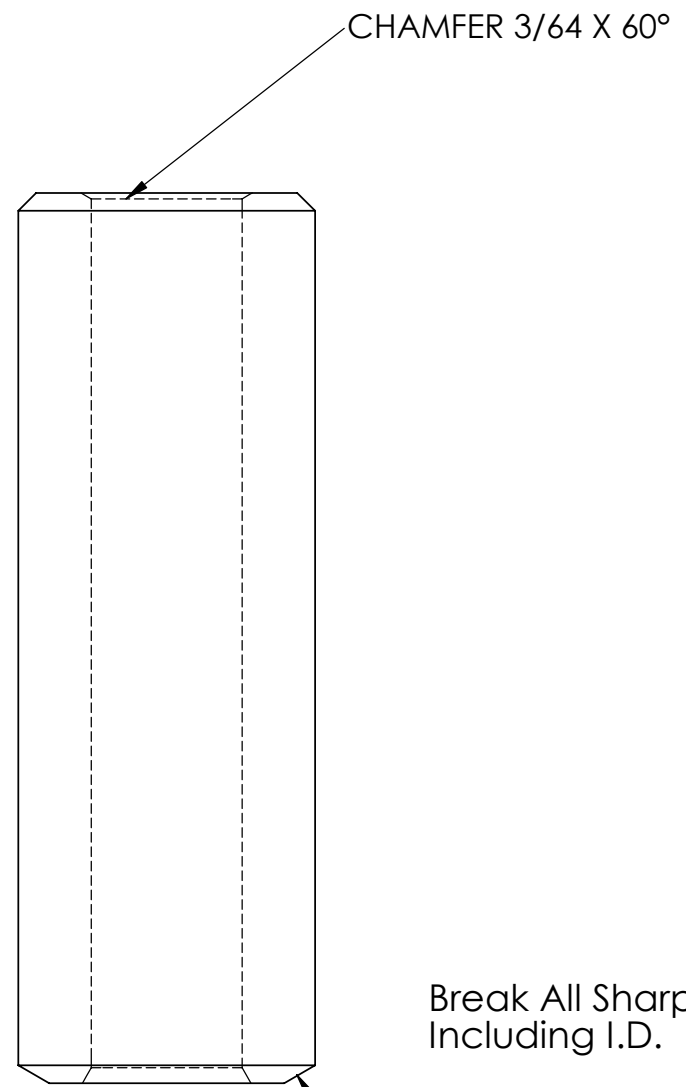
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES		DATE	NAME	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
TOLERANCES: .XX ± 0.020"		DRAWN	4/02		Hardham
.XXX ± 0.005"		REDRAWN	Fall' 02		Hammond
ANGULAR ± 30°		CHECKED	2/9/03		Kern
MATERIAL		REDRAWN	6/28/04	Spjeld	SYSTEM LASTI SUB-SYSTEM HEPI NEXT ASSY PART NAME HEPI Quarter Round Displacement Sensor Flag
FINISH 120 RMS unless noted		COMMENTS: ANODIZE COLOR: CLEAR		SIZE DWG. NO. D030705 REV A SCALE: 2:1 unless noted Sht. No. 41 / 43	

REV.	DATE	DCN #	DRAWING TREE #
	6/11/03	E030373-00-E	



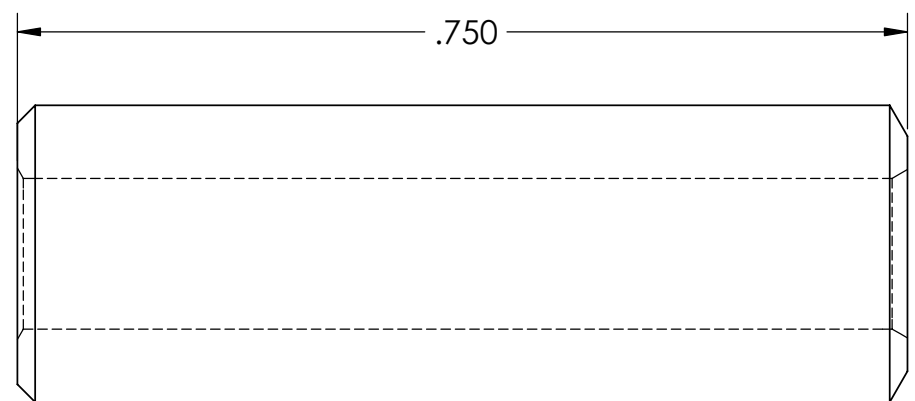
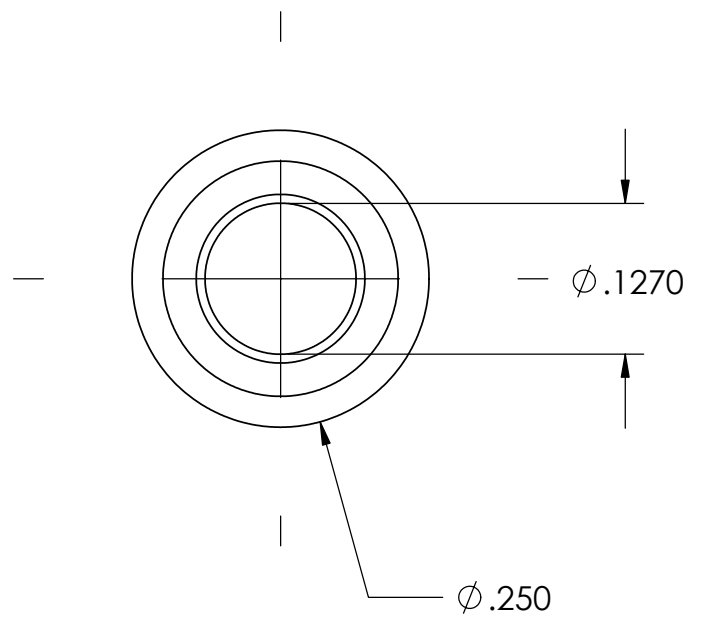
2	2	D020373-00	ACTUATOR BLEED TUBE INSERT SLEEVE		43
1	1	D020374-00	ACTUATOR BLEED TUBE		42
ITEM NO.	QTY.	PART NO.	DESCRIPTION	MATERIAL / VENDOR	SHT. NO.
UNLESS OTHERWISE SPECIFIED:					
DIMENSIONS ARE IN INCHES			DATE	NAME	
TOLERANCES:			6/25/03	Spjeld	
.XX ± 0.020"			CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
.XXX ± 0.005"					
ANGULAR ± 30°					
MATERIAL			COMMENTS:		
FINISH 120 RMS unless noted			One (1) bleed tube assembly required per actuator assembly		
			SIZE	DWG. NO.	REV
			C	D020374	A
			SCALE:	2:1	Sht. No. 42 / 43


REV.	DATE	DCN #	DRAWING TREE #
	6/11/03	E030373-00-E	



Break All Sharp Corners Including I.D.

CHAMFER 3/64 X 60°



UNLESS OTHERWISE SPECIFIED:		DATE	NAME	 CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
DIMENSIONS ARE IN INCHES		DRAWN	6/25/03	Spjeld	
TOLERANCES:		SYSTEM LASTI			
.XX ± 0.020"		SUB-SYSTEM HEPI			
.XXX ± 0.005"		NEXT ASSY			
ANGULAR ± 30'		PART NAME HEPI Actuator Bleed Tube Insert Sleeve			
MATERIAL	304 L	COMMENTS:		SIZE	DWG. NO.
FINISH	32 RMS unless noted	Two (2) required per actuator assembly		C	D020373
				SCALE:	8:1 unless noted
				Sht. No. 43 / 43	