LIGO LABORATORY
California Institute of Technology
1200 E. California Blvd.
Pasadena, CA 91125

Statement of Work
AO-523 TMS Top Mass Machined Components
LIGO-C1201789-v2

1.0 Scope (AOS Trans Mon Suspension)

This Statement of Work covers the manufacturing of most machined metal class A components used in each LIGO TMS Suspension assembly and installation. Quantities listed are for 6 TMS assemblies, and include spares. Manufacturing is according to LIGO Specification E0900364-v8 wherever applicable.

2.0 Document Access

Many supplemental documents and specifications are incorporated into and made a part this Statement of Work. Click on the document links to access these documents from the LIGO Document Control Center (DCC) or go on line to the LIGO Public DCC at https://dcc.ligo.org/ to access the DCC#.

3.0 Commercial Terms and Applicable LIGO Specifications:

Note: The documents listed below are invoked for this Statement of Work and comprise additional requirements which are integral to this Statement of Work.

- LIGO-C080185-v1 LIGO Commercial Items or Services Contract General Provisions
- LIGO-Q0900001-v5 Advanced LIGO Supplier Quality Requirements
- LIGO-Q1100003-v1 Acceptable Quality Level (AQL) for Inspection of LIGO Components
- LIGO-E0900364-v8 Metal Components for use in the Advanced LIGO Vacuum System

4.0 Quality System:

Referring to the above referenced LIGO Specification Q0900001, Suppliers should include a copy of their current ISO 9001, AS9100, or TS16949 certification in their bid package. Suppliers lacking current certification should send a copy of their Quality Manual with their bid package.

5.0 Parts to be manufactured, Quantity Required, and Inspection requirements:

Note: refer to Section 8.0 for delivery schedule and location

5.1 AQL Number is 1.0.

5.2 All tapped holes (100%) must be gauged.

Item #	Part Number	Rev	Description	Material	Set 1	Set 2	TOTAL
1	D060315	C	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, TABLECLOTH PINCH PLATE, UPPER STRUCTURE	6061-T6 Al	12	12	24
2	D060318	E	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, OSEM AND ECD MOUNTING BRACKET (LOCAL CONTROLS)	6061-T6 Al	12	12	24
3	D060321	D	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, POSITION ADJUSTER FOR FRONT PITCH OSEM	6061-T6 Al	3	3	6
4	D060323	F	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, TRANSVERSE OSEM POSITION ADJUSTMENT PLATE	6061-T6 Al	3	3	6
5	D060325	F	Advanced LIGO, SUS, TOP STAGE N-P TYPE, ROTATIONAL ADJUSTER, STATIC HALF	304/316 SSTL	6	6	12
6	D060326-0	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, BLADE CLAMP (TOP HALF)	304/316 SSTL	6	6	12
7	D060327-0	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, BLADE CLAMP (BTM HALF)	304/316 SSTL	6	6	12
8	D060328	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, 3/8-16 UNC T NUT Based on Wixroyd 2418.W120	304/316 SSTL	12	12	24
9	D060329	E	Advanced LIGO, SUS, Quad N-Ptype Top Stage, Top Stage STIFF BACK	6061 Al	6	6	12
10	D060330	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, ROTATIONAL ADJUSTER BASE PLATE	304/316 SSTL	6	6	12
11	D060331	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, JACKING SCREW/Earthquake Stop	304/316 SSTL	20	20	40
12	D060333	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, WIRE CLAMP BODY, TOP STAGE	304/316 SSTL	6	6	12
13	D060336	v4	Advanced LIGO, SUS, Penre MASS Quad N-Ptype, 2MM CAM, OSEM ADJUSTER	PH Bronze	48	48	96
14	D060377	H	Advanced LIGO, SUS, Quad N-Ptype UI MASS, BLADE TIP Z POSITION ADJ (BTM HALF PART 2)	6061-T6 Al	6	6	12
15	D060378	J	Advanced LIGO, SUS, Quad N-Ptype UI MASS, BLADE TIP Z POSITION ADJ (BTM HALF)	304, 316 OR 302 SSTL	6	6	12
16	D060380	J	ADVANCED LIGO, SUS, QUAD N-PTYPE UI MASS, BLADE CLAMP (TOP HALF)	304 SSTL	6	6	12
17	D070140-05	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim	6061-T6 Al	54	54	108
18	D070140-1	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim	6061-T6 Al	54	54	108
19	D070140-2	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim	6061-T6 Al	54	54	108
20	D0901439	B	Top Stage Modified Backbone Member	6061 Al	6	6	12
21	D1000395	v1	aLIGO INTERMEDIATE TOP MASS SPACER	304 SSTL	9	9	18
22	D1000396	v1	aLIGO INTERMEDIATE WIRE CLAMP BODY MIDDLE WIRE	304 SSTL	6	6	12
23	D1000407	v3	aLIGO_OSEMS_INTERMIDIATE_SUPPORT_RIGHT_SIDE_BRACKET	6061-T6 Al	3	3	6
24	D1000408	v3	aLIGO_BOSEMS_INTERMIDIATE_SUPPORT_LEFT_SIDE_BRACKET	6061-T6 Al	3	3	6
25	D1000409	v3	aLIGO_BOSEMS_INTERMIDIATE_SUPPORT_RIGHT_SIDE_TRAY	6061-T6 Al	3	3	6
26	D1000410	v3	aLIGO_BOSEMS_INTERMIDIATE_SUPPORT_LEFT_SIDE_TRAY	6061-T6 Al	3	3	6
27	D1000411	v3	TMS Intermediate OSUM Support Plate, Rear	6061-T6 Al	3	3	6
28	D1001534	v1	Magnetic Plug, BOSEM	416 SSTL	42	42	84
29	D1001697	v1	Magnet Retainer, BOSEM	316 SSTL	42	42	84
30	D1100358	v1	TMS Telescope Mass Attachment Screw	Titanium	100	100	200
31	D1100421	v1	TMS Suspension Tablecloth Plate, Front	6061-T6 Al	3	3	6
32	D1100573	v5	BOSEM Flat Magnet Flag, aLIGO SUS	6061-T6 Al	36	36	72

Item #	Part Number	Rev	Description	Material	Set 1	Set 2	TOTAL
33	D1100574	v3	BOSEM Flat Flag Disk	416 SSTL	36	36	72
34	D1100712-01	v2	TMS Earthquake Stop Screw	316 SSTL	25	25	50
35	D1100712-02	v2	TMS Earthquake Stop Screw	316 SSTL	100	100	200
36	D1100980	v1	ALIGO, QUAD, E.STOP SCREW, SPLIT SHAFT COLLAR	SSTL	6	6	12
37	D1101186	v1	aLIGO SUS .500-13 X 1 SHCS Modified	316 SSTL	60	60	120
38	D1101273	v1	aLIGO SUS Top Mass Stop Bridge	6061-T6 Al	6	6	12
39	D1101511	v1	aLIGO TMS Upper Mass Top Plate	304 SSTL	6	6	12
40	D1101512	v1	aLIGO TMS Upper Mass Bottom Plate	304 SSTL	3	3	6
41	D1101519	v1	aLIGO TMS Top Add Mass Tower	304 SSTL	6	6	12
42	D1101520	v1	aLIGO TMS Upper Roll Trim Mass	304 SSTL	6	6	12
43	D1200312	v1	aLIGO TMS Top Add Mass Bar	304 SSTL	6	6	12
44	D1200327	v1	aLIGO SUS BOSEM Flag Bracket	6061-T6 Al	12	12	24
45	D1200328	v1	aLIGO SUS BOSEM Flag Center Bracket	6061-T6 Al	3	3	6
46	D1200356	v1	aLIGO TMS Mass Spacer	6061-T6 Al	3	3	6
47	D1200404	v1	aLIGO TMS Lower Stage Spring Adjuster Screw	300 SSTL	20	20	40
48	D1200405	v1	aLIGO TMS Upper Pitch Trim Mass	304 SSTL	6	6	12
49	D1200406	v1	aLIGO TMS Spring Stop Screw	300 SSTL	20	20	40
50	D1200420	v1	aLIGO TMS Mass Cable Clamp Bracket	6061-T6 Al	3	3	6
51	D1200426	v1	aLIGO TMS Mass Wire Clamp Adjustment Block	6061-T6 Al	6	6	12
52	D1200427	v1	aLIGO TMS Upper SUS Wire Adjuster	6061-T6 Al	12	12	24
53	D1200431-01	v1	aLIGO TMS Balance Weight	304 SSTL	18	18	36
54	D1200431-02	v1	aLIGO TMS Balance Weight	304 SSTL	18	18	36
55	D1200432-01	v1	aLIGO TMS Small Balance Weight	304 SSTL	18	18	36
56	D1200432-02	v1	aLIGO TMS Small Balance Weight	304 SSTL	18	18	36
57	D1200476	v1	aLIGO TMS Mass Cable Clamp Screw	300 SSTL	20	20	40
58	D1200477	v1	aLIGO TMS Mass Cable Clamp Nut	Nickel-Copper Alloy 400	20	20	40

6.0 Manufacturing:

6.1 Requirements:

Suppliers must refer to the LIGO Specifications referenced in Section 3 for additional, and in some cases, non-industry standard requirements.

6.2 Sub-Contracted Work:

- The Supplier shall be responsible for all sub-contracted work.

6.3 Precedence:

The drawings typically represent the finished part as needed for use in service. There may be requirements on the drawing (such as coatings) which are specifically defined as not the responsibility of the supplier in this SOW. Suppliers should always contact a LIGO representative to resolve any discrepancies uncertainties in the documentation or instructions.

6.4 Special Instructions:

- Parts with material call outs for 5083 Aluminum MUST be manufactured with **6061-T6 Aluminum**.
- All completed parts must consist of 100% virgin material, free of repairs such as plugs or welds.
- All parts are to be 63 µ Ra.
- Part markings may be laser marked or engraved.
- Vendor is responsible for electro-polish processing where specified.
- All tapped holes oversized 0.005" unless 1) there is a call-out for heli-coils 2) there is a specific note that says not oversized.
- LIGO must approve source of all 'make from' parts.

6.5 Exclusions:

- Supplier is NOT responsible for the procurement and installation of Heli-Coils.

7.0 End Item Data Package:

Before delivery of the parts, the Supplier shall provide the following data, as a minimum:

- Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
- Material certifications
- Heat Treat and/or Stress Relief certifications, if applicable
- Electro-polish certifications, if applicable
- Pickle/Passivation certifications, if applicable
- Inspection reports of all dimensional features for the number of parts specified per the AQL number and referenced in the AQL table LIGO-Q1100003-v1 and any other inspection requirements detailed in Section 5 of this SOW
- Certificate of compliance for each part number stating conformance to contract and drawing requirements

8.0 Delivery Requirements:

8.1 Shipping Containers and Packaging:

The contractor is responsible for providing shipping containers and transportation which protects these parts from damage from the transportation environment (weather, handling, accidents, etc.). Mating edges of parts should be especially protected from damage during shipping.

8.2 Shipping Destination(s):

The deliveries are FOB at these destinations, i.e. the Supplier has the responsibility for shipping title and control of goods until they are delivered and the transportation has been completed. The contractor selects the carrier and is responsible for the risk of transportation and for filing claims for loss or damage.

These items will be shipped to:

LIGO Livingston Observatory (LLO)
Attn: Valera Frolov
19100 LIGO Lane
Livingston, LA 70754

LIGO Hanford Observatory (LHO)
Attn: Cheryl Vorvick
127124 North Route 10
Richland, WA 99354

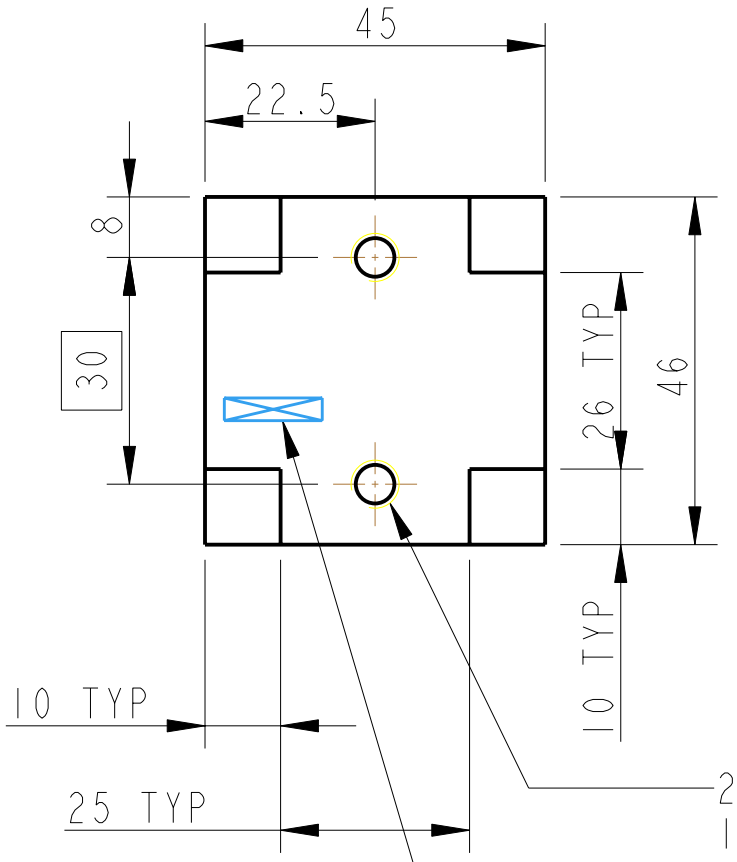
8.3 Delivery Schedule:

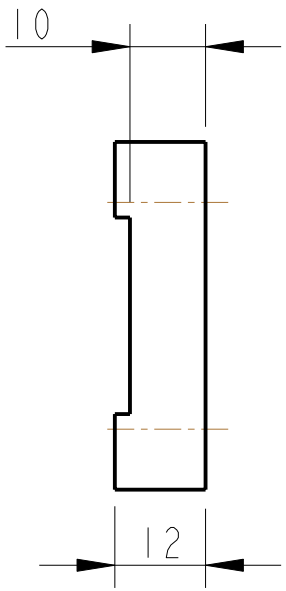
Early and/or partial deliveries are welcome.

- Ship Set 1 to: **LIGO Livingston Observatory (LLO)**
  - Due 8 weeks ARO
- Ship Set 2 to: **LIGO Hanford Observatory (LHO)**
  - Due 12 weeks ARO

INTRALINK NAME: D060315

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	.
B	19/DEC/07	E060239-B	.





2-HOLES FOR HELICOIL
1/4-20 UNC THRO'
HELICOILS NOT TO BE FITTED. ⌖ ∅0.2

PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.2 mm
ANGULAR ±0.25 °

MATERIAL: AL ALLOY 5083 T4

FINISH: SEE NOTE 3
√µm [µin] Ra = 1.6

	NAME	DATE
DRAWN	I WILMUT	26/JUN/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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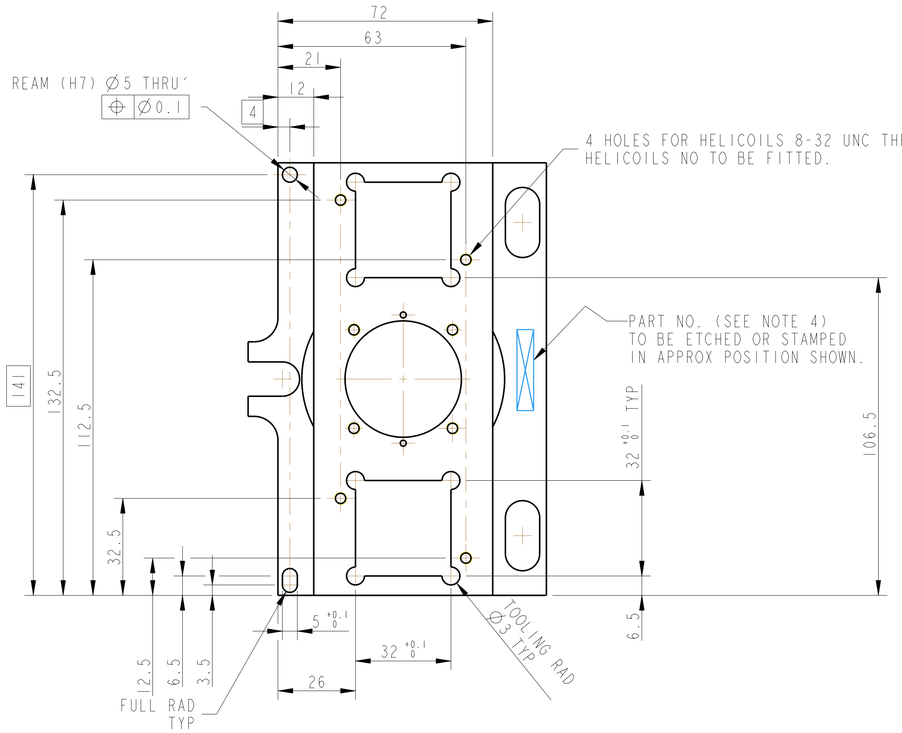
SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TABLECLOTH
PART NAME TABLECLOTH PINCH PLATE UPPER STRUCTURE

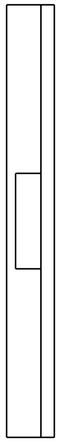
SIZE A | DRG. NO. D060315 | REV C.

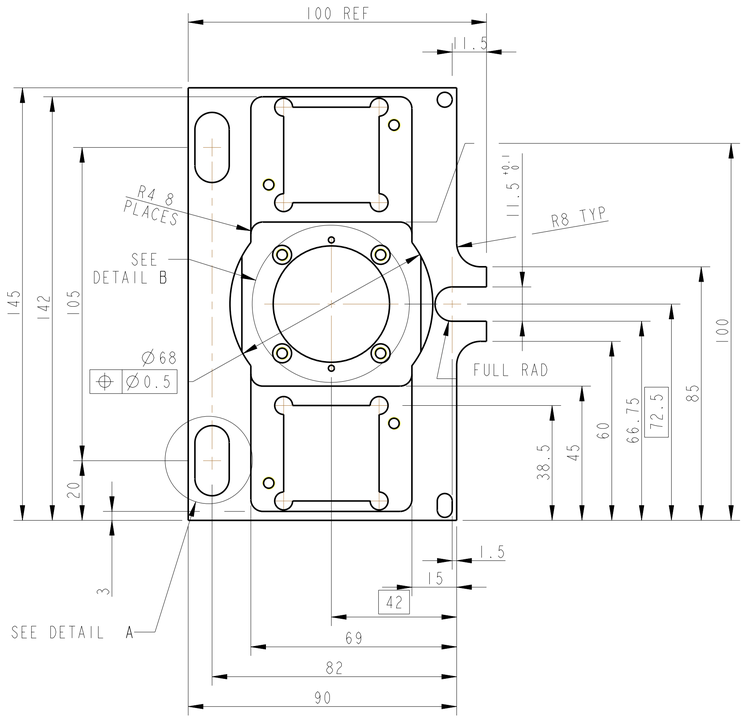
SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

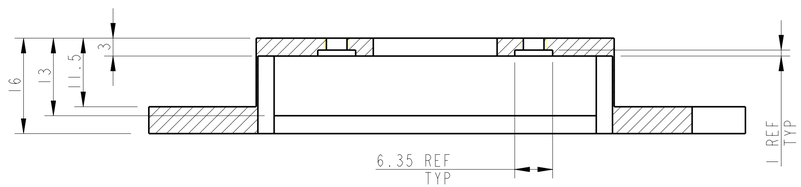
INTRALINK NAME: D060318-A

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	.
B	19/DEC/07	E060239-B	.
E	16/JULY/08	E080369	

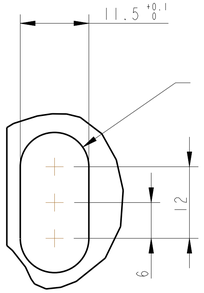




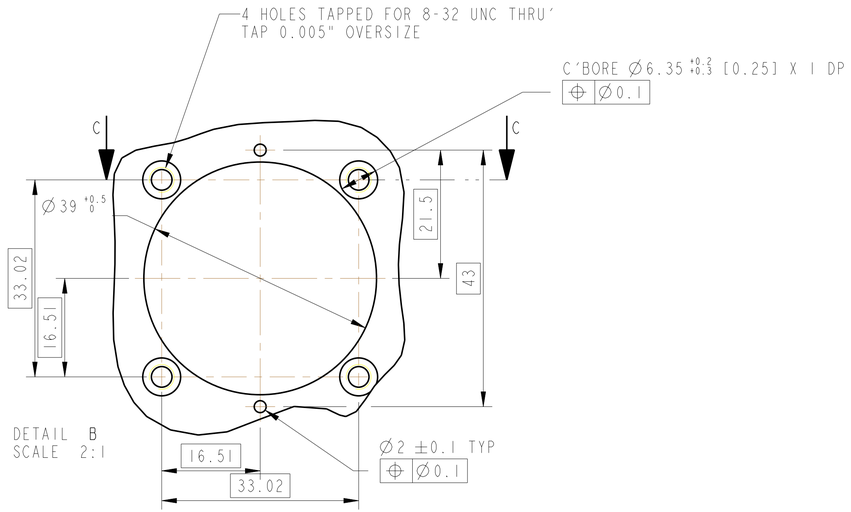




SECTION C-C



DETAIL A
SCALE 2:1



DETAIL B
SCALE 2:1

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188-001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ± 0.2
ANGULAR ±0.25°

MATERIAL: AL ALLOY 5083 H4

FINISH: CLEAN AND DEGREASED
(μm) Ra ≥ 1.6

	NAME	DATE
DRAWN	I WILMUT	03/10/06
CHECKED	MB	15/MAR/10
APPROVED	JDD	15/MAR/10

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RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TABLECLOTH

PART NAME OSEM AND ECO MOUNTING BRACKET
(LOCAL CONTROLS)

SIZE D DRG. NO. D060318 REV E.

SCALE 1:1 PROJECTION: SHEET 1 OF 1

INTRALINK NAME: D060321

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	.
B	19/DEC/07	E060239-B	.

4 HOLES TAPPED FOR
8-32 UNC THRU' TAP 0.005" OVERSIZE & C'BORE
$\varnothing 6.35\ ^{+0.3}_{+0.2}$ X 1 DP

⌖	$\varnothing 0.1$

100
80
$\varnothing 6.5$ REF
FULL RAD
20
43
3.5
3 REF
$6.5\ ^{+0.10}_{+0.05}$
35°
91
86
53 REF
20
4
8.5
11.5
4
8.5
5.5 TYP
11 TYP
50
16
REAM $\varnothing 5$
(H7) THRU'
$\varnothing 11.5\ ^{+0.1}_{0}$ TYP
FULL RAD
SECTION A-A
PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

77
A
66.5
50
33.5
23
$\varnothing 69\ ^{+1}_{0}$
83
23
30
36.5
53
69.5
76
2 HOLES $\varnothing 2\ ^{+0.1}_{0}$
THRU'
⌖	$\varnothing 0.1$
$\varnothing 39\ ^{+0.5}_{0}$
R3 TYP
TOOLING RAD
A

NOTES: (UNLESS OTHERWISE SPECIFIED)

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4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ±0.2 mm
ANGULAR ±0.25 °

MATERIAL: AL ALLOY 5083 H4

FINISH: CLEAN AND DEGREASE
√µm [µin] Ra = 1.6

	NAME	DATE
DRAWN	I WILMUT	03/10/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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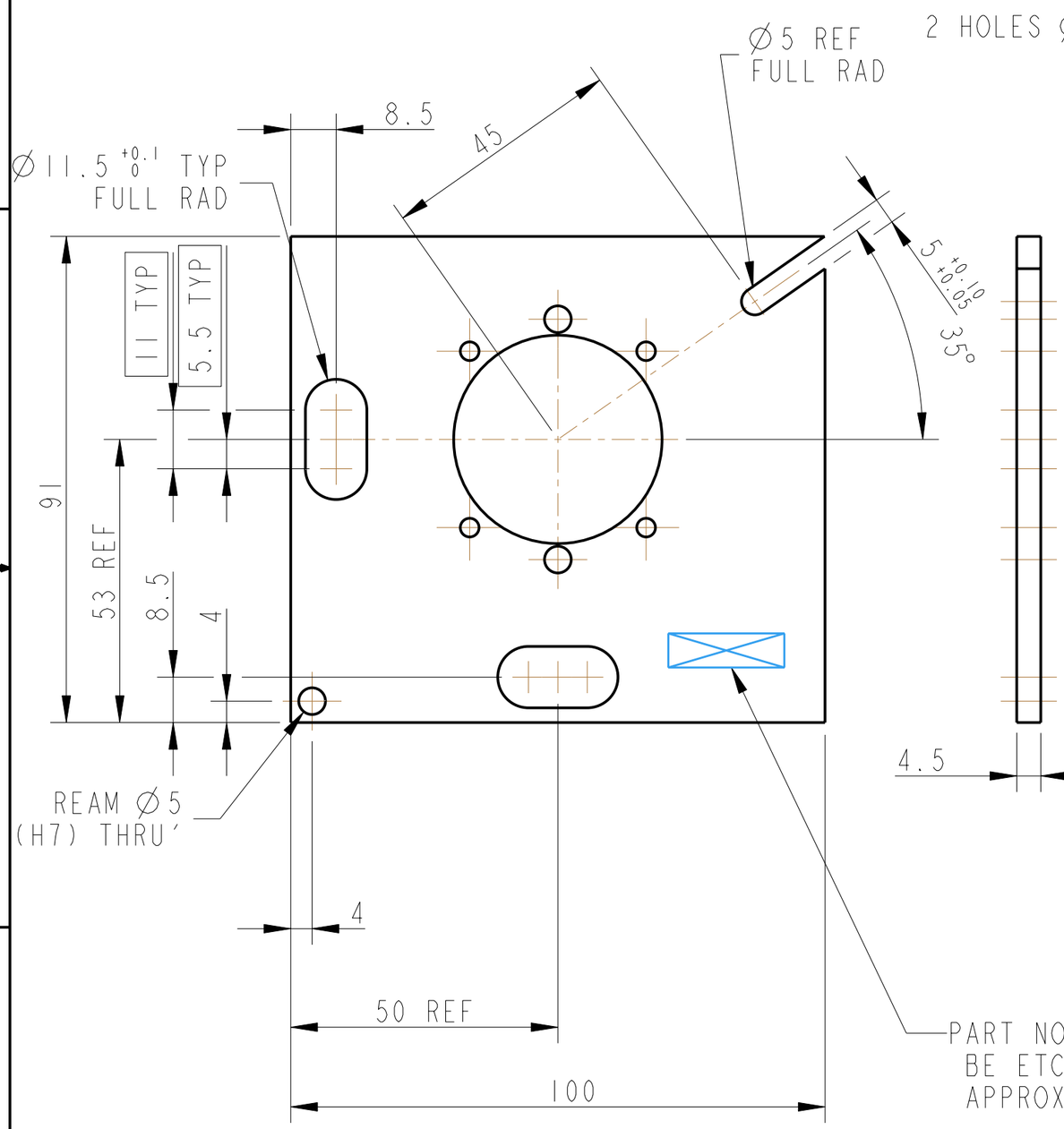
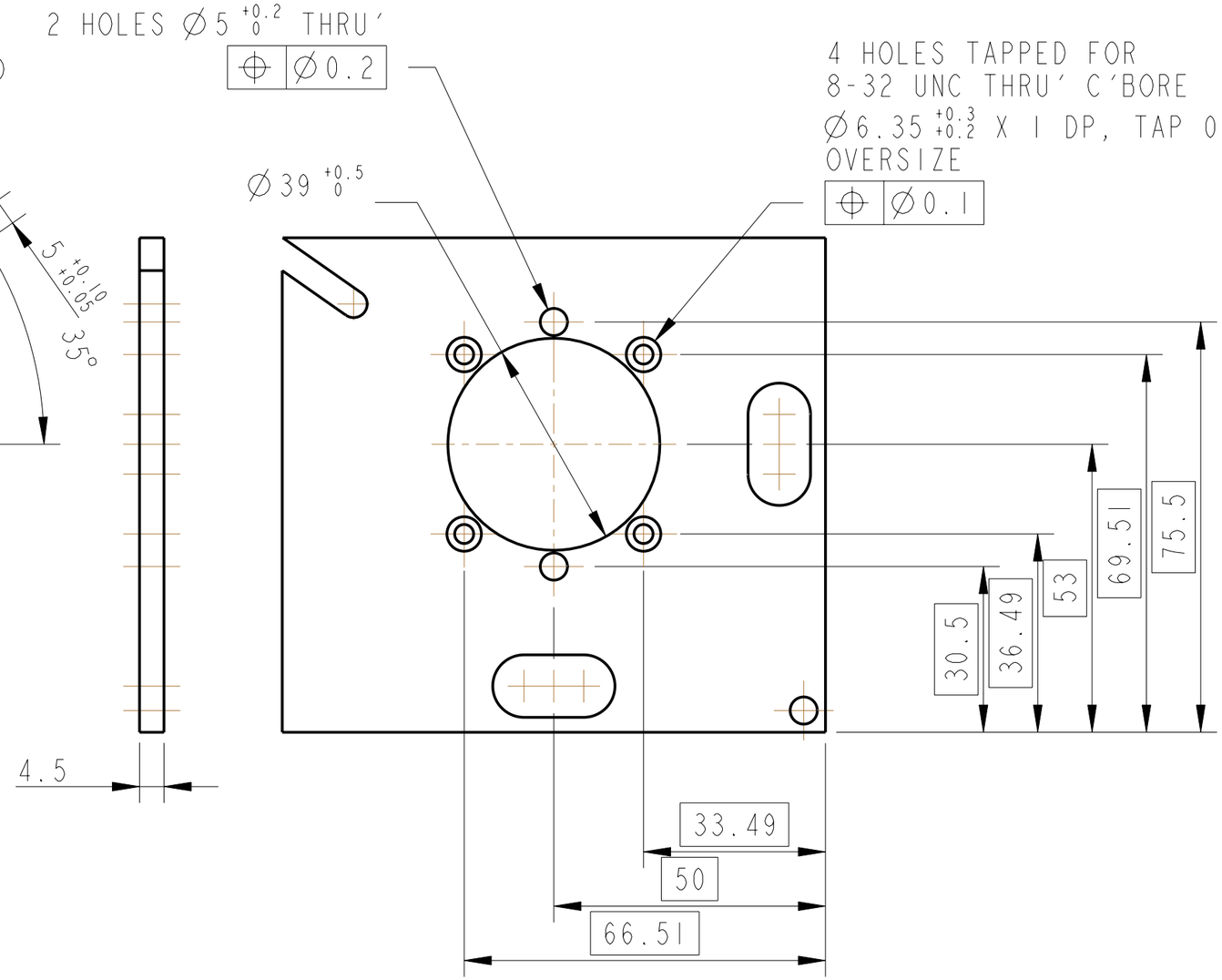
SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TABLECLOTH
PART NAME POSITION ADJUSTER FOR FRONT PITCH OSEM

SIZE B | DRG. NO. D060321 | REV D.
SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060323

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060239	.
B	19/DEC/07	E060239-B	.
E	16/JULY/08	E080369	





NOTES: (UNLESS OTHERWISE SPECIFIED)

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3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.2 mm
ANGULAR ±0.25 °

MATERIAL: AL ALLOY 5083 H4

FINISH: CLEAN AND DEGREASED
√µm [µin] Ra = 1.6

	NAME	DATE
DRAWN	I WILMUT	03/10/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TABLECLOTH

PART NAME TRANSVERSE OSEM POSITION ADJUSTMENT PLATE

SIZE B | DRG. NO. D060323 | REV F.

SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060325

REV.	DATE	DCN #	DRAWING TREE #
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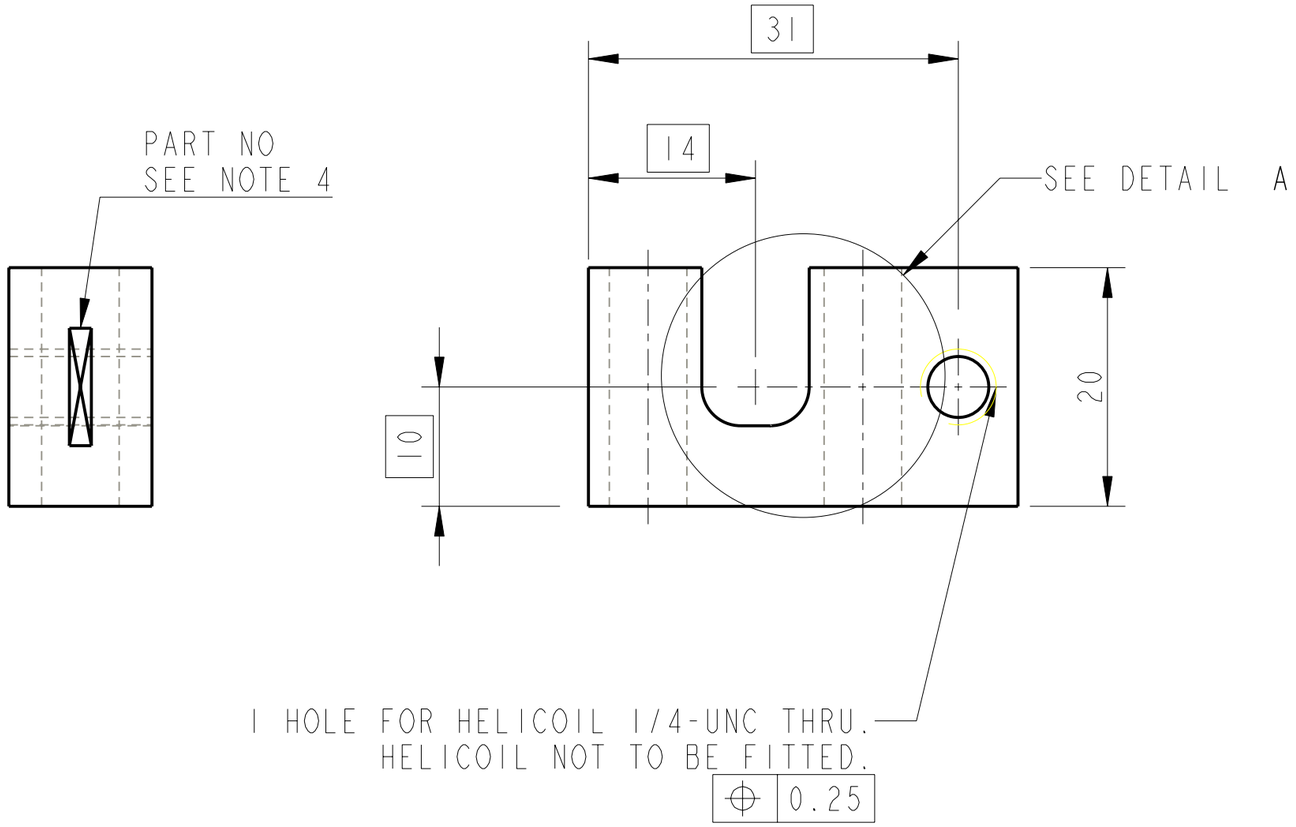
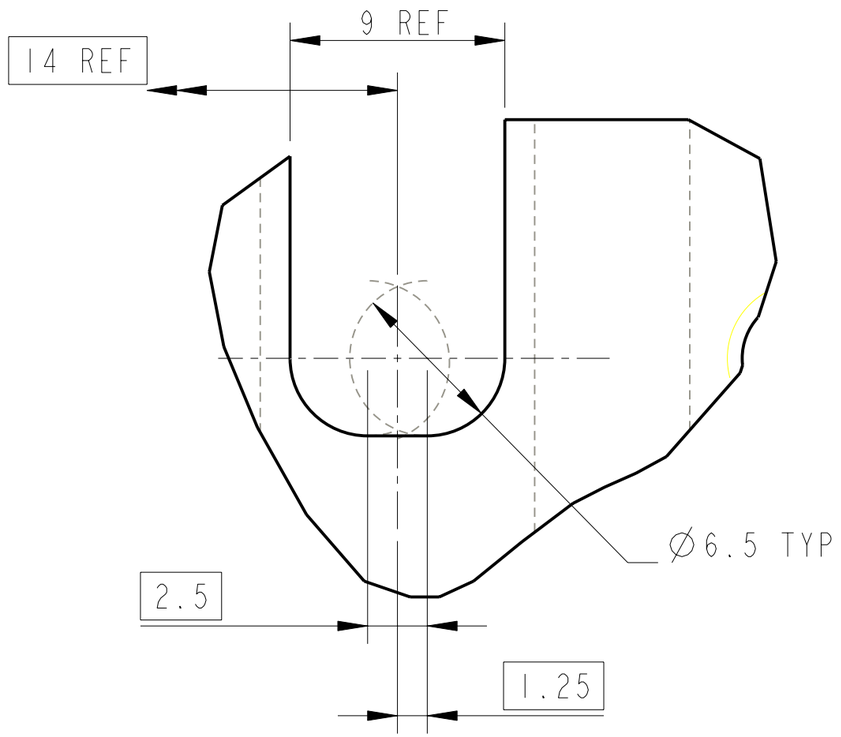
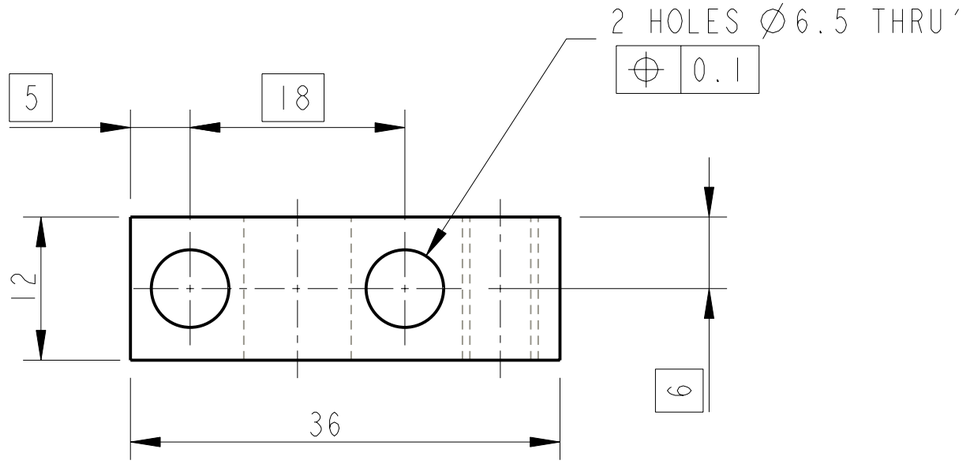
E	15/JULY/08	E080367	





DETAIL A
SCALE 4:1
0.25



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.25 mm
ANGULAR ±0.25 °

MATERIAL: ST ST 304/316

FINISH: CLEAN AND DEGREASED
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	I WILMUT	3/OCT/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

CALIFORNIA INSTITUTE OF TECHNOLOGY
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IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

PART NAME ROTATIONAL ADJUSTER STATIC HALF

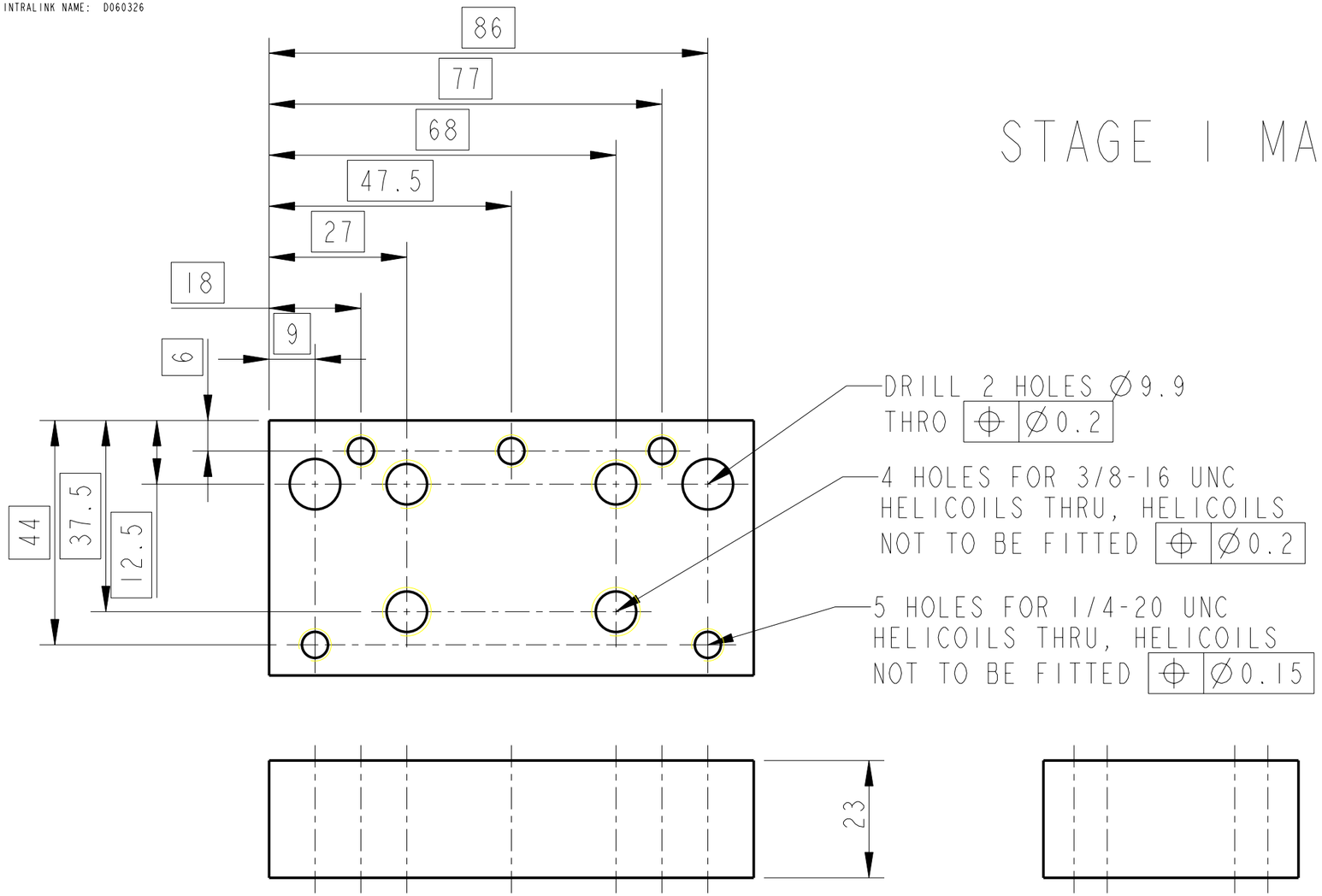
SIZE B | DRG. NO. D060325 | REV F.

SCALE 2:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060326

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	.
E	15/JULY/08	E080367	

STAGE 1 MACHINING



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.1 mm
ANGULAR ±0.25 °

MATERIAL: ST. STEEL 304/316

FINISH: CLEAN, GREASE FREE
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	J O'DELL	03/NOV/09
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

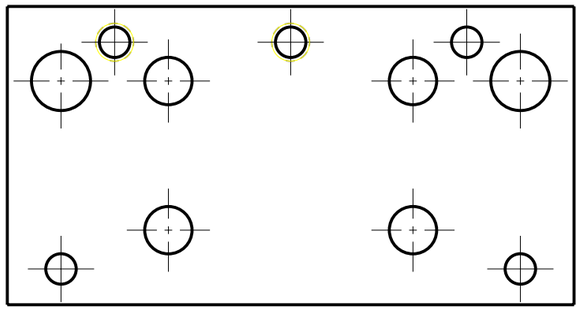
PART NAME BLADE CLAMP (TOP HALF)

SIZE B | DRG. NO. D060326 | REV F.

SCALE 1:1 | PROJECTION: | SHEET 1 OF 3

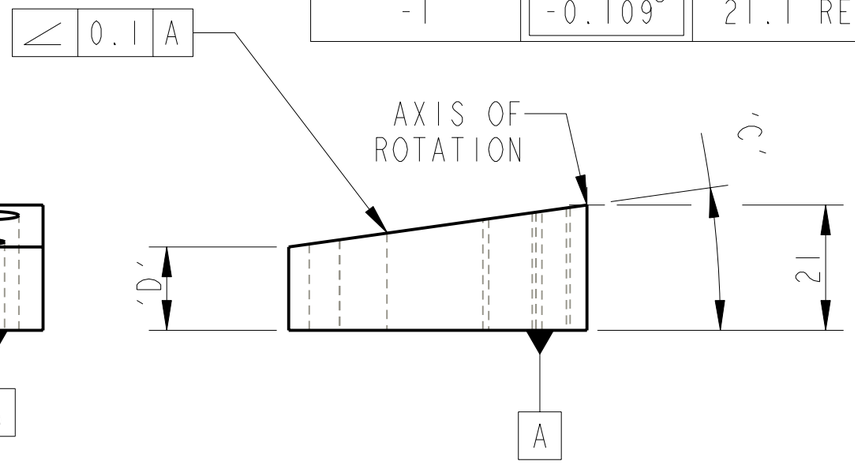
INTRALINK NAME: D060326

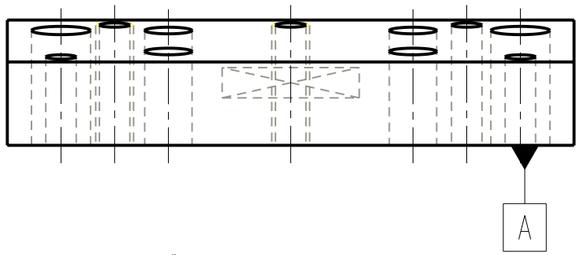
STAGE 2 MACHINING

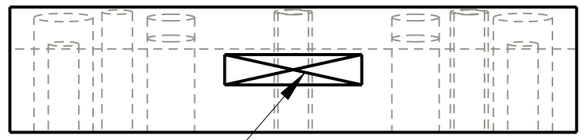


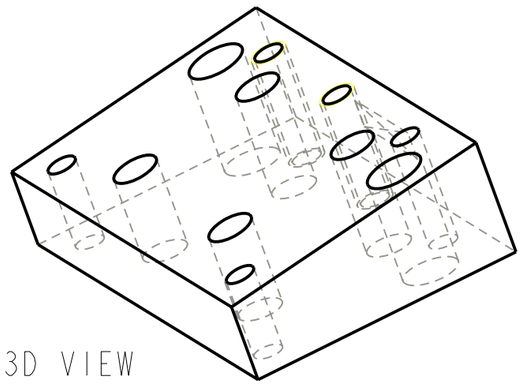
VARIANT	ANGLE C	DIM D
-10	-1.091°	21.95 REF
-9	-0.982°	21.86 REF
-8	-0.837°	21.73 REF
-7	-0.764°	21.67 REF
-6	-0.655°	21.57 REF
-5	-0.546°	21.48 REF
-4	-0.437°	21.38 REF
-3	-0.327°	21.29 REF
-2	-0.218°	21.2 REF
-1	-0.109°	21.1 REF

VARIANT	ANGLE C	DIM D
0	0°	21 REF
1	0.109°	20.90 REF
2	0.218°	20.80 REF
3	0.327°	20.71 REF
4	0.437°	20.62 REF
5	0.546°	20.52 REF
6	0.655°	20.43 REF
7	0.764°	20.33 REF
8	0.837°	20.27 REF
9	0.982°	20.14 REF
10	1.091°	20.05 REF









NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.1 mm
ANGULAR ±0.25 °

MATERIAL: ST. STEEL 304/316

FINISH: CLEAN, GREASE FREE
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	J O'DELL	03/NOV/09
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

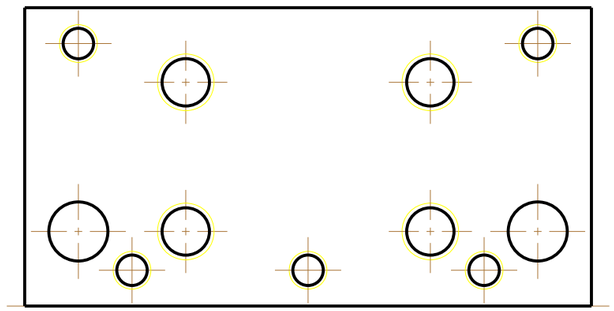
PART NAME BLADE CLAMP (TOP HALF)

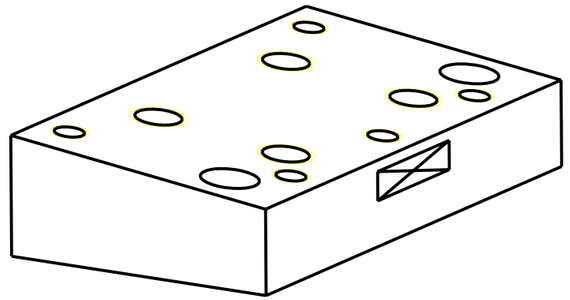
SIZE B | DRG. NO. D060326 | REV F.

SCALE 1:1 | PROJECTION: | SHEET 2 OF 3

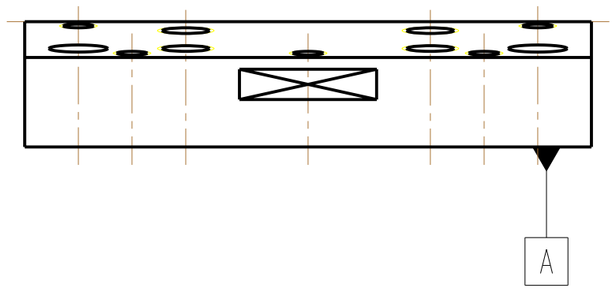
INTRALINK NAME: D060326

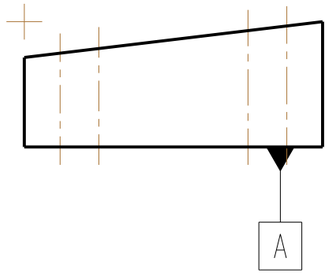
REV.	DATE	DCN #	DRAWING TREE #
.	.	.	.





VARIANT	ANGLE C	DIM D
0	0°	21 REF
1	0.109°	20.90 REF
2	0.218°	20.80 REF
3	0.327°	20.71 REF
4	0.437°	20.62 REF
5	0.546°	20.52 REF
6	0.655°	20.43 REF
7	0.764°	20.33 REF
8	0.837°	20.27 REF
9	0.982°	20.14 REF
10	1.091°	20.05 REF





NOTES: (UNLESS OTHERWISE SPECIFIED)

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DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.1 mm
ANGULAR ±0.25 °

MATERIAL: ST. STEEL 304/316

FINISH: CLEAN, GREASE FREE
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	J O'DELL	03/NOV/09
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

PART NAME BLADE CLAMP (TOP HALF)

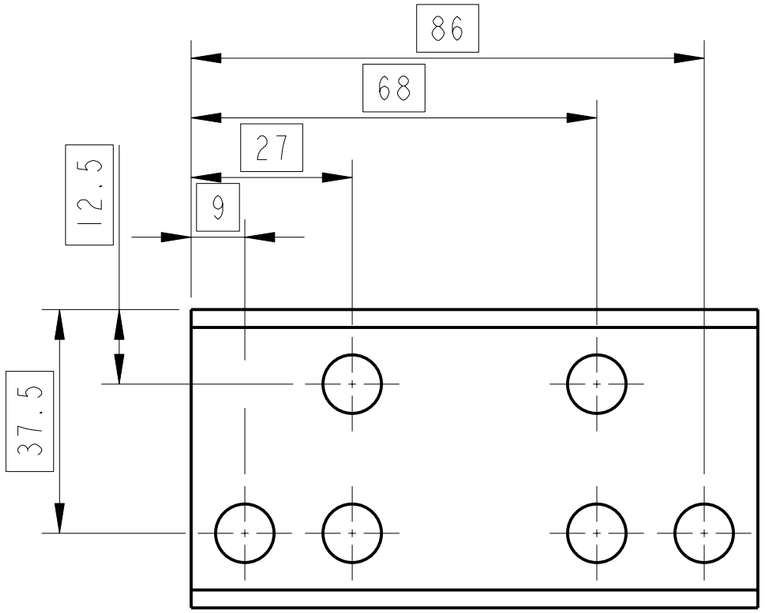
SIZE B | DRG. NO. D060326 | REV F.

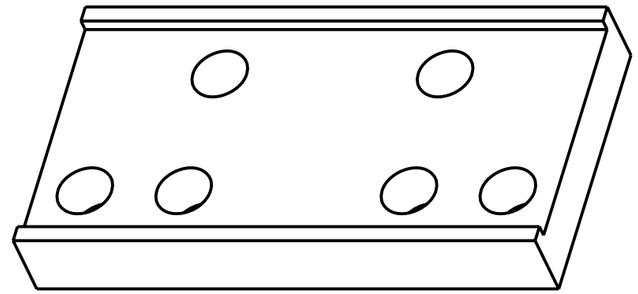
SCALE 1:1 | PROJECTION: | SHEET 3 OF 3

INTRALINK NAME: D060327

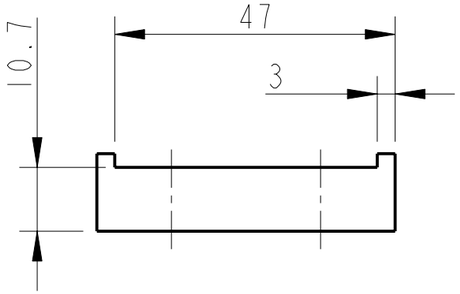
REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	.
E	15/JULY/08	E080367	

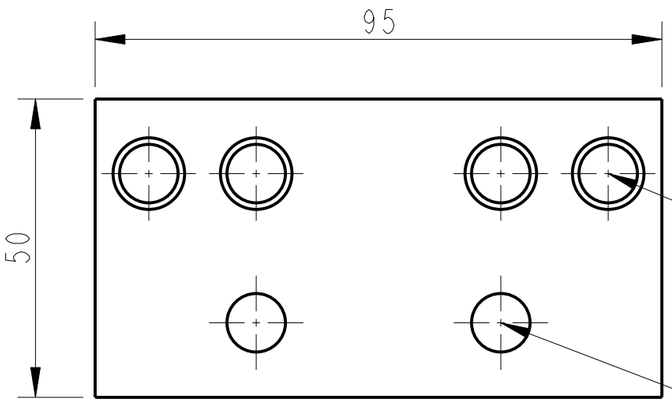
STAGE 1 MACHINING





3D VIEW





DRILL 4 HOLES ∅9.8 THRU
C'SINK ∅12

⌖	∅0.2

DRILL 2 HOLES ∅9.8 THRU

⌖	∅0.2

NOTES: (UNLESS OTHERWISE SPECIFIED)

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DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.25 mm
ANGULAR ±0.25 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN AND DEGREASED
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	J O'DELL	03/NOV/09
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

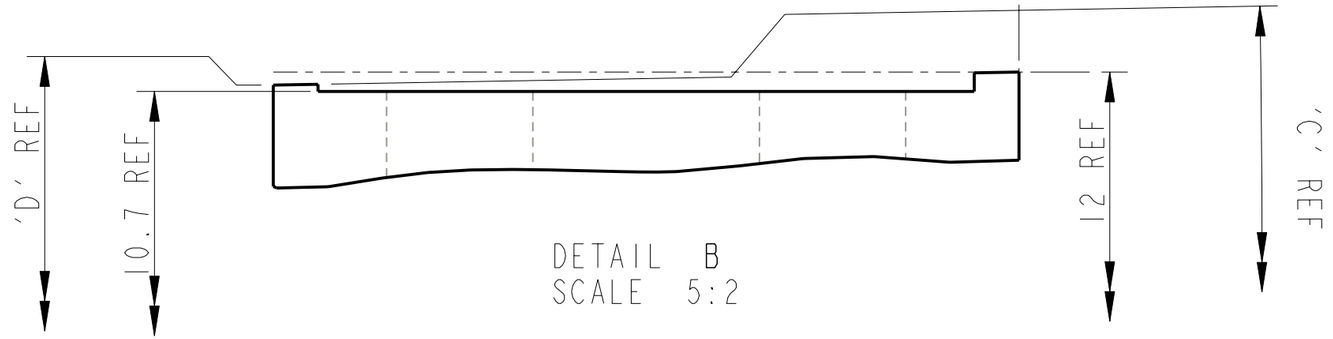
SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TOP STAGE
PART NAME BLADE CLAMP (BTM HALF)

SIZE B | DRG. NO. D060327 | REV F.

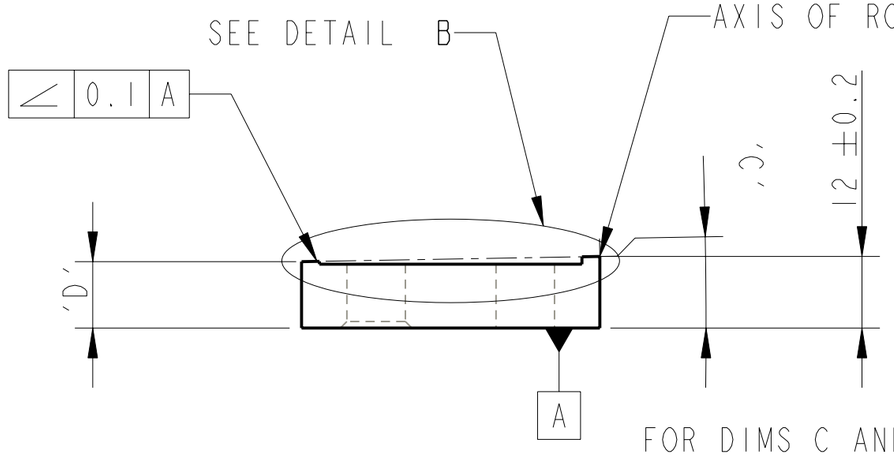
SCALE 1:1 | PROJECTION: | SHEET 1 OF 2

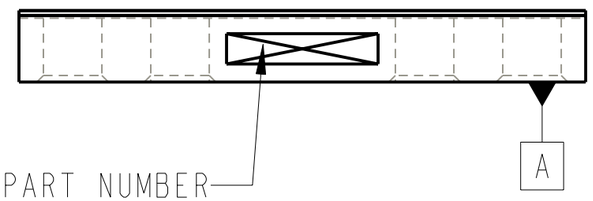
INTRALINK NAME: D060327

STAGE 2 MACHINING



DETAIL B
SCALE 5:2



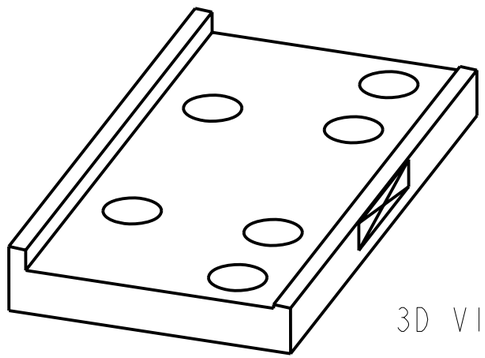


ENGRAVE PART NUMBER
SEE NOTE 4

FOR DIMS C AND
D SEE TABLE

VARIANT	ANGLE C	DIM D
0	0°	12 REF
1	0.109°	11.90 REF
2	0.218°	11.80 REF
3	0.327°	11.71 REF
4	0.437°	11.62 REF
5	0.546°	11.52 REF
6	0.655°	11.43 REF
7	0.764°	11.33 REF
8	0.837°	11.27 REF
9	0.982°	11.14 REF
10	1.091°	11.05 REF

VARIANT	ANGLE C	DIM D
-10	-1.091°	12.95 REF
-9	-0.982°	12.86 REF
-8	-0.837°	12.73 REF
-7	-0.764°	12.67 REF
-6	-0.655°	12.57 REF
-5	-0.546°	12.48 REF
-4	-0.437°	12.38 REF
-3	-0.327°	12.29 REF
-2	-0.218°	12.2 REF
-1	-0.109°	12.1 REF



3D VIEW

EXAGERATED REPRESENTATION
DO NOT SCALE

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
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DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.25 mm
ANGULAR ±0.25 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN AND DEGREASED
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	J O'DELL	03/NOV/09
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

CALIFORNIA INSTITUTE OF TECHNOLOGY
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IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TOP STAGE
PART NAME BLADE CLAMP (BTM HALF)

SIZE B | DRG. NO. D060327 | REV F.
SCALE 1:1 | PROJECTION: | SHEET 2 OF 2

NOTES CONTINUED:

⑤ SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) REVISION NUMBER ON EACH PART.
BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY.
EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD

⑥. ALL HOLES TO BE 100% GAGED WITH EMHART T00L: 1442-6 OR 1440-6

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364

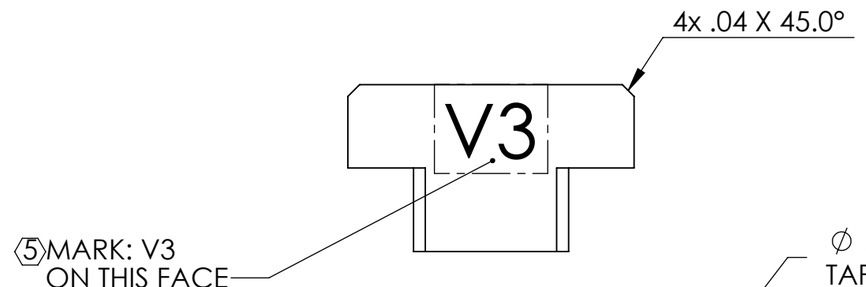
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

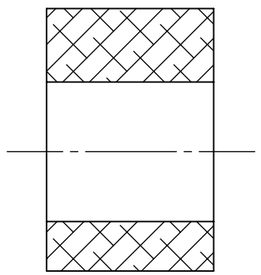
9. ALL HELI-COIL HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG, HC2000, REV 4

10. ALL HELI-COIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

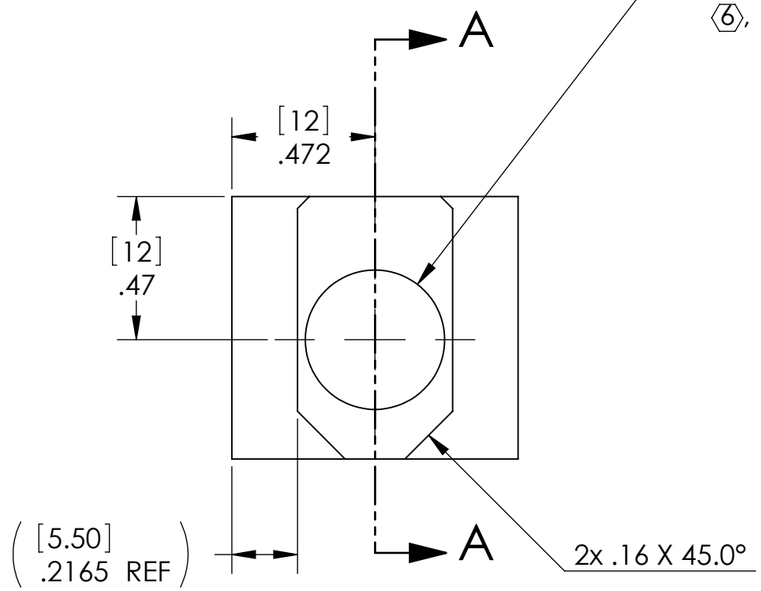
11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NO WELD REPAIRS, PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. REFER TO LIGO-E0900364.

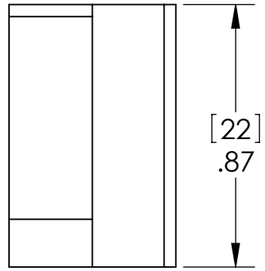
REV.	DATE	DCN #	DRAWING TREE #
V3	25 APR 2011	E1100380	-
-	-	-	-
-	-	-	-

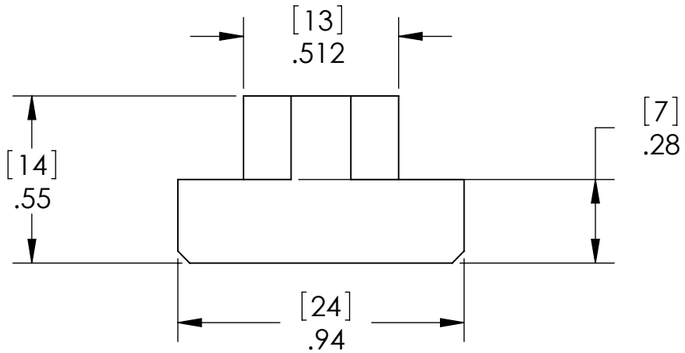


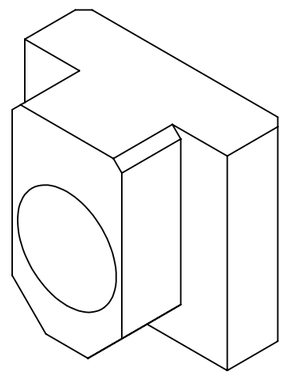


SECTION A-A









NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES [MM]

TOLERANCES:
.XX ± .008
.XXX ± .004

ANGULAR ± 0.3°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATLEY R.02 FOR SHEET METAL PARTS.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL 304 SSTL

FINISH 32 µinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PART NAME aLIGO, SUS, Quad N-P Top Stage, 3/8-16 UNC T-NUT

SYSTEM ADVANCED LIGO

SUB-SYSTEM SUS

NEXT ASSY D060324

DESIGNER	Joe Odell	22 April 2011	
DRAFTER	SBARNUM	25 Apr 2011	
CHECKER			
APPROVAL	CTORRIE		

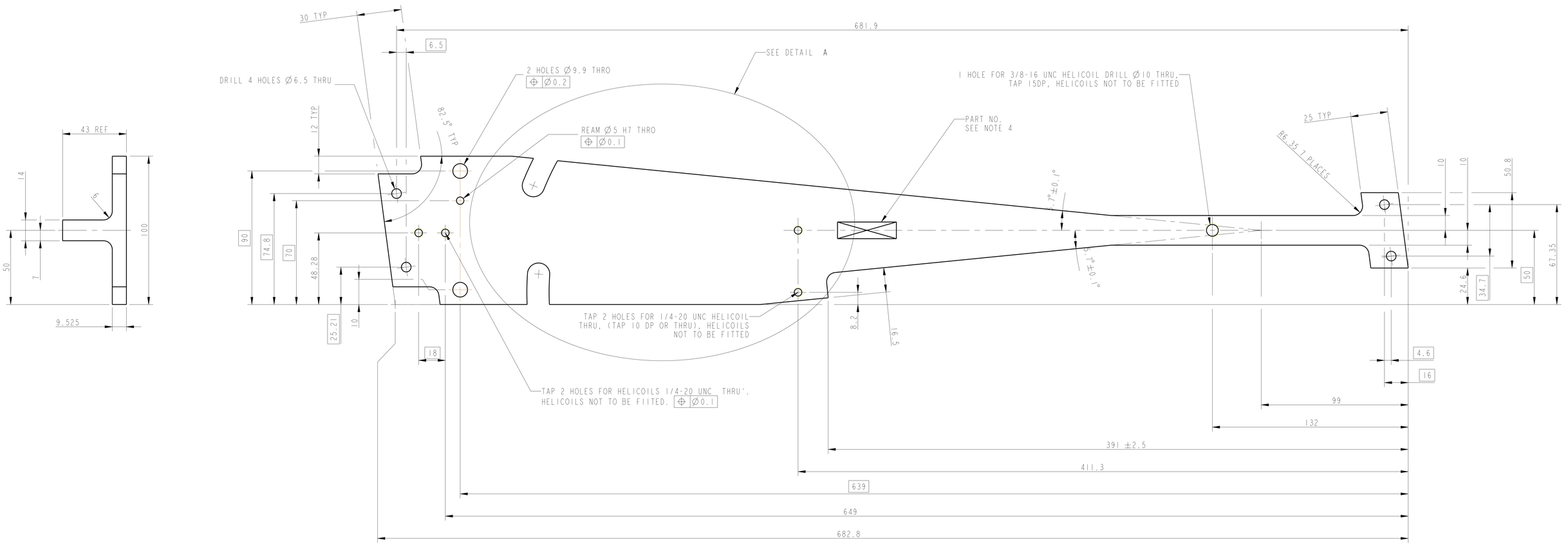
SIZE B **DWG. NO.** D060328 **REV.** v3

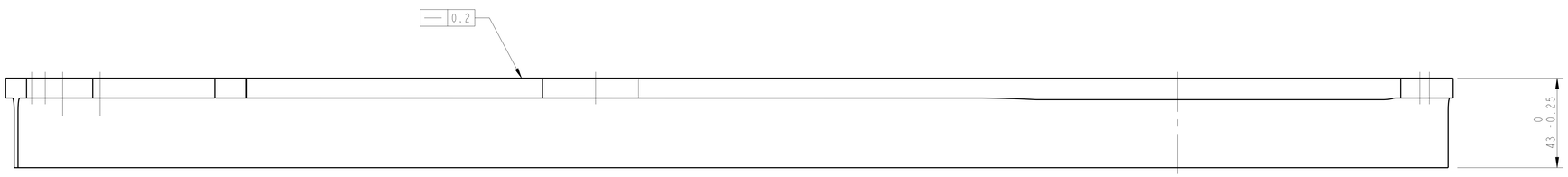
SCALE: 2:1 **PROJECTION:** **SHEET** 1 OF 1

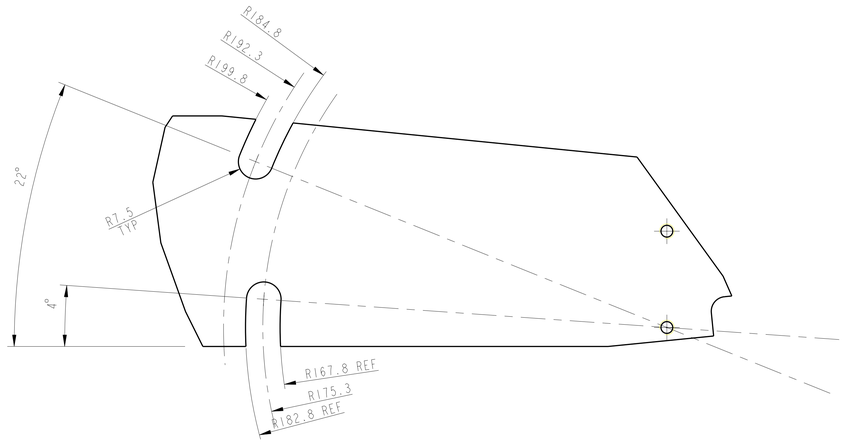
D060328 aLIGO, SUS, Quad N-P Top Stage, .375-16 UNC T-NUT, PART PDM REV: , DRAWING PDM REV:

INITIAL INK NAME: D060329

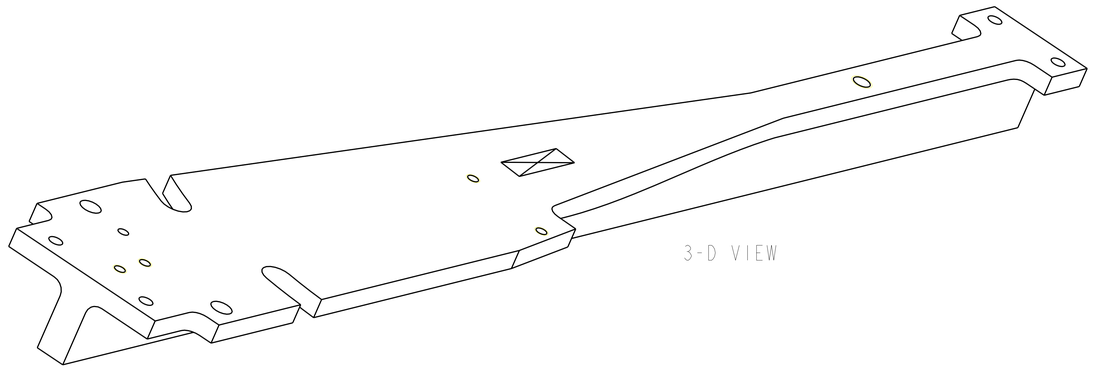
REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	-







DETAIL A
SCALE 1:1



3-D VIEW

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE.
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER STARTING WITH 001 AT BOX FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .1" HIGH CHARACTERS. EXAMPLE: D020180- 001. A HYDRATORY SOL MAY BE USED.

DIMENSIONS ARE IN mm (INCHES) TOLERANCES:
X.XX ±0.25 mm (INCHES)
ANGULAR ±0.25°

MATERIAL: AL ALLOY 6061
FINISH: CLEAN AND DEGREASED
m (µin) Ra: 1.6 (63)

	NAME	DATE
DRAWN	R WILMOT	03/OCT/06
CHECKED	MB	13/MAR/15
APPROVED	JDD	13/MAR/15

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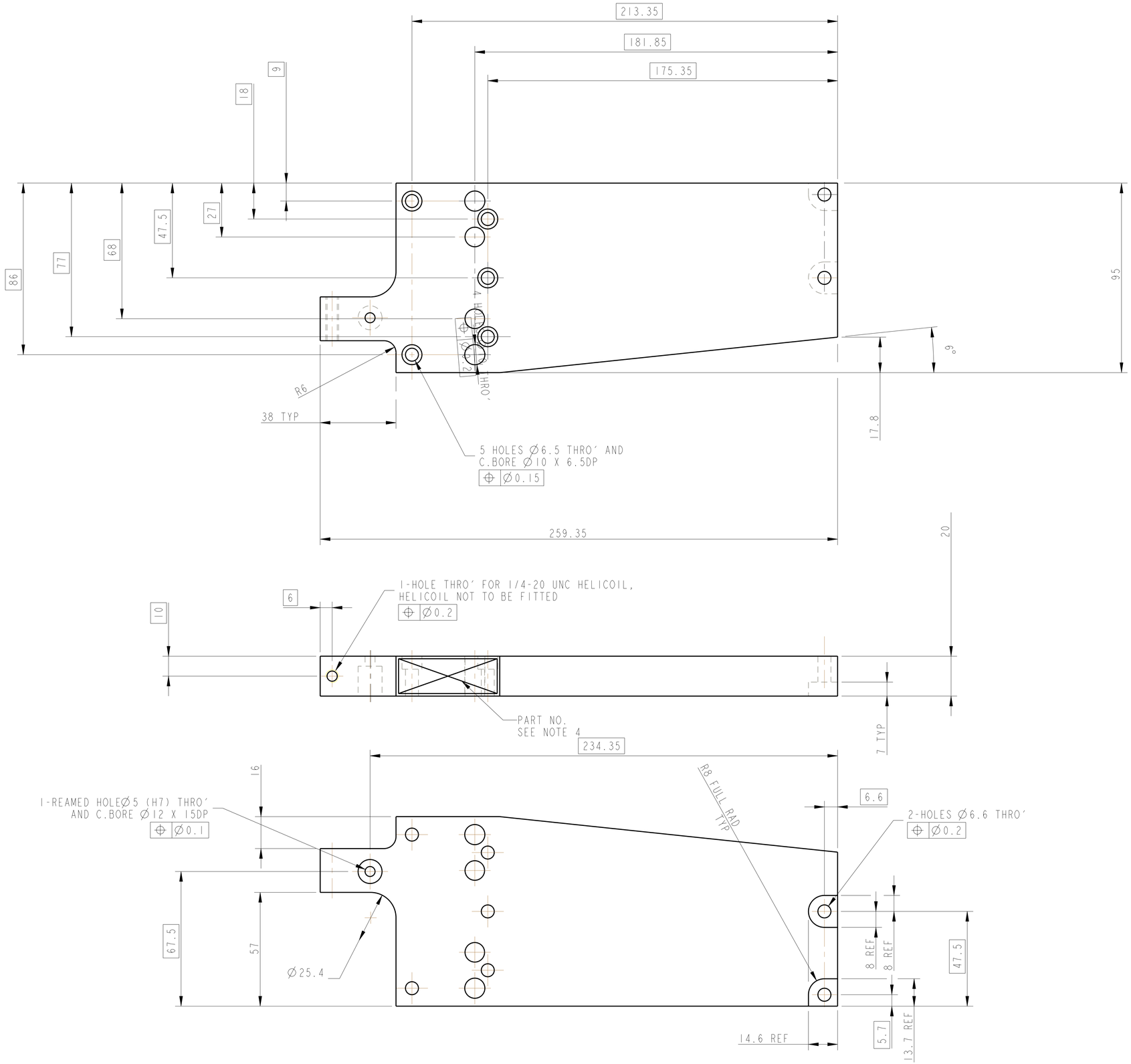
LIGO, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORY

SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TOP STAGE
PART NAME TOP STAGE STIFF BACK

SIZE E | DRG. NO: D060329 | E.
SCALE 1:1 | PROJECTION | SHEET 1 OF 1

INTRALINK NAME: D060330-A

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	.
E	15/JULY/08	E080367	



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PART NUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D070188-001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm (INCHES)
TOLERANCES:

X.XX ± 0.2
ANGULAR ±0.25 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN AND DEGREASE
$\sqrt{}$um (µin) Ra = 1.6 (63)

	NAME	DATE
DRAWN	I. WILMUT	03/OCT/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

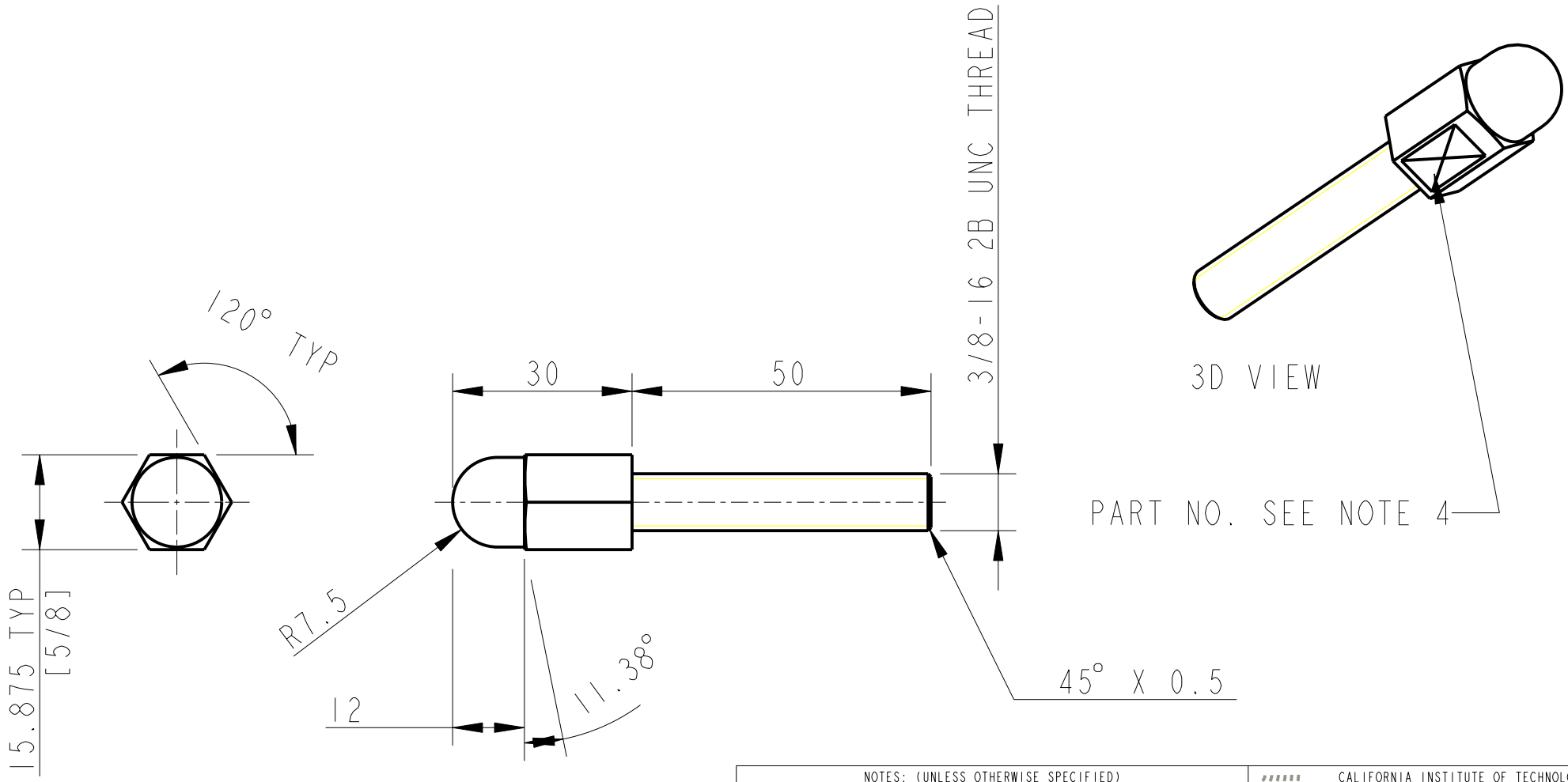
PART NAME ROTATIONAL ADJUSTER BASE PLATE

SIZE D | DRG. NO. D060330 | REV F.

SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060331

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	.
E	15/JULY/08	E080367	



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.25 mm
ANGULAR ±0.5 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN
√ µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	I WILMUT	5/OCT/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD TOP STAGE

PART NAME JACKING SCREW / EARTHQUAKE STOP

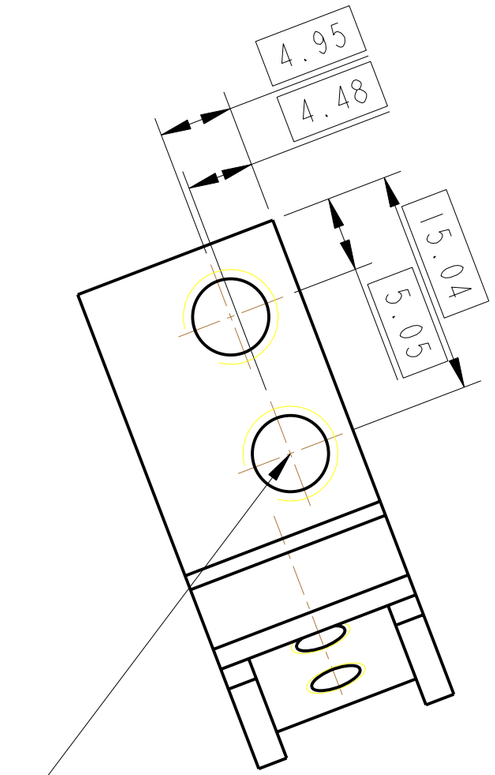
.

SIZE A | DRG. NO. D060331 | REV F.

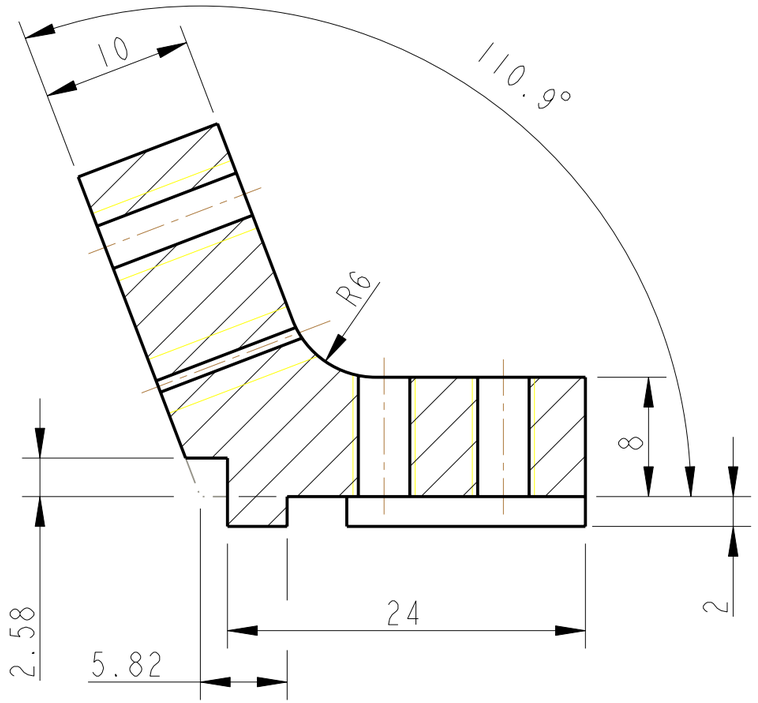
SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060333

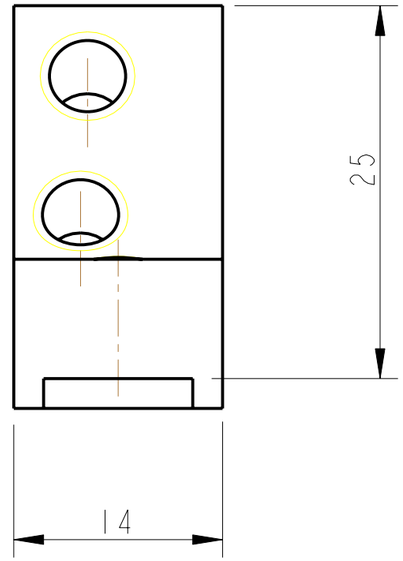
REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/06	E060238	.
E	15/JULY/08	E080367	

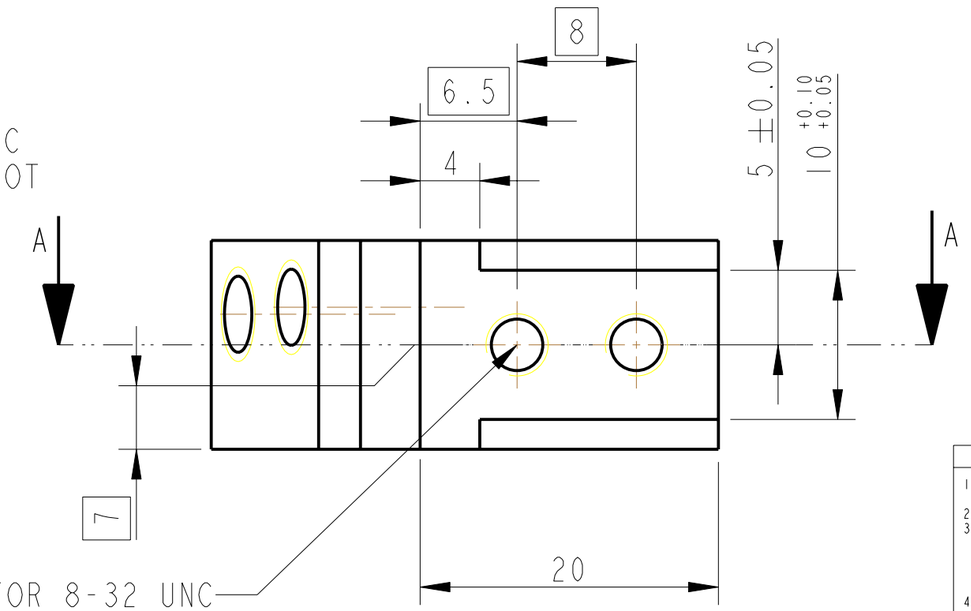


2 HOLES TAPPED FOR 1/4-20 UNC HELICOILS THRO, HELICOILS NOT TO BE FITTED ⌖ | ∅0.1



SECTION A-A





2 HOLES TAPPED FOR 8-32 UNC HELICOILS THRO, HELICOILS NOT TO BE FITTED ⌖ | ∅0.1

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.2 mm
ANGULAR ±0.25 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN AND DEGREASED
√µm [µin] Ra = 1.6 [63]

	NAME	DATE
DRAWN	I WILMUT	05/OCT/06
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TOP STAGE
PART NAME WIRE CLAMP BODY, TOP STAGE
.

SIZE B | DRG. NO. D060333 | REV F.
SCALE 5:2 | PROJECTION: | SHEET 1 OF 1

NOTES CONTINUED:

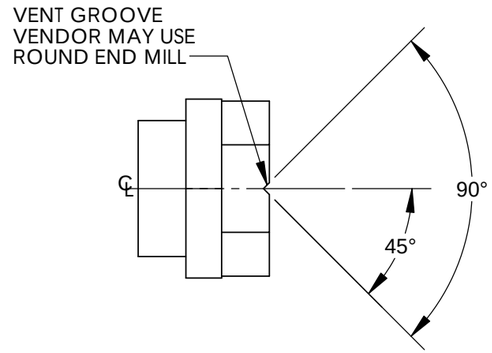
5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART): 001-v1
   EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD

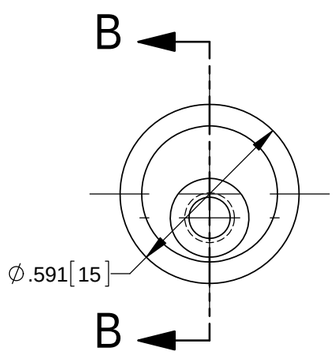
6. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364

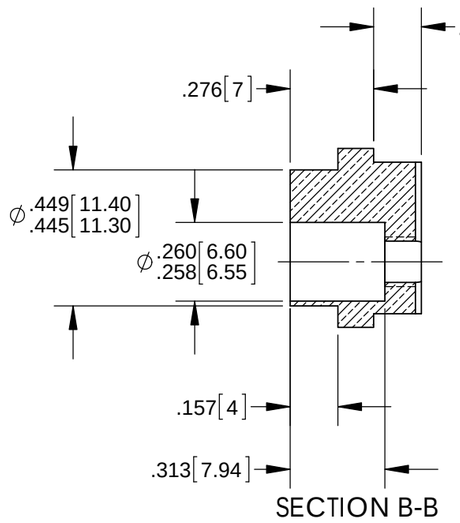
7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

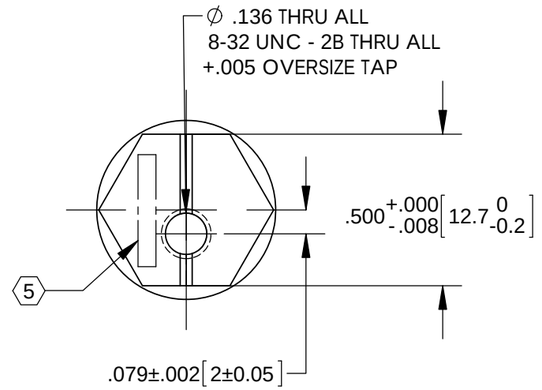
8. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NO WELD REPAIRS, PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. REFER TO LIGO-E0900364.

REV.	DATE	DCN #	DRAWING TREE #
v3	21 Jan 2012	E1200066	E1200069
v4	26 Jan 2012	E1200057	E1200069









D060336_aLIGO, SUS, Penre MASS Quad N-Ptype, 2MM CAM, OSEM ADJUSTER, PART PDM REV: X-017, DRAWING PDM REV: X-005

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)					
DIMENSIONS ARE IN INCHES [MM] TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± .5°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATLEY R.02 FOR SHEET METAL PARTS. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.				
	MATERIAL: PHOSPHOR BRONZE P<or=0.35%, PB<or= 1%, Zn<or= 1%	FINISH: 63 µinch	NEXT ASSY: MULTIPLE		

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

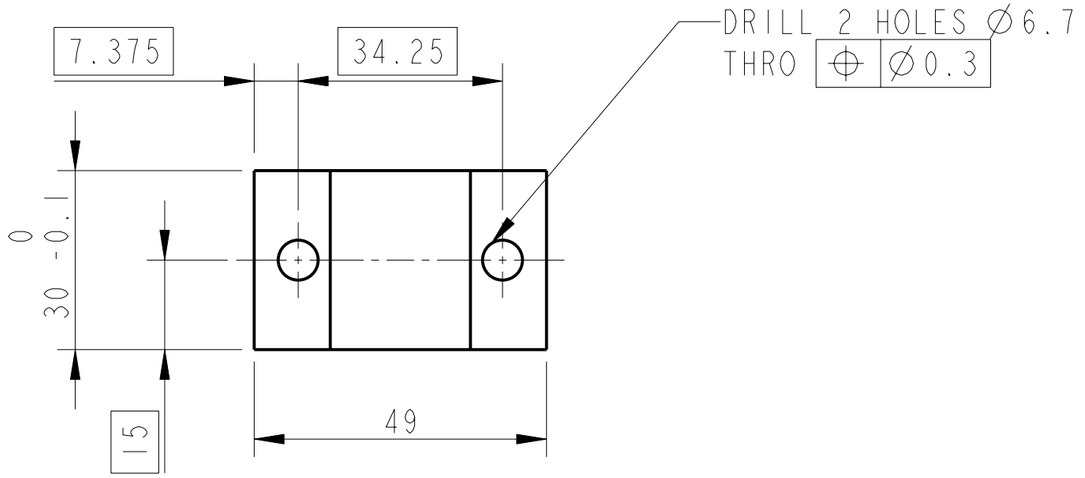
SYSTEM: ADVANCED LIGO | SUB-SYSTEM: SUS

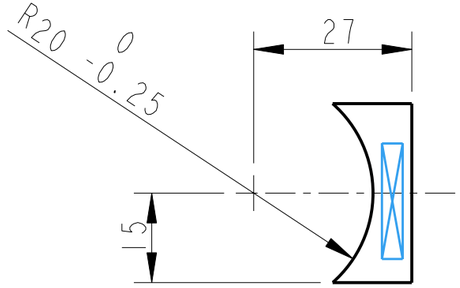
PART NAME: ALIGO, SUS, Penre MASS Quad N-Ptype, 2MM CAM, OSEM ADJUSTER

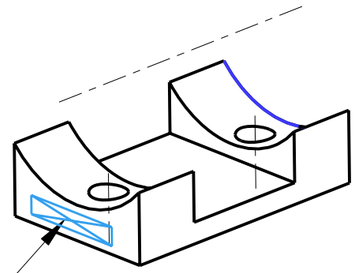
			SIZE	DWG. NO.	REV.
DESIGNER	J.ODELL	28 Oct 2006	B	D060336	v4
DRAFTER	I.WILMUT	28 OCT 2005			
CHECKER	MB	15 MAR 2010			
APPROVAL	JOD	15 MAR 2010	SCALE: 2:1	PROJECTION:	SHEET 1 OF 1

INTRALINK NAME: D060377

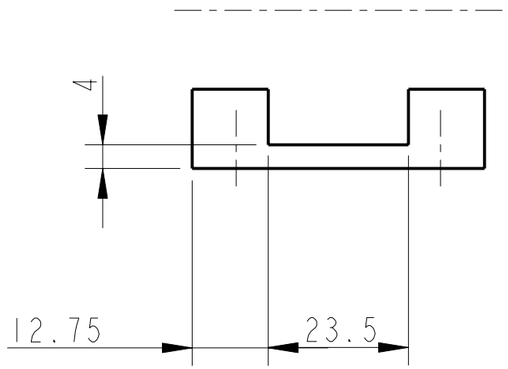
REV.	DATE	DCN #	DRAWING TREE #
A	18/OCT/06	E060247	.
B	19/DEC/07	E060247-B	.







3D VIEW



PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.1 mm
ANGULAR ±0.25 °

MATERIAL: AL ALLOY 5083 OR 6061

FINISH: CLEAN, GREASE FREE
√µm [µin] Ra = 1.6

	NAME	DATE
DRAWN	I WILMUT	10/DEC/05
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD UI MASS
PART NAME BLADE TIP Z POSITION ADJ (BTM HALF PART 2)

SIZE B | DRG. NO. D060377 | REV H.

SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060378

REV.	DATE	DCN #	DRAWING TREE #
A	18/OCT/06	E060247	.
B	19/DEC/07	E060247-B	.
H	21/JULY/08	E080371	

TAP 4-HOLES FOR HELICOILS 1/4-20 UNC THRU'
HELICOILS NOT TO BE FITTED. ⌖ Ø0.1

DRILL 2 HOLES Ø7
THRO ⌖ Ø0.2

DETAIL A
SCALE 2:1

1-HOLE FOR HELICOIL 1/4-20 UNC THRU
HELICOIL NOT TO BE FITTED.
⌖ Ø0.3

48.5

204

SEE
DETAIL A

3 PLACES R6

49 ±0.1

SEE DETAIL B

30 ±0.05

3

15

3

2 REF

56

23

80.5°

212

FILLET OPTIONAL

13

23

24

15

6

14.75

17.125

34.25

7.375

R20 $^{+0.25}_{0}$

DETAIL B
SCALE 2:1

17

19.9

21.9

22 ±0.1

PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ±0.25 mm
ANGULAR ±0.25 °

MATERIAL: ST STEEL 304/316

FINISH: CLEAN, GREASE FREE
√µm [µin]Ra = 1.6 OR STOCK

	NAME	DATE
DRAWN	I WILMUT	7/DEC/05
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO

SUB-SYSTEM SUS

NEXT ASSY QUAD UI MASS

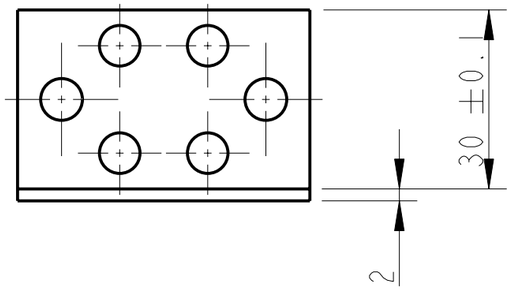
PART NAME BLADE TIP Z POSITION ADJ (BTM HALF)

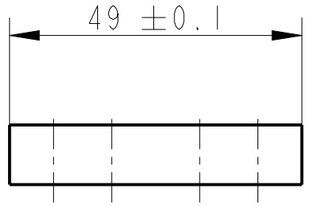
SIZE C | DRG. NO. D060378 | REV J.

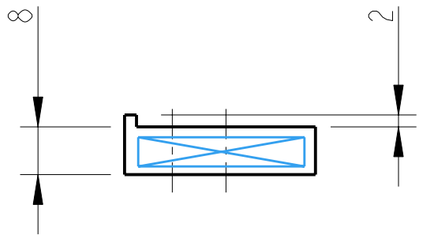
SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

INTRALINK NAME: D060380

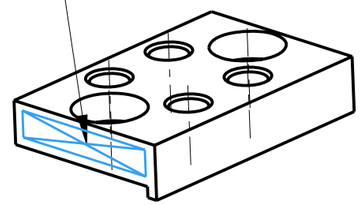
REV.	DATE	DCN #	DRAWING TREE #
A	18/OCT/06	E060247	.
B	19/DEC/07	E060247-B	.
H	21/JULY/08	E080371	



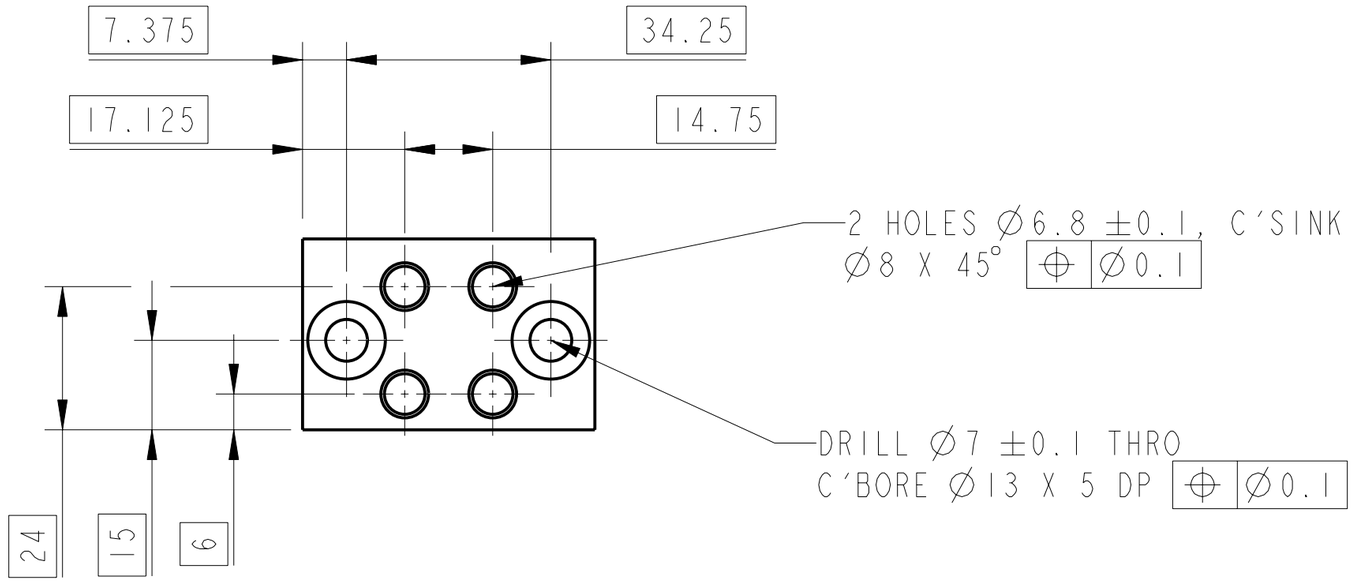




PART NO. (SEE NOTE 4)
TO BE ETCHED OR STAMPED
IN APPROX POSITION SHOWN.



3D VIEW



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL SHARP EDGES, R.02 MIN.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410 (STAINLESS STEEL)
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .07" HIGH CHARACTERS. EXAMPLE: D020188- 001. A VIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:

X.XX ±0.25 mm
ANGULAR ±0.25 °

MATERIAL: ST. STEEL 304

FINISH: CLEAN, GREASE FREE
√µm [µin] Ra = 1.6

	NAME	DATE
DRAWN	I WILMUT	09/DEC/05
CHECKED	MB	15/MAR/10
APPROVED	JOD	15/MAR/10

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
IGR, GLASGOW UNIVERSITY GEO 600 GROUP
RUTHERFORD APPLETON LABORATORIES

SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD UI MASS
PART NAME BLADE CLAMP (TOP HALF)

SIZE B | DRG. NO. D060380 | REV J.
SCALE 1:1 | PROJECTION: | SHEET 1 OF 1

NOTES CONTINUED:

⑤ SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
EXAMPLE (PART): 001-v1
EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD

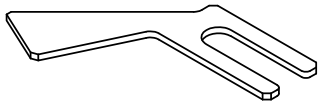
6. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364

7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

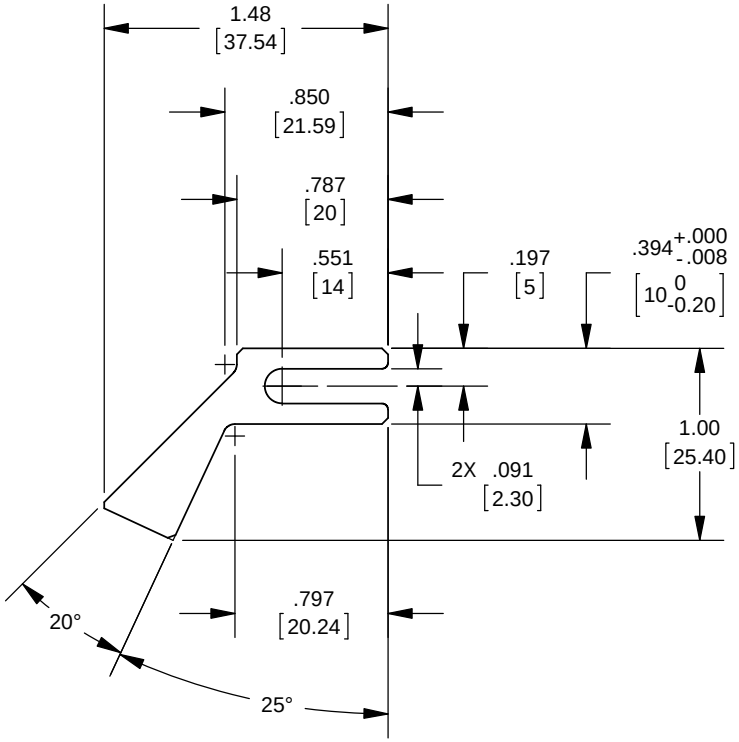
8. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NO WELD REPAIRS, PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. REFER TO LIGO-E0900364.

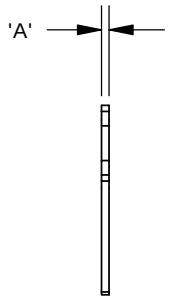
PART NO.	'A' (mm)	APPROX. WEIGHT (LB.)
D070140-05	.5	-
D070140-1	1	.001
D070140-2	2	.003
D070140-3	3	.004
D070140-4	4	.006
D070140-5	5	.007
D070140-6	6	.009

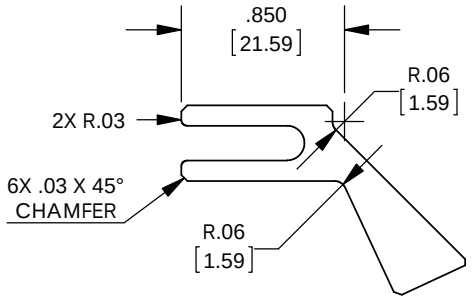
REV.	DATE	DCN #	DRAWING TREE #
v1	11 AUG 2009	-	-
v3	20 JAN 2012	E1200066-x0	-
-	-	-	-



ISO VIEW







NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES [MM]

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATELY R.02 FOR SHEET METAL PARTS.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL: 6061-T6 Al

FINISH: 63 µinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO

SUB-SYSTEM: SUS

NEXT ASSY: D060324

PART NAME: ALIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim

DESIGNER	I.WILMUT	27 APR 2007	
DRAFTER	E.SANCHEZ	20 JAN 2012	
CHECKER	SEE DCC	SEE DCC	
APPROVAL	SEE DCC	SEE DCC	

SIZE: A

DWG. NO.: D070140

REV.: v3

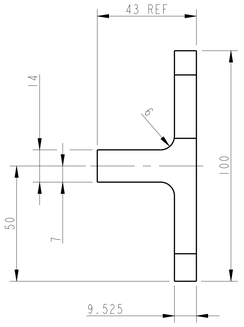
SCALE: 1:1

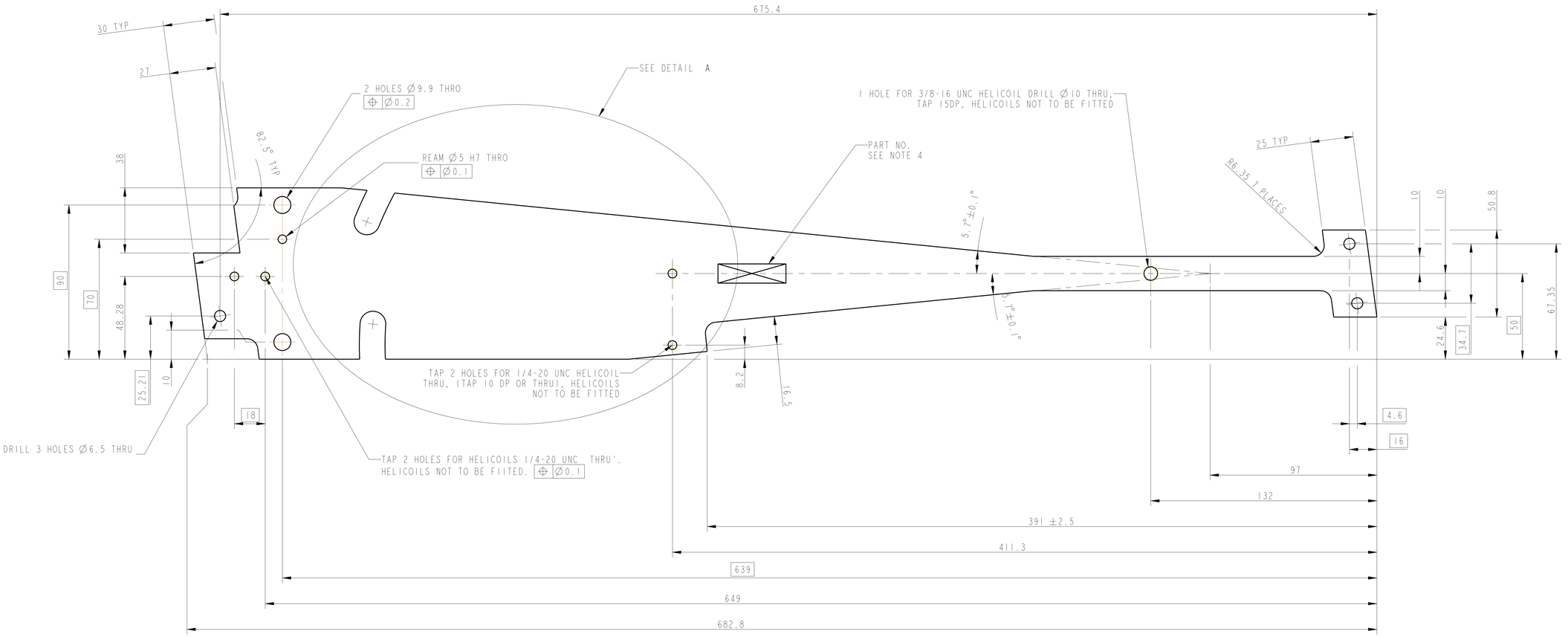
PROJECTION:

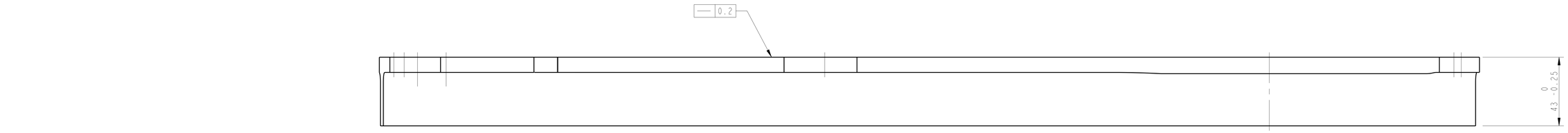
SHEET 1 OF 1

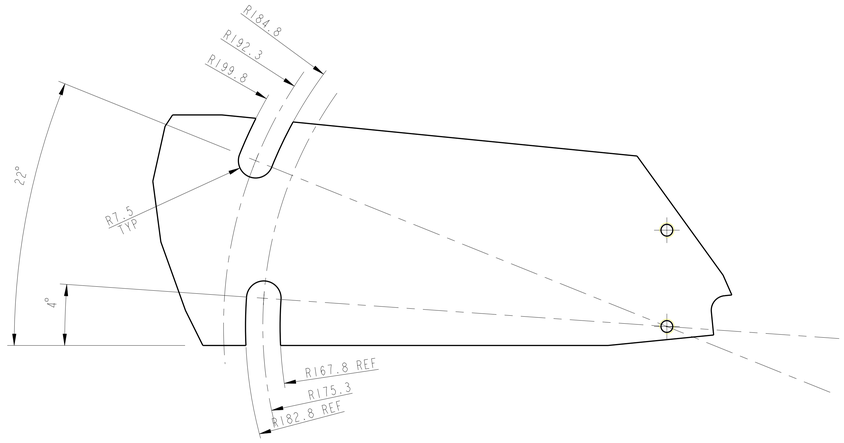
INTRALINK NAME: D0901439

REV.	DATE	DCN #	DRAWING TREE #
A	13/OCT/09	E060238	-

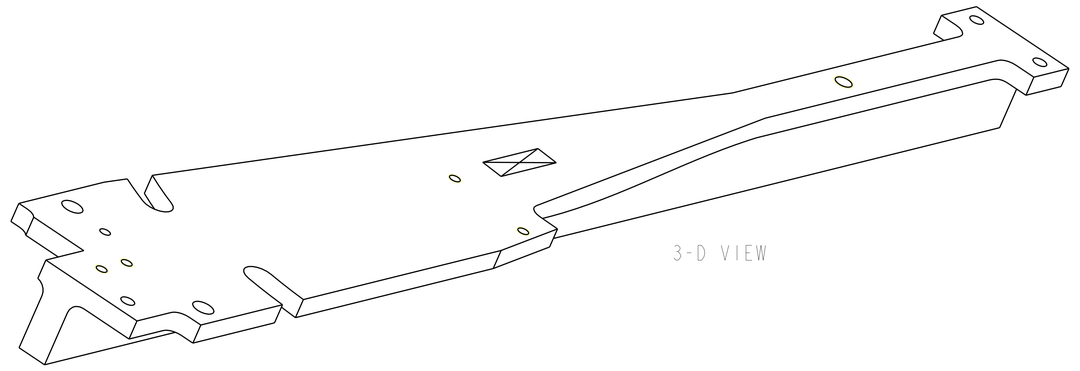








DETAIL A
SCALE 1:1



3-D VIEW

NOTES: (UNLESS OTHERWISE SPECIFIED)
1. REMOVE ALL SHARP EDGES.
2. DO NOT SCALE FROM DRAWING.
3. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE.
4. SCRIBE, ENGRAVE OR STAMP DRAWING PARTNUMBER ON NOTED SURFACE OF PART AND A THREE DIGIT SERIAL NUMBER STARTING WITH 001 AND AT 001 FOR THE FIRST PART AND PROCEED CONSECUTIVELY. USE .1" HIGH CHARACTERS. EXAMPLE: D020188- 001. A HIBRATORY TOOL MAY BE USED.

DIMENSIONS ARE IN mm [INCHES]
TOLERANCES:
X.XX ±0.25 mm [INCHES]
ANGULAR ±0.25°
MATERIAL: AL ALLOY 6061
FINISH: CLEAN AND DEGREASED
m (µin) Ra: 1.6 (63)

	NAME	DATE
DRAWN	R WILMOT	13/OCT/09
CHECKED	MB	15/MAR/10
APPROVED	JDD	15/MAR/10

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, GR. GLASGOW UNIVERSITY OF GEO 600 GROUP, RUTHERFORD APPLETON LABORATORY

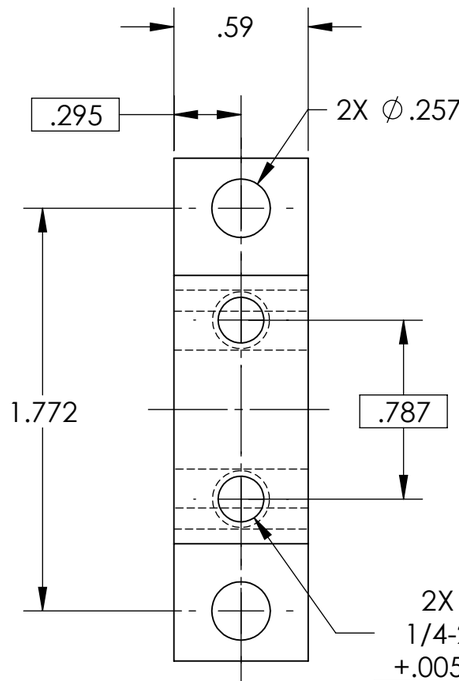
SYSTEM aLIGO
SUB-SYSTEM SUS
NEXT ASSY QUAD TOP STAGE
PART NAME TOP STAGE STIFF BACK

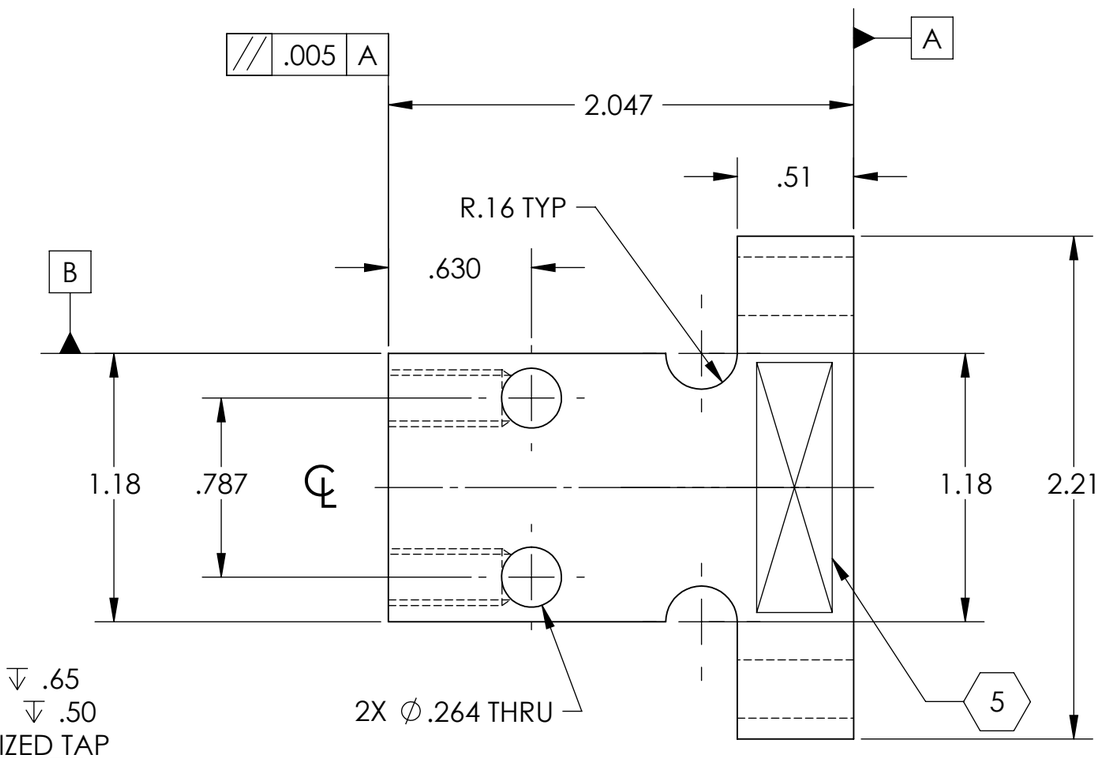
SIZE E | DRG. NO. D0901439 | B.
SCALE 1:1 | PROJECTION | SHEET 1 OF 1

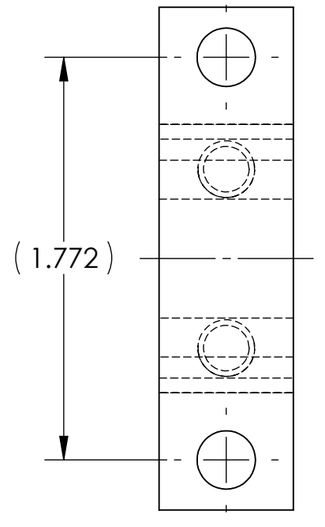
NOTES CONTINUED:

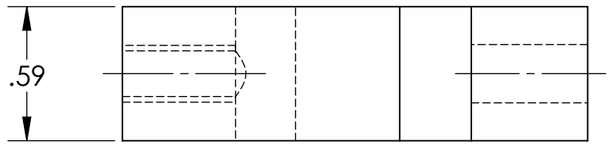
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

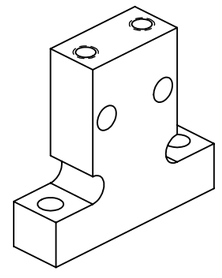
REV.	DATE	DCN #	DRAWING TREE #
v1	JUN-29-2010	E1000234	











ISO VIEW

3. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE TECHNIQUES IS NOT ALLOWED.

2. DO NOT USE SANDPAPER, SCOTCH BRITE OR SIMILAR PRODUCTS.

1. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364

NOTE: WEIGHT 0.45 lbs.

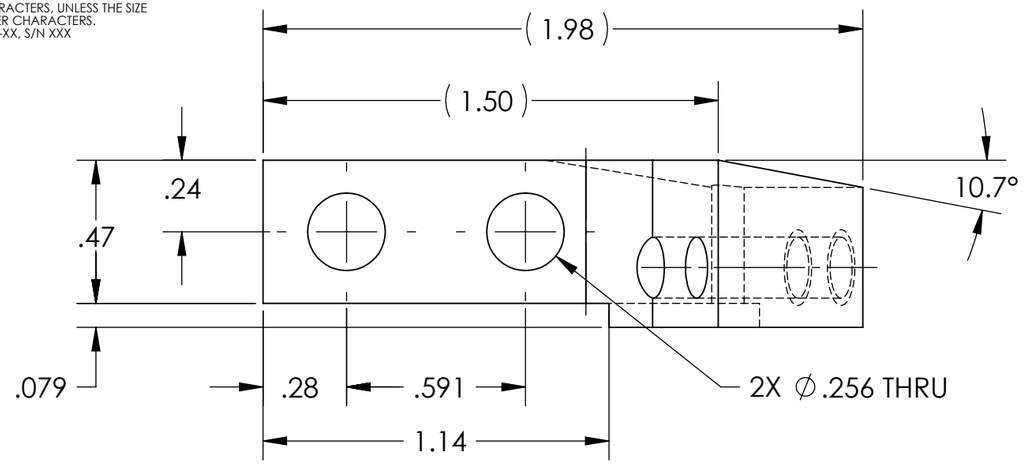
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)							
DIMENSIONS ARE IN TOLERANCES: .XX ± .010 .XXX ± .005 ANGULAR ± 5°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, R.02 MIN. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.			LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO INTERMEDIATE TOP MASS SPACER	
	MATERIAL: S. STL 304	FINISH: 32 µinch		SYSTEM: aLIGO AOS	SUB-SYSTEM: TRANSMON	SIZE: B	DWG. NO.: D1000395 REV.: v1
				NEXT ASSY: D1000442		DESIGNER: I ROMERO 4/14/10 DRAFTER: I ROMERO 4/14/10 CHECKER: K MAILAND 4/14/10 APPROVAL: KMAILAND 4/14/10	SCALE: 2:1 PROJECTION: SHEET 1 OF 1

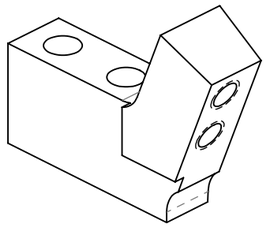
D1000395 aLIGO INTERMEDIATE TOP MASS SPACER, PART PDM REV: X-007, DRAWING PDM REV: X-004

NOTES CONTINUED:

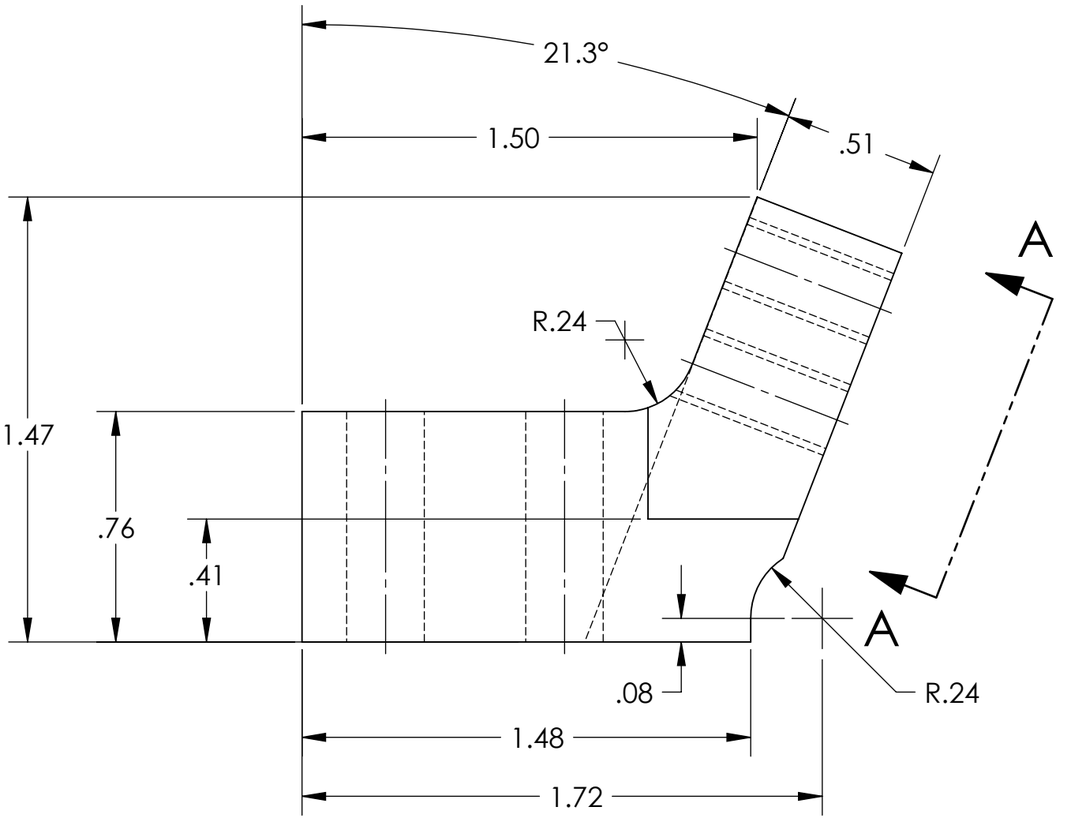
⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

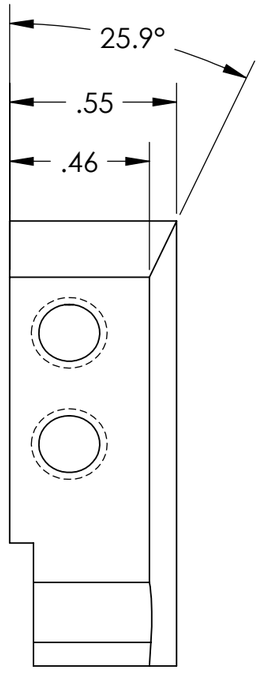
REV.	DATE	DCN #	DRAWING TREE #
v1	20 JUN 2011	E1100351	-
-	-	-	-
-	-	-	-

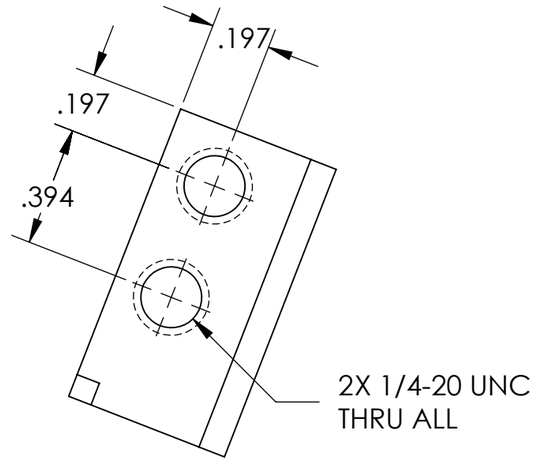




ISO VIEW





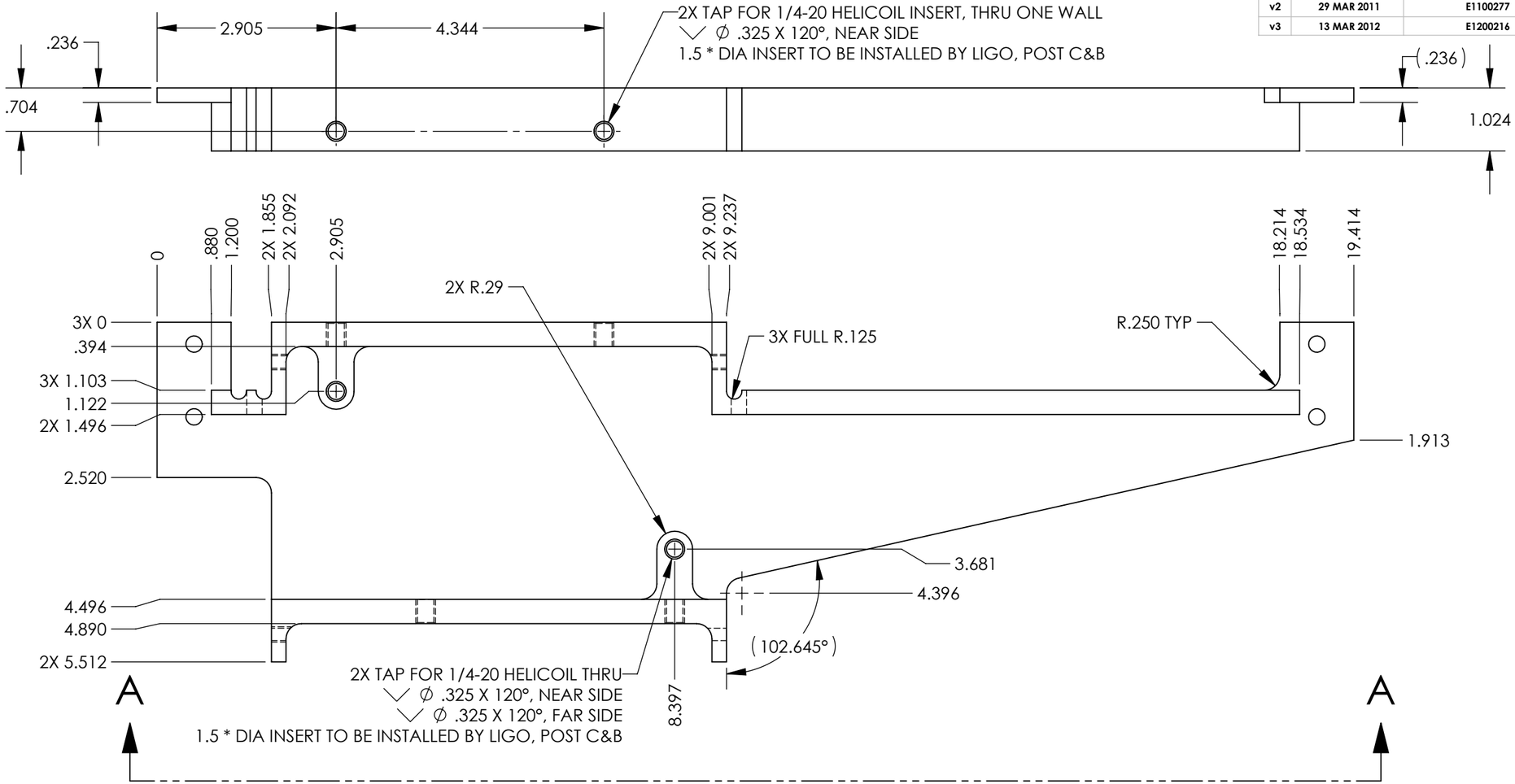


VIEW A-A

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)					
DIMENSIONS ARE IN TOLERANCES: .XX ± .XXX ± ANGULAR ± °	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, R.02 MIN. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	PART NAME: aLIGO INTERMEDIATE WIRE CLAMP BODY MIDDLE WIRE	
	MATERIAL: 304 SSTL	FINISH: 63 µinch	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: SUS	
			NEXT ASSY: D1000441	DESIGNER: K. MAILAND 22 FEB 2010	SIZE: B
				DRAFTER: K MAILALND 4/14/10	DWG. NO.: D1000396
				CHECKER: K MAILAND 4/14/10	REV.: v1
				APPROVAL	SCALE: 2:1 PROJECTION: SHEET 1 OF 1

D1000396 aLIGO INTERMEDIATE WIRE CLAMP BODY MIDDLE WIRE, PART PDM REV: X-003
DRAWING PDM REV: X-015,

REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	29 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.

(5) SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.

6. MASS: 1.013 KG [2.234 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.

10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABBORATORY. REFER TO LIGO-E0900364.

(12) ALL TAPPED HOLES (HELI-COIL EXCLUDED): USE 0.005 OVERSIZE BOTH DRILL & TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 0.1°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.

MATERIAL: 6061-T6 Al

FINISH: 63 µinch Ra

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO

SUB-SYSTEM: AOS

NEXT ASSY: D1000549

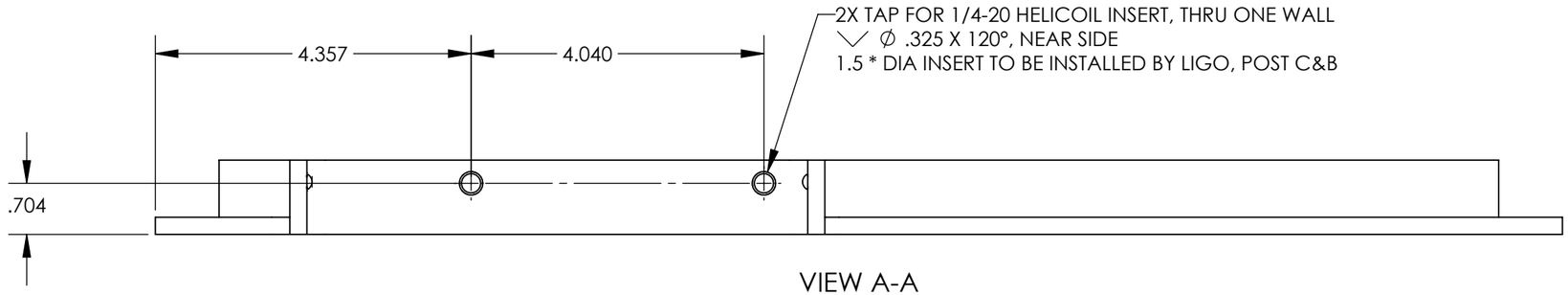
PART NAME: aLIGO OSUMS INTERMIDIATE SUPPORT RIGHT SIDE BRACKET

DESIGNER	K. MAILAND	23 FEB 2010
DRAFTER	I ROMERO	07 JUN 2010
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

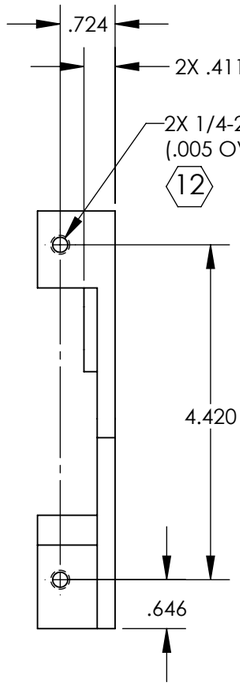
SIZE: B — DWG. NO.: D1000407 — REV.: v3

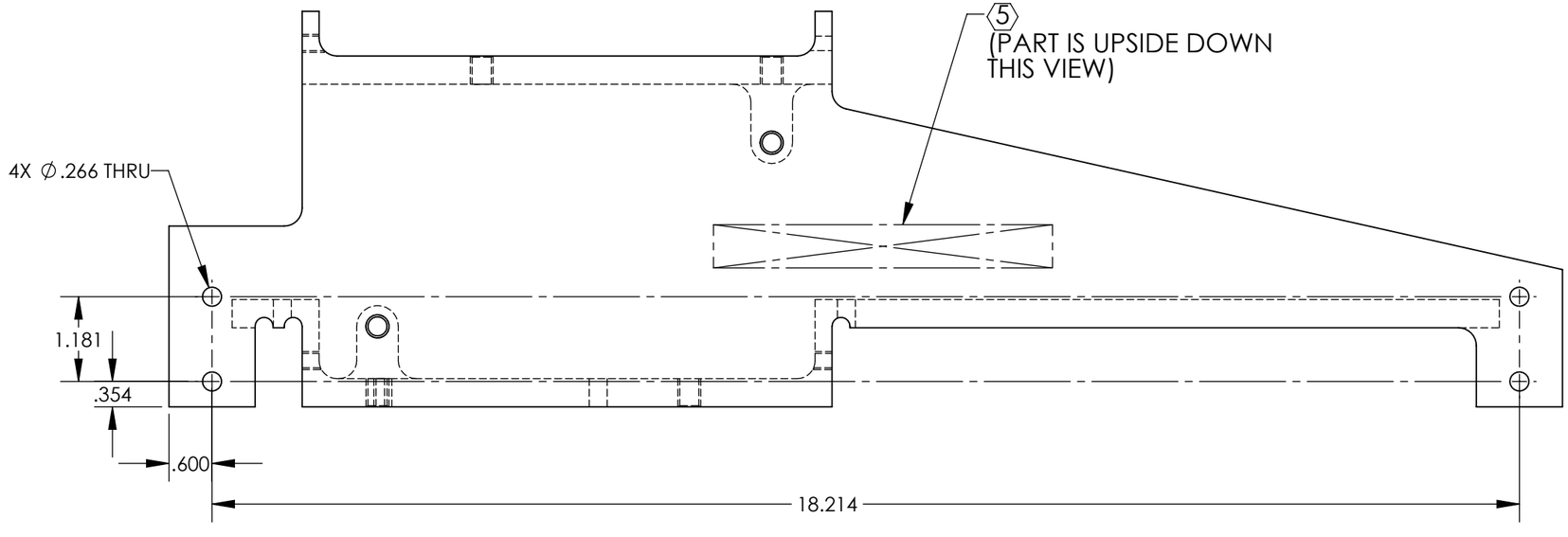
SCALE: NONE — PROJECTION: — SHEET 1 OF 3

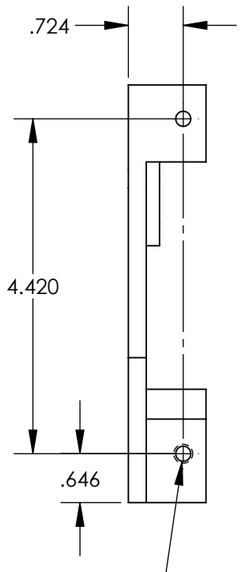
D1000407 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_RIGHT_SIDE_BRACKET, PART PDM REV: X-039, DRAWING PDM REV: X-039



VIEW A-A







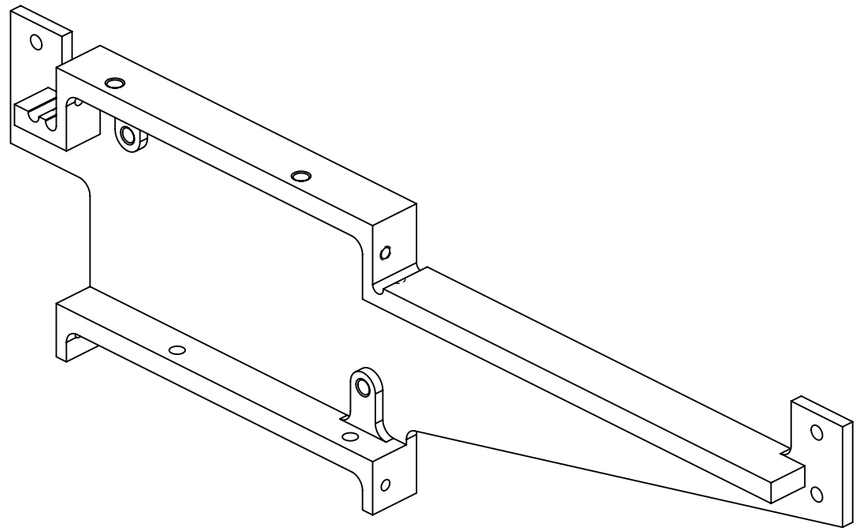
2X 1/4-20 UNC - 2B, H11, THRU NEXT
(.005 OVERSIZE BOTH DRILL & TAP)
12

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

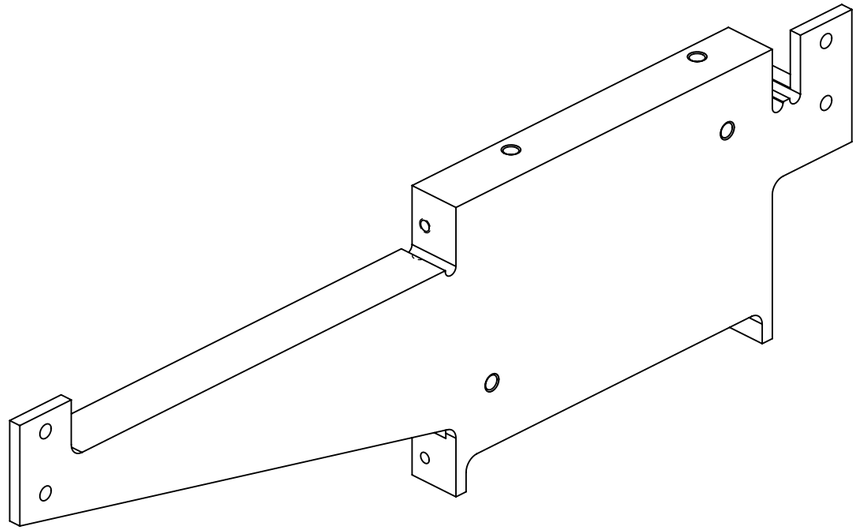
SIZE	DWG. NO.	REV.
B	D1000407	v3

SCALE:NONE PROJECTION: SHEET 2 OF 3

D1000407 GLIGO_OSUMS_INTERMIDIATE_SUPPORT_RIGHT_SIDE_BRACKET, PART PDM REV: X-089, DRAWING PDM REV: X-039



INSIDE ISO VIEW

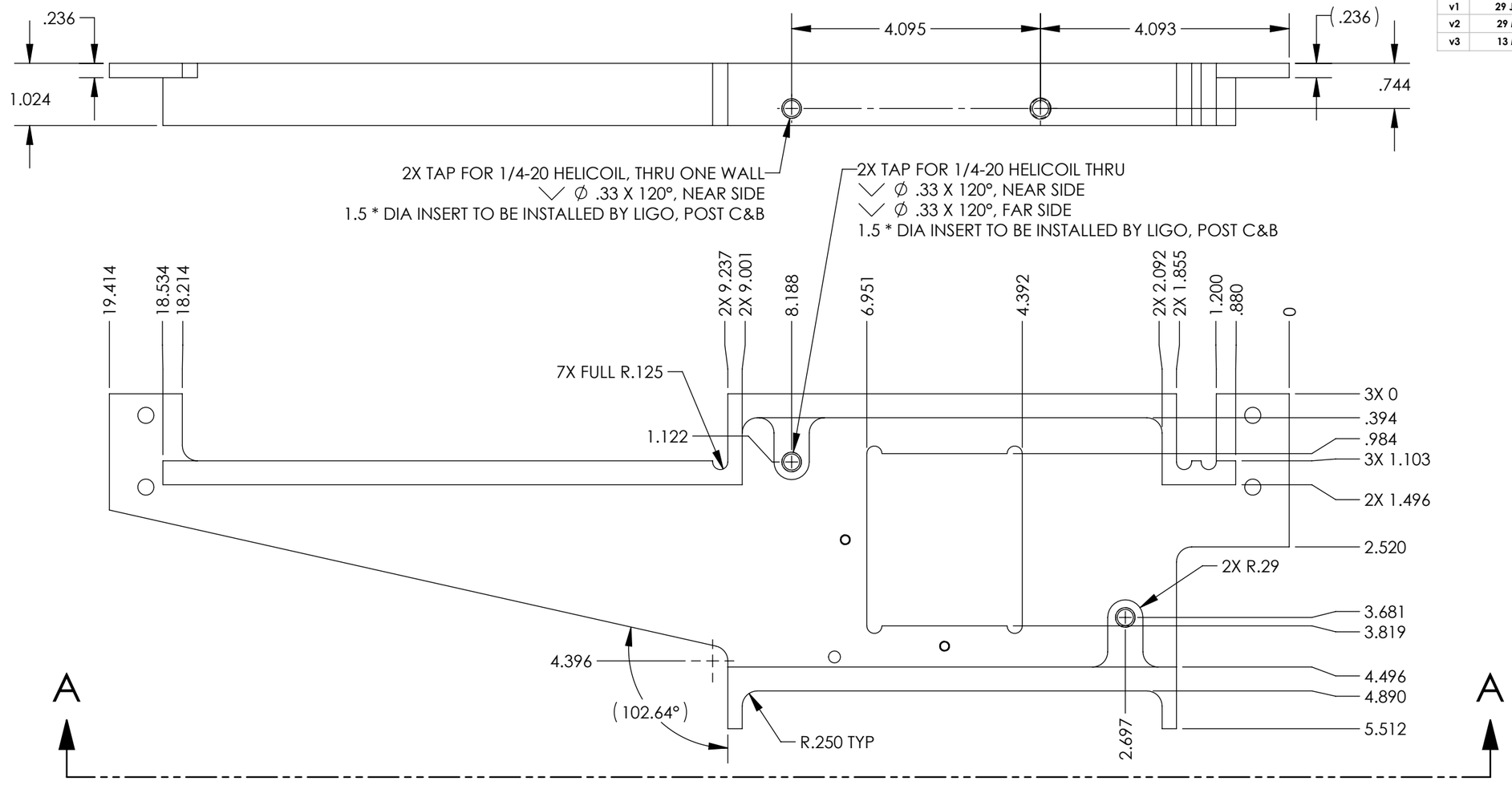


OUTSIDE ISO VIEW

D1000407 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_RIGHT_SIDE_BRACKET, PART PDM REV: X-089, DRAWING PDM REV: X-039

LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1000407	REV. v3	
SCALE:NONE	PROJECTION:	SHEET 3 OF 3	

REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	29 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.

⟨5⟩ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.

6. MASS: 0.886 KG [1.953 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.

10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABBORATORY. REFER TO LIGO-E0900364.

⟨12⟩ ALL TAPPED HOLES (HELI-COIL EXCLUDED): USE 0.005 OVERSIZE BOTH DRILL & TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)							
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	aLIGO OSUMS INTERMIDIATE SUPPORT LEFT SIDE BRACKET	
	MATERIAL: 6061-T6 Al	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: K. MAILAND 23 FEB 2010 DRAFTER: I ROMERO 26 APR 2010 CHECKER: SEE DCN APPROVAL: SEE DCN	SIZE: B	DWG. NO.: D1000408 REV.: v3
			NEXT ASSY: D1000549			SCALE: NONE	PROJECTION: SHEET 1 OF 3

D1000408 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_LEFT_SIDE_BRACKET, PART PDM REV: X-316, DRAWING PDM REV: X-034

2X TAP FOR 1/4-20 HELICOIL INSERT, THRU ONE WALL
∅.325 X 120°, NEAR SIDE
1.5 * DIA INSERT TO BE INSTALLED BY LIGO, POST C&B

4.300 2.697 .704

SECTION A-A

2X 1/4-20 UNC - 2B, H11, THRU NEXT
(.005 OVERSIZE BOTH DRILL & TAP)
12

2X .411 4.420 .646 .724 1.024

4X R.125
∅.197 THRU
5.671
(2.697)
5
(PART IS UPSIDE DOWN
THIS VIEW)
B
4.705
4.331
4.154
(3.681)
2.402
1.535
.689
.354
0
1.181
4X ∅.266 THRU
18.814
2X 8-32 UNC-2B, H11, THRU ALL
(.005 OVERSIZE BOTH DRILL & TAP)
∅.16 X 90°, NEAR SIDE
∅.16 X 90°, FAR SIDE
⌖ ∅.010 A L
12
7.797 7.482 7.305 3.545 .600 0

2X 1/4-20 UNC - 2B, H11, THRU NEXT
(.005 OVERSIZE BOTH DRILL & TAP)
12

4.420 .646

4.095 4.093 .744

2X TAP FOR 1/4-20 HELICOIL INSERT, THRU ONE WALL
∅.33 X 120°, NEAR SIDE
1.5 * DIA INSERT TO BE INSTALLED BY LIGO

A
2X ∅.257/.254
(.236) .118 (.411)

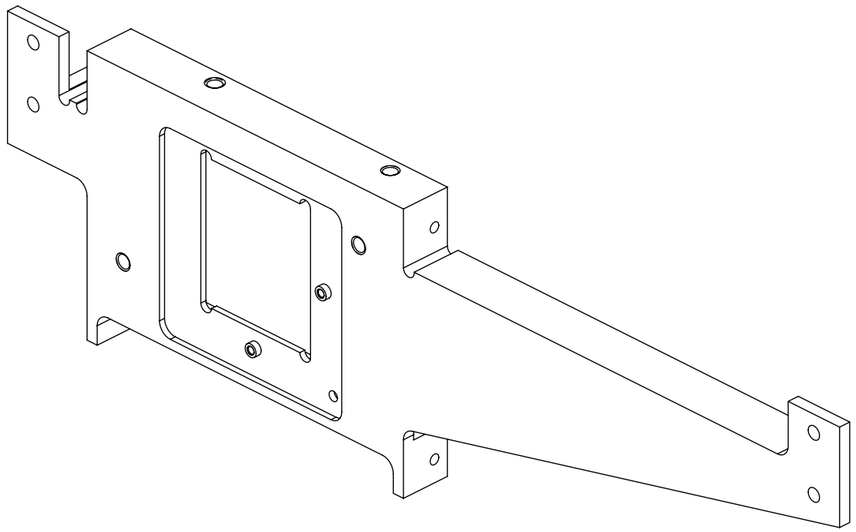
SECTION B-B

D1000408 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_LEFT_SIDE_BRACKET, PART PDM REV: X-316, DRAWING PDM REV: X-034

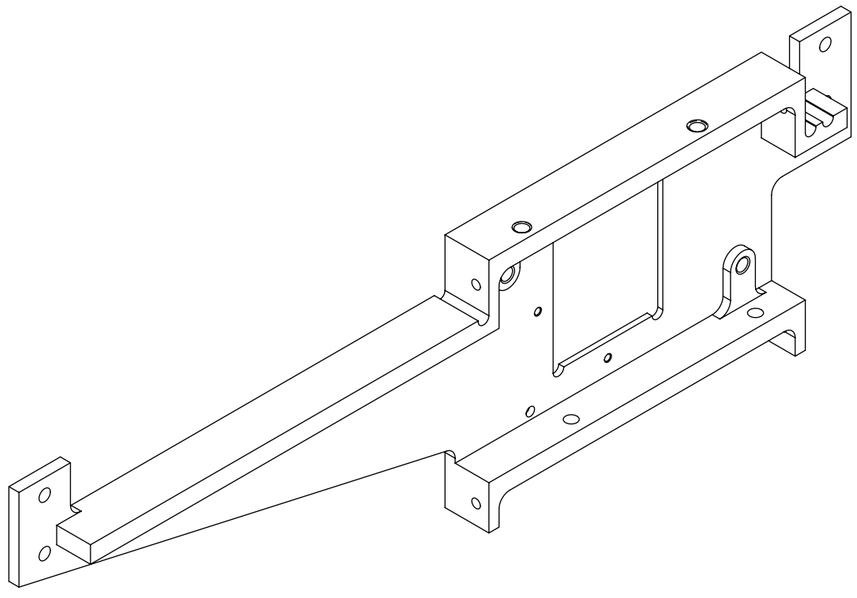
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1000408	v3

SCALE:NONE PROJECTION: SHEET 2 OF 3



INSIDE ISO VIEW

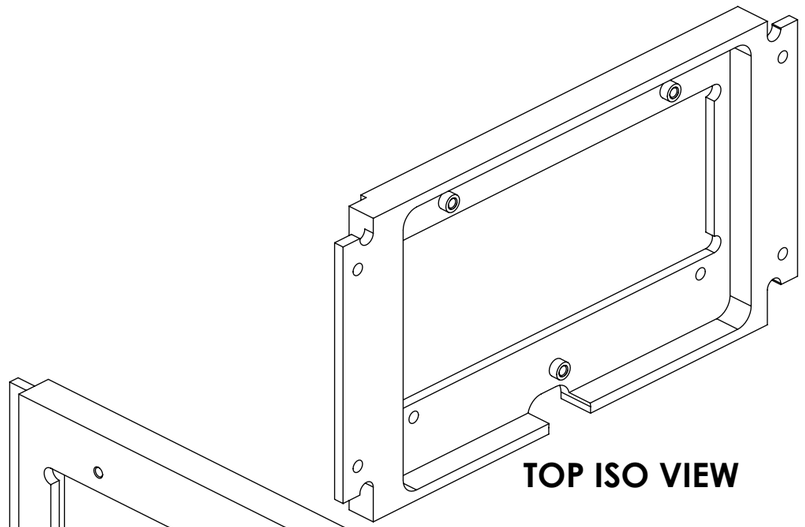


OUTSIDE ISO VIEW

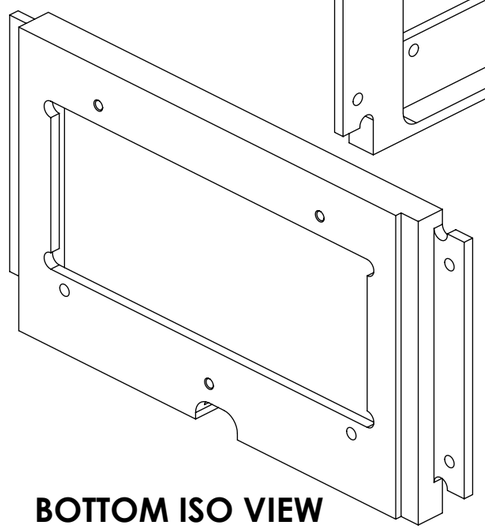
D1000408 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_LEFT_SIDE_BRACKET, PART PDM REV: X-316, DRAWING PDM REV: X-034

LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1000408	REV. v3	
SCALE: 1:8	PROJECTION:	SHEET 3 OF 3	

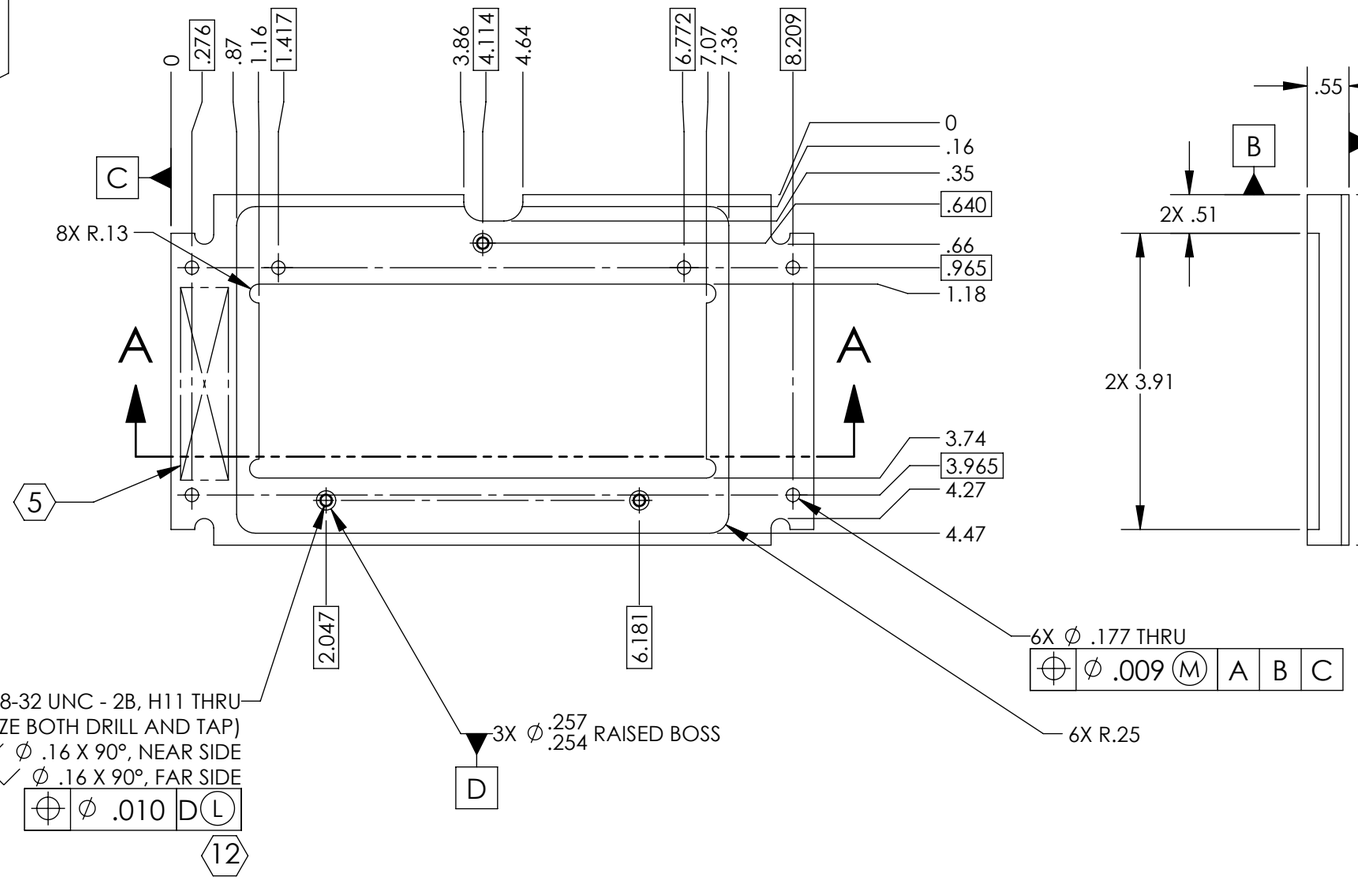
REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	31 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	

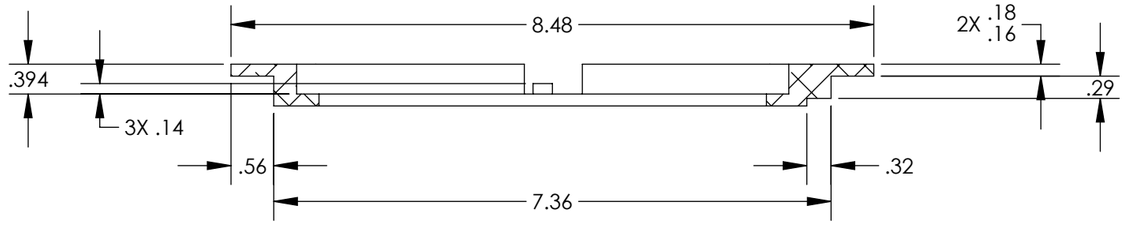


TOP ISO VIEW



BOTTOM ISO VIEW





SECTION A-A

NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.

⟨5⟩ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.

6. MASS: 256 G [0.564 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.

10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABBORATORY. REFER TO LIGO-E0900364.

⟨12⟩ ALL TAPPED HOLES: 0.005" OVERSIZE, BOTH DRILL AND TAP.

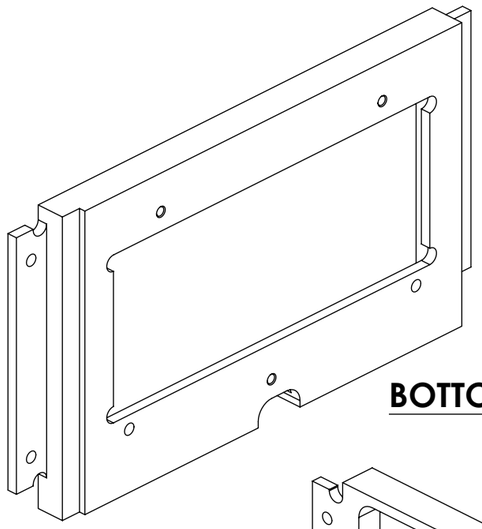
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)			
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING.		
	MATERIAL: 6061-T6 Al	FINISH: 63 µinch Ra	

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

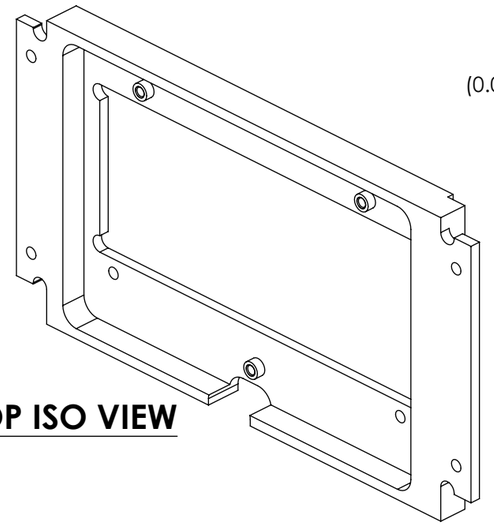
SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	PART NAME: aLIGO OSUMS INTERMIDIATE SUPPORT RIGHT SIDE TRAY	
NEXT ASSY: D1000549		DESIGNER: K. MAILAND 23 FEB 2010	SIZE: B — DWG. NO.: D1000409 — REV.: v3
		DRAFTER: I ROMERO 24 OCT 2010	
		CHECKER: SEE DCN	
		APPROVAL: SEE DCN	SCALE: NOTE — PROJECTION: — SHEET 1 OF 1

D1000409 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_RIGHT_SIDE_TRAY, PART PDM REV: X-044, DRAWING PDM REV: X-023

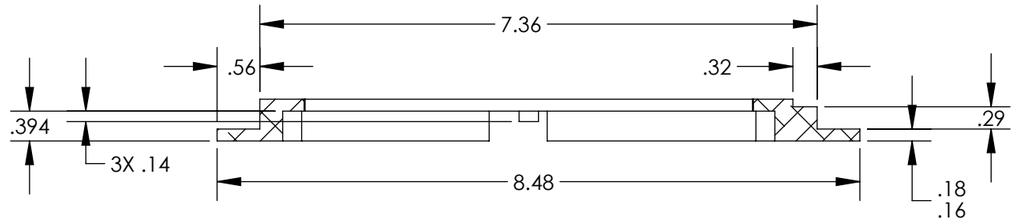
REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	31 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



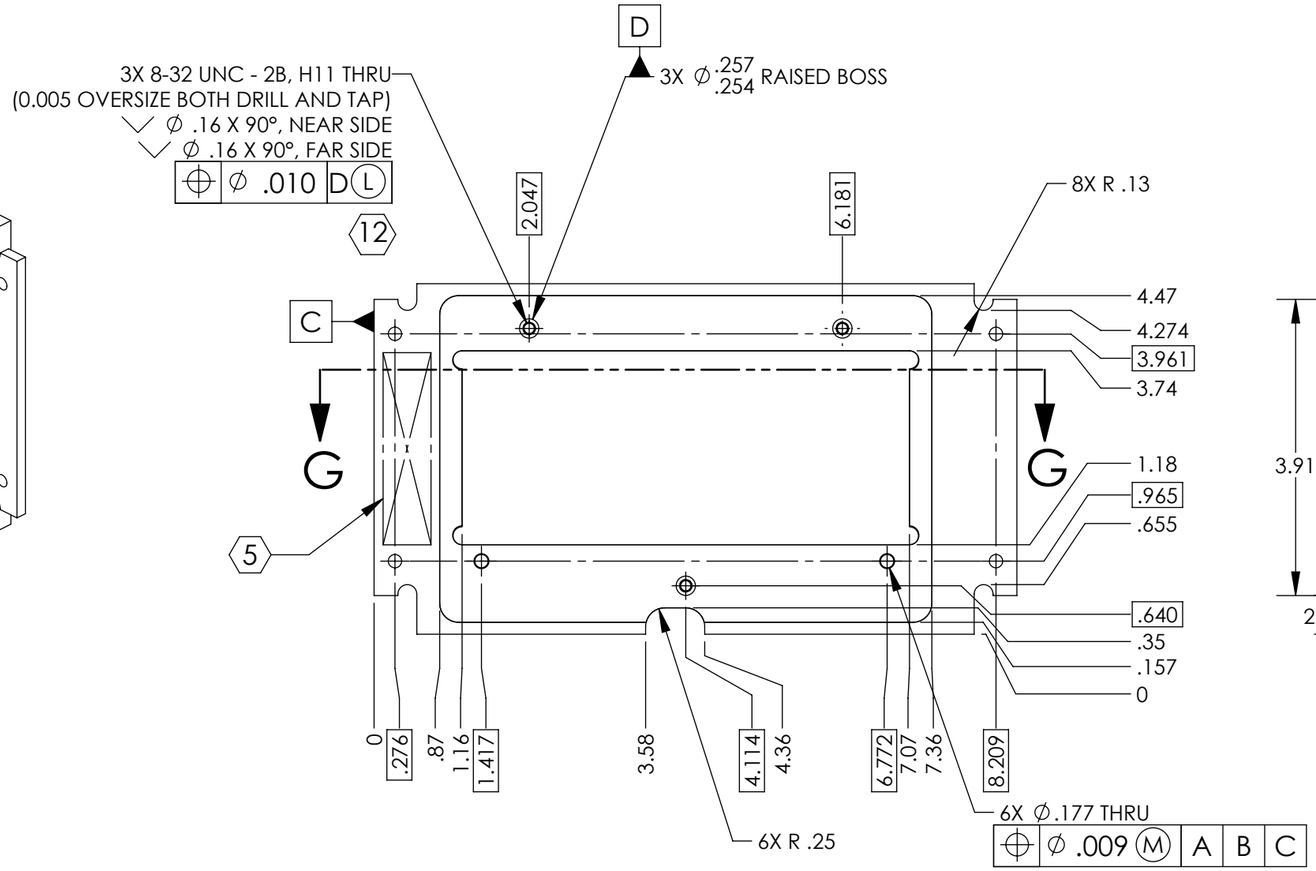
BOTTOM ISO VIEW

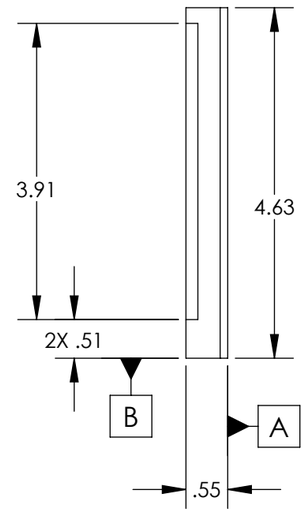


TOP ISO VIEW



SECTION G-G





NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.

⑤ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.

6. MASS: 256 G [0.564 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.

10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABBORATORY. REFER TO LIGO-E0900364.

⑫ ALL TAPPED HOLES: 0.005" OVERSIZE, BOTH DRILL AND TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 1.0°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.

MATERIAL: 6061-T6 Al

FINISH: 63 µinch Ra

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO | SUB-SYSTEM: AOS

NEXT ASSY: D1000549

PART NAME: aLIGO OSUMS INTERMIDIATE SUPPORT LEFT SIDE TRAY

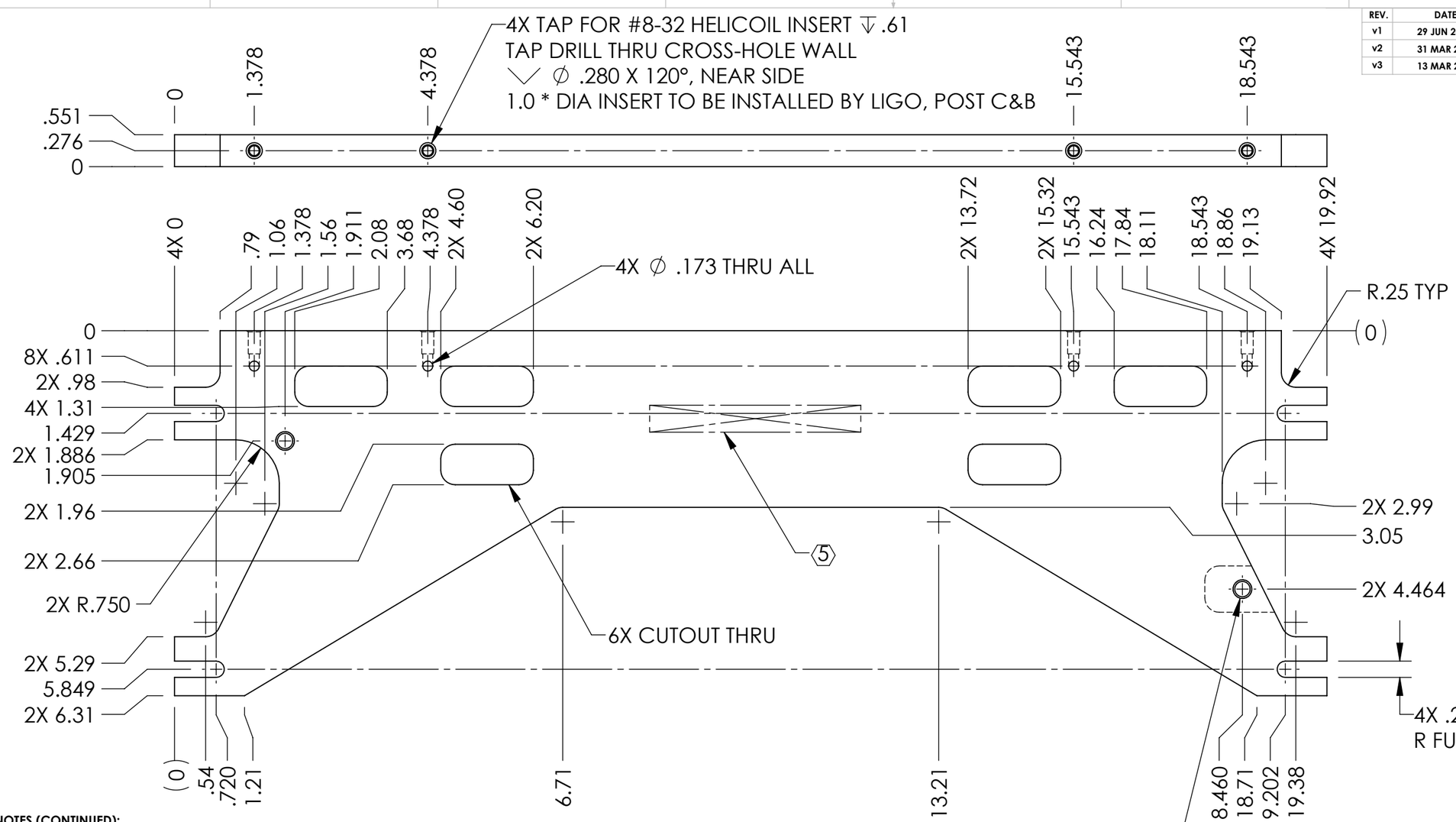
DESIGNER	K. MAILAND	23 FEB 2010
DRAFTER	I ROMERO	23 OCT 2010
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

SIZE: B | DWG. NO.: D1000410 | REV.: v3

SCALE: NONE | PROJECTION: | SHEET 1 OF 1

D1000410 aLIGO_OSUMS_INTERMIDIATE_SUPPORT_LEFT_SIDE_TRAY, PART PDM REV: X-020, DRAWING PDM REV: X-182

REV.	DATE	DCN #	DRAWING TREE #
v1	29 JUN 2010	E1000234	
v2	31 MAR 2011	E1100277	
v3	13 MAR 2012	E1200216	



NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.

(5) SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.

6. MASS: 1.640 KG [3.616 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.

10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABBORATORY. REFER TO LIGO-E0900364.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005
ANGULAR ± 0.1°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-015.
3. DO NOT SCALE FROM DRAWING.

MATERIAL: 6061-T6 Al
FINISH: 63µinch Ra

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

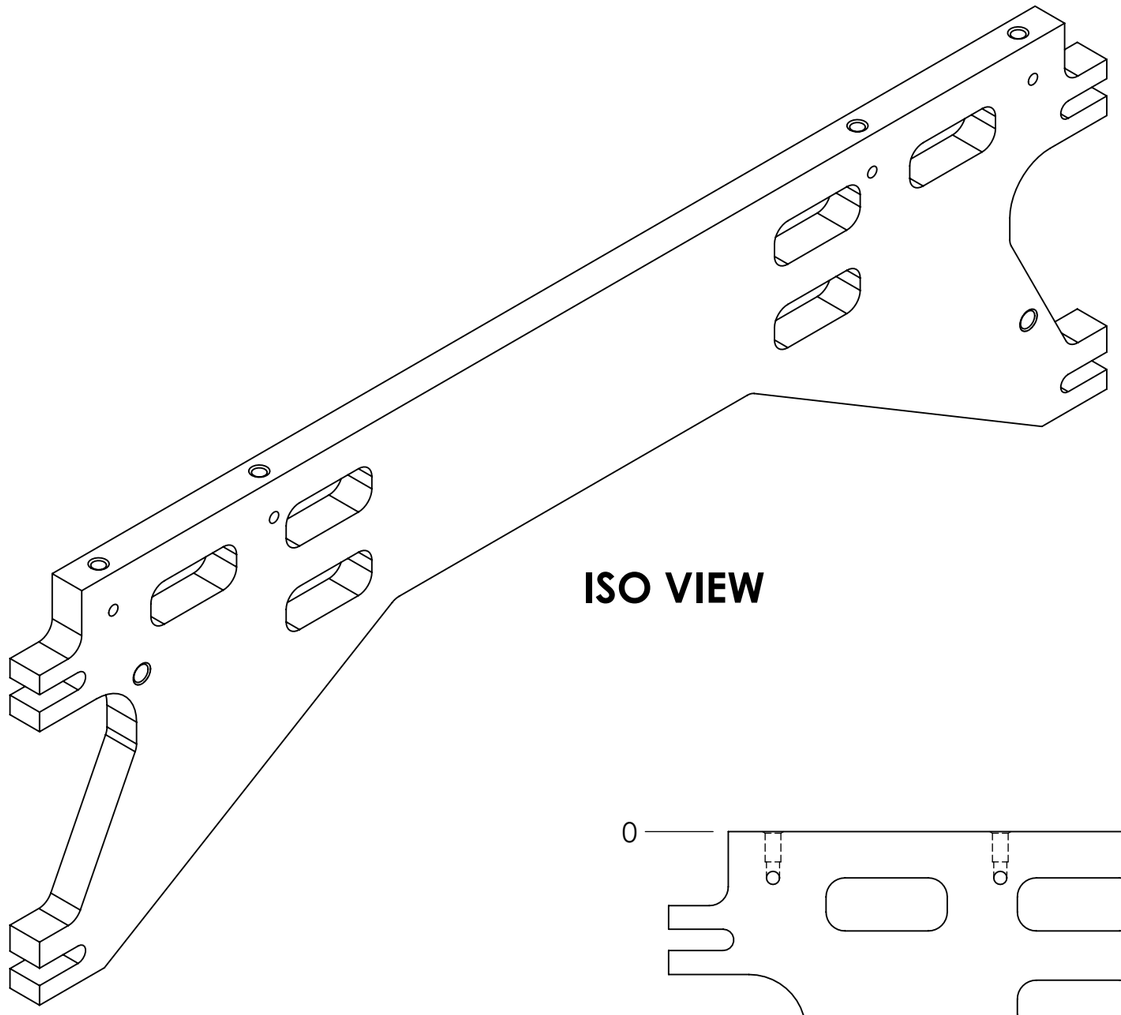
SYSTEM: ADVANCED LIGO
SUB-SYSTEM: AOS
NEXT ASSY: D1000549

PART NAME: TMS INTERMEDIATE OSUM SUPPORT PLATE, REAR

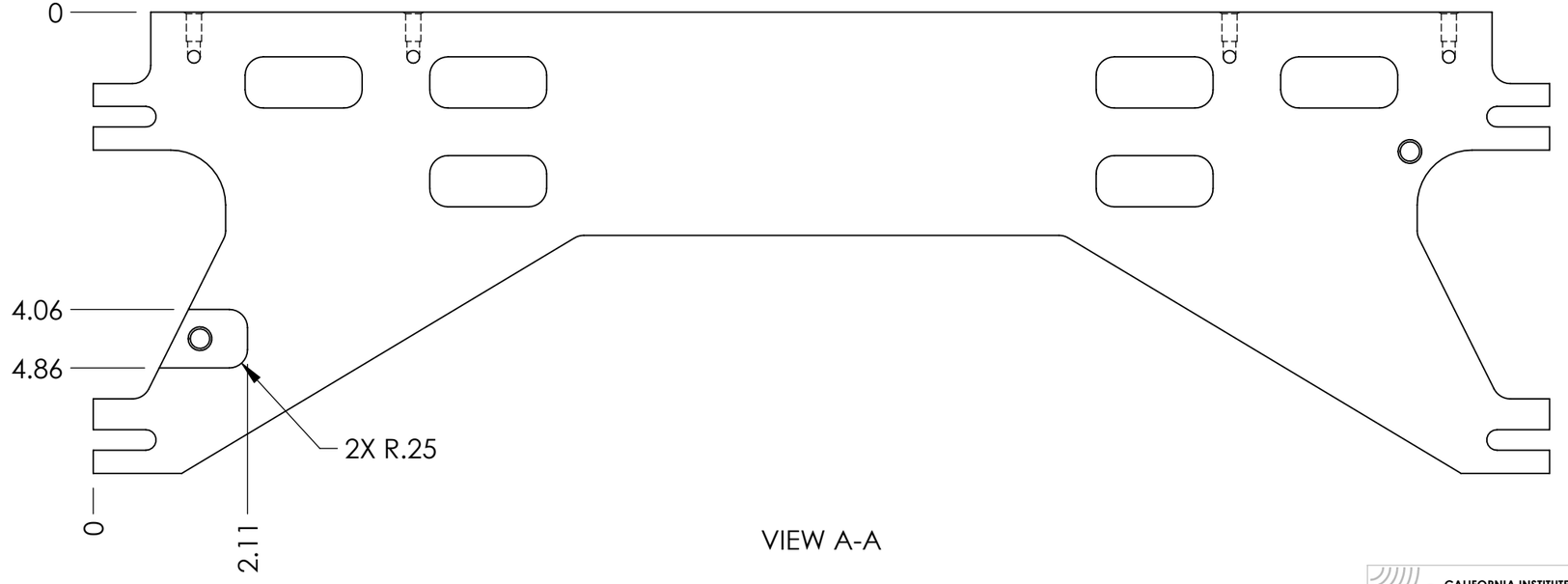
DESIGNER	K. MAILAND	04 FEB 2010
DRAFTER	I ROMERO	29 JUN 2010
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

SIZE: B | DWG. NO.: D1000411 | REV.: v3
SCALE: NONE | PROJECTION: | SHEET 1 OF 2

D1000411 TMS Intermediate OSUM Support Plate, Rear, PART PDM REV: X-047, DRAWING PDM REV: X-029



ISO VIEW



VIEW A-A

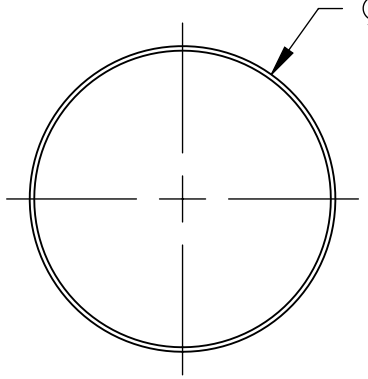
D1000411 TMS Intermediate OSUM Support Plate, Rear, PART PDM REV: X-047, DRAWING PDM REV: X-029

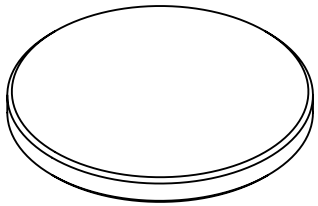
LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1000411	REV. v3	
SCALE:NONE	PROJECTION:	SHEET 2 OF 2	

NOTES CONTINUED:

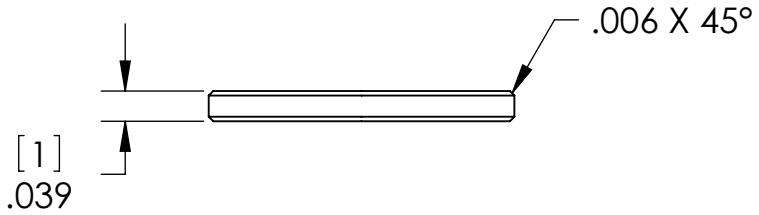
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 101 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART): XXX-v1
   EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD
6. APPROXIMATE WEIGHT = 0.644g
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

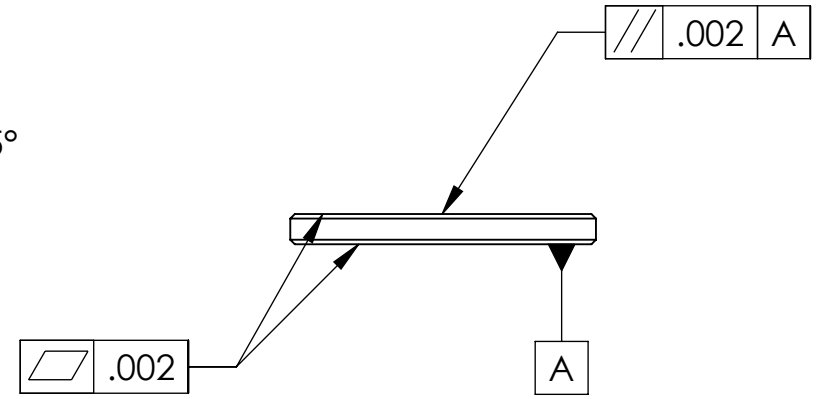
REV.	DATE	DCN #	DRAWING TREE #
v1	09 JUL 2010	E0900501	E0900353
-	-	-	-
-	-	-	-





ISOMETRIC VIEW





NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .03
.XXX ± .005

ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, R.02 MIN.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL: 416 SSTL

FINISH: 32 µinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO

SUB-SYSTEM: SUS

NEXT ASSY: MULTIPLE ASSY

PART NAME: MAGNETIC PLUG

DESIGNER	M. MEYER	14 JUN 2010
DRAFTER	B. MOORE	14 JUN 2010
CHECKER	M. MEYER	16 JUN 2010
APPROVAL		

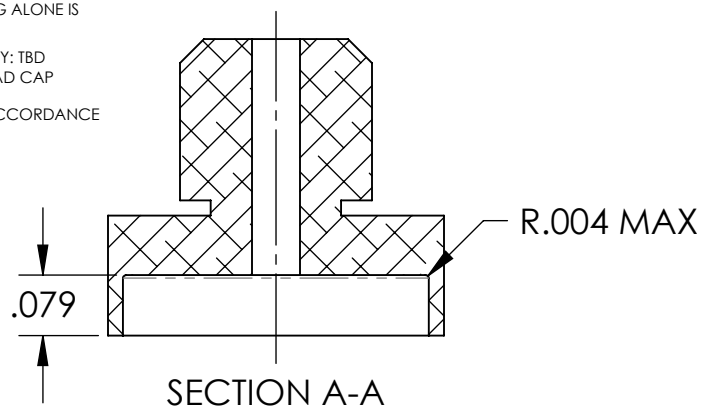
SIZE: A | **DWG. NO.**: D1001534 | **REV.**: v1

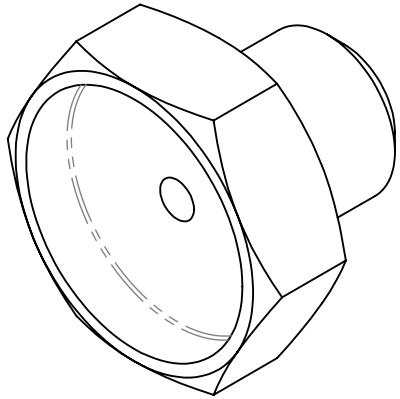
SCALE: 4:1 | **PROJECTION**: | SHEET 1 OF 1

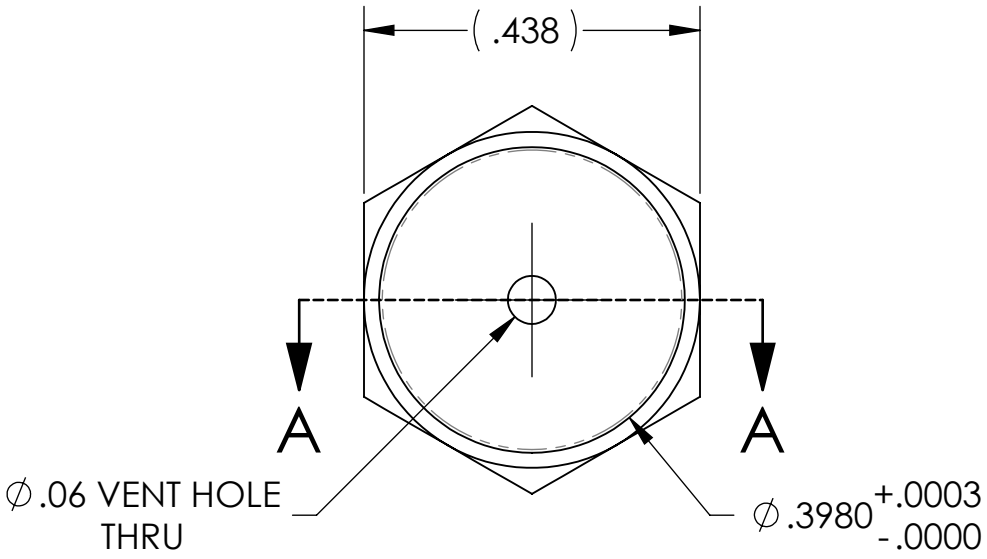
NOTES CONTINUED:

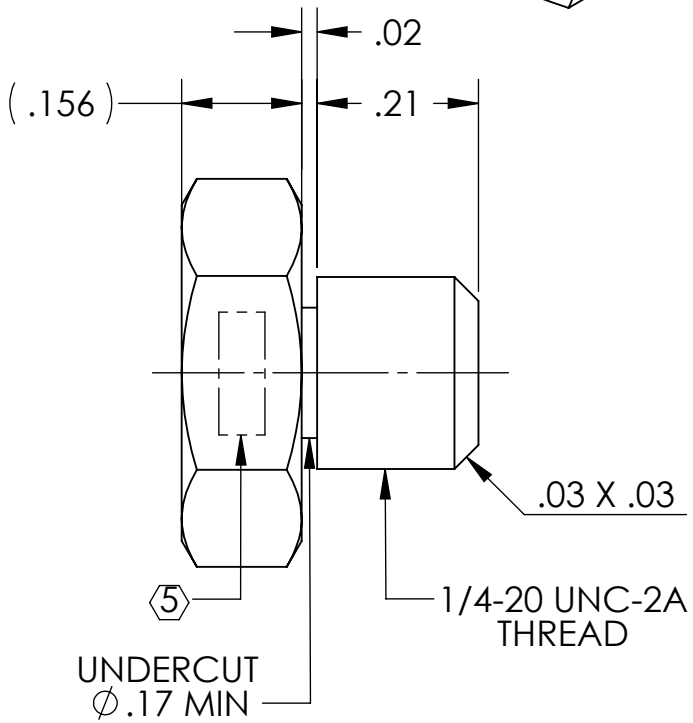
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART): 001-v1
   EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD
6. PART IS TO BE MADE FROM STOCK HEX HEAD CAP SCREW, 1/4-20 UNC-2A, FULLY THREADED.
7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

REV.	DATE	DCN #	DRAWING TREE #
v1	18 MAY 2010	E1000166	-
-	-	-	-
-	-	-	-









NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, R.02 MIN.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL: 316 SSTL 6

FINISH: 32 µinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO

SUB-SYSTEM: SUS

NEXT ASSY: MULTIPLE ASSYS

PART NAME: MAGNET RETAINER, BOSEM

DESIGNER	D. BRIDGES	13 JUL 2010
DRAFTER	D. BRIDGES	14 JUL 2010
CHECKER	M. MEYER	16 JUL 2010
APPROVAL		

SIZE: A **DWG. NO.**: D1001697 **REV.**: v1

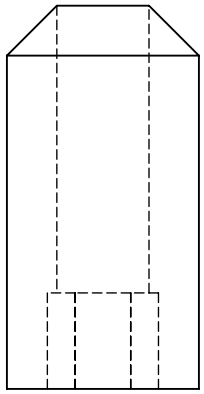
SCALE: 4:1 **PROJECTION**: **SHEET** 1 OF 1

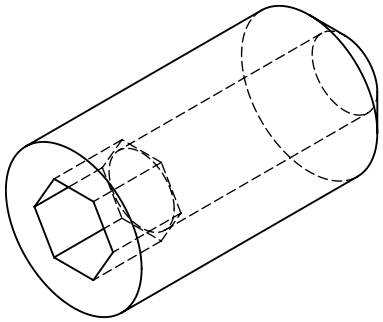
NOTES CONTINUED:

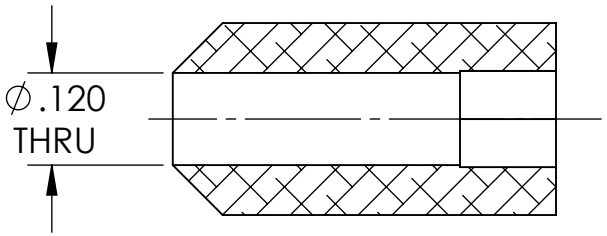
5. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, AND SERIAL NUMBER. SERIAL NUMBERS START AT 001 (UNLESS OTHERWISE SPECIFIED) FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY.
   EXAMPLE:
   DXXXXXXX-vY
   S/N-001
6. APPROXIMATE WEIGHT = .003 LB [1.27 G].
7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

⟨8⟩ MAKE FROM:
TICO TITANIUM INC.
WWW.TICOTITANIUM.COM
P/N SS142012 (1/4-20 UNC X 1/2" SOCKET SET SCREW, COMMERCIALLY PURE TITANIUM, GRADE 2) OR APPROVED EQUIVALENT.

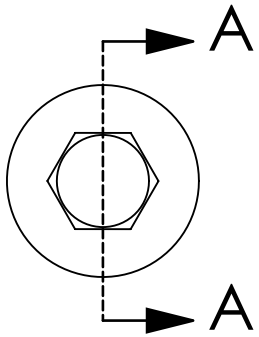
REV.	DATE	DCN #	DRAWING TREE #
v1	24 FEB 2011	E1100080-v1	-
-	-	-	-
-	-	-	-







SECTION A-A



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 0.5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATLEY R.02 FOR SHEET METAL PARTS.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL ⟨8⟩

FINISH N/A µinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM ADVANCED LIGO **SUB-SYSTEM** AOS

NEXT ASSY D1001160

PART NAME TMS TELESCOPE MASS ATTACHMENT SCREW

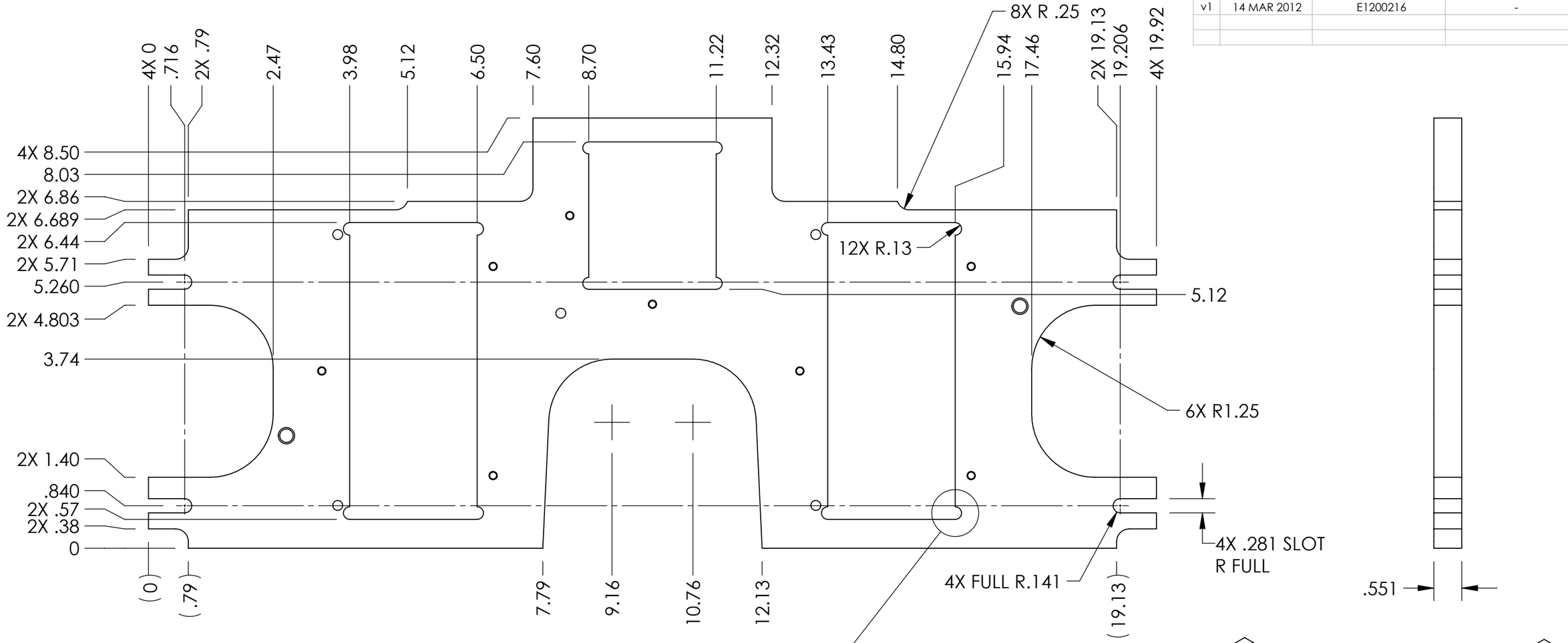
DESIGNER	C. CONLEY	24 FEB 2011
DRAFTER	C. CONLEY	24 FEB 2011
CHECKER		
APPROVAL		

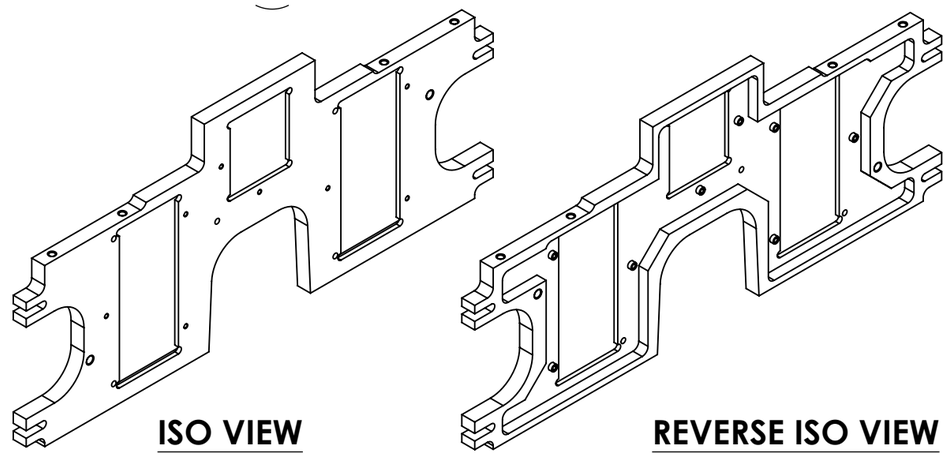
SIZE A **DWG. NO.** D1100358 **REV.** v1

SCALE: NONE **PROJECTION:** SHEET 1 OF 1

D1100358 TMS Telescope Mass Attachment Screw, PART PDM REV: X-001, DRAWING PDM REV: X-000

REV.	DATE	DCN #	DRAWING TREE #
v1	14 MAR 2012	E1200216	-





ISO VIEW

REVERSE ISO VIEW

NOTES (CONTINUED):

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE, PER LIGO SPECIFICATION E0900237.

(5) SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12 HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. A VIBRATORY TOOL MAY BE USED. EXAMPLE DXXXXXXX-VY, TYPE-XX, S/N XXX.

6. MASS: 0.960 KG [2.117 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED. REFER TO LIGO-E0900364.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. ALL HELI-COIL TAPPED HOLES TO BE PREPARED ACCORDING TO EMHART HELI-COIL PRODUCT CATALOG HC2000.

10. ALL HELICOIL INSERTS TO BE INSTALLED BY LIGO PERSONNEL, AFTER DELIVERY OF FINISHED PARTS, USE NITRONIC 60 THREADED INSERTS.

11. ALL MATERIAL IS TO BE VIRGIN MATERIAL (I.E. NOT WELD REPAIRS OR PLUGS OR RECYCLED MATERIAL). NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING BY LIGO LABBORATORY. REFER TO LIGO-E0900364.

(12) ALL TAPPED HOLES (HELI-COIL EXCLUDED): USE 0.005 OVERSIZE BOTH DRILL & TAP.

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .015
.XXX ± .005

ANGULAR ± .5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.

MATERIAL: 6061-T6 Al

FINISH: 63 µinch Ra

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO

SUB-SYSTEM: AOS

NEXT ASSY: D1000549

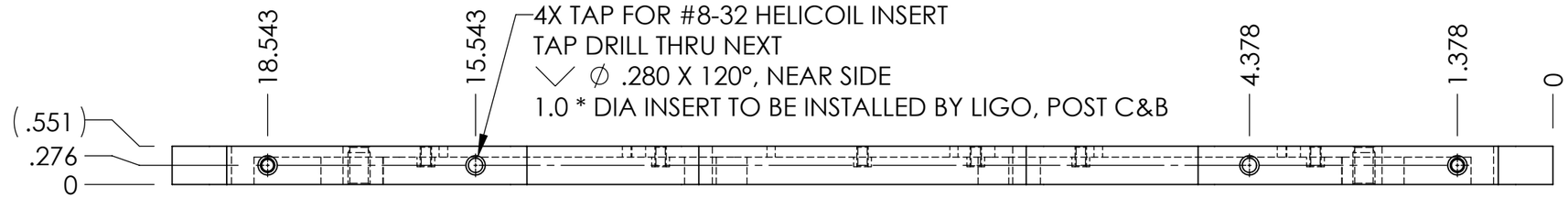
PART NAME: TMS SUSPENSION TABLECLOTH PLATE, FRONT

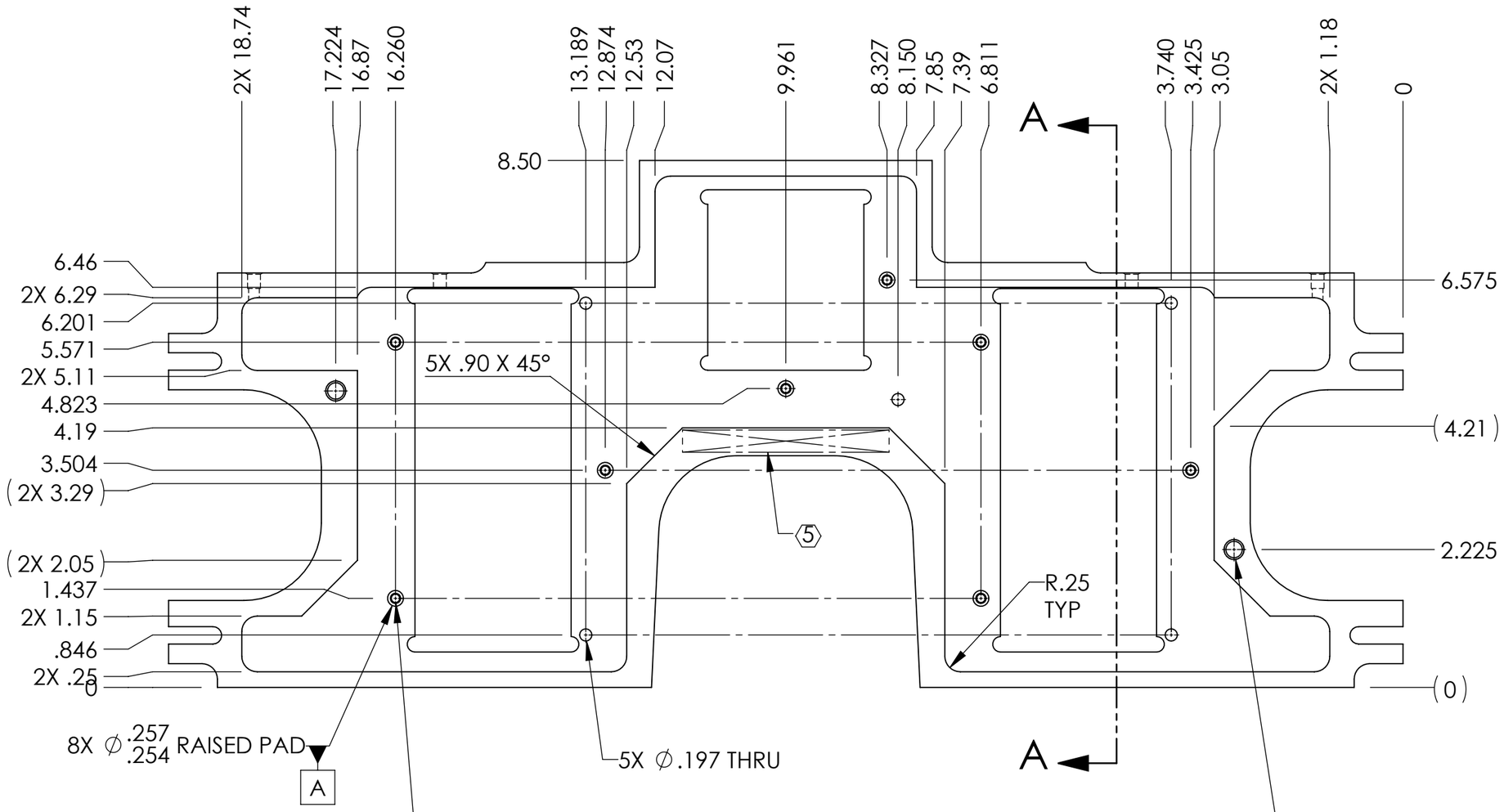
DESIGNER	C. CONLEY	04 MAR 2011
DRAFTER	M. HILLARD	14 MAR 2012
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

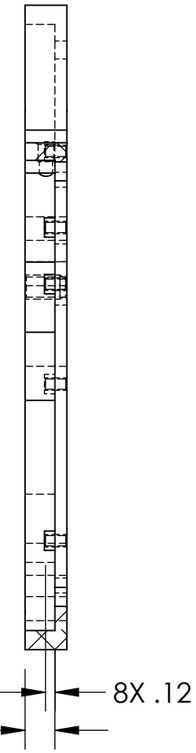
SIZE: B — DWG. NO.: D1100421 — REV.: v1

SCALE: NONE — PROJECTION: — SHEET 1 OF 2

D1100421 aLIGO AOS, TMS Suspension Tablecloth Plate, Front, PART PDM REV: X-039, DRAWING PDM REV: X-018







SECTION A-A

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1100421	v1

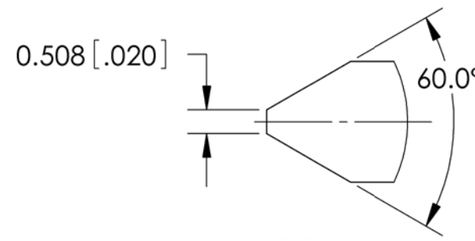
SCALE:NONE PROJECTION: SHEET 2 OF 2

D1100421 aLIGO AOS, TMS Suspension Tablecloth Plate, Front, PART PDM REV: X-039, DRAWING PDM REV: X-018

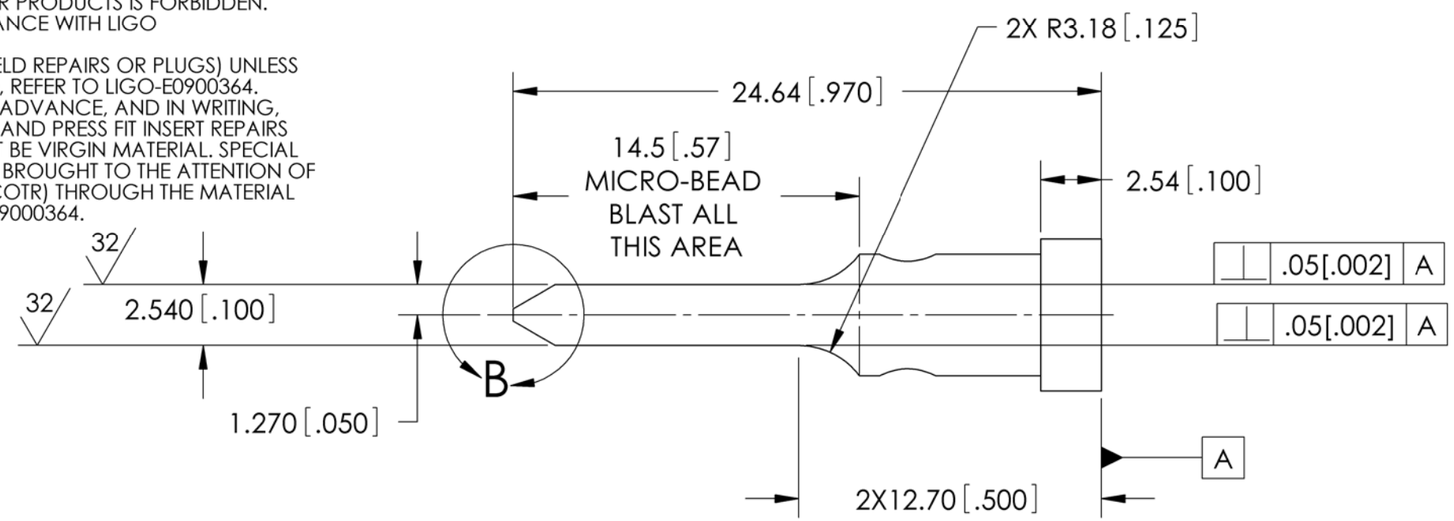
NOTES CONTINUED:

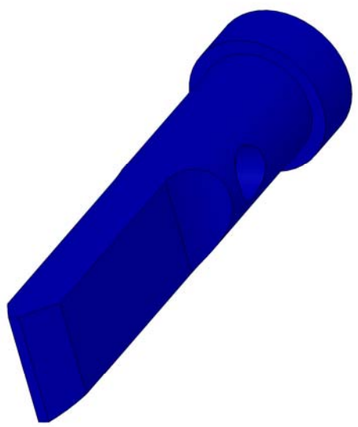
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE.
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIENT OR "TYPE" (IFF APPLICABLE), AND QUANTITY. IF PARTS ARE TO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART) : 001-V1
   EXAMPLE (TAG) DXXXXXXX-VY, TYPE-XX, S/N XXX QTY:TBD.
6. APPROXIMATE WEIGHT = 0.97 LB.
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES (INCLUDING SANDING OR SCOURING FOR MATTE FINISH) IS NOT ALLOWED. USE OF SCOTCH-BRITE OR SIMILAR PRODUCTS IS FORBIDDEN.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. ALL MATERIAL TO BE VIRGIN MATERIAL, (I.E. NOT WELD REPAIRS OR PLUGS) UNLESS APPROVED IN ADVANCE AND IN WRITING BY LIGO, REFER TO LIGO-E0900364.
10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE. THE MATERIAL USED MUST BE VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF AND WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH THE MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E09000364.

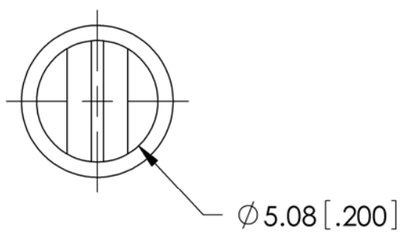
REV.	DATE	DCN #	DRAWING TREE #
v5	23 May 2011	E1100500	E1100450

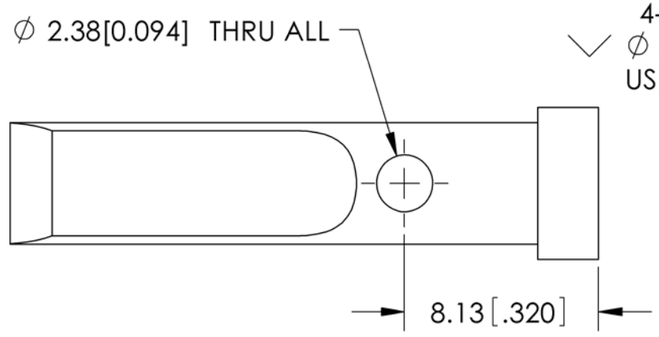


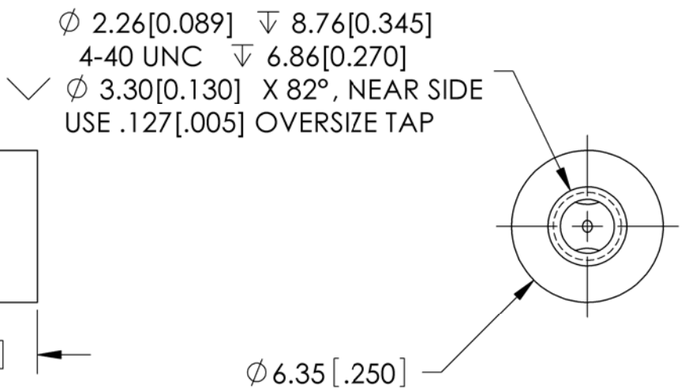
DETAIL B
SCALE 8 : 1











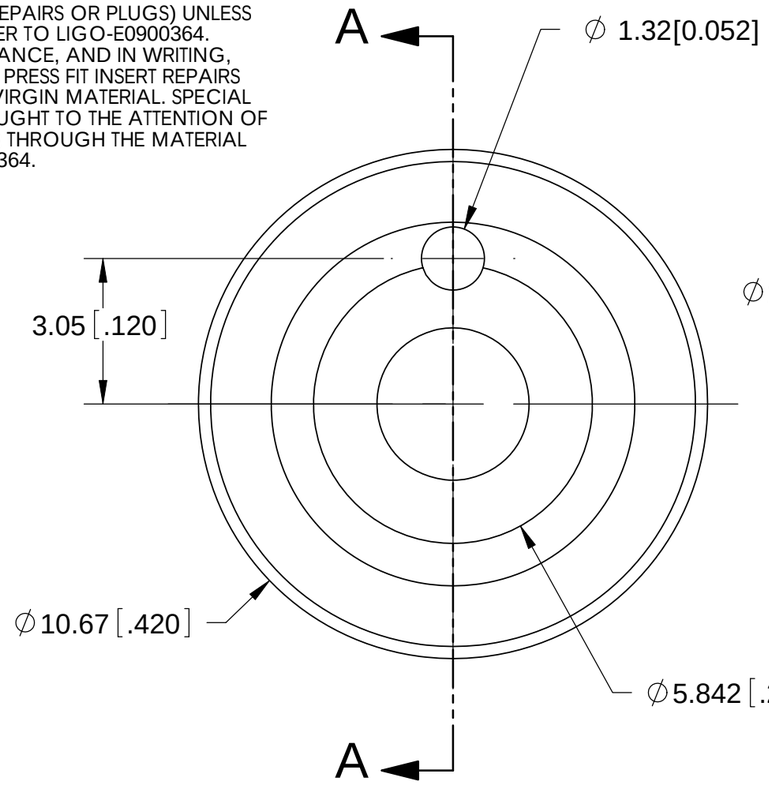
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)									
DIMENSIONS ARE IN MM [INCHES] TOLERANCES: .XX ± .381[.015] .XXX ± .127[.005] ANGULAR ± .5°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .76[.03] x 45°. 3. DO NOT SCALE FROM DRAWING.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: BOSEM FLAG , aLIGO SUS				
	MATERIAL: 6061-T6 Al	FINISH: 63 µinch	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: SUS	DESIGNER: M.EVANS 31 Mar, 2011	SIZE: B	DWG. NO.: D1100573	REV.: v5	
			NEXT ASSY: D1100937		DRAFTER: M.HILLARD 23 May 2011				
					CHECKER: J.LEWIS 23 May 2011				
					APPROVAL: J.ROMIE 23 May 2011	SCALE: 4:1	PROJECTION:	SHEET 1 OF 1	

D1100573, PART PDM REV: X-006, DRAWING PDM REV: X-015

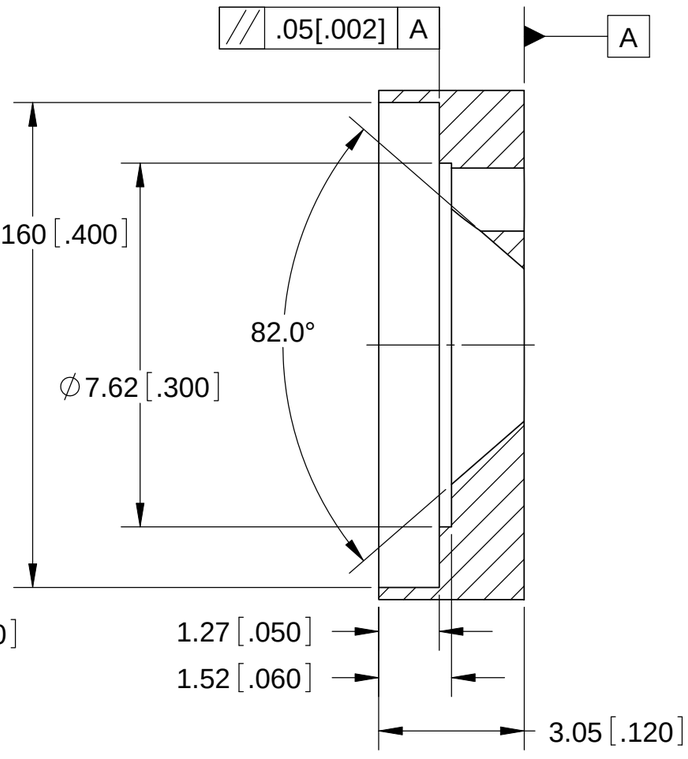
REV.	DATE	DCN #	DRAWING TREE #
v3	23 May 2011	E1100500	E1100450

NOTES CONTINUED:

4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE AND CHLORINE.
5. SCRIBE, ENGRAVE, OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIENT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART) : 001-V1
   EXAMPLE (TAG) DXXXXXXX-VY, TYPE-XX, S/N XXX QTY:TBD.
6. APPROXIMATE WEIGHT = 1.06 grams.
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES (INCLUDING SANDING OR SCOURING FOR MATTE FINISH) IS NOT ALLOWED. USE OF SCOTCH-BRITE OR SIMILAR PRODUCTS IS FORBIDDEN.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. ALL MATERIAL TO BE VIRGIN MATERIAL, (I.E. NOT WELD REPAIRS OR PLUGS) UNLESS APPROVED IN ADVANCE AND IN WRITING BY LIGO, REFER TO LIGO-E0900364.
10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE. THE MATERIAL USED MUST BE VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF AND WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTATIVE (COTR) THROUGH THE MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E09000364.



SECTION A-A



D1100574, PART PDM REV: X-006, DRAWING PDM REV: X-009

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)					
DIMENSIONS ARE IN MM [INCHES] TOLERANCES: .XX ± ..381[.015] .XXX ± .127[.005] ANGULAR± .5°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .76[.03] x 45°. 3. DO NOT SCALE FROM DRAWING.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: BOSEM FLAT FLAG DISK aLIGO SUS
	MATERIAL: 416 SSTL	FINISH: 63 µinch	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: SUS	NEXT ASSY: D1100937

			SIZE	DWG. NO.	REV.
DESIGNER	M.EVANS	31 Mar 2011	B	D1100574	v3
DRAFTER	M.HILLARD	23 May 2011			
CHECKER	J.LEWIS	23 May 2011			
APPROVAL	J.ROMIE	23 May 2011	SCALE: 8:1	PROJECTION:	SHEET 1 OF 1

NOTES CONTINUED:

5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY.
   EXAMPLE (TAG): DXXXXXXX-VY, QTY: X, LOT S/N 001.

6. MASS
   -01: 19 G [0.042 LB]
   -02: 12.5 G [0.028 LB]

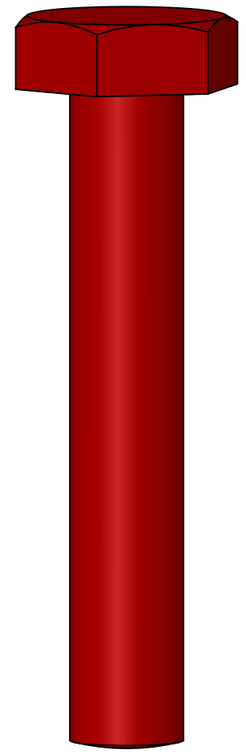
7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

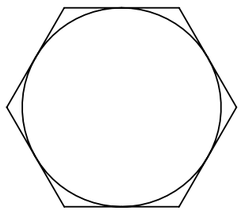
⟨8⟩ MAKE FROM: McMASTER-CARR P/N 93190A552 OR EQUIVALENT PER ASME B18.2.1.

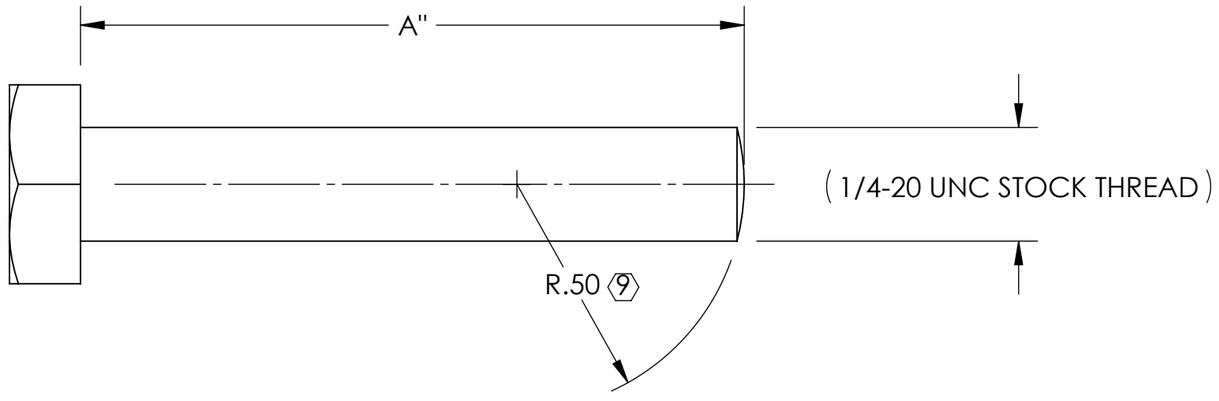
(HEX HEAD CAP SCREW, 1/4-20 UNC-2A FULLY THREADED, 316 STAINLESS STEEL)

⟨9⟩ 63 µINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACE. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	28 APR 2011	E1100351	-
v2	21 MAR 2012	E1101214	-
-	-	-	-







TYPE	DIM 'A' (+0/-.04)
-01	2.50
-02	1.50

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 1.0°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL ⟨8⟩ **FINISH** 63 µinch Ra ⟨9⟩

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM ADVANCED LIGO **SUB-SYSTEM** AOS

NEXT ASSY VARIOUS

PART NAME TMS EARTHQUAKE STOP SCREW

DESIGNER	C. CONLEY	18 APR 2011
DRAFTER	M. MILLER	29 APR 2011
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

SIZE B **DWG. NO.** D1100712 **REV.** v2

SCALE: NONE **PROJECTION:** SHEET 1 OF 1

D1100712 TMS Earthquake Stop Screw, PART PDM REV: X-022, DRAWING PDM REV: X-015

NOTES CONTINUED:

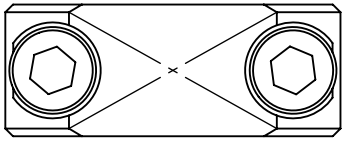
5. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY.
   EXAMPLE (PART): 001-v1
   EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD

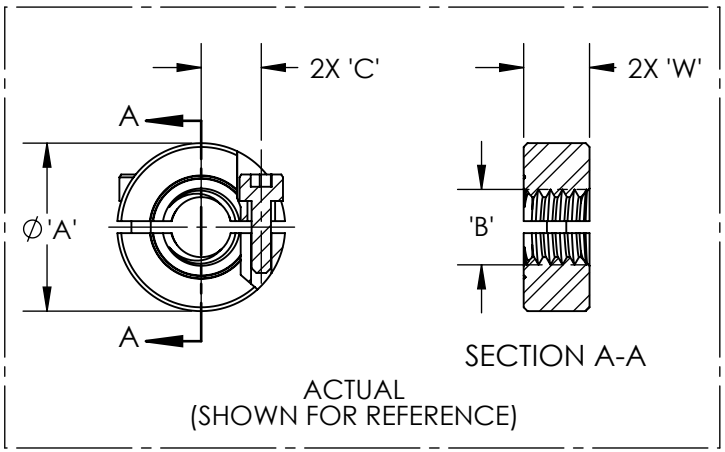
6. MAKE FROM: RULAND
   PART NO. TSP-6-16-SS
   THREADED SHAFT COLLAR (TWO PIECE)

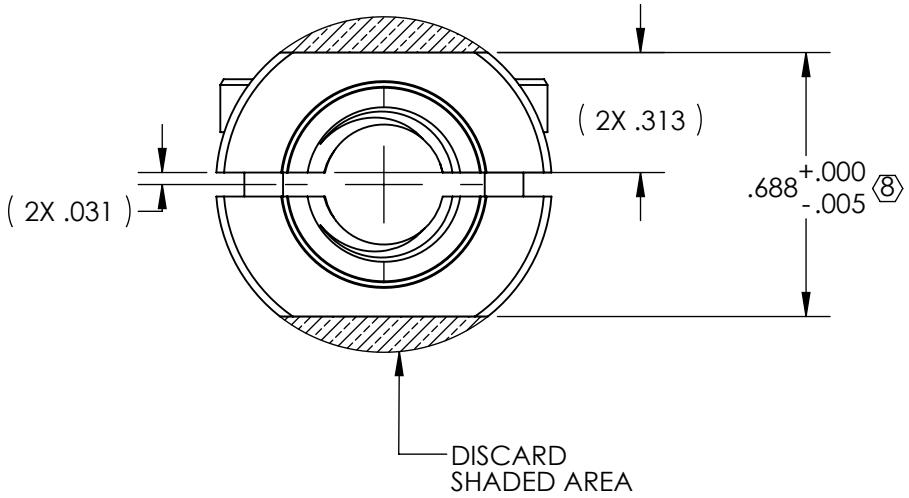
7. SURFACE FINISH TO BE AS-PROCESSED FROM MILL/SUPPLIER, FREE FROM SCRATCHES OR GOUGES.

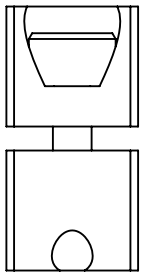
8. WHILE CLAMPED ON A 3/8-16 UNC-2A FASTENER.

REV.	DATE	DCN #	DRAWING TREE #
v1	24 MAY 2011	E1100462-x0	-
-	-	-	-
-	-	-	-









TWO-PIECE SHAFT COLLAR SPECIFICATIONS (DIMENSIONS SHOWN FOR REFERENCE)					
'A' (OUTER DIAMETER)	**'B' (BORE)**	**'W' (WIDTH)**	**'C' (SCREW LOCATION)**	**FORGED CLAMP SCREW**	**MATERIAL**
∅.88	3/8-16	.343	.313	6-32 X .38 LG.	SSTL

ALTERED ITEM DRAWING

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± .5°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015. FOR MACHINED PARTS. ROUND ALL EDGES APPROXIMATLEY R.02 FOR SHEET METAL PARTS.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL AS NOTED (SEE SPEC.)

FINISH N/A µinch

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM ADVANCED LIGO

SUB-SYSTEM SUS

NEXT ASSY N/A

PART NAME ALIGO, SUS, QUAD, E. STOP SCREW, SPLIT SHAFT COLLAR

DESIGNER	E.SANCHEZ	24 MAY 2011	
DRAFTER	E.SANCHEZ	24 MAY 2011	
CHECKER	J.LEWIS	24 MAY 2011	
APPROVAL			

SIZE A **DWG. NO.** D1100980 **REV.** v1

SCALE: 1:1 **PROJECTION:** **SHEET 1 OF 1**

D1100980 ALIGO, QUAD, E. STOP SCREW, SPLIT SHAFT COLLAR, PART PDM REV: X-000, DRAWING PDM REV: X-000

NOTES CONTINUED:

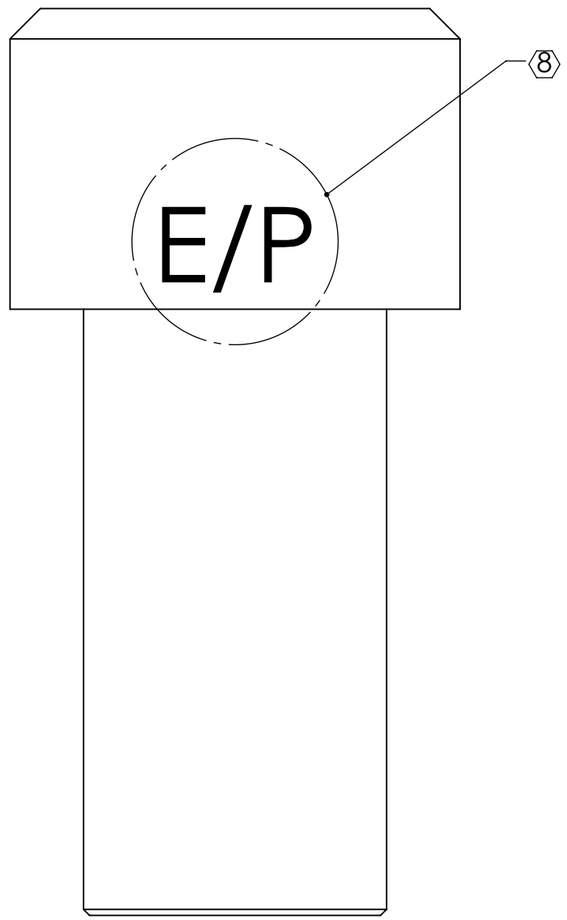
5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXXX-VY, QTY: X, LOT S/N 001.
6. APPROXIMATE WEIGHT = .11 LB [49 G].

⟨7⟩ MAKE FROM: McMASTER-CARR P/N 92185A712 OR EQUIVALENT. (SOCKET HEAD CAP SCREW, 1/2-13 UNC-3A, 316 STAINLESS STEEL)

⟨8⟩ ENGRAVE "E/P" APPROXIMATELY WHERE SHOWN. CHARACTER HEIGHT .13" MINIMUM.

⟨9⟩ ELECTRO-POLISH PER LIGO SPECIFICATION E0900364, SECTION 5.2.2.2, FOR 5.5 MINUTES.

REV.	DATE	DCN #	DRAWING TREE #
v1	27 JUN 2011	E1100351-v1	-
-	-	-	-
-	-	-	-



D1101186 aLIGO SUS .500-13 X 1 SHCS Modified, PART PDM REV: X-003, DRAWING PDM REV: X-001

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ±
.XXX ±

ANGULAR ± °

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, R.02 MIN.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL ⟨7⟩ | FINISH ⟨9⟩

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO | SUB-SYSTEM: SUS

NEXT ASSY: D1000549

PART NAME: aLIGO SUS .500-13 X 1 SHCS MODIFIED

DESIGNER	K. MAILAND	27 JUN 2011
DRAFTER	C. CONLEY	27 JUN 2011
CHECKER		
APPROVAL		

SIZE: B | DWG. NO.: D1101186 | REV.: v1

SCALE: NONE | PROJECTION: | SHEET 1 OF 1

NOTES CONTINUED:

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 51.4 G [0.113 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

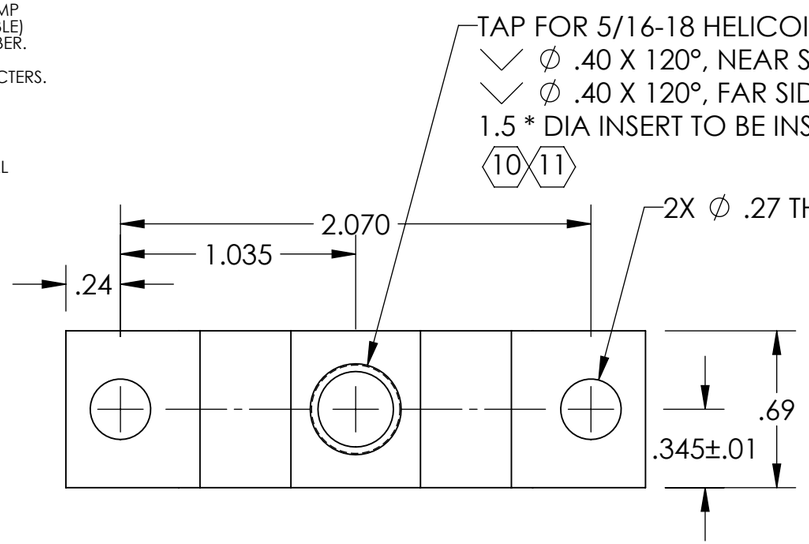
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

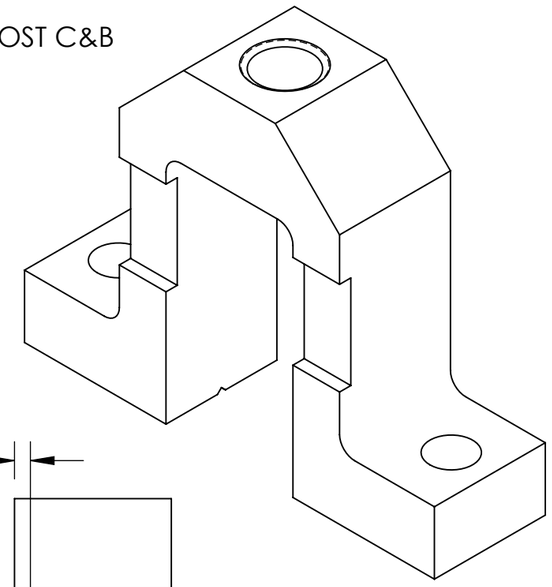
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

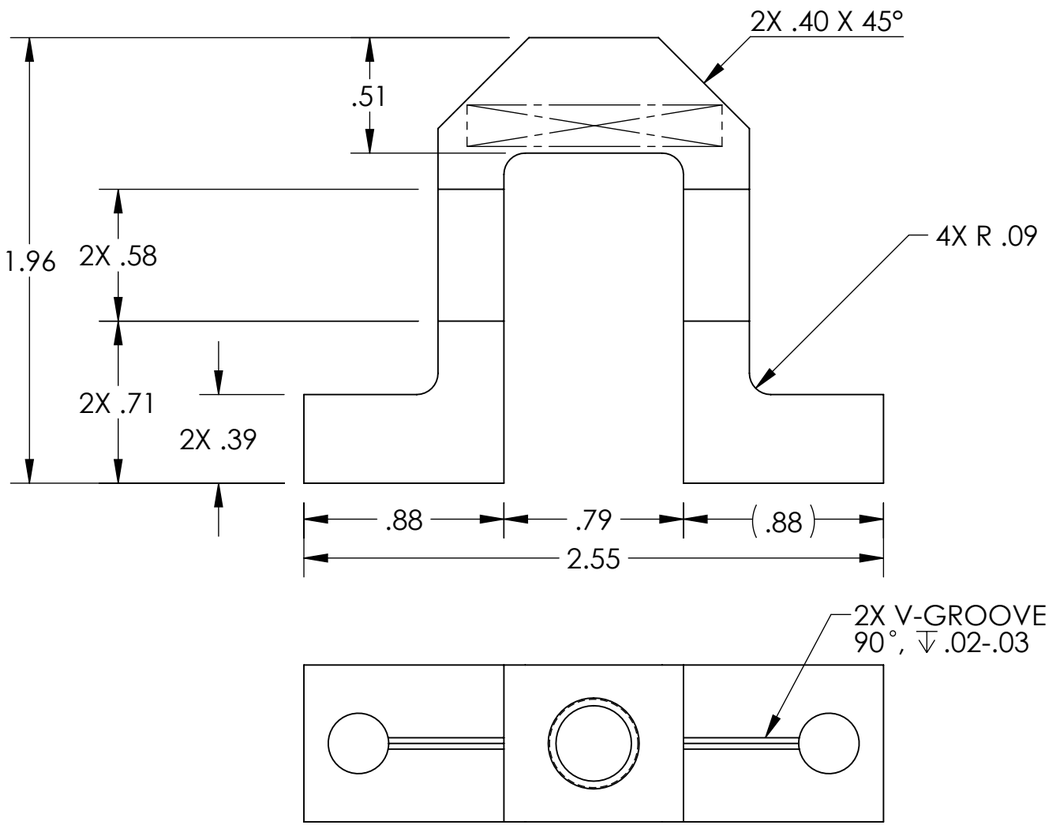
10. PREPARE HELICOIL TAPPED HOLE ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.

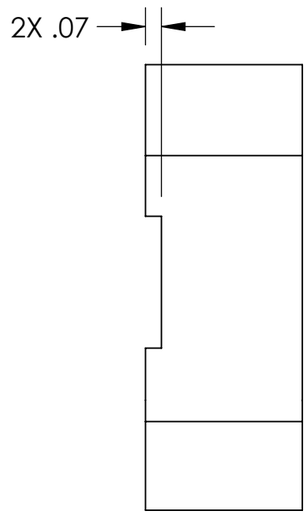
11. INTERNAL NOTE: HELICOIL TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-









NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 1.0°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.

MATERIAL 6061-T6 Al

FINISH 63 µinch Ra

NEXT ASSY D1101527

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM ADVANCED LIGO **SUB-SYSTEM** AOS

PART NAME aLIGO SUS TOP MASS STOP BRIDGE

DESIGNER	C. CONLEY	21 FEB 2012
DRAFTER	J. TERRAZAS	20 MAR 2012
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

SIZE B **DWG. NO.** D1101273 **REV.** v1

SCALE: NONE **PROJECTION:** **SHEET** 1 OF 1

D1101273_aLIGO SUS TOP MASS STOP BRIDGE, PART PDM REV: X-018, DRAWING PDM REV: X-005

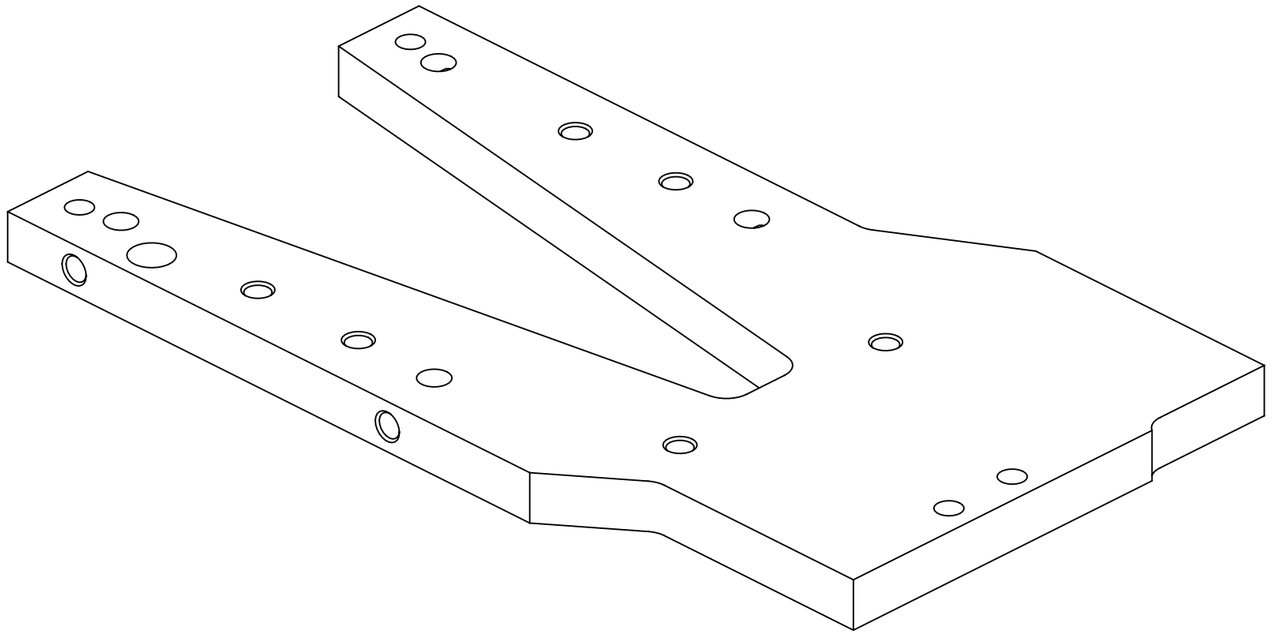
NOTES (CONTINUED):

⟨5⟩ SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 2.427 KG [5.351 LB].
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

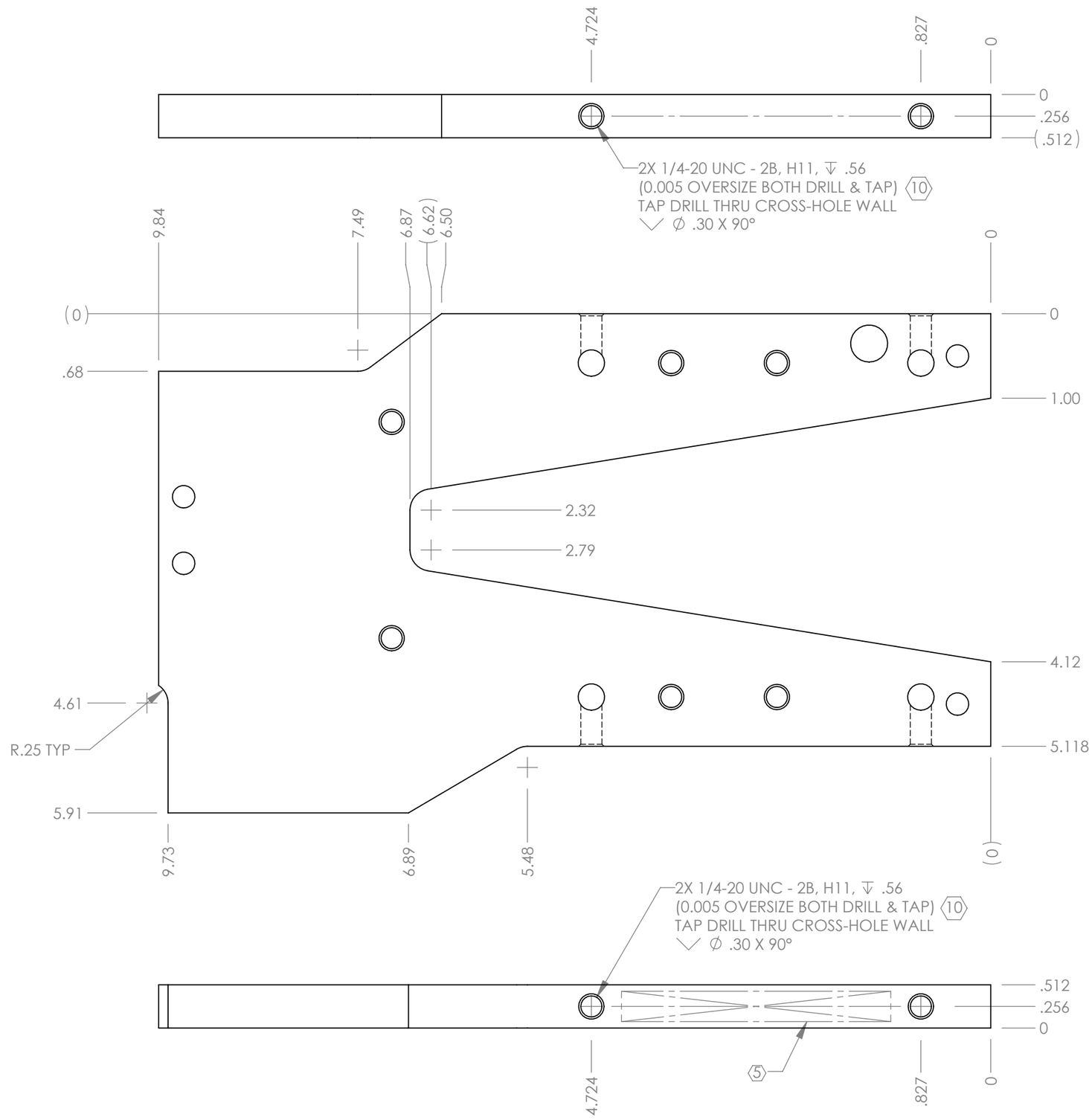
⟨10⟩ ALL TAPPED HOLES: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	25 MAR 2012	E1101214	



D1101511 aLIGO TMS Upper Mass Top Plate, PART PDM REV: X-029, DRAWING PDM REV: X-010

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)					
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	PART NAME: aLIGO TMS INTERMEDIATE MASS TOP PLATE	
	MATERIAL: 304 SSTL	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	
			NEXT ASSY: D1101527	DESIGNER: K. MAILAND 19 MAR 2012 DRAFTER: C. CONLEY 25 MAR 2012 CHECKER: SEE DCN APPROVAL: SEE DCN	SIZE: B DWG. NO.: D1101511 REV.: v1 SCALE: NONE PROJECTION: SHEET 1 OF 3

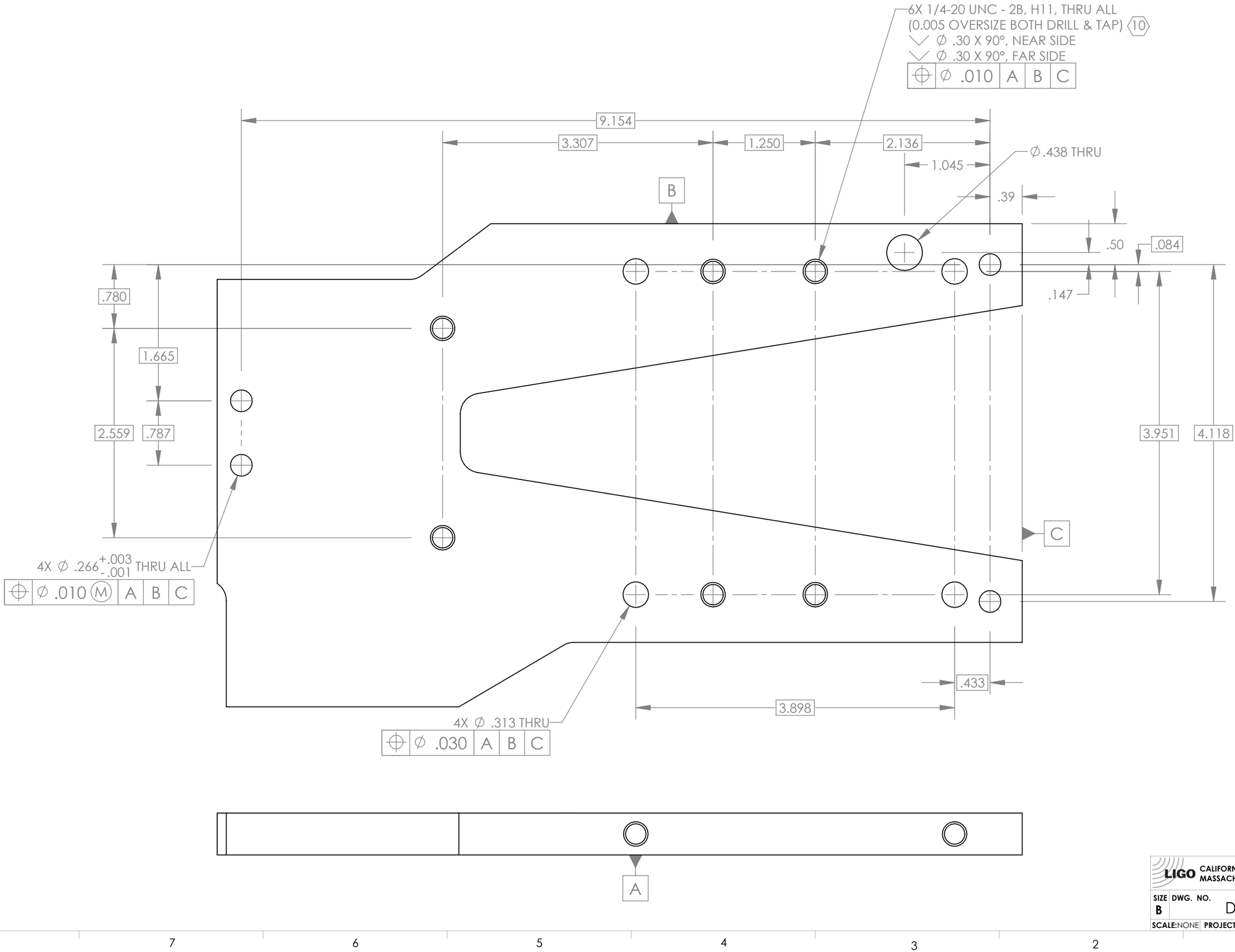


D1101511 aLIGO TMS Upper Mass Top Plate, PART PDM REV: X-029, DRAWING PDM REV: X-010

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1101511	v1

SCALE:NONE PROJECTION: SHEET 2 OF 3



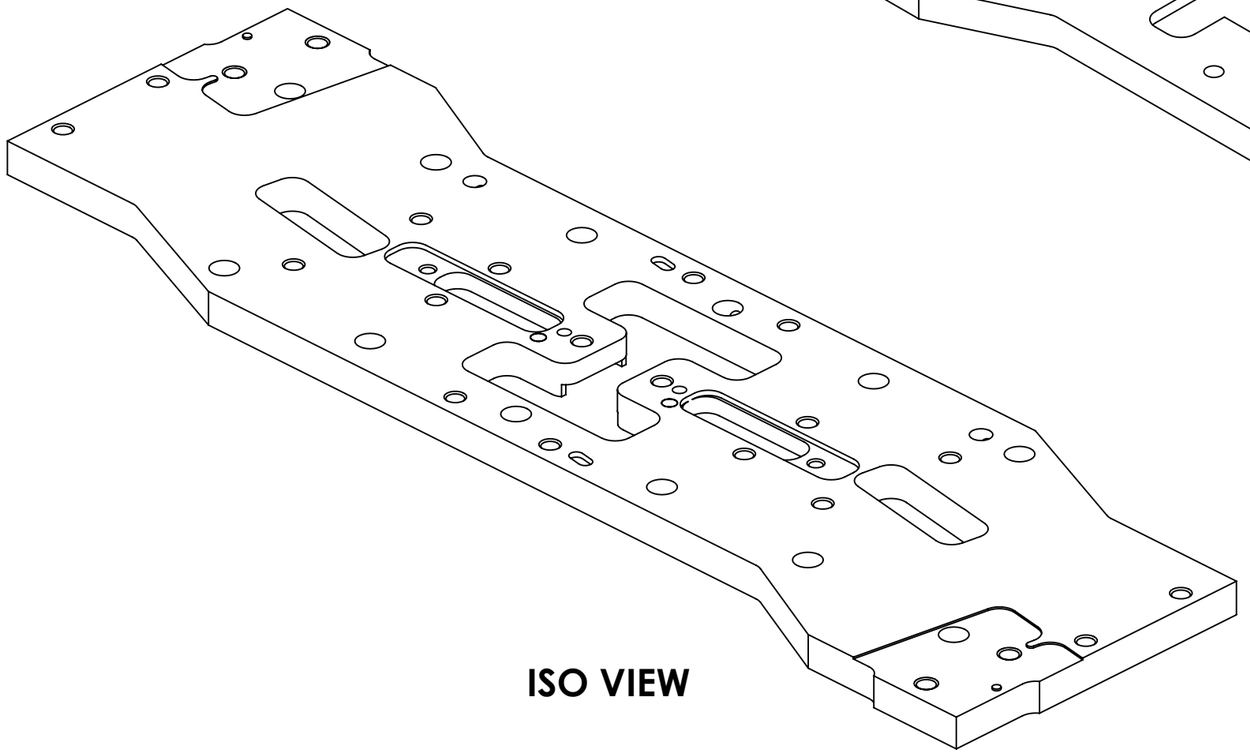
LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1101511	REV. v1	
SCALE:NONE	PROJECTION:	SHEET 3 OF 3	

D1101511 aLIGO TMS Upper Mass Top Plate, PART PDM REV: X-029, DRAWING PDM REV: X-010

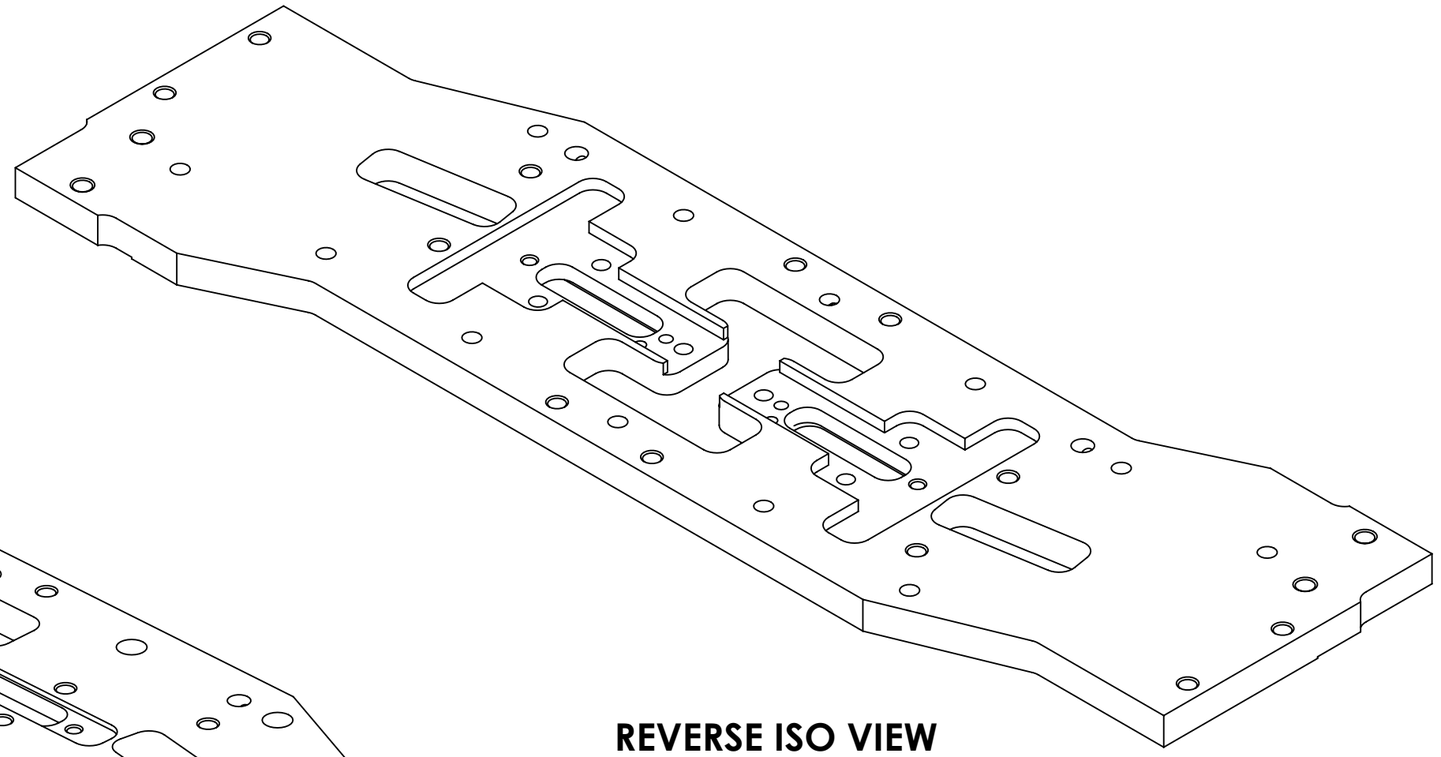
REV.	DATE	DCN #	DRAWING TREE #
v1	25 MAR 2012	E1101214	

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX
6. MASS: 5.399 KG [11.903 LB].
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.
10. ALL TAPPED HOLES (HELICOIL EXCLUDED): 0.005 OVERSIZE BOTH DRILL AND TAP.
11. PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.
12. INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.



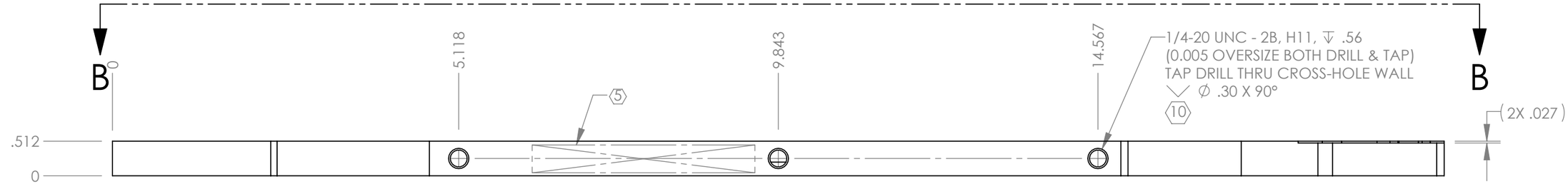
ISO VIEW

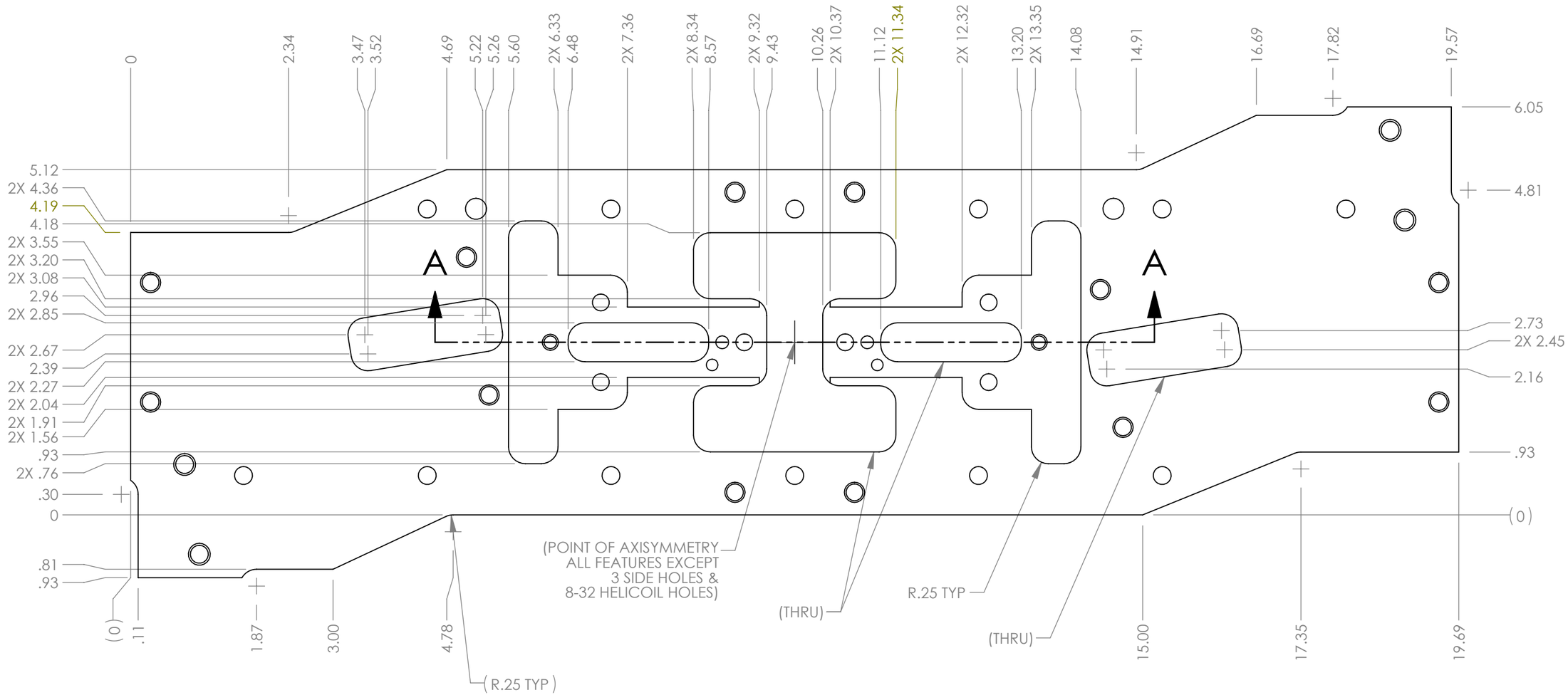


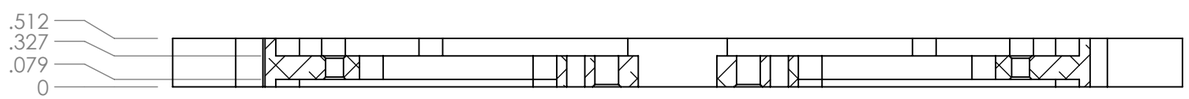
REVERSE ISO VIEW

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)											
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS UPPER MASS BOTTOM PLATE					
	MATERIAL: 304 SSTL	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	NEXT ASSY: D1200469	DESIGNER: K. MAILAND 28 JUL 2011	DRAFTER: C. CONLEY 25 MAR 2012	CHECKER: SEE DCN	APPROVAL: SEE DCN	SIZE: B	DWG. NO.: D1101512	REV.: v1
									SCALE: NONE	PROJECTION:	SHEET 1 OF 6	

D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



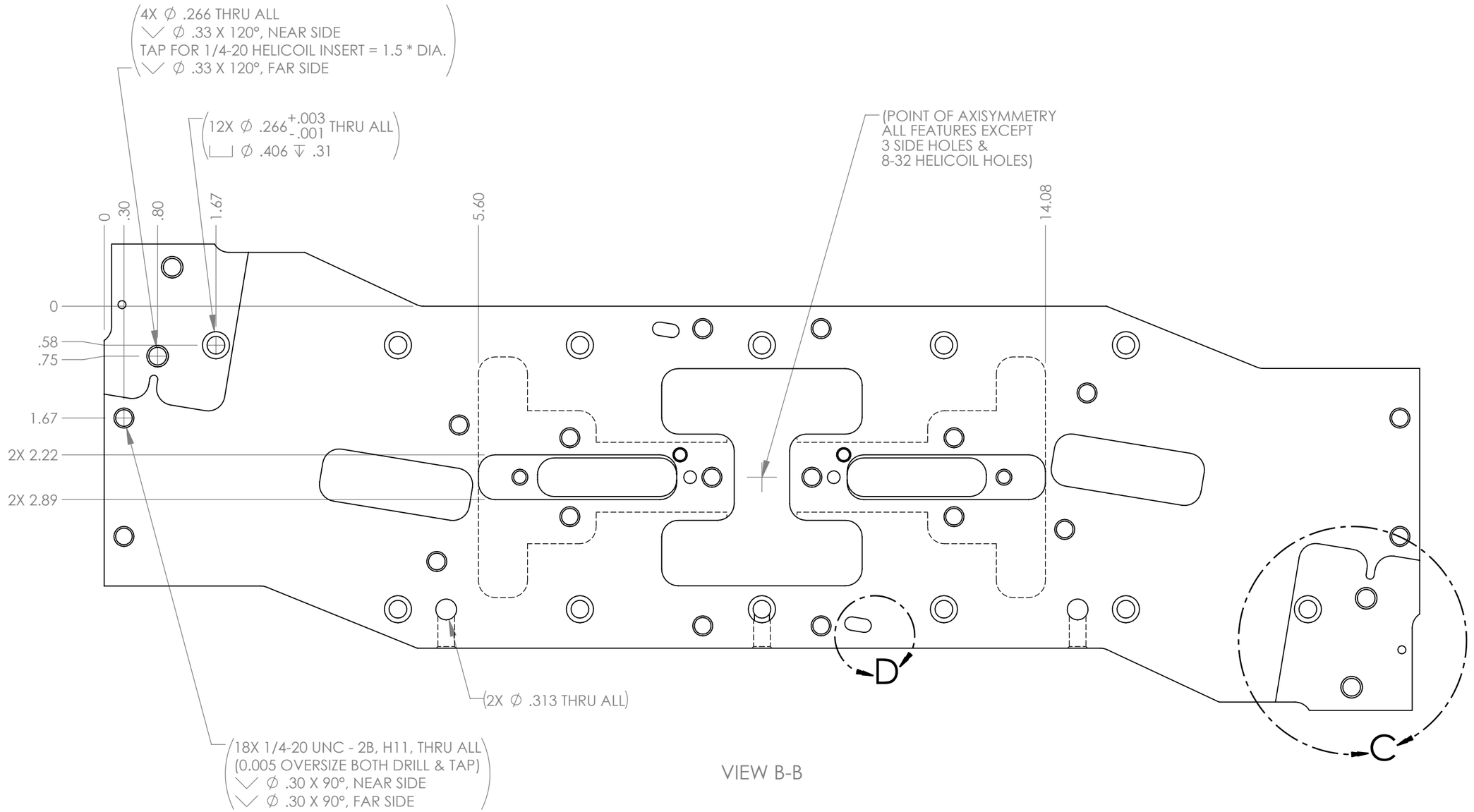




SECTION A-A

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1101512	REV. v1
SCALE:NONE	PROJECTION:	SHEET 2 OF 6

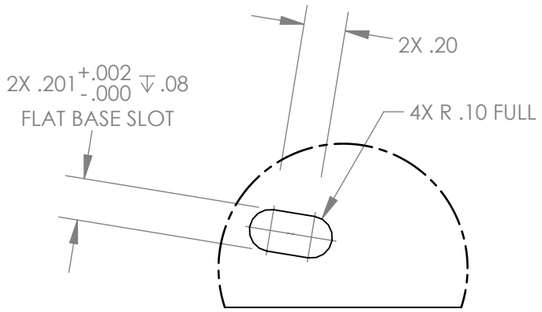
D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



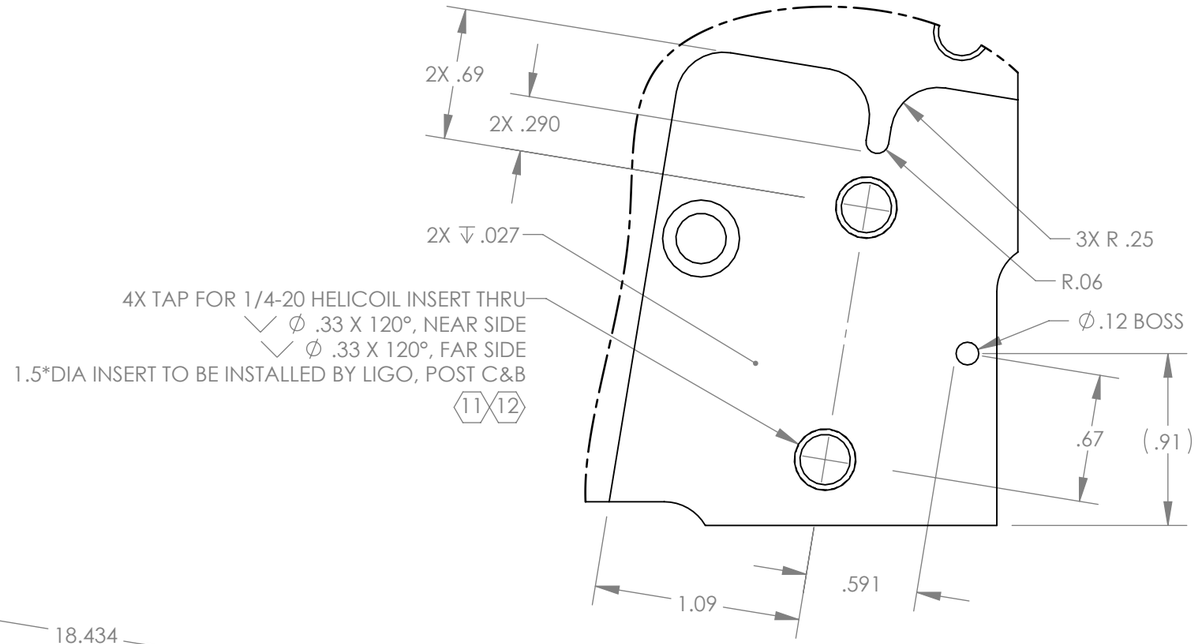
VIEW B-B

D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021

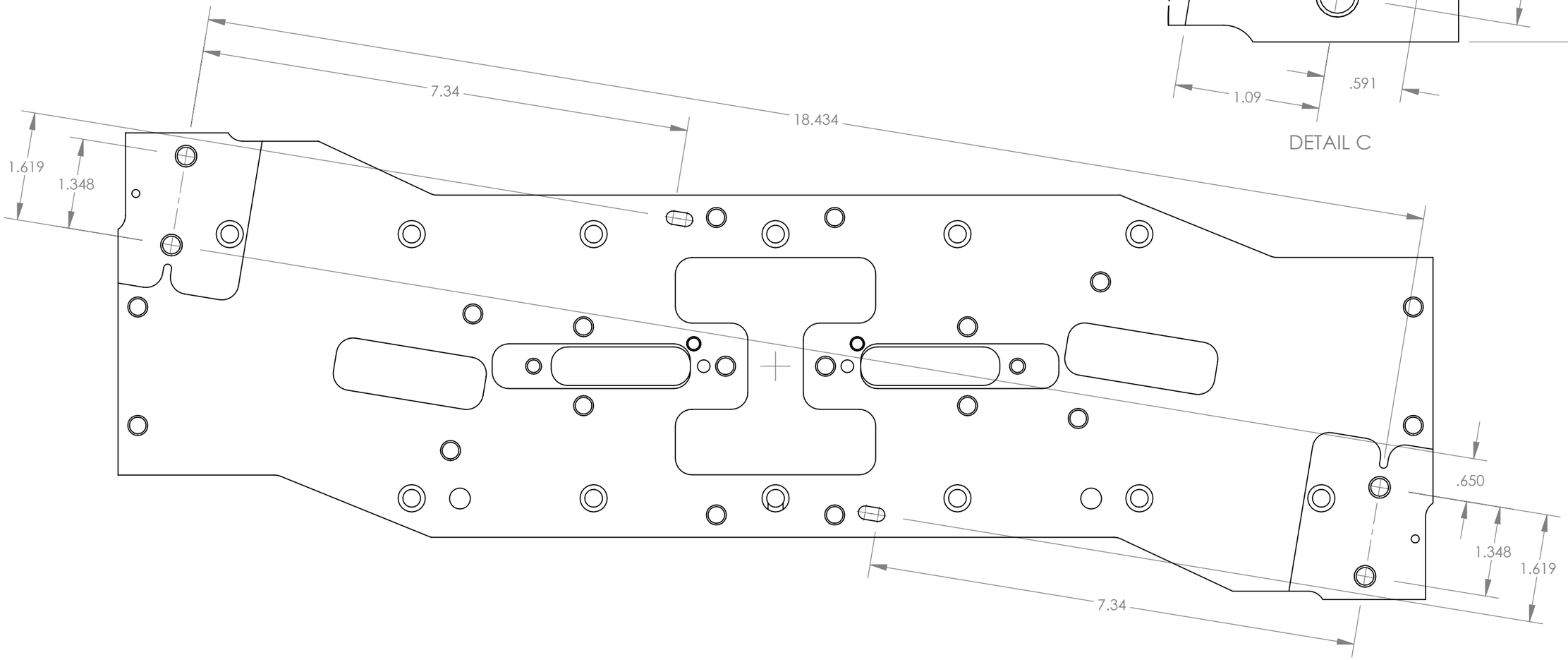
LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
SIZE B	DWG. NO. D1101512	REV. v1
SCALE:NONE	PROJECTION:	SHEET 3 OF 6



DETAIL D

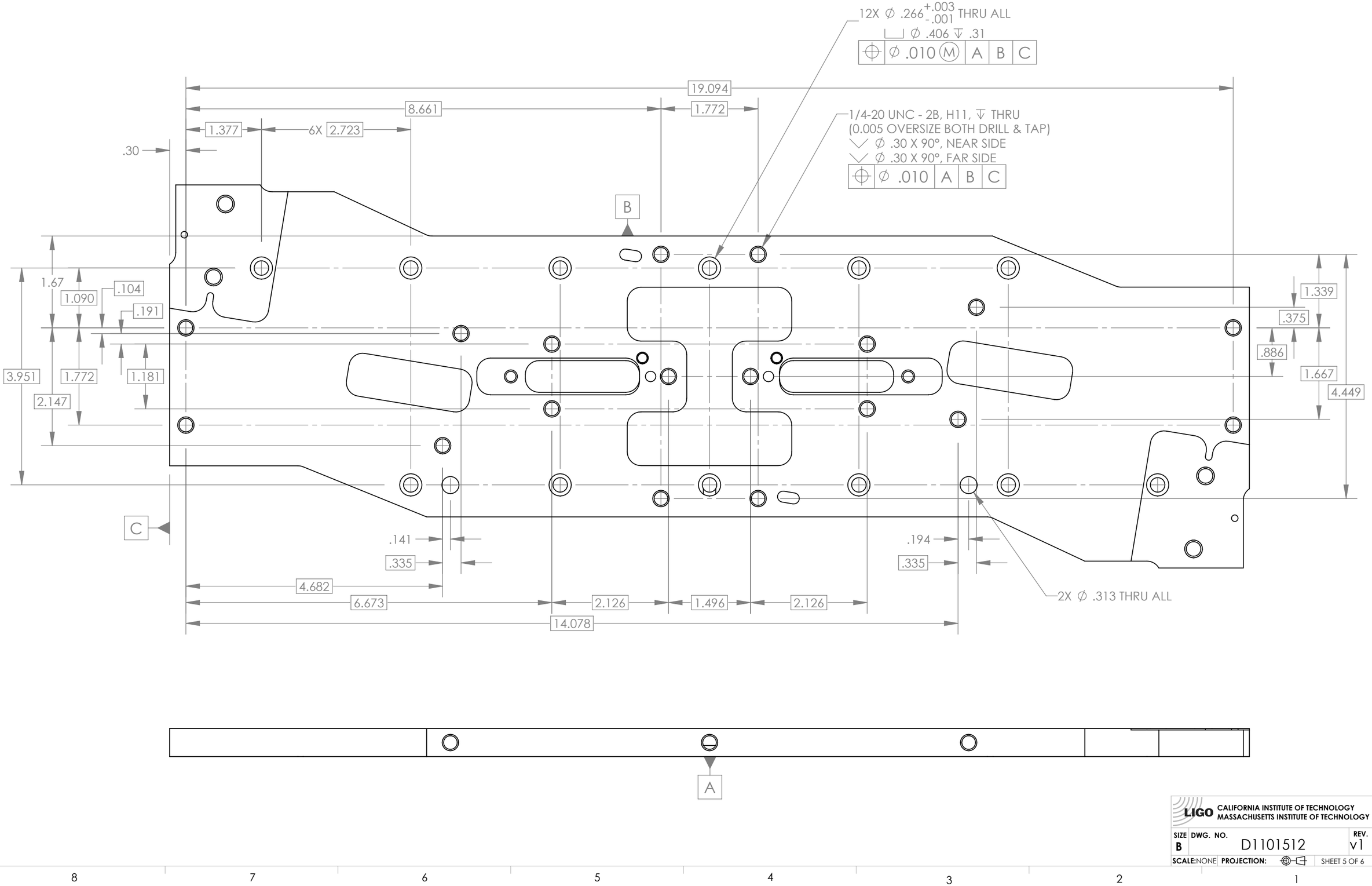


DETAIL C



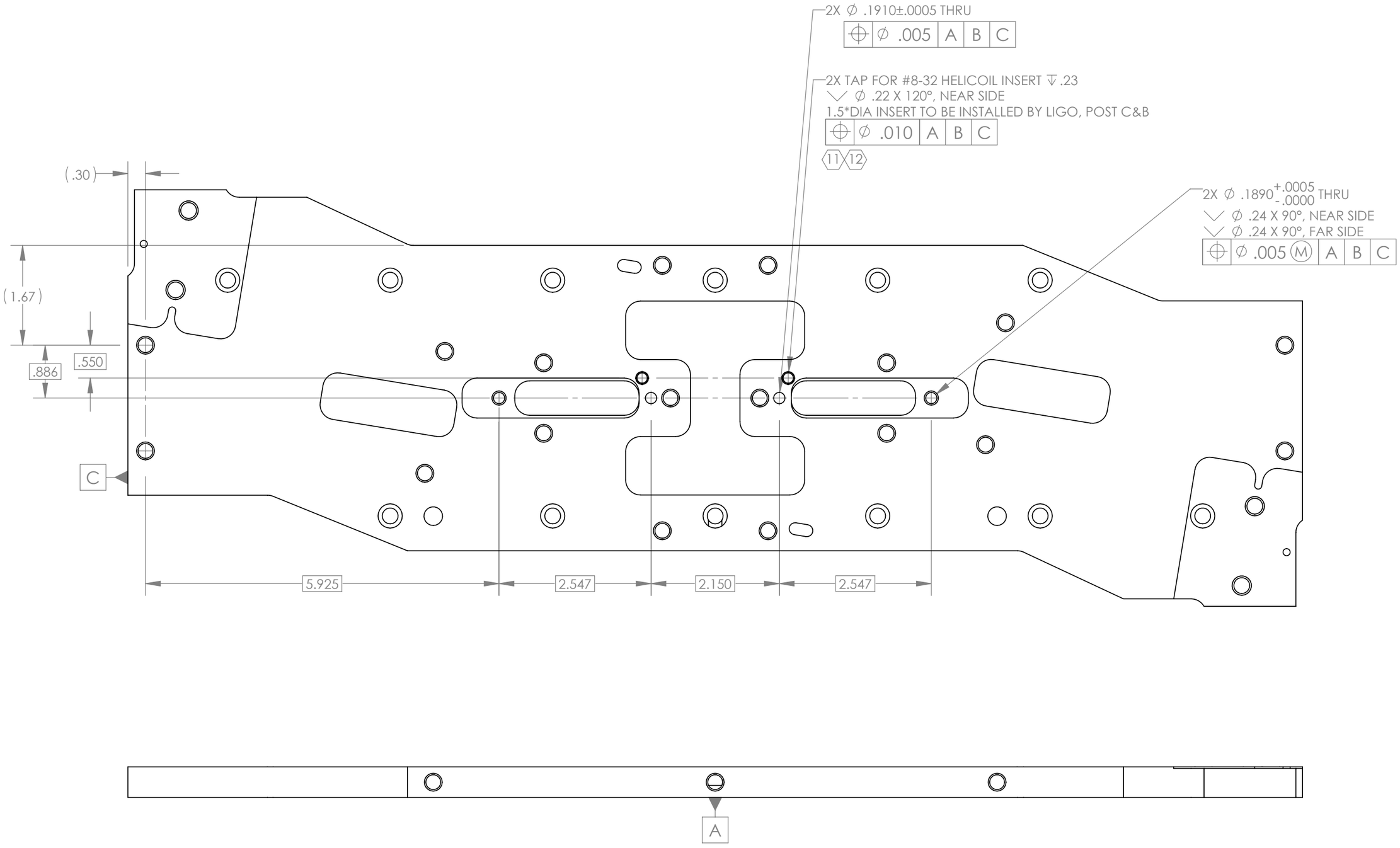
LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	
SIZE B	DWG. NO. D1101512	REV. v1
SCALE:NONE	PROJECTION:	SHEET 4 OF 6

D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SIZE B	DWG. NO. D1101512
REV.	v1
SCALE:NONE	PROJECTION:
SHEET 5 OF 6	

D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021



D1101512 aLIGO TMS Upper Mass Bottom Plate, PART PDM REV: X-058, DRAWING PDM REV: X-021

LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1101512	REV. v1	
SCALE: NONE	PROJECTION:	SHEET 6 OF 6	

REV.	DATE	DCN #	DRAWING TREE #
v1	22 MAR 2012	E1101214	

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

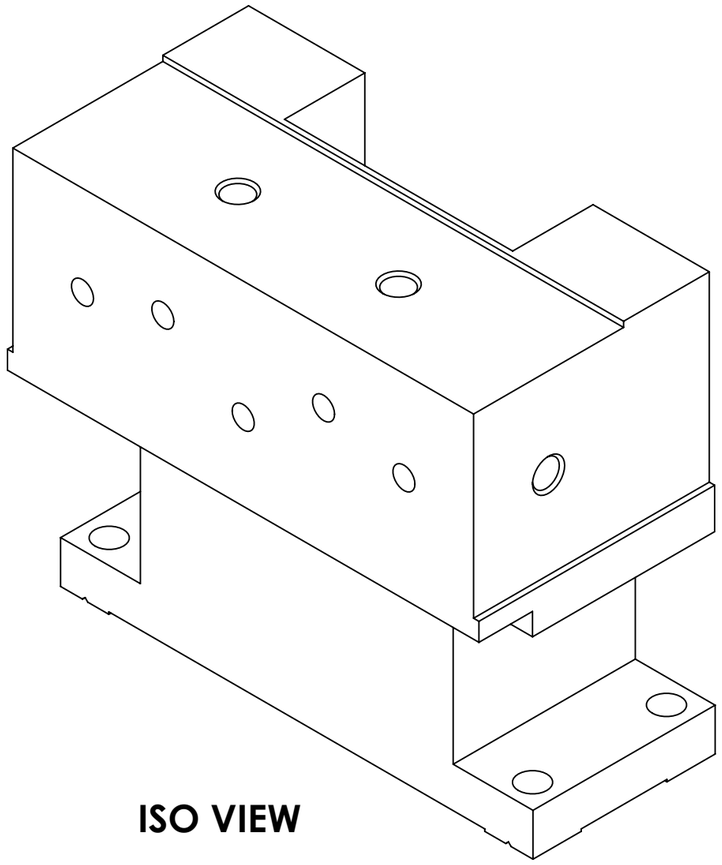
6. MASS: 2.914 KG [6.425 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

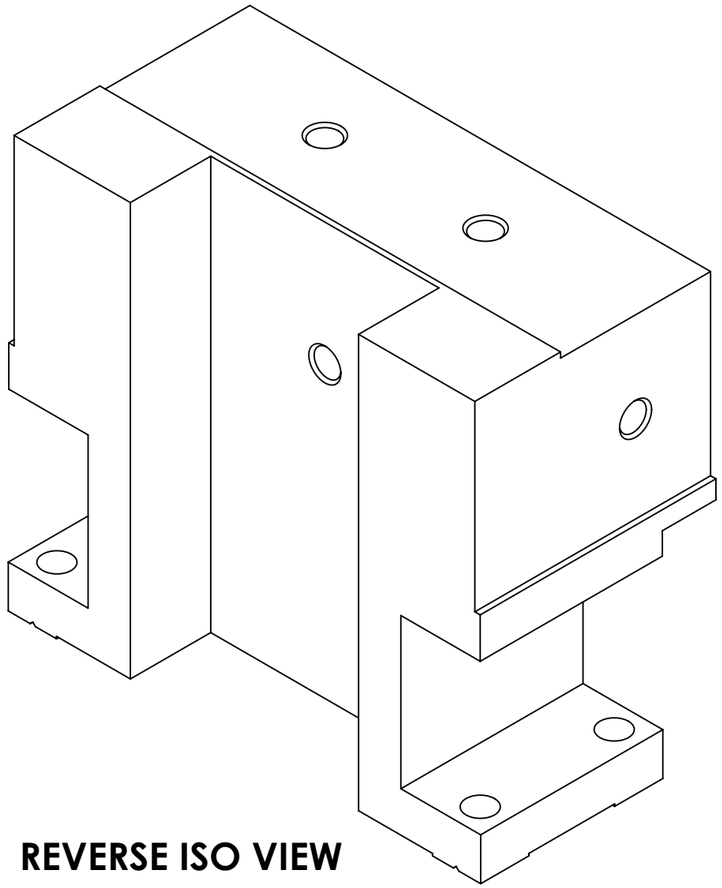
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10. ALL TAPPED HOLES: 0.005 OVERSIZE BOTH DRILL AND TAP.



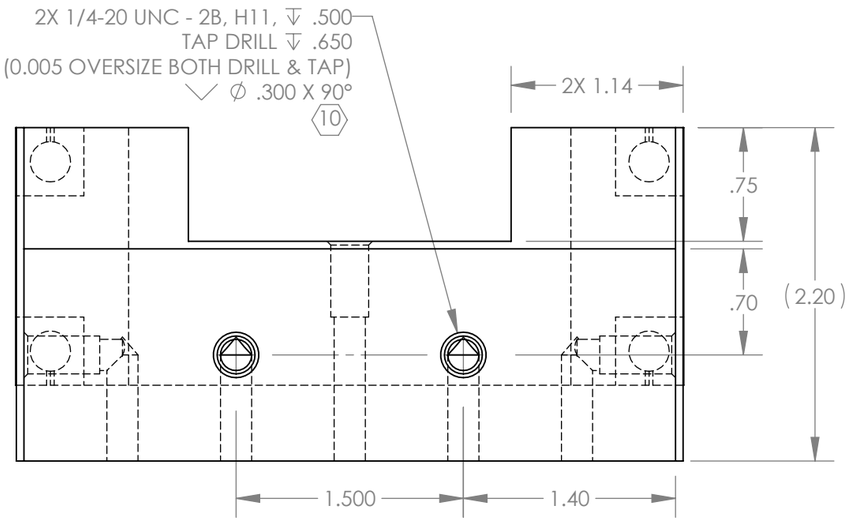
ISO VIEW

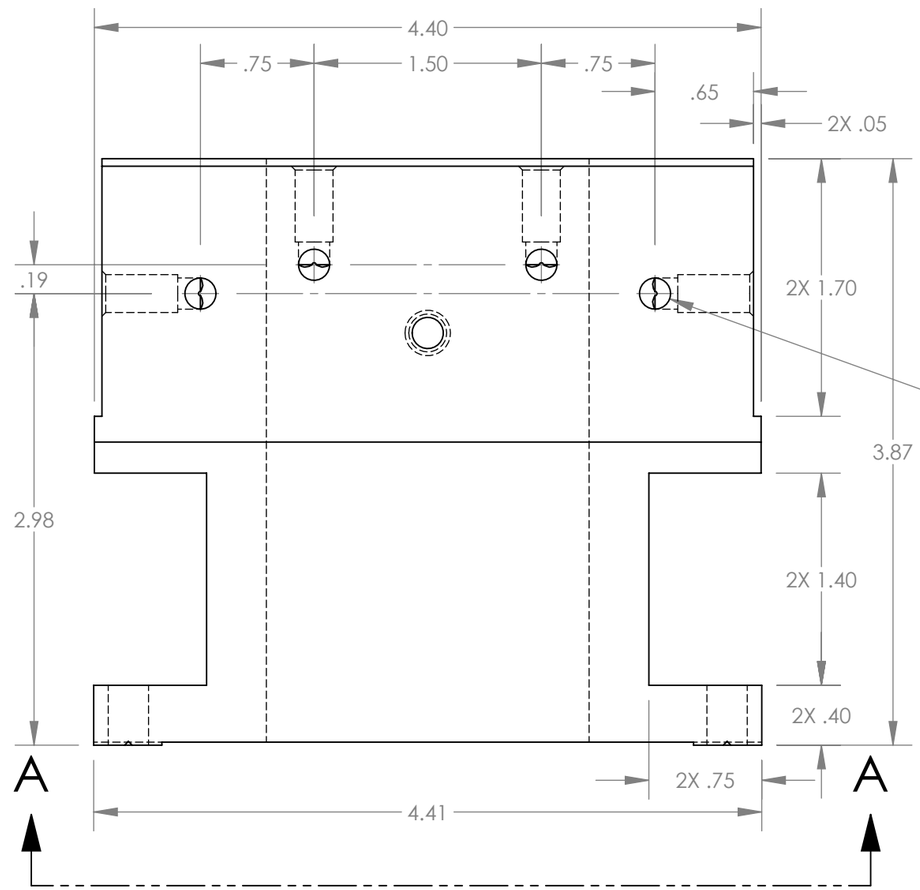


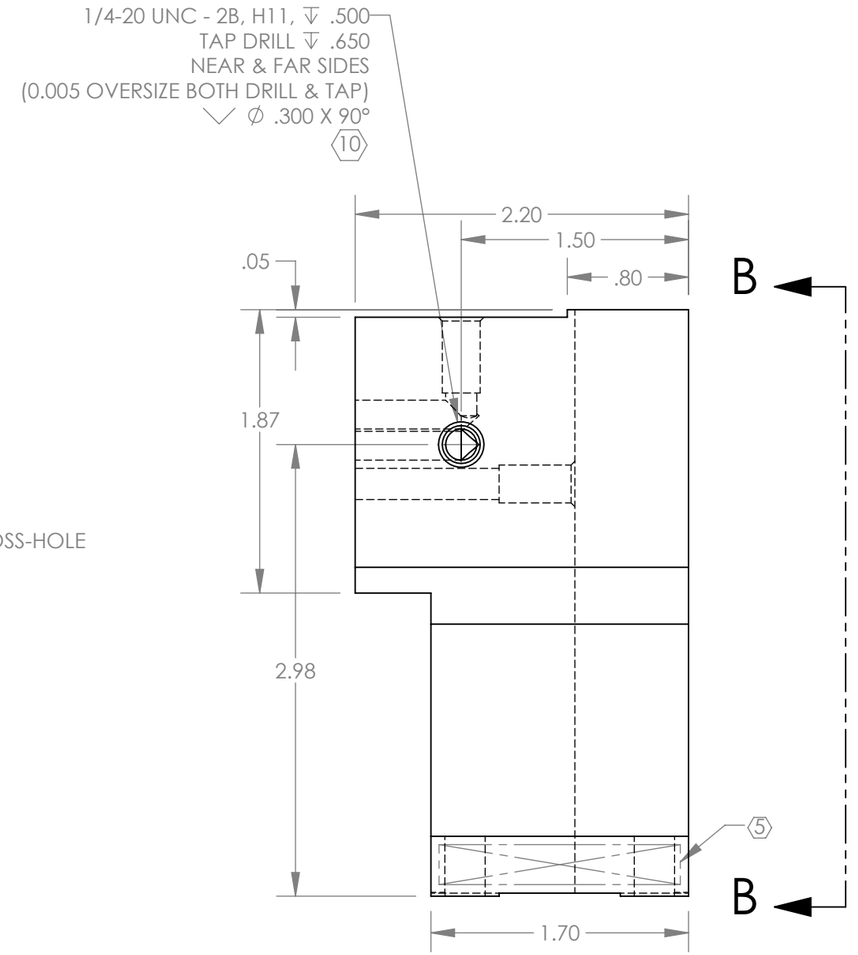
REVERSE ISO VIEW

D1101519 aLIGO TMS Top Add Mass Tower, PART PDM REV: X-014, DRAWING PDM REV: X-000

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)									
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS TOP ADD MASS TOWER				
MATERIAL: 304 SSTL	FINISH: 63 µinch Ra		SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: K. MAILAND 28 JUL 2011	SIZE: B	DWG. NO.: D1101519	REV.: v1	
NEXT ASSY: D1101526					DRAFTER: C. CONLEY 22 MAR 2012				
					CHECKER: SEE DCN				
					APPROVAL: SEE DCN	SCALE: NONE	PROJECTION:	SHEET 1 OF 3	

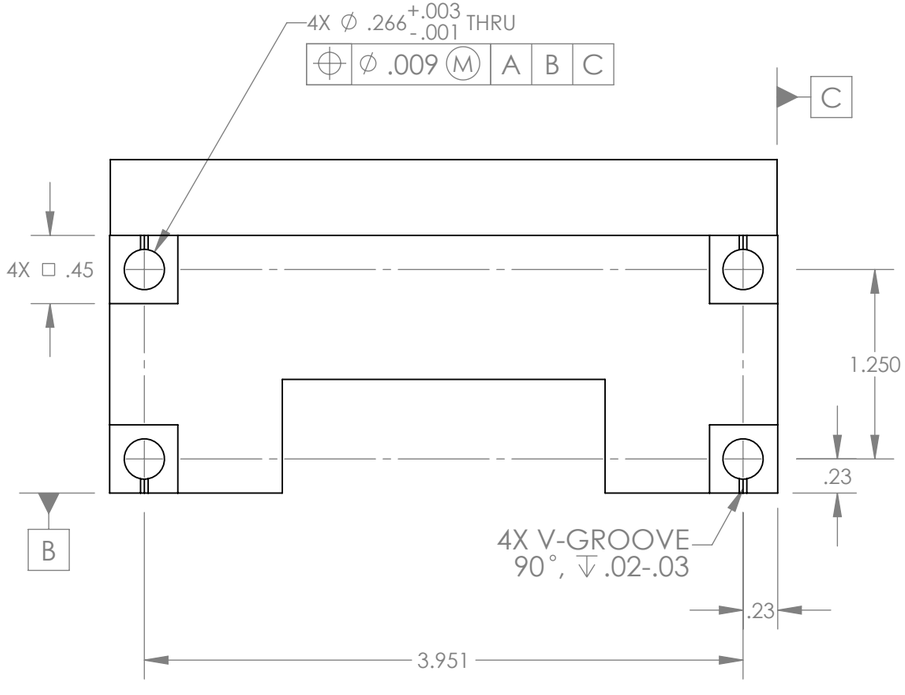




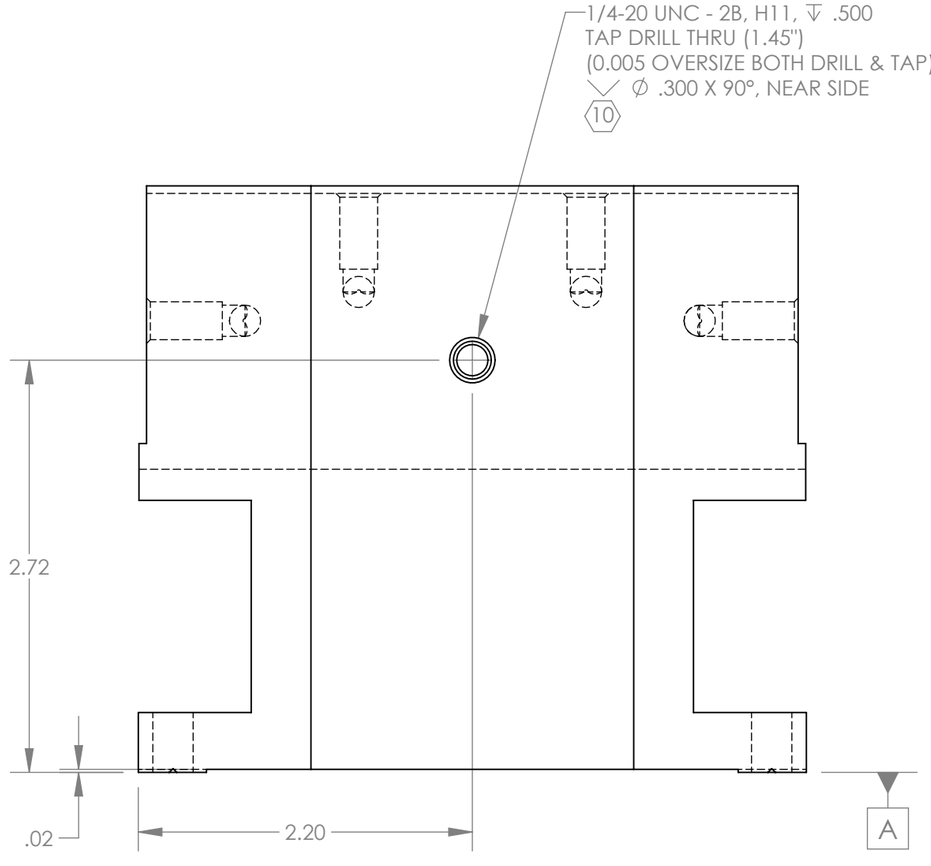


LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1101519	REV. v1
SCALE:NONE	PROJECTION:	SHEET 2 OF 3

D1101519 aLIGO TMS Top Add Mass Tower, PART PDM REV: X-014, DRAWING PDM REV: X-000



VIEW A-A



VIEW B-B

D1101519 aLIGO TMS Top Add Mass Tower, PART PDM REV: X-014, DRAWING PDM REV: X-000

LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1101519	REV. v1	
SCALE:NONE	PROJECTION:	SHEET 3 OF 3	

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

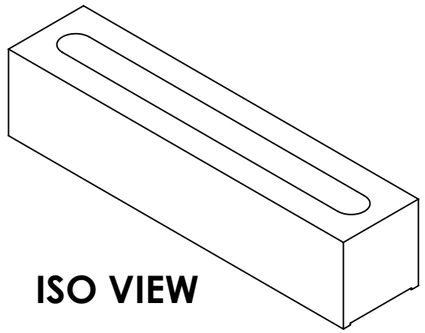
6. MASS: 1.199 KG [2.643 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

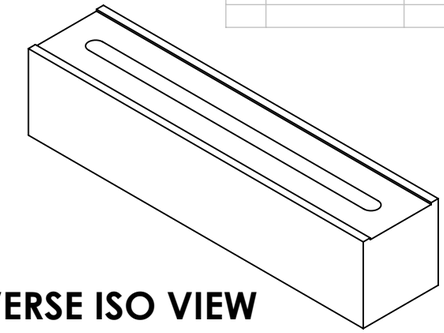
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

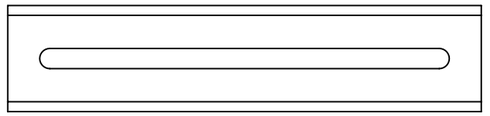
REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	

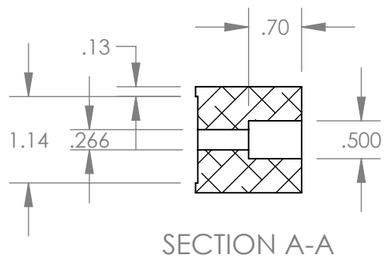


ISO VIEW

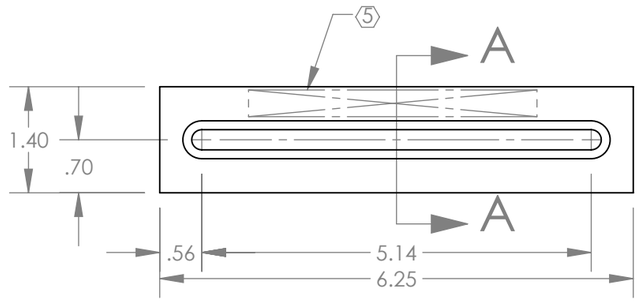


REVERSE ISO VIEW





SECTION A-A



NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)										
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS UPPER ROLL TRIM MASS					
MATERIAL: 304 SSTL	FINISH: 63 µinch Ra	NEXT ASSY: D1101526	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER	K. MAILAND	28 JUL 2011	SIZE: B	DWG. NO.: D1101520	REV.: v1
					DRAFTER	C. CONLEY	23 MAR 2012			
					CHECKER	SEE DCN				
					APPROVAL	SEE DCN		SCALE: NONE	PROJECTION:	SHEET 1 OF 1

D1101520 aLIGO TMS Upper Roll Trim Mass, PART PDM REV: X-012, DRAWING PDM REV: X-002

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 8.269 KG [18.229 LB].

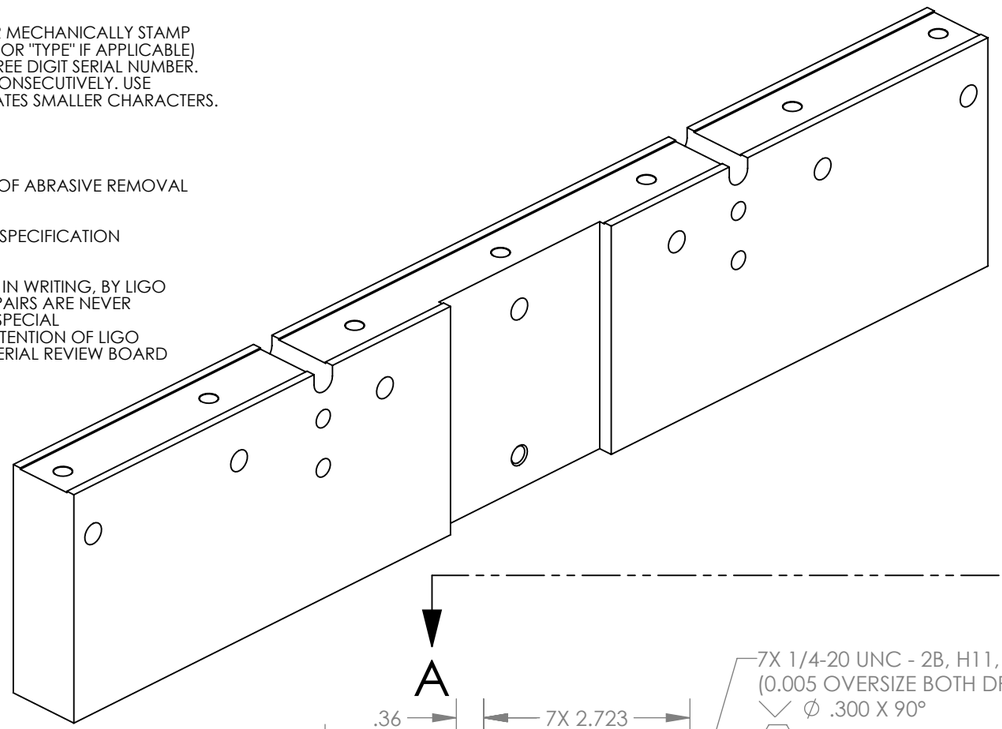
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

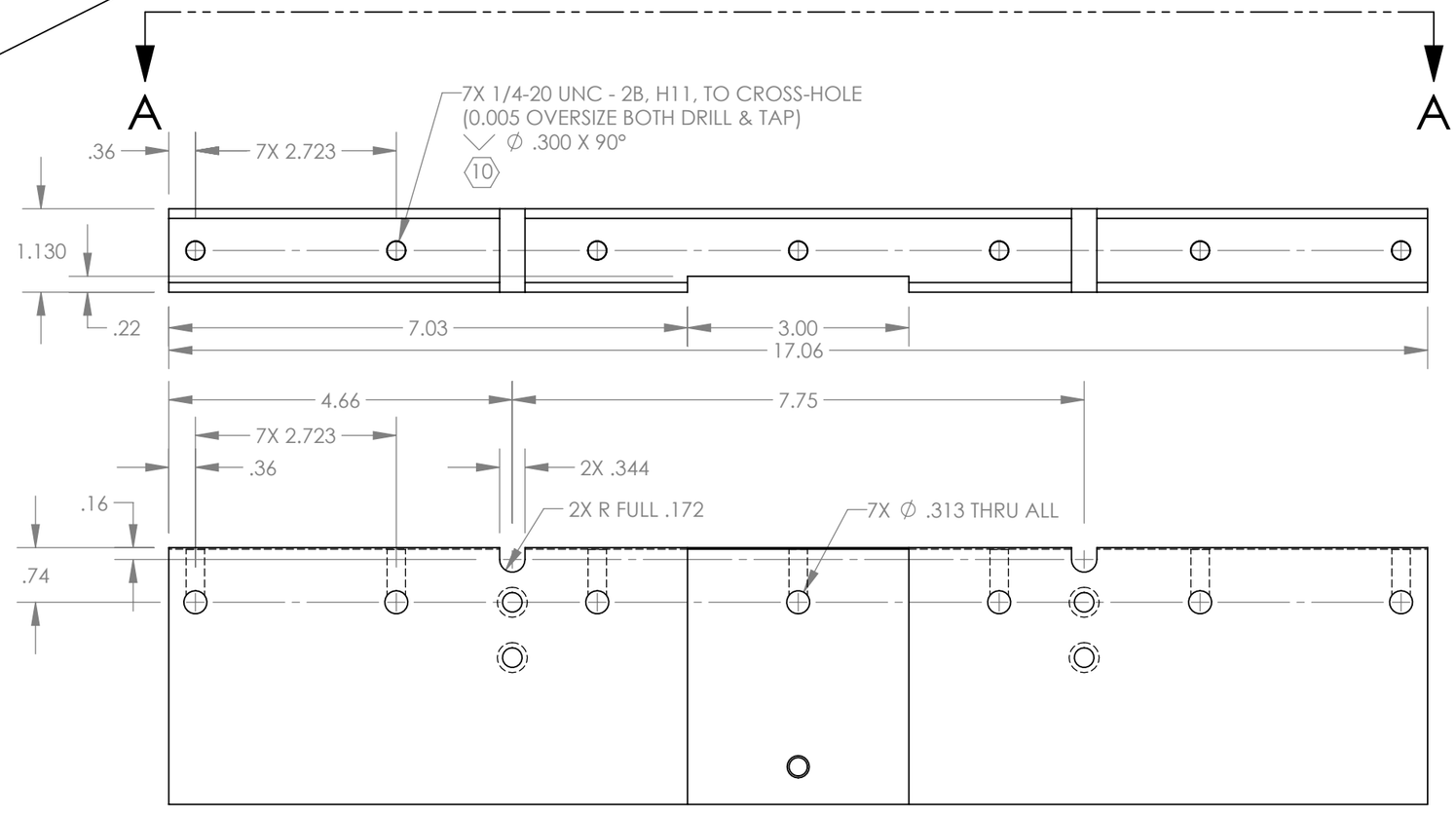
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

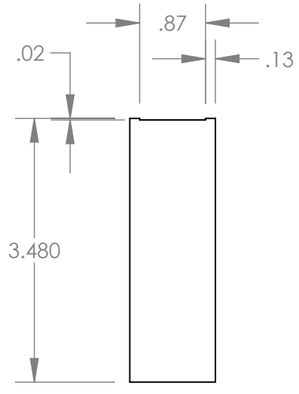
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10. ALL TAPPED HOLES: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	

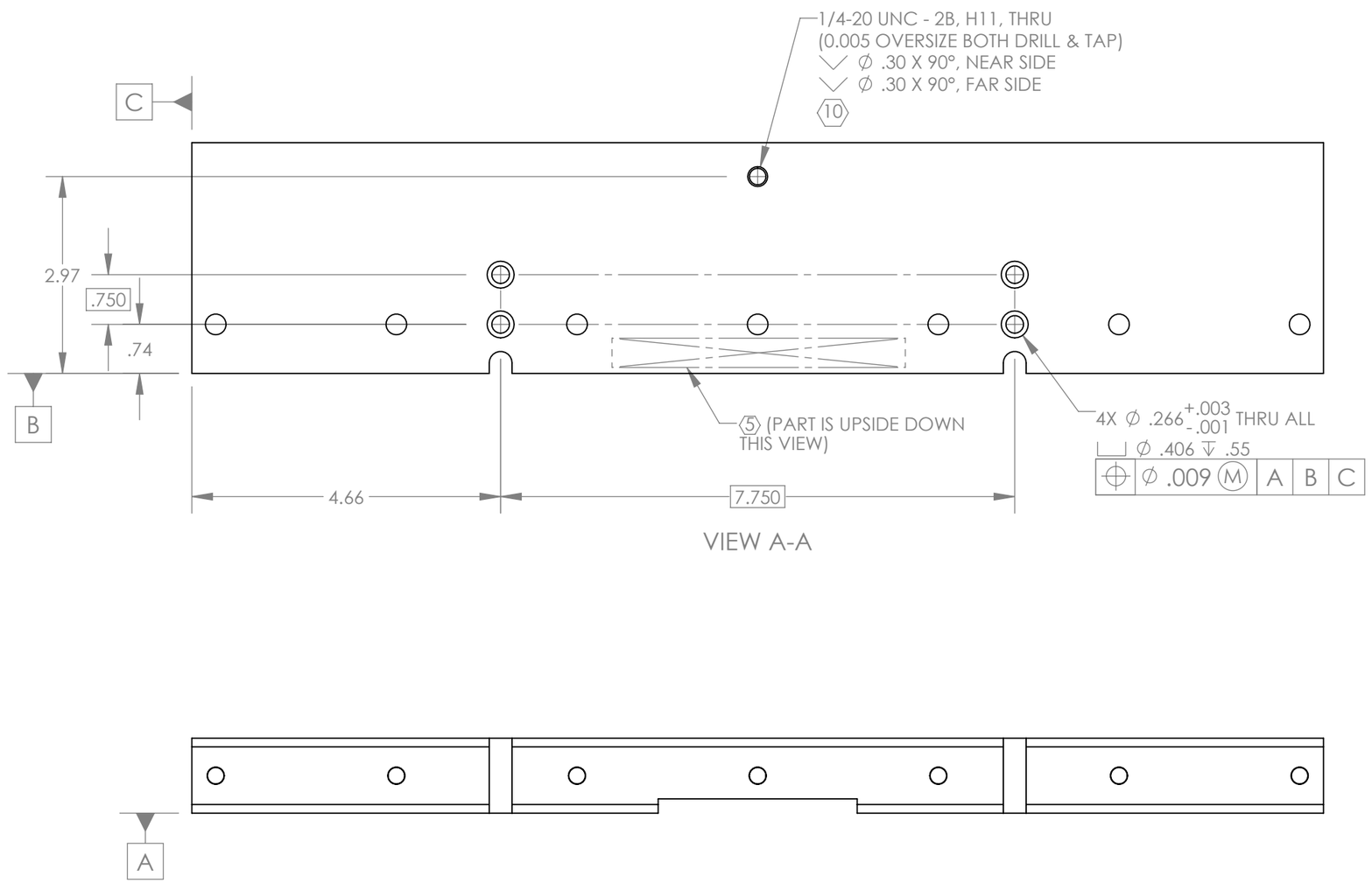






NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)									
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS TOP ADD MASS BAR				
MATERIAL: 304 SSTL	FINISH: 63 µinch Ra	NEXT ASSY: D1101526	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: K. MAILAND 21 FEB 2012	SIZE: B	DWG. NO.: D1200312	REV.: v1	
					DRAFTER: C. CONLEY 23 MAR 2012				
					CHECKER: SEE DCN				
					APPROVAL: SEE DCN	SCALE: NONE	PROJECTION:	SHEET 1 OF 2	

D1200312 aLIGO TMS Top Add Mass Bar, PART PDM REV: X-026, DRAWING PDM REV: X-002



VIEW A-A

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY			
SIZE B	DWG. NO. D1200312		REV. v1
SCALE:NONE	PROJECTION:	SHEET 2 OF 2	

D1200312 aLIGO TMS Top Add Mass Bar, PART PDM REV: X-026, DRAWING PDM REV: X-002

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

NOTES CONTINUED:

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 26.3 G [0.058 LB].

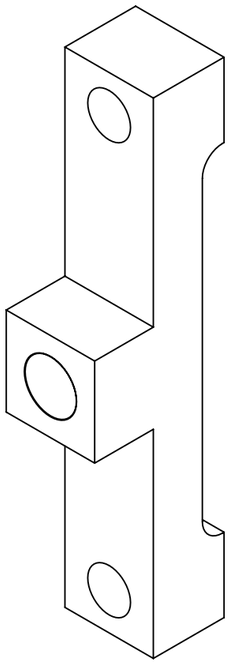
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

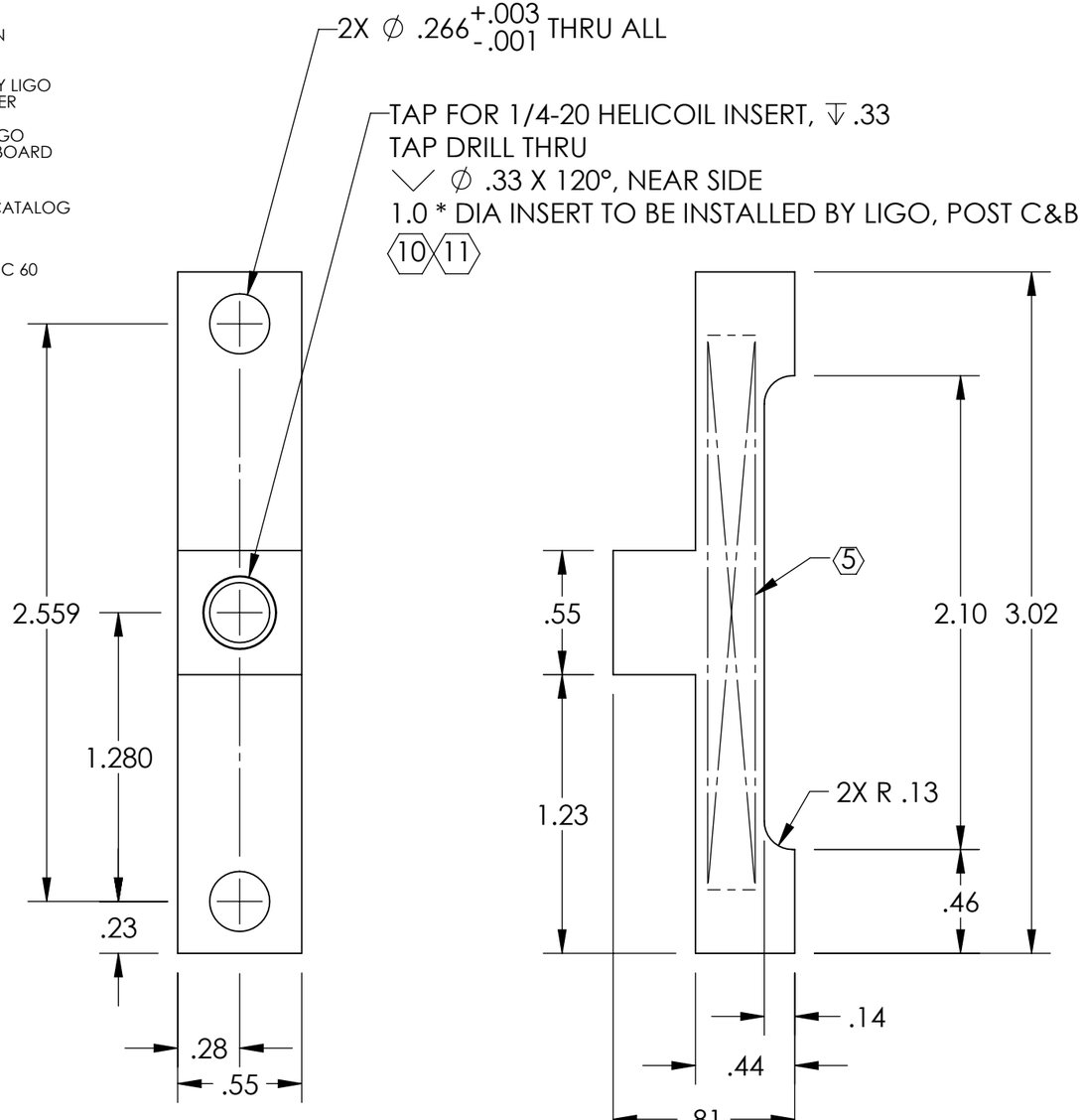
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

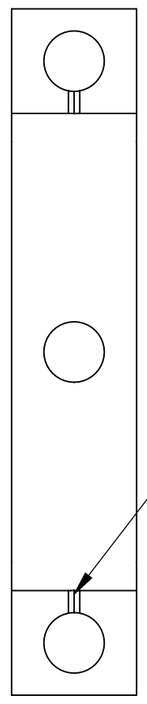
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10. PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOIL.

11. INTERNAL NOTE: HELICOIL TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.







NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)							
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME aLIGO SUS BOSEM FLAG BRACKET		
	MATERIAL 6061-T6 Al	FINISH 63 µinch Ra	SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS	DESIGNER C. CONLEY 28 FEB 2012 DRAFTER J. TERRAZAS 23 MAR 2012 CHECKER SEE DCN APPROVAL SEE DCN	SIZE B	DWG. NO. D1200327 REV. v1
			NEXT ASSY D1101527			SCALE:NONE	PROJECTION: SHEET 1 OF 1

D1200327 aLIGO SUS BOSEM Flag Bracket, PART PDM REV: X-014, DRAWING PDM REV: X-003

NOTES CONTINUED:

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 72.5 G [0.160 LB].

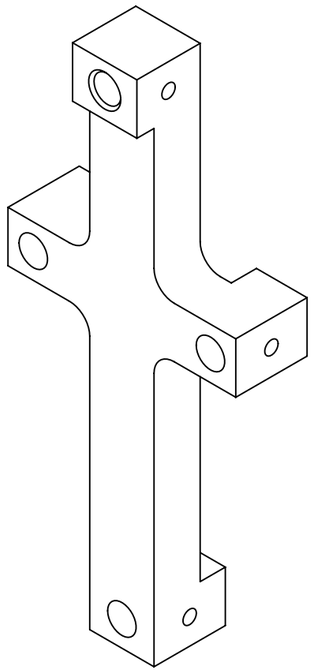
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

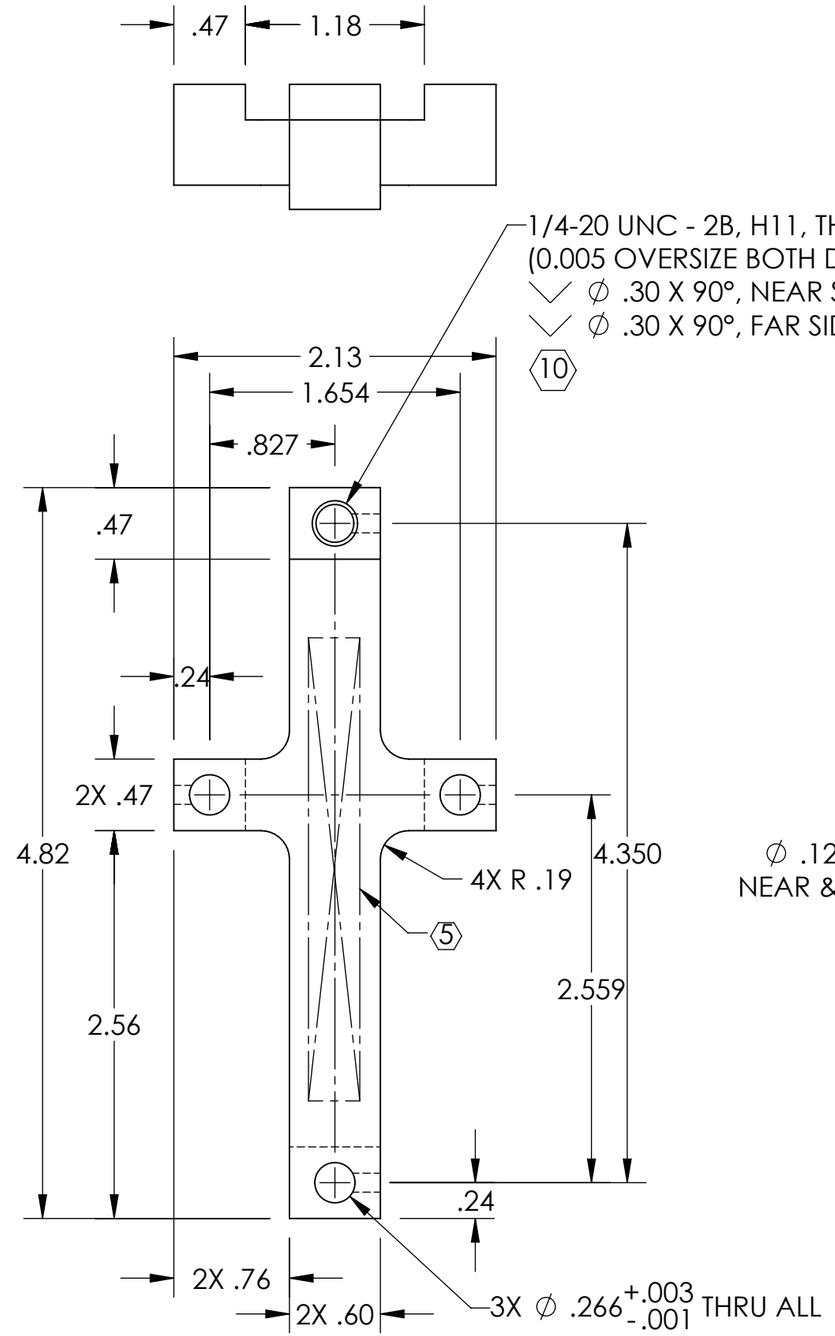
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

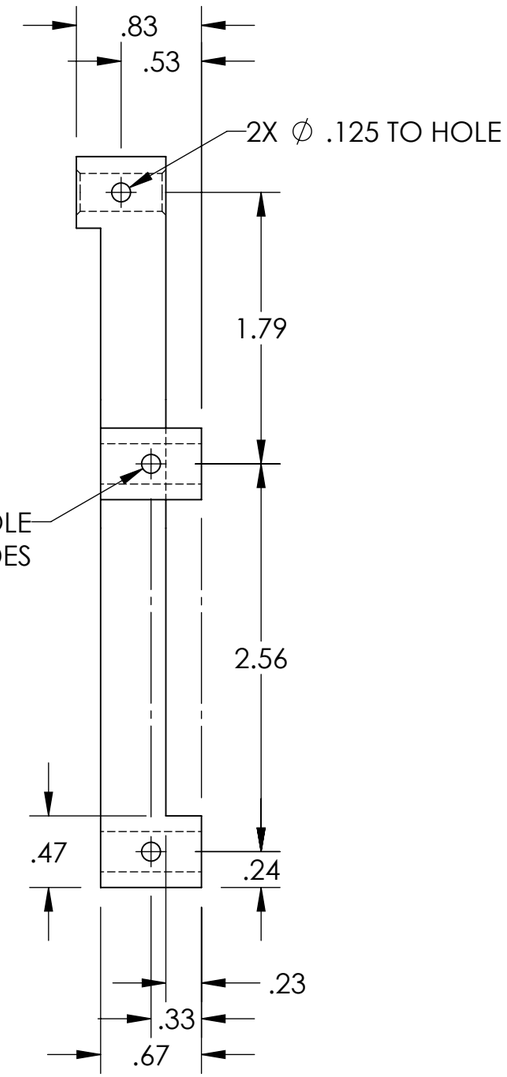
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10. TAPPED HOLE: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-







NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)								
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO SUS BOSEM FLAG CENTER BRACKET			
	MATERIAL: 6061-T6 Al	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: J. O'dell 28 FEB 2012	SIZE: B	DWG. NO.: D1200328	REV.: v1
			NEXT ASSY: D1101527		DRAFTER: C. CONLEY 23 MAR 2012			
					CHECKER: SEE DCN			
					APPROVAL: SEE DCN	SCALE: 1:1	PROJECTION:	SHEET 1 OF 1

D1200328 aLIGO SUS BOSEM Flag Center Bracket, PART PDM REV: X-014, DRAWING PDM REV: X-001

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

NOTES CONTINUED:

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 70.7 G [0.156 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

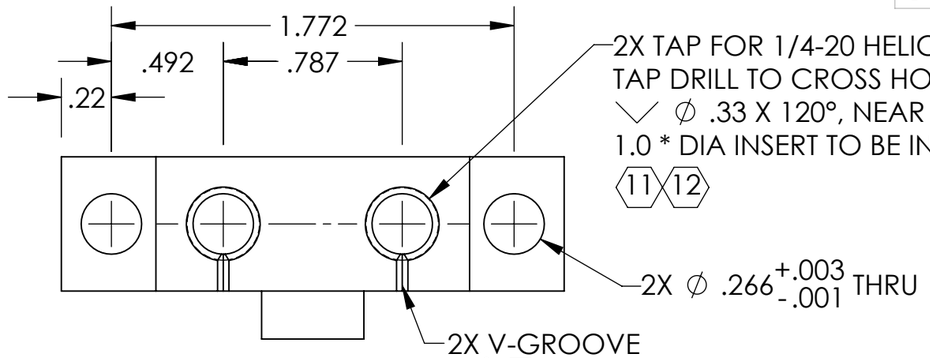
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

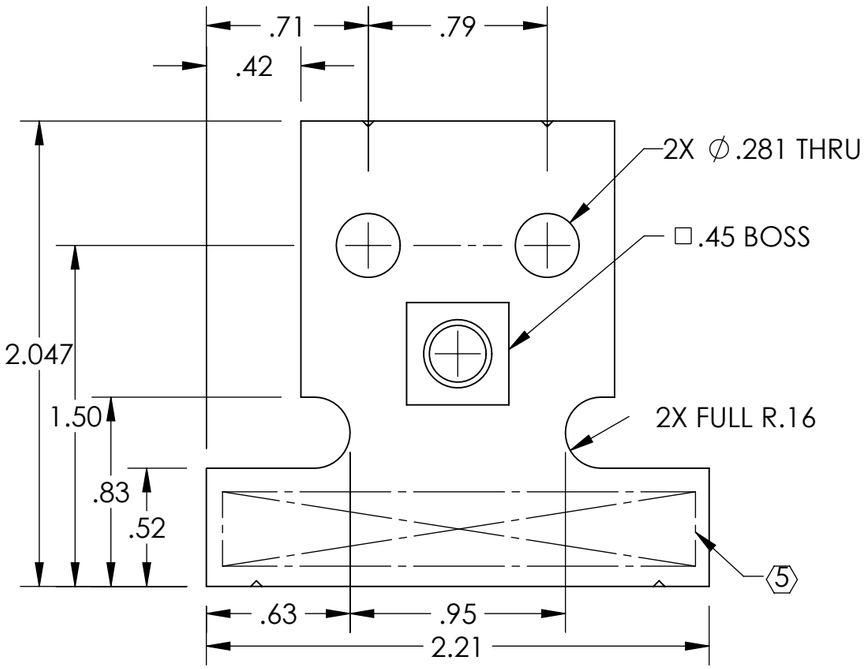
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

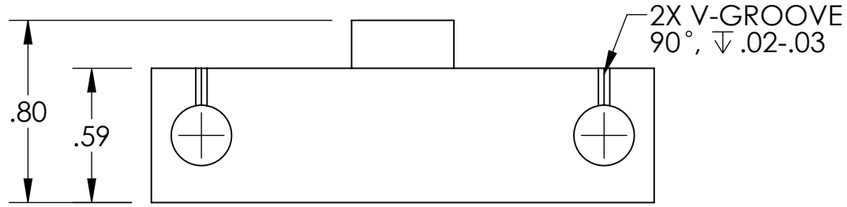
⟨10⟩ TAPPED HOLE (HELICOILS EXCLUDED): 0.005 OVERSIZE BOTH DRILL AND TAP.

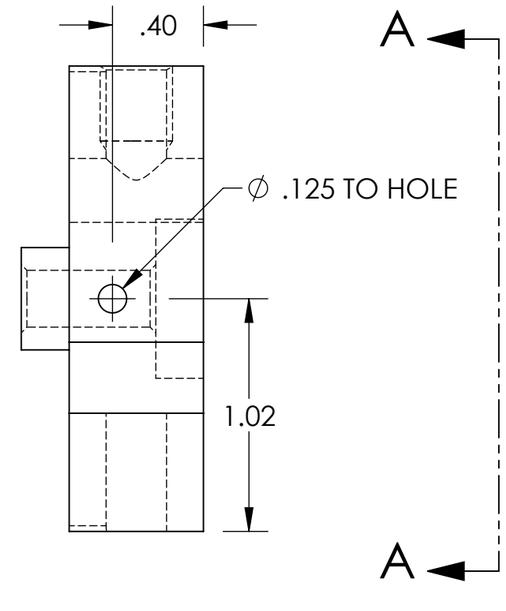
⟨11⟩ PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.

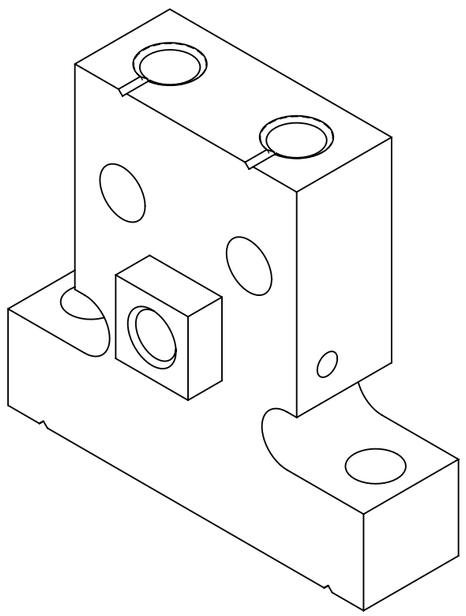
⟨12⟩ INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.





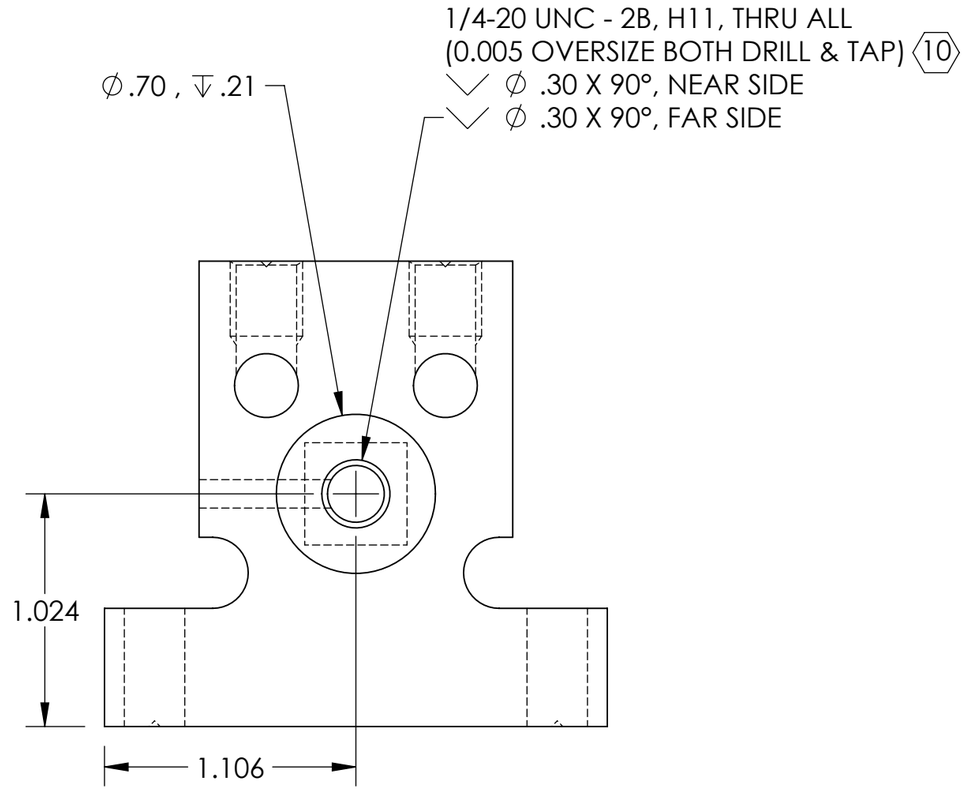






NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)									
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	aLIGO TMS MASS SPACER			
MATERIAL	6061-T6 Al	FINISH	63 µinch Ra	SYSTEM	ADVANCED LIGO	SUB-SYSTEM	AOS		
NEXT ASSY	D1101527			DESIGNER	C. CONLEY	29 FEB 2012	SIZE	DWG. NO.	REV.
				DRAFTER	J. TERRAZAS	23 MAR 2012	B	D1200356	v1
				CHECKER	SEE DCN				
				APPROVAL	SEE DCN		SCALE: NONE	PROJECTION:	SHEET 1 OF 2

D1200356 aLIGO TMS Mass Spacer, PART PDM REV: X-011, DRAWING PDM REV: X-003



VIEW A-A

D1200356 aLIGO TMS Mass Spacer, PART PDM REV: X-011, DRAWING PDM REV: X-003

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1200356	REV. V1
SCALE:NONE	PROJECTION:	SHEET 2 OF 2

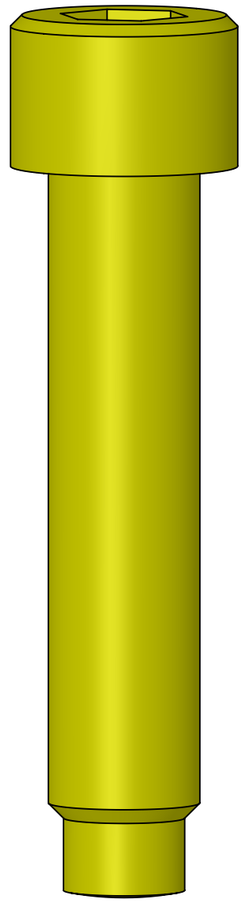
NOTES CONTINUED:

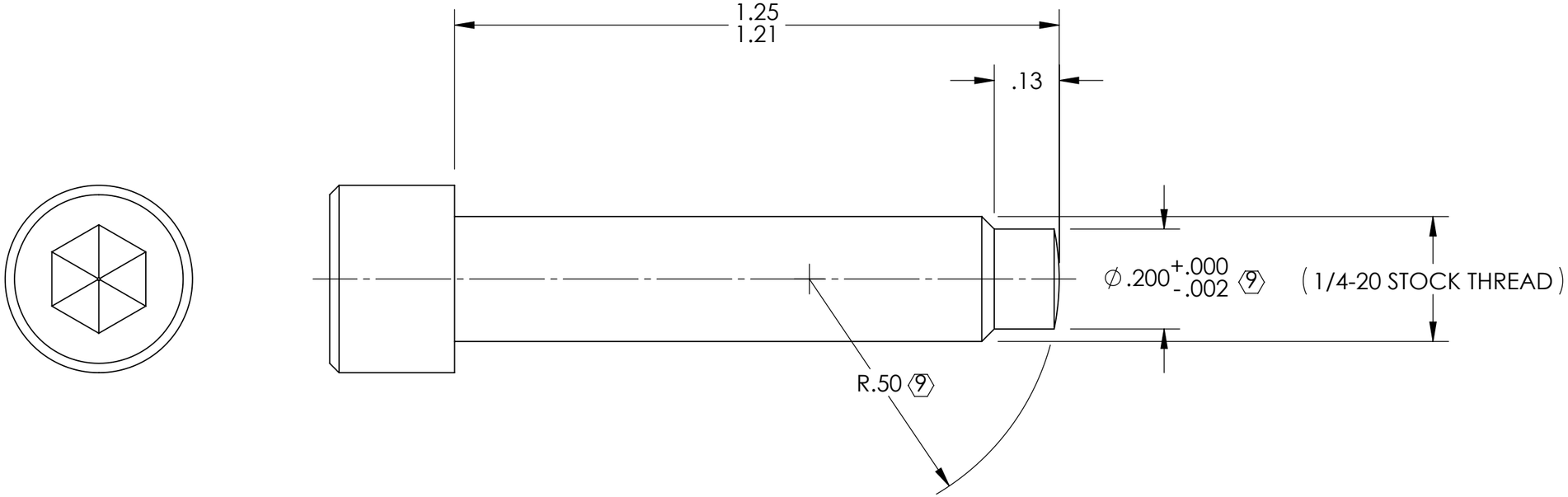
5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXXX-VY, QTY: X, LOT S/N 001.
6. MASS: 0.023 LB [10.5 G].
7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

⟨8⟩ MAKE FROM: McMASTER-CARR P/N 92200A544 OR EQUIVALENT PER MS16995. (SOCKET HEAD CAP SCREW, 1/4-20 UNC-3A FULLY THREADED, 300 SERIES STAINLESS STEEL)

⟨9⟩ 63 µINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACES. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-





D1200404 aLIGO TMS Lower Stage Spring Adjuster Screw, PART PDM REV: X-003, DRAWING PDM REV: X-004

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)						
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.	MATERIAL ⟨8⟩	FINISH 63 µinch Ra ⟨9⟩	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS
				NEXT ASSY D1101527		

PART NAME	aLIGO TMS LOWER STAGE SPRING ADJUSTER SCREW		
DESIGNER	C. CONLEY	03 MAR 2012	
DRAFTER	C. CONLEY	20 MAR 2012	
CHECKER	SEE DCN		
APPROVAL	SEE DCN		
SIZE B	DWG. NO. D1200404	REV. v1	
SCALE: NONE	PROJECTION:	SHEET 1 OF 1	

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

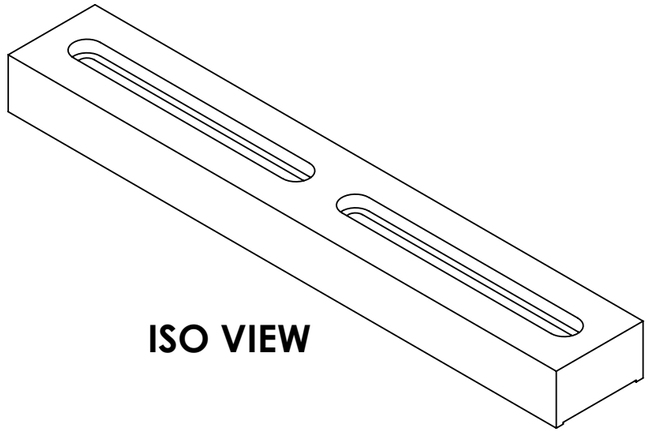
6. MASS: 1.628 KG [3.590 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

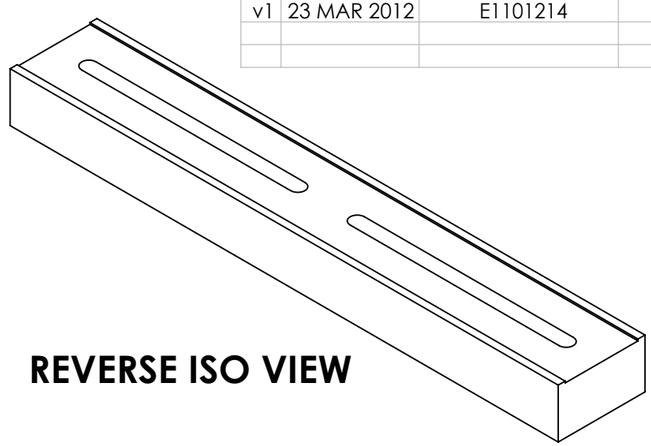
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

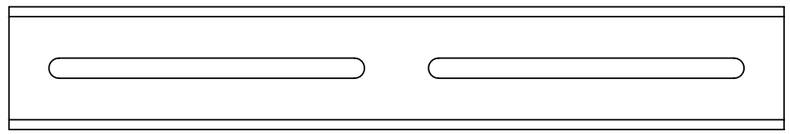
REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	

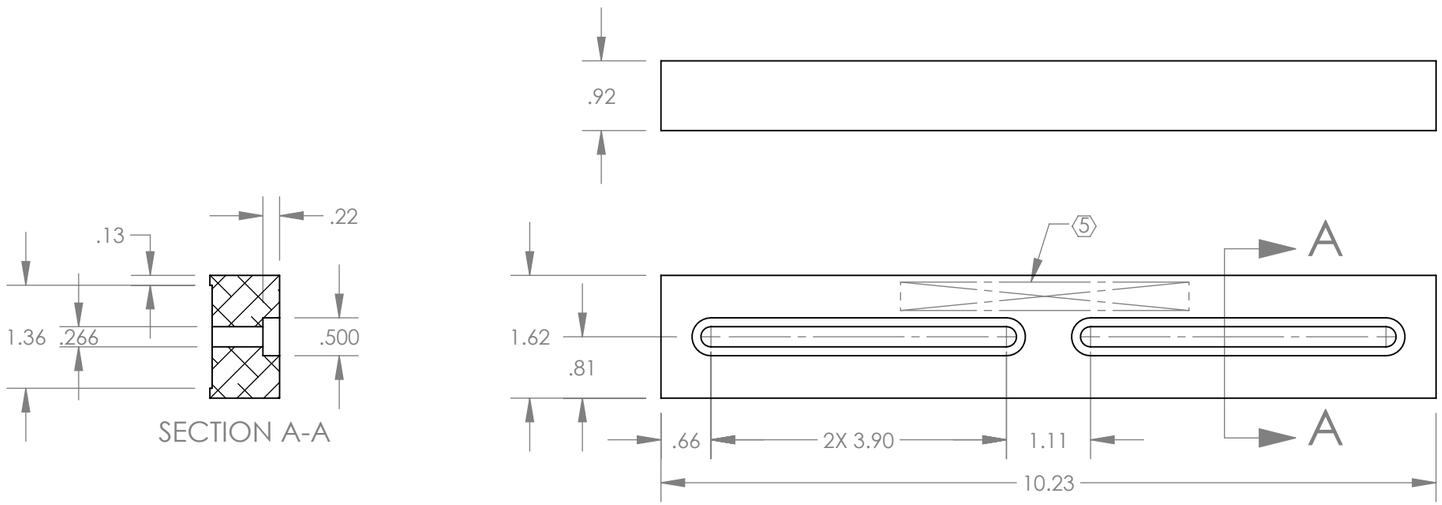


ISO VIEW



REVERSE ISO VIEW





NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS ARE IN INCHES

TOLERANCES:
.XX ± .01
.XXX ± .005

ANGULAR ± 0.1°

1. INTERPRET DRAWING PER ASME Y14.5-1994.
2. REMOVE ALL SHARP EDGES, .005-.015.
3. DO NOT SCALE FROM DRAWING.
4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.

MATERIAL: 304 SSTL
FINISH: 63 µinch Ra

LIGO — CALIFORNIA INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SYSTEM: ADVANCED LIGO
SUB-SYSTEM: AOS
NEXT ASSY: D1101526

PART NAME: aLIGO TMS UPPER PITCH TRIM MASS

DESIGNER	K. MAILAND	07 MAR 2012
DRAFTER	C. CONLEY	23 MAR 2012
CHECKER	SEE DCN	
APPROVAL	SEE DCN	

SIZE: B — DWG. NO.: D1200405 — REV.: v1

SCALE: NONE — PROJECTION: — SHEET 1 OF 1

D1200405 aLIGO TMS Upper Pitch Trim Mass, PART PDM REV: X-007, DRAWING PDM REV: X-003

NOTES CONTINUED:

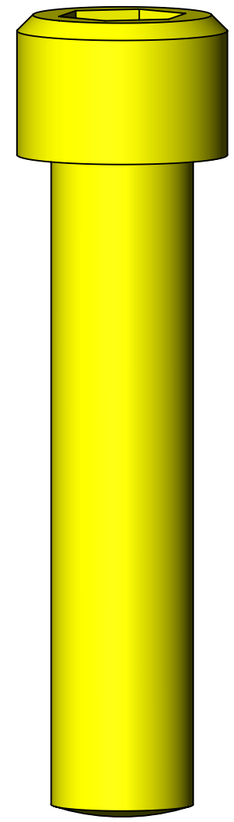
5. BAG AND TAG LOT WITH DRAWING NUMBER, REVISION, QUANTITY, AND LOT SERIAL NUMBER. LOT SERIAL NUMBERS START AT 001 AND PROCEED CONSECUTIVELY. EXAMPLE (TAG): DXXXXXXX-VY, QTY: X, LOT S/N 001.
6. MASS: 20 G [0.044 LB]
7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

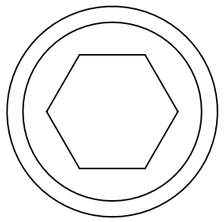
⟨8⟩ MAKE FROM: McMASTER-CARR P/N 92200A634 OR EQUIVALENT PER MS16995.

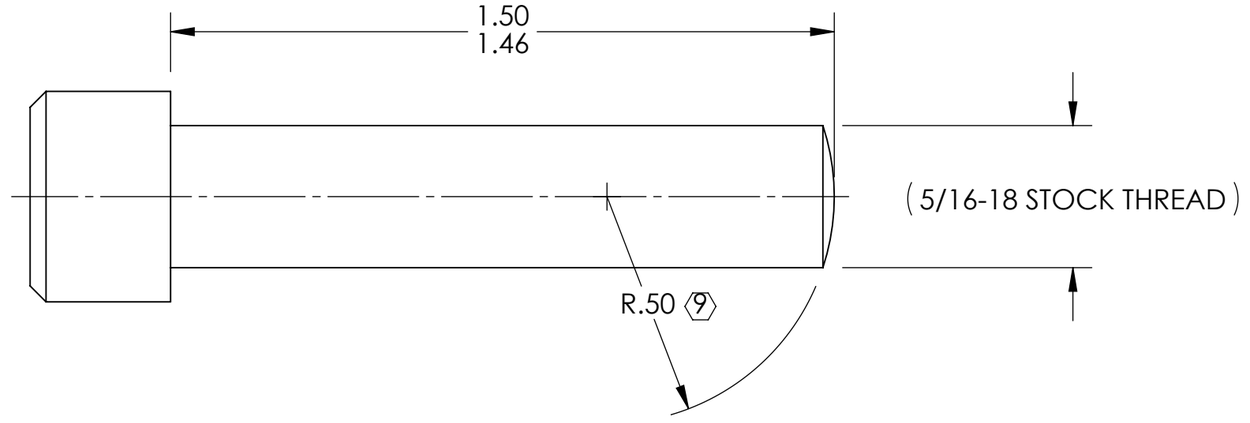
(SOCKET HEAD CAP SCREW, 5/16-18 UNC-3A FULLY THREADED, 300 SERIES STAINLESS STEEL)

⟨9⟩ 63 µINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACE. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-







NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)										
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE. MATERIAL ⟨8⟩ FINISH 63 µinch Ra ⟨9⟩	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME aLIGO TMS SPRING STOP SCREW						
		SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS	DESIGNER	C. CONLEY	07 MAR 2012	SIZE B	DWG. NO. D1200406	REV. v1
		NEXT ASSY D1101527		DRAFTER	M. MILLER	20 MAR 2012			
				CHECKER	SEE DCN				
				APPROVAL	SEE DCN		SCALE: NONE	PROJECTION:	SHEET 1 OF 1

D1200406 aLIGO TMS Spring Stop Screw, PART PDM REV: X-002, DRAWING PDM REV: X-004

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 21.5 G [0.047 LB].

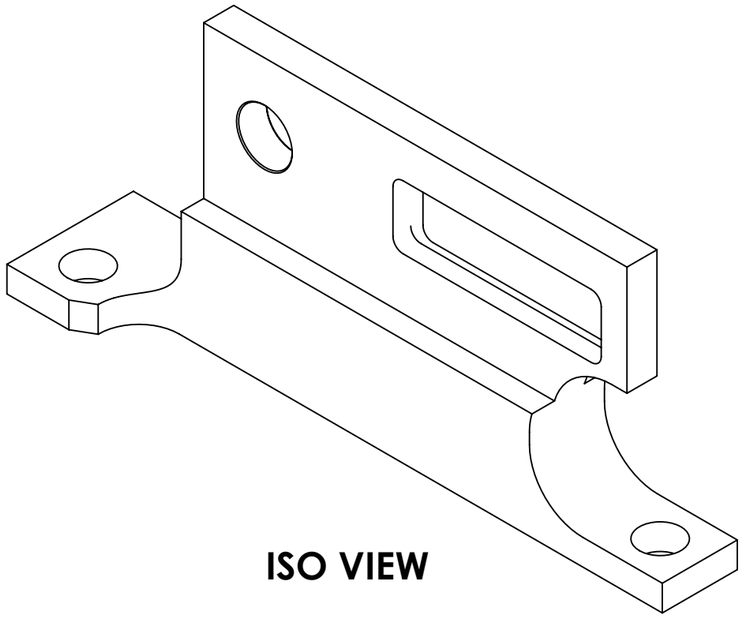
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

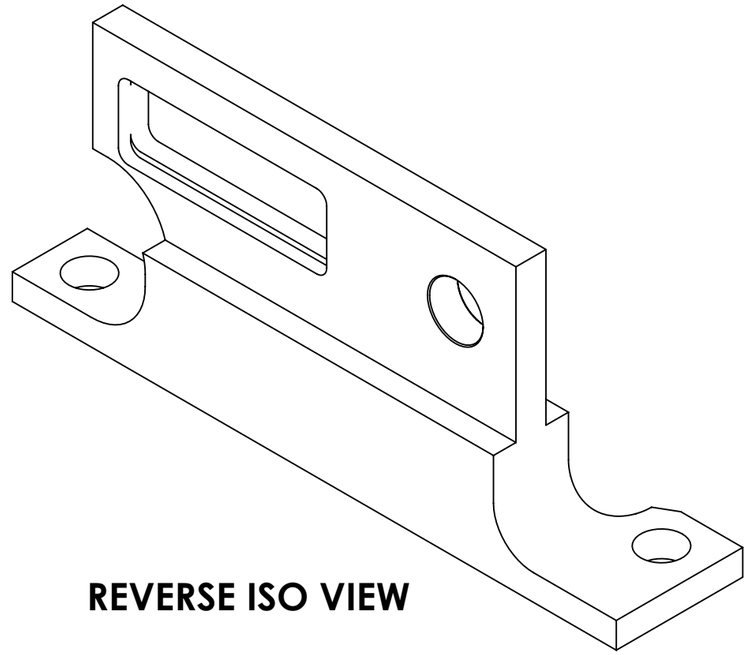
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

10. TAPPED HOLE: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-



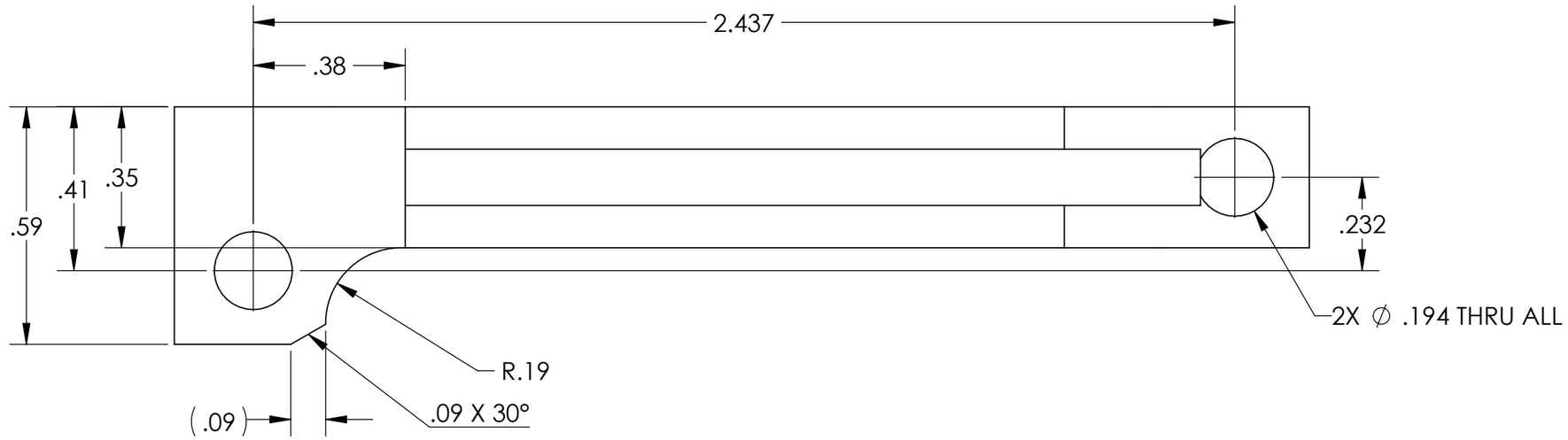
ISO VIEW

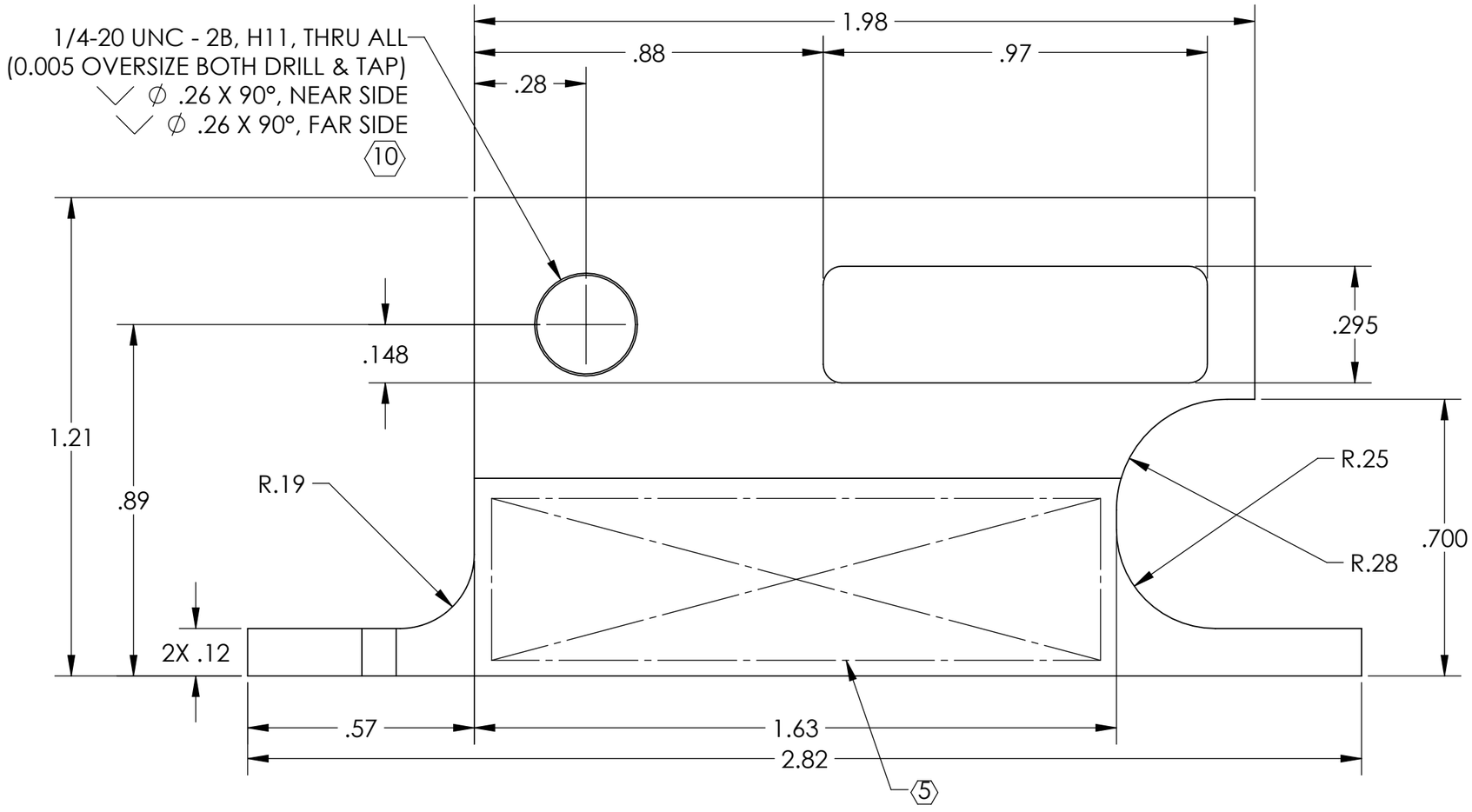


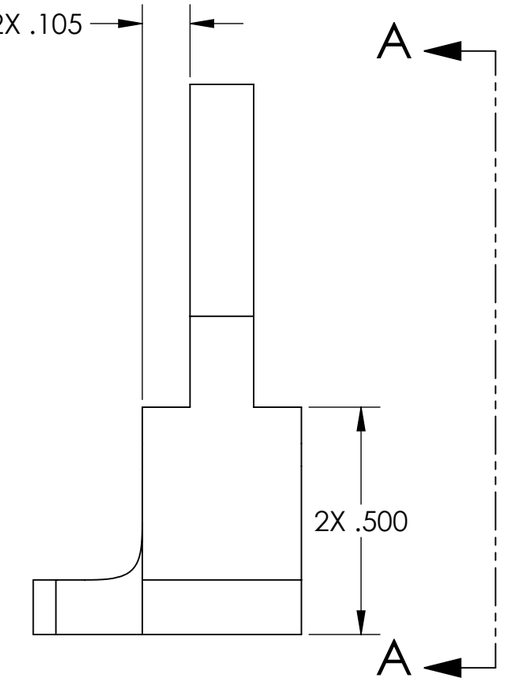
REVERSE ISO VIEW

D1200420 aLIGO TMS Mass Cable Clamp Bracket, PART PDM REV: X-019, DRAWING PDM REV: X-008

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)									
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS MASS CABLE CLAMP BRACKET				
	MATERIAL: 6061-T6 Al	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: C. CONLEY 08 MAR 2012	SIZE: B	DWG. NO.: D1200420	REV.: v1	
			NEXT ASSY: D1200421		DRAFTER: C. CONLEY 23 MAR 2012				
					CHECKER: SEE DCN				
					APPROVAL: SEE DCN	SCALE: NONE	PROJECTION:	SHEET 1 OF 3	

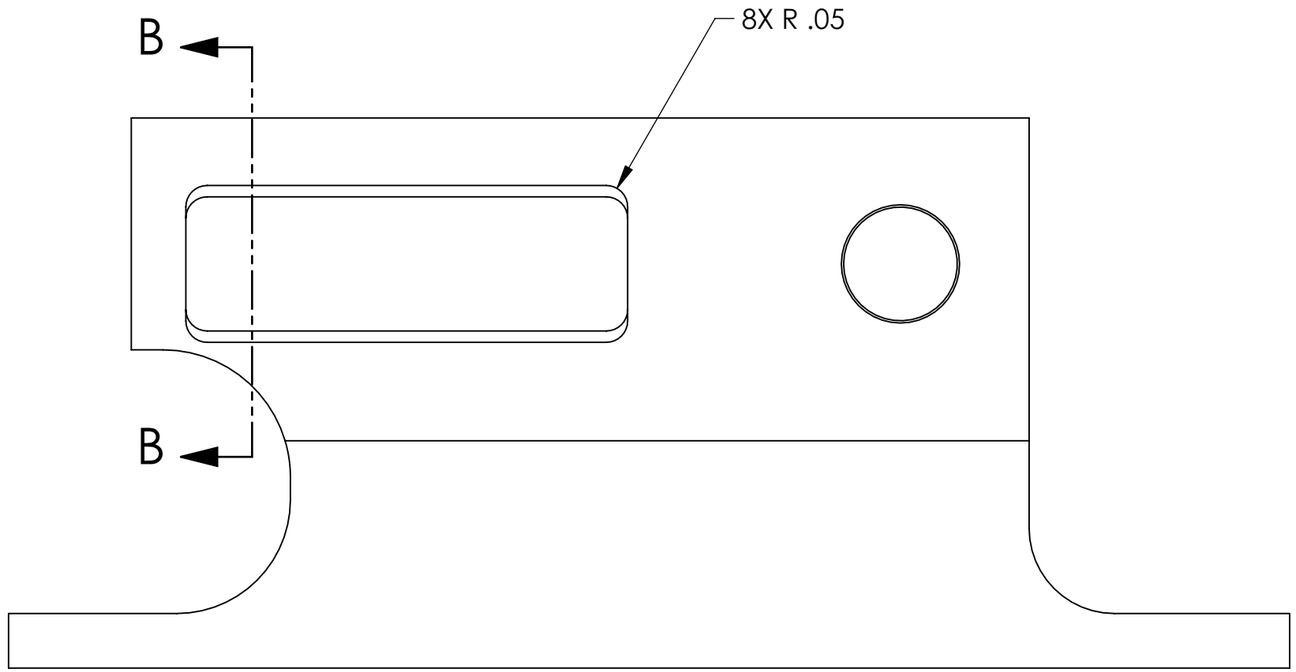




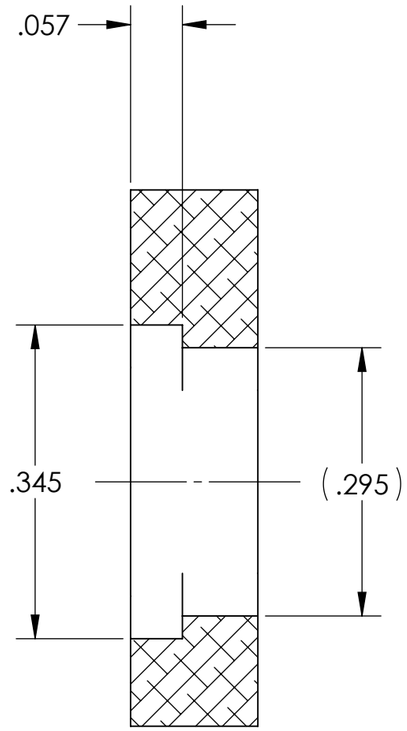


LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1200420	REV. v1
SCALE:NONE	PROJECTION:	SHEET 2 OF 3

D1200420 aLIGO TMS Mass Cable Clamp Bracket, PART PDM REV: X-019, DRAWING PDM REV: X-008



VIEW A-A



SECTION B-B

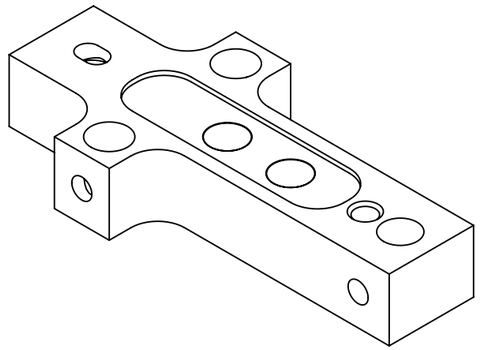
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY			
SIZE B	DWG. NO. D1200420		REV. v1
SCALE:NONE	PROJECTION:		SHEET 3 OF 3

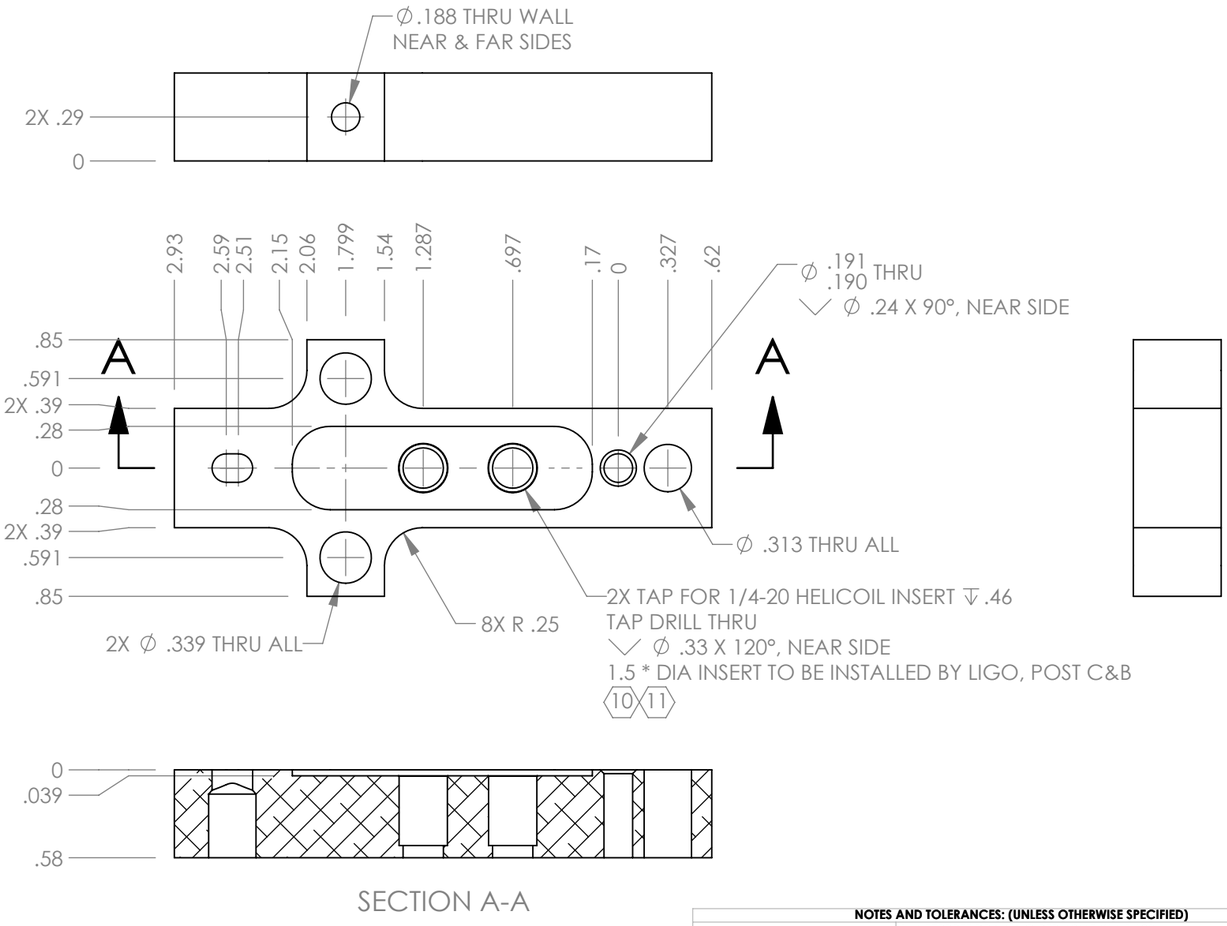
D1200420 aLIGO TMS Mass Cable Clamp Bracket, PART PDM REV: X-019, DRAWING PDM REV: X-008

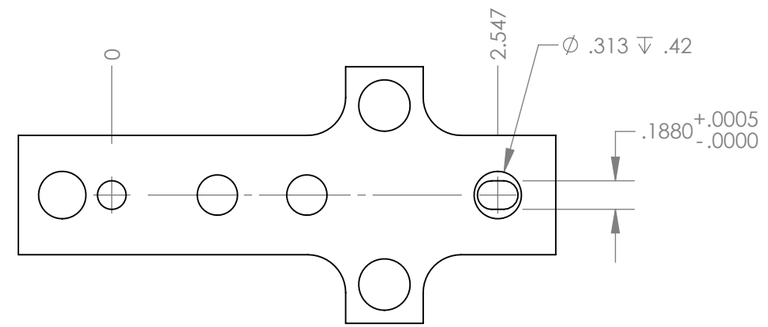
REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	

NOTES (CONTINUED):

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX
6. MASS: 5.410 KG [11.927 LB].
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.
10. PREPARE HELICOIL TAPPED HOLES ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOILS.
11. INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.







SECTION A-A

NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)											
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 0.1°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS SHALL BE WATER SOLUBLE AND FREE OF SULFUR, CHLORINE AND SILICONE, SUCH AS CINCINNATI MILACRON'S CIMTECH 410.		LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME	aLIGO TMS MASS WIRE CLAMP ADJUSTMENT BLOCK				
	MATERIAL	FINISH	SYSTEM	SUB-SYSTEM		DESIGNER	C. CONLEY	08 MAR 2012	SIZE	DWG. NO.	REV.
	6061-T6 Al	63 µinch Ra	ADVANCED LIGO	AOS		DRAFTER	C. CONLEY	23 MAR 2012	B	D1200426	v1
			NEXT ASSY			CHECKER	SEE DCN				
			D1101527			APPROVAL	SEE DCN		SCALE: NONE	PROJECTION:	SHEET 1 OF 1

D1200426 aLIGO TMS Mass Wire Clamp Adjustment Block, PART PDM REV: X-013, DRAWING PDM REV: X-004

NOTES CONTINUED:

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS: 31.2 G [0.069 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

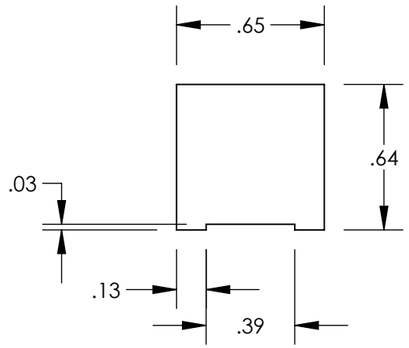
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

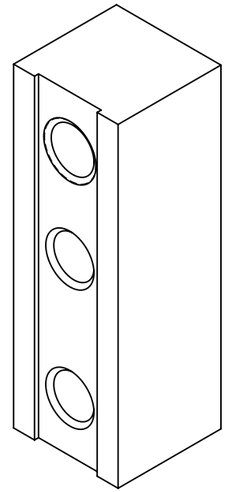
⟨10⟩ TAPPED HOLES (HELICOIL EXCLUDED): 0.005 OVERSIZE BOTH DRILL AND TAP.

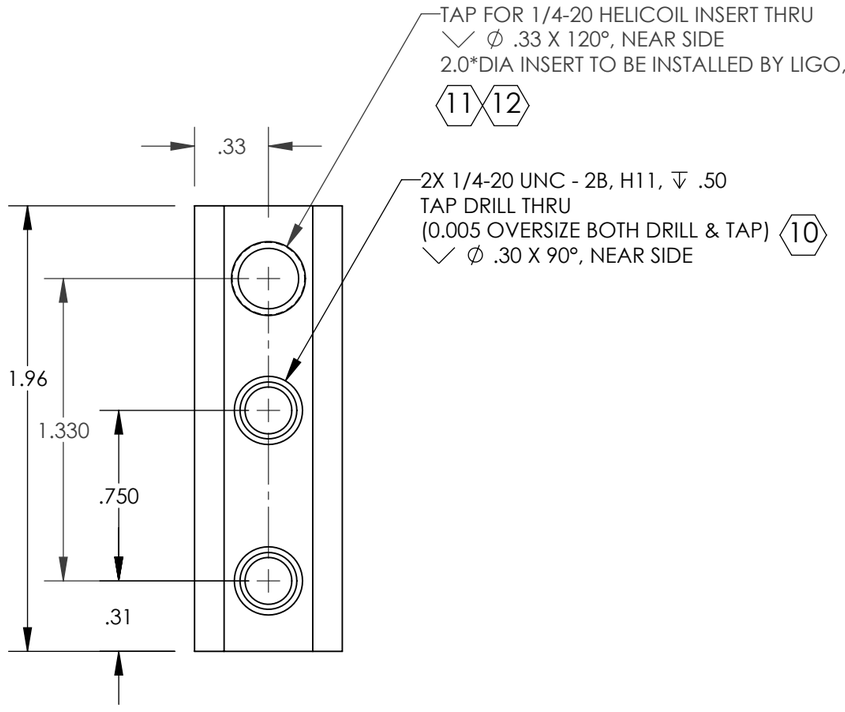
⟨11⟩ PREPARE HELICOIL TAPPED HOLE ACCORDING TO EMHART HELICOIL PRODUCT CATALOG HC2000. DO NOT INSTALL HELICOIL.

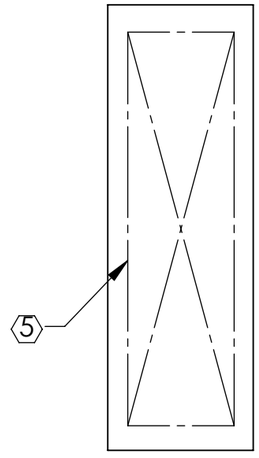
⟨12⟩ INTERNAL NOTE: HELICOILS TO BE INSTALLED BY LIGO, POST C&B. USE ONLY NITRONIC 60 HELICOILS.

REV.	DATE	DCN #	DRAWING TREE #
v1	25 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-









NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)										
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS UPPER SUS WIRE ADJUSTER				
	MATERIAL: 6061-T6 Al	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: C. CONLEY 08 MAR 2012	SIZE: B	DWG. NO.: D1200427	REV.: v1		
			NEXT ASSY: D1101526		DRAFTER: C. CONLEY 25 MAR 2012					
					CHECKER: SEE DCN					
					APPROVAL: SEE DCN		SCALE: NONE	PROJECTION:	SHEET 1 OF 1	

D1200427 aLIGO TMS Upper SUS Wire Adjuster, PART PDM REV: X-012, DRAWING PDM REV: X-003

NOTES CONTINUED:

5. SCRIBE, ENGRAVE (A VIBRATORY TOOL MAY BE USED), LASER MARK OR MECHANICALLY STAMP (NO INKS OR DYES) DRAWING PART NUMBER, REVISION (AND VARIANT OR "TYPE" IF APPLICABLE) ON NOTED SURFACE OF PART FOLLOWED ON THE NEXT LINE WITH A THREE DIGIT SERIAL NUMBER. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. USE MINIMUM 0.12" HIGH CHARACTERS, UNLESS THE SIZE OF THE PART DICTATES SMALLER CHARACTERS. EXAMPLE: DXXXXXXX-VY, TYPE-XX, S/N XXX

6. MASS:
   -01; 125 G [0.275 LB]
   -02; 250 G [0.550 LB].

7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.

8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

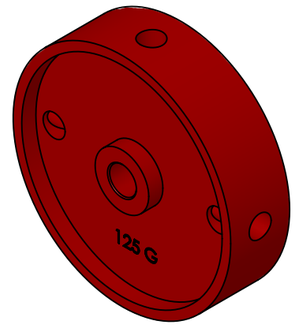
9. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NOT WELD REPAIRS OR PLUGS UNLESS APPROVED IN ADVANCE IN WRITING BY LIGO, REFER TO LIGO-E0900364.

10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

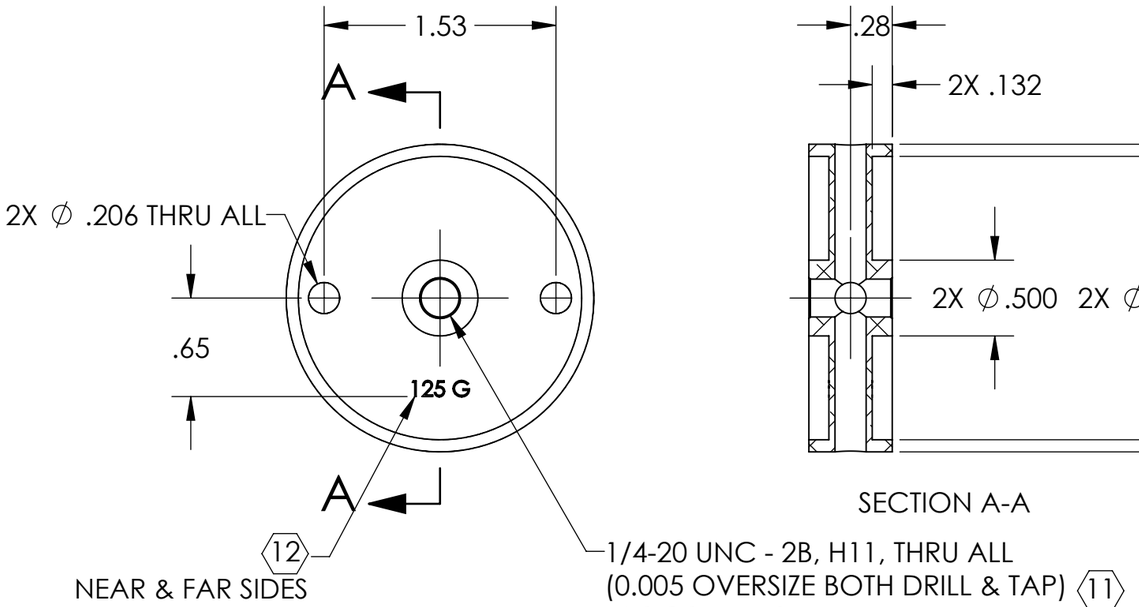
11. TAPPED HOLES: .005 OVERSIZE BOTH DRILL AND TAP.

12. SCRIBE, ENGRAVE, LASER MARK, OR MECHANICALLY STAMP (NO INKS OR DYES), "125 G" FOR -01, "250 G" FOR -02, APPROXIMATELY CENTER JUSTIFIED AS SHOWN. CHARACTER HEIGHT 0.10-0.18. NEAR & FAR SIDES.

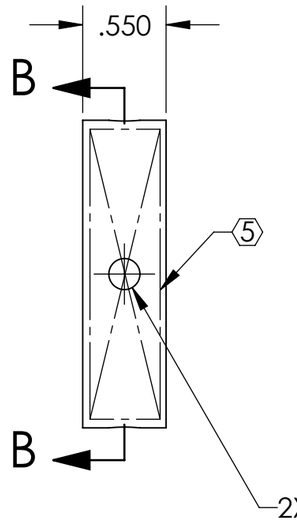
REV.	DATE	DCN #	DRAWING TREE #
v1	19 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

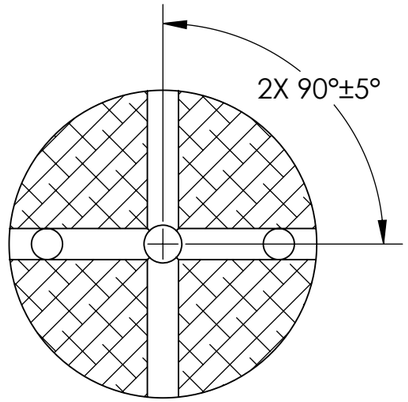


-01



SECTION A-A



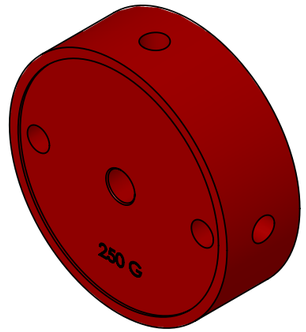


SECTION B-B

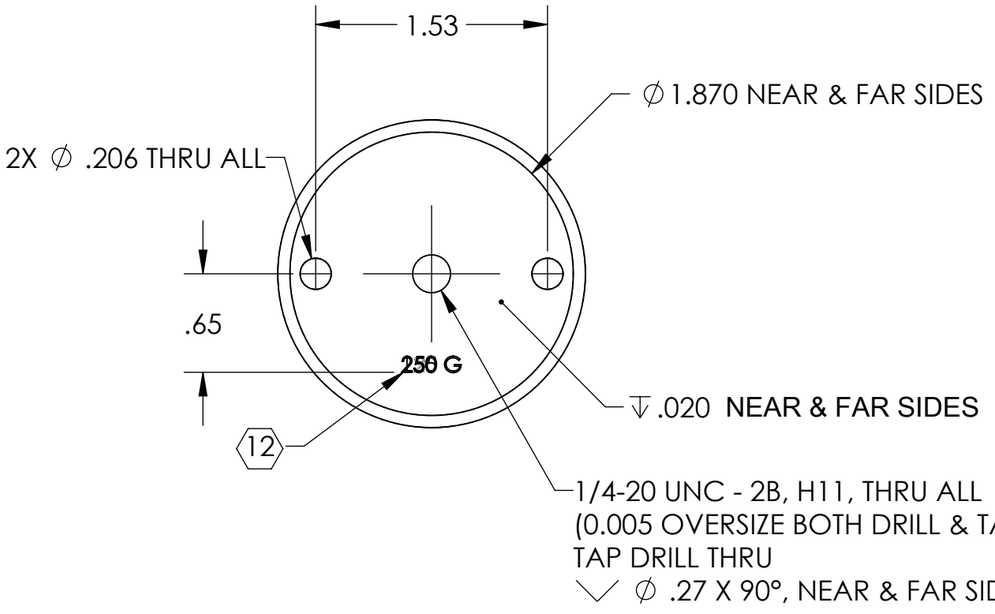
1/4-20 UNC - 2B, H11, THRU ALL
(0.005 OVERSIZE BOTH DRILL & TAP) 11
TAP DRILL THRU
∅ .27 X 90°, NEAR & FAR SIDES

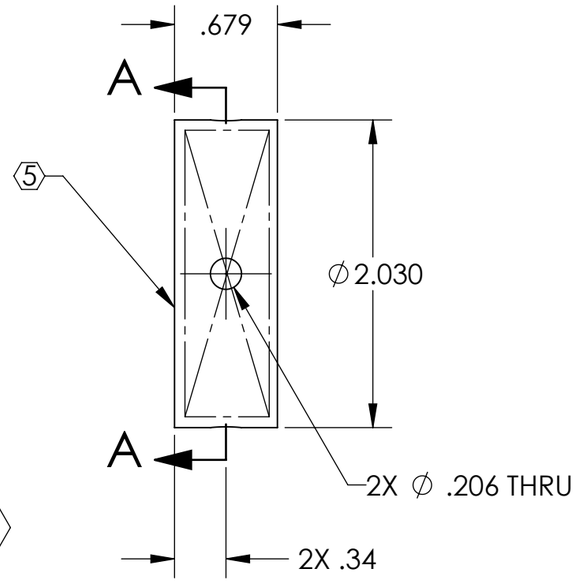
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)										
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME aLIGO TMS BALANCE WEIGHT					
	MATERIAL 304 SSTL	FINISH 63 µinch Ra	SYSTEM ADVANCED LIGO	SUB-SYSTEM AOS	DESIGNER	C. CONLEY	11 MAR 2012	SIZE B	DWG. NO. D1200431	REV. v1
			NEXT ASSY VARIOUS		DRAFTER	C. CONLEY	19 MAR 2012			
					CHECKER	SEE DCN				
					APPROVAL	SEE DCN		SCALE:NONE	PROJECTION:	SHEET 1 OF 2

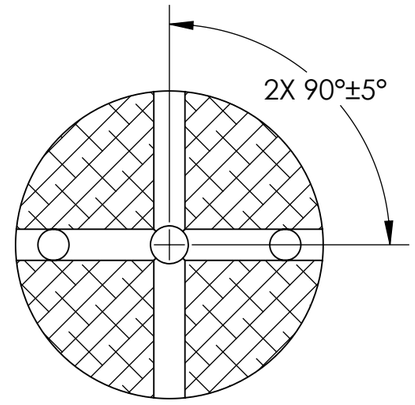
D1200431 aLIGO TMS Balance Weight, PART PDM REV: X-007, DRAWING PDM REV: X-005



-02







SECTION A-A

D1200431 aLIGO TMS Balance Weight, PART PDM REV: X-007, DRAWING PDM REV: X-005

LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SIZE	DWG. NO.	REV.
B	D1200431	v1

SCALE: NONE PROJECTION: SHEET 2 OF 2

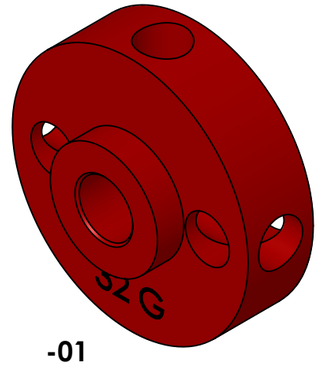
NOTES CONTINUED:

5. LASER MARK A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART IN THE NOTED AREA. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEDE CONSECTUVELY. BAG AND TAG ITEMS WITH THEIR PART NUMBER, REVISION, VARIANT OR "TYPE", AND QUANTITY.
   EXAMPLE (PART): 001-v1
   EXAMPLE (TAG): DXXXXXXX-v1, TYPE-01, QTY: TBD
6. MASS:
   -01; 32 G [0.07 LB]
   -02; 63 G [0.14 LB].
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. ALL MATERIAL IS TO BE VIRGIN MATERIAL (i.e. NOT WELD REPAIRS OR PLUGS UNLESS APPROVED IN ADVANCE IN WRITING BY LIGO, REFER TO LIGO-E0900364.
10. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

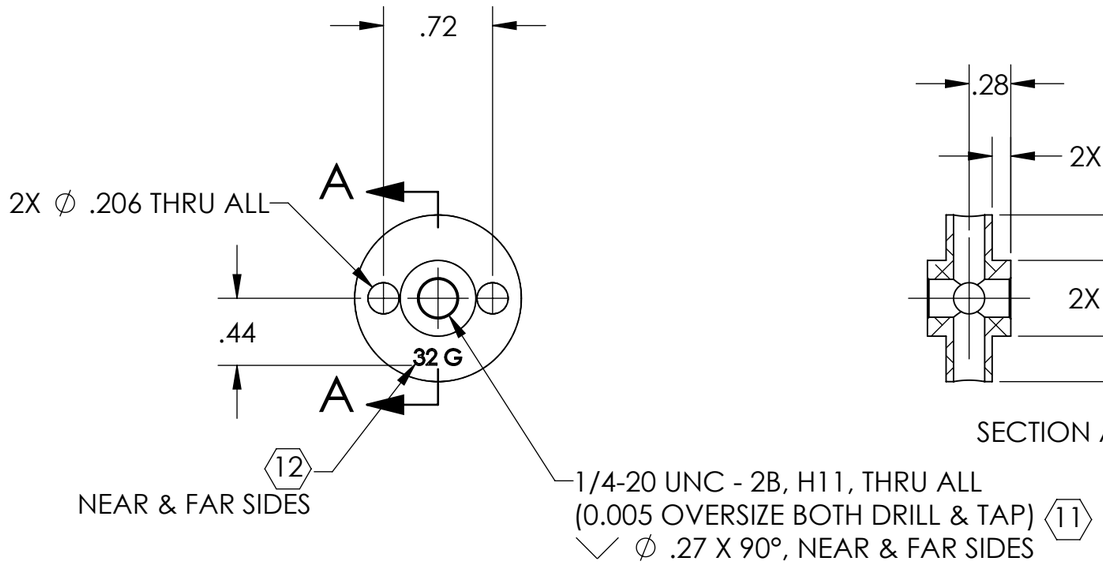
⟨11⟩ TAPPED HOLES: .005 OVERSIZE BOTH DRILL AND TAP.

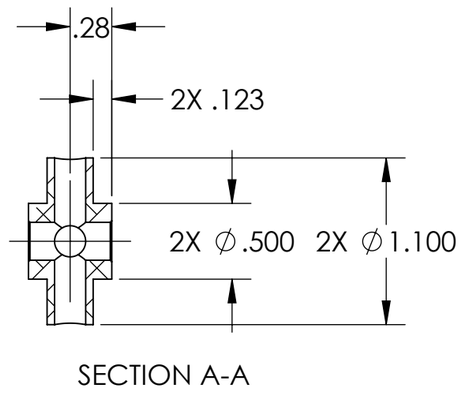
⟨12⟩ SCRIBE, ENGRAVE, LASER MARK, OR MECHANICALLY STAMP (NO INKS OR DYES), "32 G" FOR -01, "63 G" FOR -02, APPROXIMATELY CENTER JUSTIFIED AS SHOWN. CHARACTER HEIGHT 0.10-0.18. NEAR & FAR SIDES.

REV.	DATE	DCN #	DRAWING TREE #
v1	19 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-

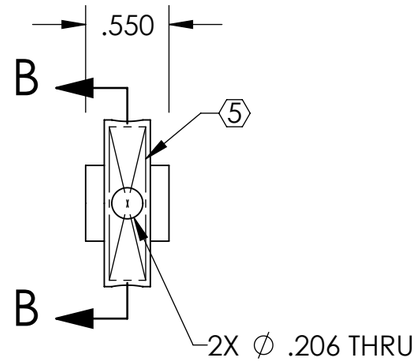


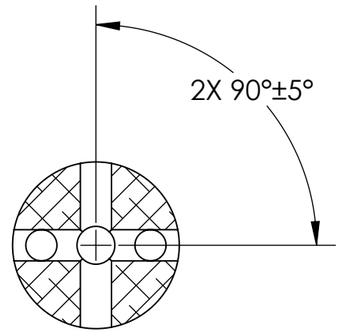
-01





SECTION A-A



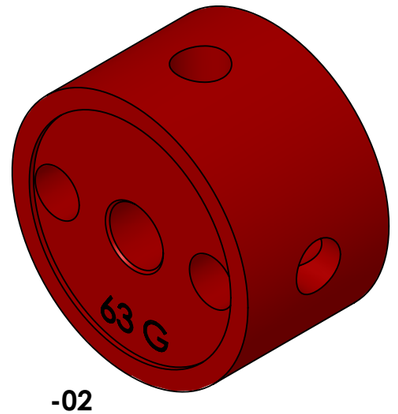


SECTION B-B

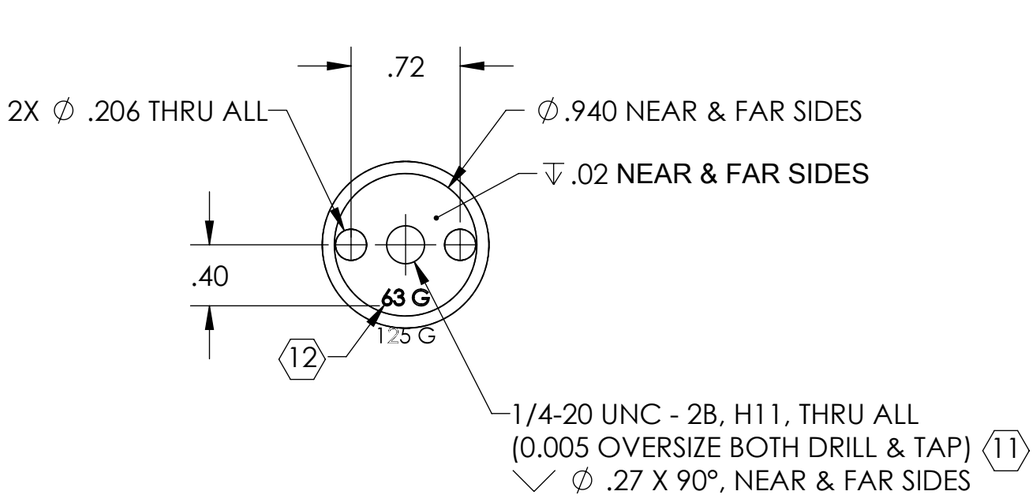
D1200432 aLIGO TMS Small Balance Weight, PART PDM REV: X-011, DRAWING PDM REV: X-006

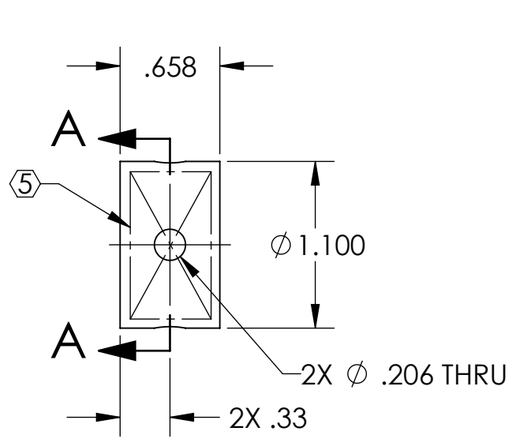
NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)							
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.	MATERIAL: 304 SSTL	FINISH: 63 µinch Ra	LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	NEXT ASSY: VARIOUS

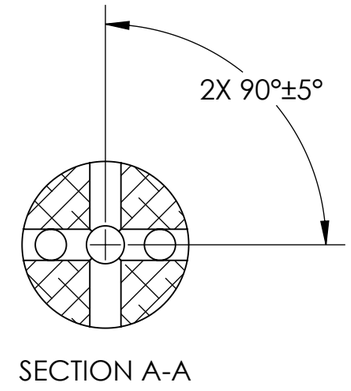
PART NAME: aLIGO TMS SMALL BALANCE WEIGHT					
DESIGNER	C. CONLEY	12 MAR 2012	SIZE: B	DWG. NO.: D1200432	REV.: v1
DRAFTER	C. CONLEY	19 MAR 2012			
CHECKER	SEE DCN				
APPROVAL	SEE DCN		SCALE: NONE	PROJECTION:	SHEET 1 OF 2



-02







SECTION A-A

D1200432 aLIGO TMS Small Balance Weight, PART PDM REV: X-011, DRAWING PDM REV: X-006

LIGO	CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		
SIZE B	DWG. NO. D1200432	REV. v1	
SCALE: NONE	PROJECTION:	SHEET 2 OF 2	

NOTES CONTINUED:

5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART): 001-v1
   EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD

6. MASS: 8.1 G [0.018 LB]

7. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.

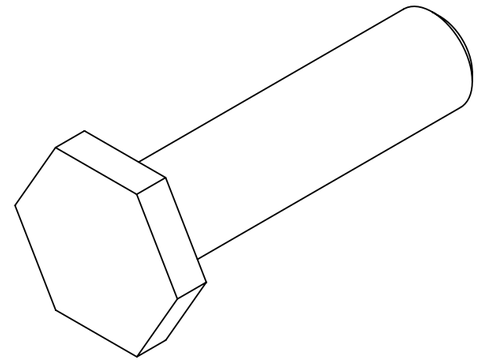
8. MAKE FROM: 1/4-20 HEX HEAD CAP SCREW PER MS35307.
   (300 SERIES STAINLESS STEEL)

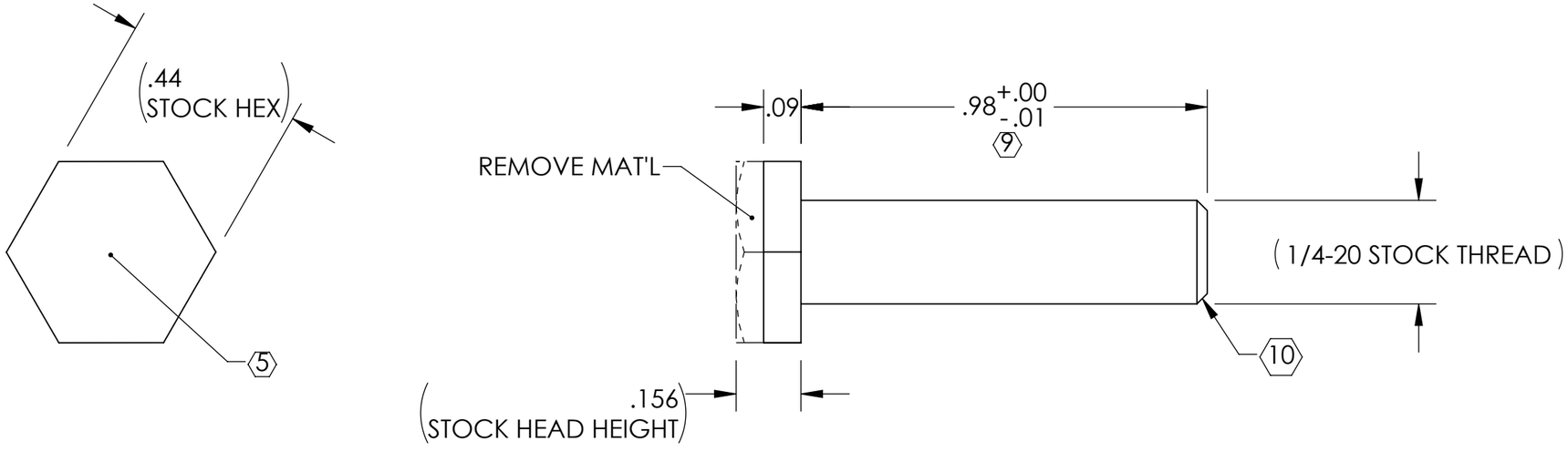
9. MACHINE TO SPECIFIED LENGTH, IF REQUIRED, TO MEET NOTED DIMENSION.

10. IF LENGTH MACHINING IS REQUIRED, CHAMFER END 45° TO THE THREAD MINOR DIAMETER.

11. 63 mINCH Ra FINISH APPLIES ONLY TO MACHINED SURFACE. STOCK THREAD AND PART SURFACES TO BE UN-MARRED.

REV.	DATE	DCN #	DRAWING TREE #
v1	20 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-





NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)								
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS MASS CABLE CLAMP SCREW			
	MATERIAL: 8	FINISH: 63 µinch Ra 11	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: C. CONLEY 19 MAR 2012	SIZE: B	DWG. NO.: D1200476	REV.: v1
			NEXT ASSY: D1200421		DRAFTER: C. CONLEY 20 MAR 2012			
					CHECKER: SEE DCN			
					APPROVAL: SEE DCN	SCALE: NONE	PROJECTION:	SHEET 1 OF 1

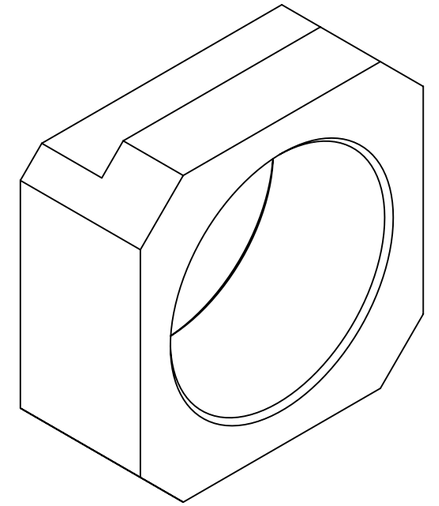
D1200476 aLIGO TMS Mass Cable Clamp Screw, PART PDM REV: X-012, DRAWING PDM REV: X-007

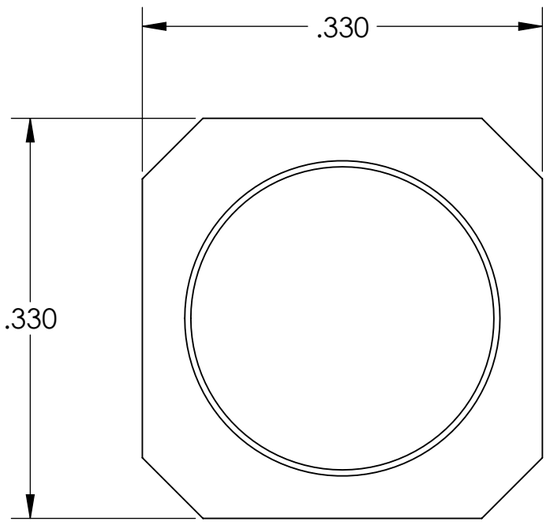
NOTES (CONTINUED):

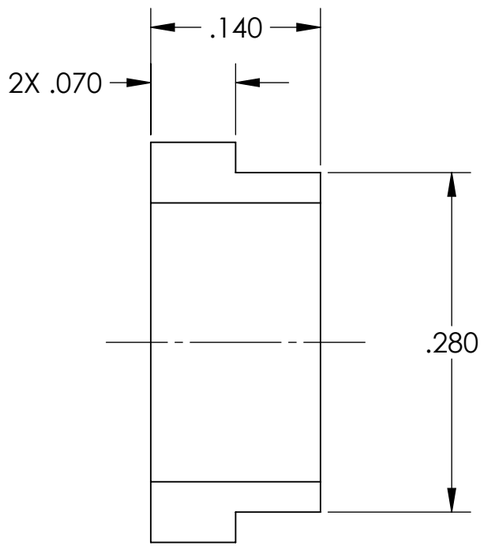
5. SCRIBE, ENGRAVE, LASER MARK OR MECHANICALLY STAMP (NO DYES OR INKS) A UNIQUE THREE DIGIT SERIAL NUMBER & REVISION NUMBER ON EACH PART. SERIAL NUMBERS START AT 001 FOR THE FIRST ARTICLE AND PROCEED CONSECUTIVELY. BAG AND TAG PARTS WITH THEIR DRAWING PART NUMBER, REVISION, VARIANT OR "TYPE" (IF APPLICABLE), AND QUANTITY. IF PARTS ARE TOO SMALL TO SCRIBE, BAGGING AND TAGGING ALONE IS SUFFICIENT.
   EXAMPLE (PART): 001-v1
   EXAMPLE (TAG): DXXXXXXX-VY, TYPE-XX, QTY: TBD
6. MASS: 0.981 G [0.002 LB].
7. MACHINE ALL SURFACES TO REMOVE OXIDES AND MILL FINISH, USE OF ABRASIVE REMOVAL TECHNIQUES IS NOT ALLOWED.
8. ALL PARTS SHALL BE MANUFACTURED IN ACCORDANCE WITH LIGO SPECIFICATION E0900364.
9. NO REPAIRS SHALL BE MADE UNLESS APPROVED IN ADVANCE, AND IN WRITING, BY LIGO LABORATORY. IN GENERAL, WELD REPAIRS AND PRESS FIT INSERT REPAIRS ARE NEVER ACCEPTABLE; THE PART SHOULD BE MADE WITH VIRGIN MATERIAL. SPECIAL CIRCUMSTANCES CAN BE REVIEWED IF / WHEN BROUGHT TO THE ATTENTION OF LIGO CONTRACTING OFFICER'S REPRESENTITIVE (COTR) THROUGH A MATERIAL REVIEW BOARD (MRB) PROCESS, REFER TO LIGO-E0900364.

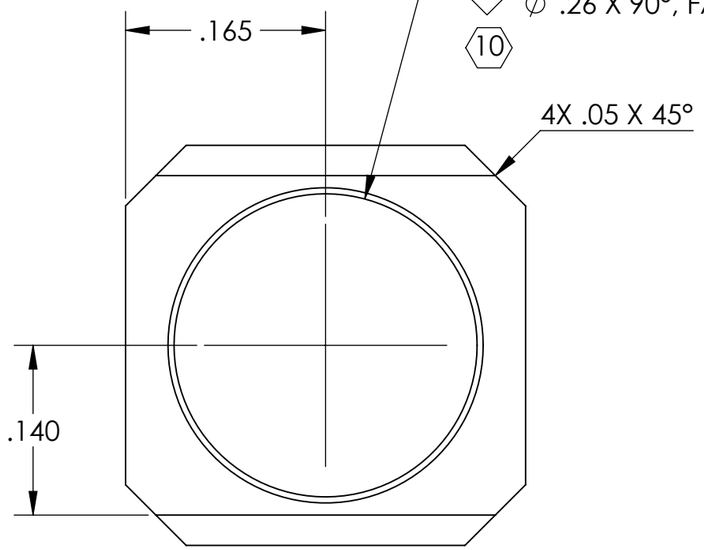
⟨10⟩ TAPPED HOLE: 0.005 OVERSIZE BOTH DRILL AND TAP.

REV.	DATE	DCN #	DRAWING TREE #
v1	23 MAR 2012	E1101214	-
-	-	-	-
-	-	-	-









NOTES AND TOLERANCES: (UNLESS OTHERWISE SPECIFIED)											
DIMENSIONS ARE IN INCHES TOLERANCES: .XX ± .01 .XXX ± .005 ANGULAR ± 1.0°	1. INTERPRET DRAWING PER ASME Y14.5-1994. 2. REMOVE ALL SHARP EDGES, .005-.015. 3. DO NOT SCALE FROM DRAWING. 4. ALL MACHINING FLUIDS MUST BE FULLY SYNTHETIC, FULLY WATER SOLUBLE AND FREE OF SULFUR, SILICONE, AND CHLORINE.		LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		PART NAME: aLIGO TMS MASS CABLE CLAMP NUT					
	MATERIAL: NICKEL-COPPER ALLOY 400	FINISH: 63 µinch Ra	SYSTEM: ADVANCED LIGO	SUB-SYSTEM: AOS	DESIGNER: C. CONLEY 08 MAR 2012	SIZE: B	DWG. NO.: D1200477	REV.: v1		
			NEXT ASSY: D1200421		DRAFTER: C. CONLEY 23 MAR 2012					
					CHECKER: SEE DCN					
					APPROVAL: SEE DCN	SCALE: NONE	PROJECTION:	SHEET 1 OF 1		

D1200477 aLIGO TMS Mass Cable Clamp Nut, PART PDM REV: X-009, DRAWING PDM REV: X-005